

# Age and the role of restricted activities in adjustment to disability-related pain

Journal of Health Psychology  
2014, Vol. 19(8) 1025–1034  
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sagepub.co.uk/journalsPermissions.nav  
DOI: 10.1177/1359105313483156  
hpq.sagepub.com  


Ivan R Molton<sup>1</sup>, Adam T Hirsh<sup>2</sup>,  
Amanda E Smith<sup>1</sup> and Mark P Jensen<sup>1</sup>

## Abstract

Chronic pain is common in individuals with multiple sclerosis and spinal cord injury and is associated with depressed mood. This may be because pain creates interference in performing and enjoying valued activities. The importance of pain interference may also vary with age, since older adults may have lowered expectations regarding function. This study analyzed relationships among pain variables, age, and mood in 521 individuals with multiple sclerosis or spinal cord injury. As predicted, pain interference mediated the relationship between pain severity and depressed mood. There was no evidence that older adults were less distressed by pain interference than were younger adults.

## Keywords

chronic pain, multiple sclerosis, pain-related activity restriction, spinal cord injury

Being physically disabled encompasses a broad range of experiences, including physical changes and limitations, challenges to identity and roles, navigation of complex social and medical care systems, and social stigma. Determining which of these “disability-related” experiences are the strongest contributors to quality of life has become an important research target in rehabilitation medicine.

In persons aging with long-standing conditions associated with physical disability (e.g. spinal cord injury (SCI) or multiple sclerosis (MS)), the list of potential detractors from quality of life also includes a host of secondary health conditions, such as fatigue, nausea, imbalance, and weakness, that appear to worsen with age. One key secondary health condition in persons aging with disability is chronic pain,

and the study of chronic pain in persons with long-standing or acquired disabilities has gained a good deal of recent attention (e.g. Ehde et al., 2003; Jensen et al., 2004; Stroud et al., 2006). However, the mechanism(s) by which chronic pain influences quality of life in persons with disability is not completely understood. One strong possibility is that chronic pain exerts its negative effects by creating limitations in a person’s ability to perform or

<sup>1</sup>University of Washington School of Medicine, USA

<sup>2</sup>Indiana University—Purdue University Indianapolis, USA

## Corresponding author:

Ivan R Molton, Department of Rehabilitation Medicine,  
University of Washington School of Medicine, 1959 NE Pacific  
St, Box # 356490, Seattle, WA 98195, USA.  
Email: imolton@u.washington.edu

enjoy normal tasks of living. For example, chronic pain may limit an individual's ability to perform household tasks, to socialize, to be physically active, and to engage in pleasurable activities, and this restriction may then contribute to negative outcomes such as depressed mood. Indeed, pain-related interference with activities has been shown to be a key mediating variable in the relationship between pain and psychological distress in a number of studies of medical patients (Williamson, 1998; Williamson et al., 1998; Williamson and Schulz, 1995).

Chronological age also appears to be an important factor in the relationship between pain and psychological distress. Despite the increased prevalence of chronic pain in later adulthood and a well-documented impact of pain on quality of life (including sleep, social functioning, health care utilization and cost, and disability/functional dependence; Bookwala et al., 2003; Dorantes-Mendoza et al., 2007; Edwards, 2006; Ferrell et al., 1990; Gallagher et al., 2000), many studies have reported that older adults appear to be less bothered or emotionally impacted by chronic pain than are younger adults (Molton et al., 2007; Riley et al., 2000; Rustoen et al., 2005). A number of explanations for this effect have been proposed for this phenomenon (see Lachapelle and Hadjistavropoulos, 2005; Molton et al., 2007). For example, it may be that older adults experience improvements in pain-related coping that result over time (Edwards RR (2006); Riley et al., 2000; Sofaer et al., 2005). Alternately, given evidence that illness perceptions (the beliefs an individual holds about his or her illness) have strong effects on outcomes in persons with persistent pain (Treharne et al., 2005), it may be that older adults perceive pain-related limitations as more "normal" than do younger adults (Gibson & Helme, 2001), and therefore find them less psychologically threatening. In one landmark study on this topic, Williamson and Schulz (1995) examined the relative strength of pain-related activity restriction as a mediator of the relationship between pain and depression in adult cancer patients. Analyses

were also performed by age, with participants grouped as either older or younger than 65 years. Results suggested that the effects of pain on depressive symptoms were mediated entirely by pain-related activity restriction in the younger group but were only partially mediated by pain-related activity restriction in the older group. The authors proposed that older persons are likely less distressed by restricted activities because increasing age brings lowered expectations about functional status.

Although the interpretation that older adults are not as bothered by pain-related restrictions in activity is often discussed, there is a dearth of data that test this hypothesis directly, and the role of pain-related activity restriction has not received adequate examination in older adults with long-standing physical disabilities. Similarly, the association of pain-related interference in depression has not been investigated during middle-age, when many individuals with physical disabilities are forced by worsening symptoms to move into early retirement (e.g. Johnson et al., 2010). Given the increasing prevalence of disability in aging (as well as the increased longevity of adults living with childhood disabilities), understanding the ways in which pain interferes with quality of life in the disabled population is an important area for research.

## **The present study**

The present study sought to extend previous work in disability-related chronic pain by evaluating the relationships among chronic pain, pain-related interference with activities, and depressed affect in a group of individuals with disability due to either SCI or MS. SCI is commonly associated with a number of chronic pain problems, including musculoskeletal and neuropathic pain (Ehde et al., 2003; Finnerup et al., 2001). Recent evidence suggests that the vast majority of patients with SCI report chronic painful sensations, and that as many as one-third of these patients describe the pain as severe (Jensen et al., 2004; Siddal and Loeser,

2001; Widerstrom-Noga and Turk, 2003). Chronic pain is also recognized as a common symptom in MS, with one study reporting that 65 percent of individuals with MS experience pain, and that 32 percent report pain among the most severe symptoms of their disease (Stenager et al., 1995).

The present study was also designed to evaluate the effect of chronological age in these relationships. Based on the extant literature, we hypothesized that pain-related interference with activities would mediate the relationship between pain severity and depressed mood, but that the strength of this effect would be smaller (or absent) among older participants.

## Methods

### *Recruitment procedures*

Individuals with MS or SCI were recruited for participation in this study via a combination of methods. Invitations were sent to subjects who participated in previous University of Washington Studies through the University of Washington Disability Registry, the University of Washington Center on Outcomes Research in Rehabilitation, and through disability specific registries (e.g. the Northwest Regional Spinal Cord Model Systems Research Registry). Participants also responded to web and print advertisements that were posted in clinics and with disability support organizations (National MS Society) and through friends and family members who referred them to the study.

All interested subjects were eligible for participation if they were 18 years of age or older; could read, write, and understand English; and had a self-report diagnosis of MS or SCI. Surveys were mailed to all eligible and interested subjects along with a postage paid return envelope. Reminder letters were sent 3–6 weeks after the survey was mailed to those who had not yet returned their survey. Research assistants reviewed returned surveys for missing data and made up to three follow-up calls to retrieve the data. All participants were sent a

check for US\$25 after their survey was returned. All subjects provided informed consent and all procedures were approved by the Human Subjects division of the University of Washington.

Of the 1087 surveys that were returned (92% response rate), 11 were excluded due to lack of signed consent, due to lack of true diagnosis of disability, because the survey was returned after the dataset was finalized, or because the subject wished to withdraw from the study. A total of 1076 surveys were included in the final dataset (MS = 584, SCI = 492). Our measure of pain interference with activities was administered to only a randomly selected subset of these participants, making for a final sample size of 521 (MS = 282, SCI = 239).

### *Measures*

*Demographic and clinical characteristics.* Participants provided information about their age, race and ethnicity, education level, marital status, and employment status. They also completed clinical questions regarding their injury/disease status, including the date of onset.

*Pain severity.* Average pain severity for the past week was assessed using a standard 11-point numeric rating scale (NRS) ranging from 0 (no pain) to 10 (pain as bad as could be). NRSs are commonly used in pain research, and substantial evidence supports their validity as measures of pain severity across pain problems and populations (Jensen and Karoly, 2000), including older adults (Hadjistavropoulos et al., 2007).

*Pain-related interference.* Pain-related interference with activities was assessed using the Patient Reported Outcomes Measurement Information System (PROMIS) Pain Interference Short Form (PRO-PI-SF), developed under the National Institutes of Health's recent PROMIS. (Amtmann et al., 2010). This 6-item measure assesses the degree to which pain has interfered with meaningful activities including day-to-day functioning, ability to

concentrate, social activity, and ability to enjoy recreation, over the past 7 days. Items include “How much did pain interfere with your day-to-day activities?” “How much did pain interfere with doing your tasks away from home (e.g. getting groceries, running errands) and “How often did pain keep you from socializing with others?” Responses are provided on a 5-point anchored scale ranging from “not at all” to “very much.”

**Depression.** Depressed mood is a critical outcome variable in pain research, and it has been shown to predict poorer quality of life in individuals with chronic pain (Orenius et al., 2013). In the present study, depression was measured using the Patient Health Questionnaire-9 (PHQ-9), a depression module taken from the Primary Care Evaluation of Mental Disorders (PRIME-MD) measure. The PHQ-9 consists of 9 items reflecting the nine diagnostic criteria for major depressive episode in the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., text rev.; *DSM-IV-TR*). The PHQ-9 has been shown to be effective in screening for depression among the general population in a primary care setting (Spitzer et al., 1999) as well as in patients with MS (Ferrando et al., 2007) and SCI (Richardson and Richards, 2008).

### Statistical analyses

Descriptive statistics were computed to characterize the study sample. For all subsequent analyses, participants were divided into the following three age groups: 18–45 years ( $n = 90$ ), 45–65 years ( $n = 367$ ), and 65+ years ( $n = 64$ ). These groups are referred to as *younger aged*, *middle-aged*, and *older aged*, respectively. The cutoffs for these age groups were chosen to remain consistent with previous work (e.g. Boerner, 2004; Keefe and Williams, 1990) and because they represent developmentally important transition periods in life. For example, the younger age group (mean age = 37.0 years) was thought to represent a period that is often associated with early career development and/or family

planning. The middle-age group (mean age = 54.9 years) was expected to capture a period that is often notable for career peak, retirement planning, family individuation, and/or the early experience of an “empty nest.” Finally, the older age group (mean age = 71.0 years) was thought to represent a period that is often associated with postretirement and transition to older adulthood.

**Control variables.** Next, we tested for differences among the three age groups on demographic and clinical variables. These analyses consisted of chi-square tests for categorical variables and one-way analyses of variance (ANOVAs) (with Sidak-corrected post hoc tests) for continuous variables. Variables that significantly differed among the age groups were further analyzed to determine whether they were also significantly related to pain, depression, or pain-related interference with activities. In the event that a variable was related to both age and one or more of the primary variables (i.e. pain, depression, pain-related interference with activities), then it was included as a control in the subsequent mediation analyses.

An a priori decision was also made to control for participant sex and diagnostic group (i.e. MS or SCI) in the regression analyses. This decision was made in an attempt to equalize the groups as much as possible, given that sex is confounded with diagnostic group (men are more likely to sustain an SCI, e.g. Chiu et al., 2010; women are more likely to develop MS, e.g. Kuhlmann et al., 2009) and that diagnostic group is typically confounded with age (compared to those with SCI, individuals with MS tend to live longer and to be diagnosed later in life).

**Mediation analyses.** The primary analyses for this study were conducted to determine whether pain-related interference with activities mediated the relationship between pain severity and depression and whether the strength of this mediation varied as a function of age. We employed the standard Baron and Kenny (1986) approach for testing mediation. According to

this approach, four conditions must be satisfied to establish mediation. The first three conditions involve demonstrating significant associations between depression (dependent variable) and pain severity (predictor), between depression and pain-related interference (mediator), and between pain-related interference and pain severity. Finally, one must demonstrate that the association between pain severity and depression is attenuated after controlling for pain-related interference. Full mediation is indicated if the significant relationship between pain severity and depression is no longer significant after controlling for pain-related interference. Because changes in the number of variables (and therefore degrees of freedom) can lead to false-positive findings when relying on *p* values alone, it is common practice to also include a separate measure of the strength of the indirect effect. We used the Sobel test (Sobel, 1982) to determine the strength and significance of the indirect (mediated) effect whenever mediation occurred.

Prior to the mediation analyses, the statistical assumptions of multiple regression were tested for each age group. Then, the first three conditions of mediation were tested in a series of simple regressions. Following these analyses, a fourth regression was conducted in which pain severity and pain-related interference with activities were entered simultaneously in the model predicting depressed mood. This fourth regression allows one to determine whether the relationship between pain severity and depressed mood is attenuated after controlling for pain-related interference with activities. As previously noted, separate analyses were conducted for the three age groups: younger (18–45 years), middle (45–65 years), and older (65+ years).

## Results

### *Participant characteristics*

The study sample consisted of 521 adults who reported chronic pain secondary to either MS or SCI. The average age of the total sample was 51.8 years (SD = 12.00 years; range: 21–88 years). Table 1 presents the demographic and

clinical characteristics of participants in the three age groups.

### *Demographic and clinical characteristics among age groups*

Table 1 presents the results of the analyses examining age group differences across the demographic and clinical variables. Significant age-related differences emerged for variables pertaining to diagnosis, duration of injury/disease, race, marital status, and employment. Compared to the younger and middle-aged groups, older participants were more likely to be Caucasian, less likely to be African-American, and more likely to be widowed. Younger adults were more likely to have an SCI than MS. As would be expected, the older aged group had a longer duration of injury/disease than both the middle-aged and younger aged groups, and the middle-aged group had a longer duration than the younger aged group. Employment outside the home showed a linear decline with age, with significant differences present between all three age groups (16.5, 10.2, and 3.6 hours, respectively).

In addition, a nonsignificant trend was detected for depression ( $p = .07$ ) in which the older aged group endorsed fewer symptoms of depression than did the other age groups. Pain-related interference and pain severity levels were comparable across the three age groups.

### *Control variables*

As noted above, participant sex and diagnostic group were included (a priori) as control variables in the subsequent mediation analyses. In addition, injury/disease duration, ethnicity, and employment status met the above statistical criteria for inclusion in the subsequent analyses.

### *Mediation results*

All predictor and outcome variables were assessed at each level of age prior to further analysis. Standard statistical assumptions for all subsequent analyses were satisfied (data not presented).

**Table 1.** Demographic and outcome variables across age group.

	Younger aged	Middle-aged	Older aged	F	$\chi^2$	p
Diagnosis					13.96	<.001
Spinal cord injury	87	127	25			
Multiple sclerosis	61	182	39			
Years since onset (mean (SD))	10.6 (6.6)*†	17.4 (9.9)*‡	22.7 (13.0)†‡	42.95		<.001
Sex					2.0	NS
Men	61	120	31			
Women	87	189	33			
Ethnicity						
Hispanic	3	2	2		3.2	NS
Non-Hispanic White	126	297	61		17.3	<.001
African-American	15	8	0		17.0	<.001
Asian	2	1	1		20	NS
Education					4.28	NS
High school graduate or less	6	8	0			
Greater than high school	142	301	64			
Marital status						
Married/partnered	71	200	44		13.3	<.001
Not married/partnered	76	109	20			
Employment						
>20 hours	53	70	5		20.4	<.001
<20 hours or not employed	95	239	59			
PHQ-9 (mean (SD))	6.9 (5.3)	6.8 (5.1)	5.3 (5.2)	2.65		.07
Pain-related interference with activities (mean (SD))	12.5 (5.9)	13.6 (6.5)	13.41 (6.2)	1.3		NS
Average pain (mean (SD))	3.8 (2.6)	3.8 (2.4)	3.7 (2.7)	.03		NS

NS: not significant ( $p > .05$ ).

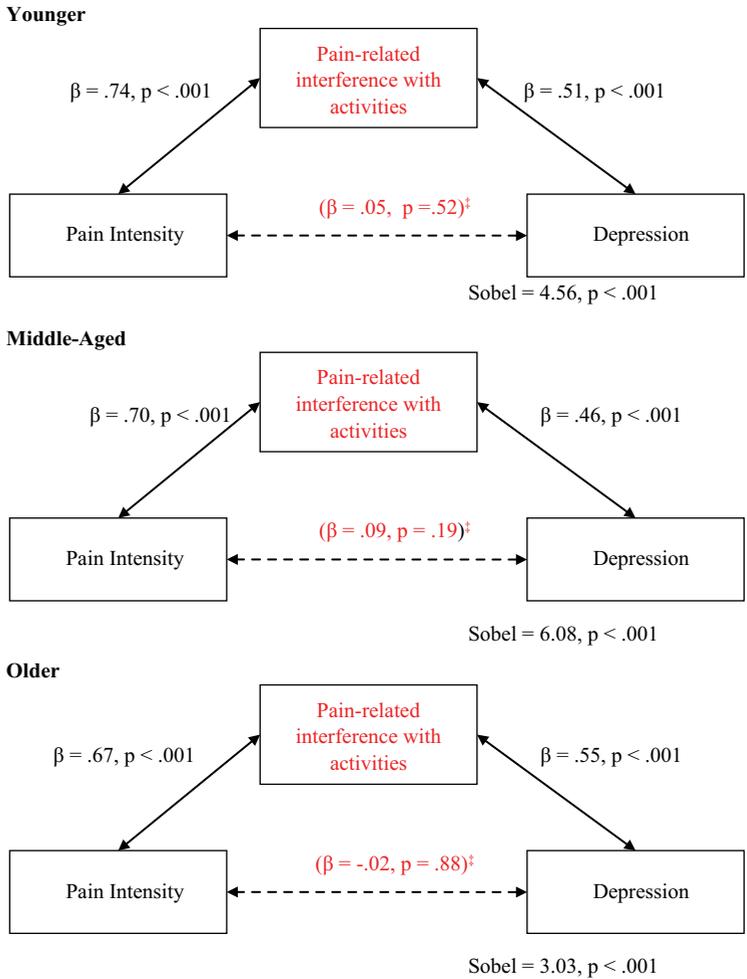
\*Significant difference between younger and middle-aged groups (after Sidak correction,  $p < .05$ ).

†Significant difference between younger and older groups (after Sidak correction,  $p < .05$ ).

‡Significant difference between middle-aged and older groups (after Sidak correction,  $p < .05$ ).

The results indicated that for all age groups, the first three conditions for the establishment of mediation were satisfied: (1) pain severity significantly predicted depression, (2) pain-related interference with activities significantly predicted depression, and (3) pain severity significantly predicted pain-related interference with activities. The results of the fourth regression indicated that for all age groups, the relationship between pain severity and depressed mood was fully mediated by pain-related interference with activities. That is, pain severity was no longer a significant predictor of depression after controlling for the interference

in activities caused by pain. The Sobel test was significant for each age group as well, supporting the conclusion that pain-related interference significantly mediated the relationship between pain severity and depression for younger aged, middle-aged, and older aged individuals with MS and SCI. Although mediation was supported for each age group, the strength of the indirect effect varied by age. The indirect effect was slightly stronger among middle-aged adults and slightly weaker in older aged adults (Sobel statistic: younger aged = 4.56; middle-aged = 6.08; older aged = 3.03;  $p < .001$  for all; see Figure 1).



**Figure 1.** Mediation by age group.  
<sup>‡</sup>Beta after inclusion of mediator variable.

**Discussion**

Consistent with findings from previous work, we found that interference on activities and enjoyment due to pain mediated the relationship between pain severity and depressed mood. Although this is now a fairly well-documented finding in a range of pain conditions including pediatric and cancer pain (Walters and Williamson, 1999; Williamson and Schulz, 1995), this study is the first to extend these findings to a sample of adults with pain that is

secondary to acquired neurological disability. In short, in persons with disabilities, it appears that the severity of chronic pain impacts mood primarily because it prevents a person from performing valued activities and from enjoying them, and these limitations then lead to emotional suffering

This study also sought to test the hypothesis that the pain severity → pain interference with activities → depression pathway would be either very weak or absent in older adults, based on the idea that older adults may have lowered

their expectations for functioning and therefore feel less threatened by restrictions in activities. Our findings did not support this hypothesis. Although the strength of pain-related interference as a mediating variable did vary slightly with age (with older adults showing the weakest mediation), the mediating relationship was present in all groups, and the size of the indirect effect did not differ dramatically across age cohorts. Thus, it appears that although the mediating role of pain-related interference with activities may be slightly less intense in older adults, older adults with disability remain bothered by the restrictions created by pain, and this appears to be an important pathway by which pain contributes to low mood. Although we did not measure cognitions directly, our data do not support the notion that older adults find activity restrictions due to pain less threatening or "more normal" than do younger adults.

It is also interesting to note that for middle-aged adults, levels of pain-related interference with activities were the highest, and the mediating effect of this interference was the strongest, relative to both younger and older aged participants. This makes conceptual sense when one considers the many activity requirements of middle-age, which may include raising children, peak work productivity, and in the case of the medically disabled, transition into retirement. Thus, middle-aged individuals with physical disability appear to be particularly vulnerable to depressed affect that is specifically tied to an inability to perform and enjoy important activities.

In reviewing literature at the intersection of aging, disability, and pain, a number of "paradoxes" become clear. For example, given that older adults often experience multiple losses, occurring simultaneously and within a short period of time, it would be logical to hypothesize that old age should be associated with decrements in well-being. However, these assumptions are not supported by data; it is now well documented that emotional well-being is relatively stable throughout adulthood and does not show large negative changes even in very old age (e.g. Kunzmann et al., 2000). Research has also shown that the

majority of individuals with a range of physically disabling conditions often report high levels of quality of life despite significant physical impairments (Albrecht and Devlieger, 1999). Data from the current sample are consistent with these notions of resiliency in older adults with disability, as the older participants in this study reported similar pain levels, as well as similar levels of pain-related interference, but lower levels of psychological distress than did their younger counterparts. This was true even after controlling for a number of potentially important confounds including sex, medical diagnosis, duration of symptoms, and current employment. This finding is consistent with previous work looking at pain in later adulthood (e.g. Molton et al., 2007; Riley et al., 2000; Rustoen et al., 2005).

However, it would be a mistake to infer from these findings that pain is not detrimental to older people, or that older persons are not bothered by the restrictions in activity that often accompany pain. Pain severity was a significant predictor of depression for *all* age groups in the present study. Although our findings and those of others indicate that older adults may suffer somewhat *less* with pain than their younger counterparts, they still suffer, and data from the present study suggest that they are *also* bothered by restrictions in their activities.

This study has a number of limitations worth discussing. Most importantly, these data are cross sectional, which significantly limit the ability to draw causal conclusions from the mediation analyses. However, the pathways tested in this study were derived from other studies utilizing longitudinal designs (e.g. Williamson and Schulz, 1995), which add some support to the interpretations that can be drawn from our cross-sectional model. Additionally, while this study is one of only a few to address issues of pain in adults aging with medical disabilities, it is possible that these individuals represent a special case in terms of pain-related interference, and may not generalize the population at large. Finally, the "old" group was really composed of young-old adults ( $M = 71.0$  years), which might explain similarities to the middle-aged and younger groups they were compared to;

that is, it remains possible that the mediation effect of pain interference on the pain severity → depression relationship is minimal in the elderly (e.g. >80 years old) with physical disabilities.

Despite these limitations, the study findings highlight the importance of addressing restrictions due to pain in the management of depression across the life span, and caution against the widely held assumption that for older adults, restriction in meaningful activities due to pain is normative and is not associated with psychological distress. Future studies might investigate the relative importance of pain-related interference with activities in older adults using key observable outcomes, such as social and community engagement and “life space” (Aberg, 2008). Moreover, the findings emphasize a need for further research examining the potential benefits of interventions that reduce the impact of pain on activities (e.g. in multidisciplinary pain treatment), depression, and quality of life in persons with disabilities.

## Funding

The contents of this article were developed under a grant from the Department of Education, NIDRR grant number H133B080024. However, these contents do not necessarily represent the policy of the Department of Education, and you should not assume endorsement by the Federal Government.

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