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Social support and physical activity as moderators of life stress in predicting baseline depression and change in depression over time in the Women's Health Initiative

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Abstract

Purpose—To determine whether social support and/or physical activity buffer the association between stressors and increasing risk of depression symptoms at baseline and at 3 year follow-up.

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Methods—This is a secondary analysis of data from the Women’s Health Initiative Observational Study. 91,912 community-dwelling post-menopausal women participated in this prospective cohort study. Depression symptoms were measured at baseline and 3 years later; social support, physical activity, and stressors were measured at baseline.

Results—Stressors at baseline, including verbal abuse, physical abuse, caregiving, social strain, negative life events, financial stress, low income, acute pain, and a greater number of chronic medical conditions, were all associated with higher levels of depression symptoms at baseline and new onset elevated symptoms at three year follow-up. Social support and physical activity were associated with lower levels of depressive symptoms. Contrary to expectation, more social support at baseline strengthened the association between concurrent depression and physical abuse, social strain, caregiving, and low income. Similarly, more social support at baseline increased the association between financial stress, income, and pain on new-onset depression 3 years later. Physical activity similarly moderated the effect of caregiving, income, and pain on depression symptoms at baseline.

Conclusion—Stressors, social support, and physical activity showed predicted main effect associations with depression. Multiplicative interactions were small in magnitude and in the opposite direction of what was expected.

Keywords

depression; risk factors; acute stress; chronic stress; protective factors; effect moderation

Introduction

Previous research has shown that negative life events (acute stressors) and chronic stressors increase risk for onset, persistence, or worsening of depression [1–3]. First, interpersonal events such as marital separations [4] or loss of a spouse [5] are associated with vulnerability to depression. In addition, the ongoing stress of having to provide significant care for a sick family member increases the risk of depression [6,7]. Second, having or developing a medical illness or pain also increases risk for onset of depression [5,8,9] Third, financial difficulties, including the chronic stress of a low income or acute stressors such as transitioning to welfare, can place one at risk for depression [2,1]. As women age, there is an increased likelihood of experiencing many of these life events, including death of a spouse, chronic illness [10], chronic musculoskeletal pain [11], and a lower income (relative to middle age/ pre-retirement) [12].

In contrast, there are protective factors that reduce risk of depression. Interpersonal protective factors include adequate social support, which may protect against the onset of depression [13] or may result in a more benign course of depression[2]. According to the buffering hypothesis, social support can protect a person from the potentially pathogenic influence of stressful events [14]. Previous data support the idea that social support may moderate (i.e., buffer) the effect of stressors on depression [5,13,15,16], including in older individuals [5], although other studies fail to find substantive support for this hypothesis [17–20]. However, we note that some of the negative findings may be due to insufficient power [20,18] or lack of differentiation between different types of stressors.

Another potential protective factor is physical activity. Individuals who engage in regular physical activity have less depression over time [21]. Preliminary evidence from randomized controlled trials suggests that regular aerobic exercise may be an effective intervention for adults with mild-moderate depression [22–24], and that aerobic exercise may be as effective as sertraline [25] or cognitive-behavioral therapy [26]. Physical activity may also serve as a buffer for the effect of stress on depression. This effect has been demonstrated in new

mothers; however, we were unable to find any research supporting this possibility in older women [27].

In sum, although it is well-established that certain stressors and protective factors are associated with changes in depression symptoms over time, less is known about effect moderation. Do social support and physical activity attenuate the effects of acute or chronic stressors? Do these protective factors attenuate the effects of particular stressors (but not others)? These questions can be difficult to answer because reliable detection of effect moderation (i.e., interaction effects) requires very large sample sizes [28]. Further, much of the previous research on moderation has used cross-sectional rather than longitudinal datasets, preventing assessment of change in depressive symptoms over time.

The objective of this study was to examine risk and protective factors for baseline depression symptoms and new-onset elevated depression symptoms three years later in older women. We used data from the Women's Health Initiative Observational Study (WHI-OS) cohort, which is a multisite longitudinal study designed to assess risk factors for numerous chronic diseases in a sample of almost 100,000 postmenopausal women [29].

First, we hypothesized that negative life events or ongoing stressors would predict increased likelihood of elevated depression symptoms at baseline. We examined interpersonal stressors (interpersonal negative life events, abuse, caregiving, and social strain); medical stressors (presence of medical conditions or pain); and financial stressors (low income or a negative financial event). Second, we hypothesized that protective factors (i.e., social support and physical activity) would be associated with decreased likelihood of elevated depression symptoms at baseline. Third, we hypothesized that social support and physical activity would moderate the effects of stressors on baseline depression, such that higher levels of social support or physical activity would be associated with an attenuated association between stressors and depression.

Next, we conducted longitudinal data analyses. All participants with elevated depression symptoms at baseline were excluded from the analysis. We hypothesized that putative risk factors would be associated with increased risk of elevated symptoms at year 3, whereas social support and physical activity would show a protective effect. Finally, we hypothesized that social support and physical activity at baseline would moderate the effects of baseline stressors on incident depression at year 3.

Methods

Women's Health Initiative: Participants

Postmenopausal women (aged 50–79) were recruited primarily through mass-mailings to participate in the Women's Health Initiative at one of 40 sites throughout the U.S between 1997–1998. The WHI study as a whole was designed to be as inclusive as possible and special efforts were made to recruit women from varying racial and ethnic backgrounds. Percentage of women from different racial or ethnic groups mirrored the general population [30]. Women who did not want to participate or were not eligible to participate (primarily for medical reasons) in WHI clinical trials were recruited into the Observational Study, on which these analyses are based. Exclusion criteria for the Observational Study included planning to move out of the area within 3 years, participating in a randomized trial, predicted survival of less than 3 years, alcohol or drug dependency, diagnosed mental illness that the participant felt would preclude her being able to participate, or dementia. All participants provided informed consent. The study was approved by the Institutional Review Boards of the participating sites.

Assessment Instruments

Depression in the previous week was assessed at baseline and at the three year follow-up using a modified 6-item version of the Center for Epidemiologic Studies – Depression Scale (CES-D[31–33]). Scores ranged from 0 to 18, with 18 representing more symptoms. As in previous studies of the Women’s Health Initiative, we used a cutoff of 5 or more to separate women into lower and higher levels of depression symptoms [33]. This corresponds to the commonly used cut-off of 16 on the full-scale CES-D score.

Demographics, including age, race, marital status, years of education, and total family income before taxes were assessed via self-report at baseline.

Physical abuse over the past year was assessed via a yes/ no question: “Were you physically abused by being hit, slapped, pushed, shoved, punched, or threatened with a weapon by a family member or close friend?” Verbal abuse in the past year was similarly assessed. Interpersonal life events over the past year were assessed via a series of yes/ no questions regarding death of a spouse or partner, serious illness in a spouse or partner, serious illness or death of a close friend or family member, divorce or break-up with a spouse or partner, divorce or break-up for a family member or close friend, and major conflict with children or grandchildren. We used the total number of interpersonal life events (not including verbal or physical abuse) for our data analyses. Finally, financial stress in the past year was assessed with the question: “Did you have major problems with money?” These stressful life events items, including verbal abuse, physical abuse, and financial stress originally came from the Alameda County Epidemiologic Study [34] and were later modified for the Beta Blocker Heart Attack Trial [35].

Caregiving was assessed using an item from the Cardiovascular Health Survey [36]: “Are you now helping at least one sick, limited, or frail family member or friend on a regular basis?” If yes, participants were asked to specify how often they helped in a week.

Social strain was assessed using four items from a measure of negative aspects of social relationships [37]. Participants were asked: “Of the people who are important to you, how many...” “get on your nerves?” “ask too much of you?” “do not include you?” and “try to get you to do things you don’t want to do?” Total scores could range from 4 (no social strain) to 20 (high social strain).

Pain over the past four weeks was assessed using 2 pain questions from the SF-36 questionnaire [38]. Higher scores indicate less pain (i.e., better health).

To assess total number of medical conditions, participants were asked: “Has a doctor ever told you that you have any of the following conditions or have you had any of the following procedures?” Participants could mark as many as applied. The list included 29 different common medical problems, such as heart problems, arthritis, hypertension, or cancer.

Social support was assessed using 9 items from the Medical Outcomes Study social support questionnaire [39]. Questions asked about four types of social support: emotional/ informational, affection, tangible, and positive social interaction. We used a total support index; scores could range from 9 to 45, with higher scores reflecting more social support.

To assess physical activity, women were asked how often they walked outside the home for more than 10 minutes and at what speed, as well as how often and for how long they engaged in strenuous, moderate, and mild exercise. Women were asked to estimate minutes per week. An estimated metabolic equivalent (MET) level for each type of activity was then assigned from a compendium of activities. MET level is kilocalories per kilogram of body weight expended each hour during a specific activity. This information was then

summarized into a continuous variable estimating total weekly energy expenditure (MET-hours per week), which quantifies the total kilocalories expended per kilogram per week. MET units are independent of body weight. Previous publications from the WHI study have documented that 3-month test-retest reliability of METS/week (categorized into 4 levels), conducted on a subsample of participants was good ($\kappa = 0.77$; [40]). In a study that compared the questionnaire data with accelerometer data, questionnaire reliability was good ($r = 0.73$, and 100% sensitivity for meeting the physical activity guidelines; [41]).

Data Analyses

After compute descriptive statistics (i.e., frequencies, means, and standard deviations (SDs)), we log-transformed non-normally distributed variables (e.g., physical activity), and we standardized continuous variables, including social strain, acute pain, social support, and log-transformed physical activity (to have a mean of 0, standard deviation of 1). We used unadjusted logistic regression models to determine whether demographics, stressors, and social support and physical activity were each associated with depression status at baseline. Each variable (i.e., stressor, social support, and physical activity) was examined in a separate logistic regression. We repeated these logistic regressions, adjusting for age, race/ethnicity and marital status. (We did not adjust for indicators of social economic status because income was one of the stressors that we were examining.) We conducted formal tests for interactions for each stressor and moderator (i.e., social support and physical activity) by including both main effects and the multiplicative interaction term in a logistic regression model. In order to determine whether the interaction term significantly improved model fit, we used a χ^2 test for differences in log-likelihood between logistic regression models with and without the interaction term.

Next, we examined longitudinal data to evaluate the association between stressors as predictors of incident depression at year 3. We conducted this analysis among a cohort without elevated depression symptoms at baseline ($n=67,972$). We used logistic regression analyses similar to the procedures described above, with depression symptom status after 3 years as the outcome variable.

Results

As depicted in Table 1, depressed individuals tended to be slightly younger, were more likely to be African American, Hispanic/ Latino, or “other;” and were less likely to be Asian. Increasing levels of education were associated with lower levels of depressive symptoms, as was being married or partnered.

Table 2 shows associations between stressors, social support, physical activity, and depression at baseline. Verbal abuse, physical abuse, increased levels of caregiving, increased social strain, more negative life events, acute financial stress, lower income, acute pain, and more chronic medical conditions were all associated with increased likelihood of elevated depression symptoms. More social support and more physical activity were associated with decreased likelihood of elevated depression symptoms at baseline, even when adjusting for demographics. We also re-ran all analyses, including baseline use of antidepressants as a covariate; that did not change the magnitude or statistical significance of the ORs (results not shown in the table; available upon request).

Next, we examined interactions between social support and life stressors in predicting baseline depression levels. Social support significantly moderated the effect of physical abuse (χ^2 difference test = 7.33, $df = 1$, $p < .05$), caregiving (χ^2 difference test = 10.81, $df = 1$, $p < .05$), social strain (χ^2 difference test = 5.31, $df = 1$, $p < .05$), and income (χ^2 difference test = 22.32, $df = 2$, $p < .05$) on depression status at baseline. In order to elucidate the

statistically significant moderation effects, we present odds ratios stratified by social support levels in Table 3, and depict the interactions in Figure 1. All interactions show the same pattern. Contrary to our hypothesis, ORs representing the association between stressors and depression get larger as social support is better. An examination of Figure 1 clarifies this association: the reason that the ORs are larger when social support is higher may be that, in the absence of the stressor (e.g., physical abuse), the predicted probability of depression at higher levels of social support is much lower than at lower levels of social support. Although in linear regression, interactions represent departure from additivity, in logistic regression, interactions represent departure from multiplicativity [42]. Analysis of probabilities depicted in Figure 1 suggests that some of the results we found may be consistent with a departure from additivity *in the hypothesized direction* (e.g., for physical abuse and social strain [42]), with social support serving as a buffer. Regardless, inspection of Figure 1 indicates that the magnitude of the interaction effects is small.

We also examined interactions between physical activity and life stressors in predicting baseline depression. Physical activity significantly moderated the effect of caregiving (χ^2 difference test = 7.01, df = 1, $p < .05$), income (χ^2 difference test = 15.64, df = 2, $p < .05$), and pain (χ^2 difference test = 16.73, df = 1, $p < .05$). We present ORs stratified by level of physical activity in Table 3, and depict the interactions in Figure 2. We found the same pattern of results as with the social support interactions. However, it appears that the magnitudes of the interaction effects are very small.

Table 3 shows results of a series of logistic regressions examining whether stressors, social support, and physical activity at baseline predicted increased likelihood of incident depression symptoms 3 years later. All stressors predicted increased likelihood of new onset depression three years later, and higher levels of social support and physical activity predicted decreased likelihood of new onset depression three years later. We also re-ran analyses, including baseline use of antidepressants as a covariate; that did not change the magnitude or statistical significance of the ORs (results not shown in the table; available upon request).

Turning to moderators, social support moderated the effect of three variables on subsequent depression status: financial stress (χ^2 difference test = 4.08, df = 1, $p < .05$), income (χ^2 difference test = 15.89, df = 2, $p < .05$), and pain (χ^2 difference test = 6.01, df = 1, $p < .05$). See Table 5 and Figure 3. All three variables show the same pattern as seen in the baseline analysis. From a multiplicative interaction perspective, the effect of the stressor on depression gets larger as social support is higher; however, overall magnitude of interaction effects is quite small. Physical activity did not significantly moderate the effect of any of the stressors on incident depression 3 years later.

Discussion

As women age, they have an increased likelihood of experiencing certain acute or chronic stressors. We found that interpersonal, medical, and financial stressors were associated with concurrent elevated depression symptoms as well as risk of depression symptoms increasing over 3 years time. This was true despite the fact that older individuals, relative to younger people, may show decreased negative reactivity to life stressors [43]. We also found that social support and physical activity were associated with lower concurrent levels of depression symptoms, and lower risk of incident depression symptoms over a 3-year time period.

Given that many stressors are hard to avoid, it is essential to investigate what buffers the effects of these stressors. When we examined whether social support or physical activity

served to buffer the effects of stressors on depression, we in fact found the opposite of what we hypothesized. That is, the association between certain stressors and depression got somewhat stronger at higher levels of social support or physical activity (i.e., ORs were larger at higher levels of social support/ physical activity). It appears that this is related to the fact that social support and physical activity are themselves negatively associated with depression, and women with higher levels of social support or physical activity were less likely to be depressed in the absence of a stressor, and therefore the presence of a stressor multiplied their risk for depression to a greater degree than it did for women with lower social support or physical activity. Significant interaction terms in logistic regression represent a departure from multiplicativity (rather than a departure from additivity, as in linear regression). There is some discussion in the literature about how it may be useful to examine interactions in logistic regression as defined by departures from additivity rather than multiplicativity [42,44]. Inspection of our data suggest that some of our results might be consistent with a departure from additivity as hypothesized (i.e., with social support potentially serving as a buffer for the effects of physical abuse and social strain). However, the entire discussion must be contextualized by the fact that the magnitude of any interaction appears small.

That said, social support did serve as powerful predictor of depression. McEwen and Sapolsky [45] have suggested that engagement in a more socially and emotionally supportive environment results in lower levels of physiologic arousal; this in turn protects against cognitive decline and depression secondary to direct positive stimulatory effects on the brain. Fortunately, the social environment is modifiable. For example, one can directly increase social support through participation in support groups or other organizations that promote social bonds such as religious or civic groups. Alternatively, behavioral health specialists can also indirectly help to increase an older individual's social support through teaching of skills directed at gaining needed support [46]. Similarly, physical activity was associated with lower depression levels, both concurrently and prospectively, and therefore may still be useful in decreasing the likelihood of depression as women age.

One of the strengths of this study was the large sample size; this is particularly important in order to have sufficient power to examine interaction effects. This cohort is also diverse in terms of geographic region of the country and race/ ethnicity. Results must also be interpreted in the context of study limitations. First, we used a brief measure of depressive symptoms rather than a measure of diagnostic depression. A high score on this measure is not the equivalent of having a diagnosis of major depression [47], although some argue that depressive symptoms do exist on a spectrum [48]. Similarly, WHI did not include commonly used but longer measures of life stress due to concerns about participant burden and the fact life stress was not a primary outcome. Second, the three year time lapse between assessments at time 1 and time 2 is arbitrary. It may be that there are effects at a 1 year time point that deteriorate by the 3 year time point. Finally, because this is an observational study, our longitudinal data analyses are consistent with, but do not prove, a causal relationship.

In spite of these limitations, this study extends existing literature on stressors, social support, and physical activity, and their robust associations with depression in older women. Encouragement of physical activity, and increasing social support, may help protect against increases in depression symptoms.

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Figure 1.
Predicted probability of depression at baseline stratified by social support levels

Figure 2.
Predicted probability of depression at baseline stratified by physical activity levels

Figure 3.
Predicted probability of depression at year 3 stratified by social support levels

Table 1

Demographic characteristics presented by depression status at baseline

	Depressed	Not Depressed	Crude OR	95% CI
Total Sample	14,763	77,149		
Race				
Caucasian	11,702	65,229	REF	REF
African American	1,448	5,885	1.37	1.29, 1.46
Hispanic/Latino	972	2,366	2.29	2.12, 2.47
Asian	287	2,342	0.68	0.60, 0.77
Other	310	1,116	1.55	1.36, 1.76
Education				
Less than High School Grad	1,293	3,271	REF	REF
High School Graduate	2,693	12,108	0.56	0.52, 0.61
Some College	5,665	27,706	0.52	0.48, 0.56
College Graduate	4,965	33,475	0.38	0.35, 0.40
Marital status				
Married/Marriage-like Relationship	8,004	48,900	0.69	0.66, 0.71
Single/Divorced/Widowed	6,670	27,902	REF	REF
Mean Age (SD)	62.8 (7.6)	63.7 (7.3)	0.98	0.98, 0.99

Note. REF = reference category

All p-values are <0.0001

Table 2

Stressors and protective factors presented by depression status at baseline

	Depressed	Not Depressed	Crude OR	95% CI	AOR ^a	95% CI
Total sample	14,763	77,149				
Verbal abuse						
Yes	3,516	6,493	3.41 *	3.26, 3.57	3.38 *	3.23, 3.54
No	11,204	70,531	REF	REF	REF	REF
Physical abuse						
Yes	524	591	4.77 *	4.24, 5.37	4.23 *	3.74, 4.77
No	14,215	76,484	REF	REF	REF	REF
Caregiving						
2 times/week or less	11,763	66,006	REF	REF	REF	REF
3 times/week or more	2,891	10,720	1.51 *	1.45, 1.58	1.52 *	1.45, 1.59
Social Strain	Mean = 8.00 SD = 3.0	Mean = 6.21 SD = 2.3	1.87 * ^b	1.84, 1.90 ^b	1.84 * ^b	1.81, 1.88 ^b
Acute life events						
No major life event	2,166	25,282	REF	REF	REF	REF
1 major life event	1,048	9,299	1.32 *	1.22, 1.42	1.30 *	1.20, 1.41
2 major life events	1,974	14,714	1.57 *	1.47, 1.67	1.56 *	1.46, 1.66
3 major life events	9,560	27,783	4.02 *	3.82, 4.22	3.81 *	3.62, 4.01
Acute financial stress						
Yes	6,892	17,243	3.05 *	2.94, 3.17	2.83 *	2.73, 2.94
No	7,814	59,686	REF	REF	REF	REF
Income (Annual household)						
<\$20,000	3,359	10,166	2.37 *	2.25, 2.49	2.42 *	2.28, 2.57
\$20,000 – \$49,999	5,981	31,083	1.38 *	1.32, 1.44	1.45 *	1.38, 1.51
>\$50,000	4,241	30,415	REF	REF	REF	REF
Acute Pain – SF-36 ^c	Mean = 62.27 SD = 27.5	Mean = 76.55 SD = 22.1	0.58 * ^b	0.57, 0.59 ^b	0.58 * ^b	0.57, 0.59 ^b
Number of chronic conditions						

	Depressed	Not Depressed	Crude OR	95% CI	AOR ^a	95% CI
0	1,265	9,807	REF	REF	REF	REF
1	2,283	15,909	1.11	1.03, 1.20	1.18 [*]	1.09, 1.27
2	2,698	15,953	1.31 [*]	1.22, 1.41	1.46 [*]	1.35, 1.57
3+	7,579	31,769	1.85 [*]	1.74, 1.97	2.21 [*]	2.07, 2.36
Social Support	Mean = 31.07 SD = 8.9	Mean = 36.87 SD = 7.3	0.51 ^{ab}	0.50, 0.52 ^b	0.50 ^{ab}	0.49, 0.51 ^b
Physical Activity – MET hours/ week	Mean = 11.00 SD = 13.1	Mean = 14.22 SD = 14.5	0.94 ^{cd}	0.93, 0.94 ^d	0.94 ^{cd}	0.93, 0.95 ^d

^{*} $p < 0.0001$

Note. REF = reference category.

^a Adjusted for race/ethnicity, age, marital status

^b Based on standardized value (mean = 0, SD = 1)

^c Higher score indicates more favorable health state

^d Based on log transformed value and standardized value

Table 3

Odds ratios depicting interactions that significantly predict depression status at baseline

	Social Support Levels			Physical Activity Levels		
	1 SD below the mean	Mean	1 SD above the mean	1 SD below the mean	Mean	1 SD above the mean
Physical abuse						
Yes	3.23	3.78	4.42			
No	REF	REF	REF			
Caregiving						
2 times/ week or less	REF	REF	REF	REF	REF	REF
3 times/ week or more	1.38	1.49	1.60	1.42	1.50	1.59
Social strain ^a	1.64	1.67	1.70			
Income (annual household)						
<\$20,000	1.43	1.61	1.81	2.06	2.26	2.48
\$20,000–\$49,000	1.08	1.12	1.16	1.29	1.33	1.38
>\$50,000	REF	REF	REF	REF	REF	REF
Acute pain ^a				0.61	0.59	0.57

Note. REF = reference category. Cells are left blank when there is not a statistically significant interaction effect.

^aBased on standardized value (mean = 0, SD = 1)

Table 4

Stressors and protective factors presented by depression status at year 3 follow-up amongst those not depressed at baseline (N=67,972)

	Depressed	Not Depressed	Crude OR	95% CI	AOR ^a	95% CI
Total sample	7,751	60,221				
Verbal abuse						
Yes	998	4,625	1.78*	1.65, 1.91	1.78*	1.65, 1.91
No	6,736	55,513	REF	REF	REF	REF
Physical abuse						
Yes	92	354	2.03*	1.61, 2.56	1.97*	1.56, 2.49
No	7,650	59,817	REF	REF	REF	REF
Caregiving						
2 times/week or less	6,342	52,008	REF	REF	REF	REF
3 times/week or more	1,371	7,900	1.43*	1.34, 1.52	1.42*	1.33, 1.51
Social Strain	Mean = 6.95 SD = 2.6	Mean = 6.07 SD = 2.2	1.46* ^b	1.42, 1.49 ^b	1.46* ^b	1.42, 1.50 ^b
Acute life events						
No major life event	1,946	20,551	REF	REF	REF	REF
1 major life event	847	7,431	1.20*	1.11, 1.31	1.21*	1.11, 1.31
2 major life events	1,428	11,699	1.29*	1.20, 1.39	1.28*	1.19, 1.38
3 major life events	3,526	20,494	1.82*	1.71, 1.93	1.79*	1.69, 1.90
Acute financial stress						
Yes	2,471	11,971	1.89*	1.79, 1.99	1.89*	1.79, 2.00
No	5,256	48,101	REF	REF	REF	REF
Income (Annual household)						
<\$20,000	1,273	6,988	1.70*	1.58, 1.83	1.88*	1.73, 2.05
\$20,000 – \$49,999	3,262	24,248	1.25*	1.19, 1.32	1.33*	1.26, 1.41
>\$50,000	2,674	24,931	REF	REF	REF	REF
Acute Pain – SF-36 ^c	Mean = 69.37 SD = 24.6	Mean = 77.94 SD = 21.2	0.68* ^b	0.67, 0.70 ^b	0.69* ^b	0.67, 0.70 ^b
Number of chronic conditions						

	Depressed	Not Depressed	Crude OR	95% CI	AOR ^a	95% CI
0	708	8,094	REF	REF	REF	REF
1	1,366	12,870	1.21 [*]	1.10, 1.33	1.24 [*]	1.13, 1.37
2	1,407	12,736	1.26 [*]	1.15, 1.39	1.32 [*]	1.20, 1.46
3+	3,841	23,866	1.84 [*]	1.69, 2.00	2.00 [*]	1.83, 2.18
Social Support	Mean = 35.08 SD = 7.8	Mean = 37.3 SD = 7.0	0.74 [*] <i>b</i>	0.72, 0.76 <i>b</i>	0.72 [*] <i>b</i>	0.70, 0.73 <i>b</i>
Physical Activity MET hours/ week	Mean = 12.77 SD = 14.0	Mean = 14.69 SD = 14.6	0.96 [*] <i>d</i>	0.95, 0.97 <i>d</i>	0.96 [*] <i>d</i>	0.96, 0.97 <i>d</i>

^{*} *p* < 0.0001

Note. REF = reference category.

^a Adjusted for race/ethnicity, age, marital status

^b Based on standardized value (mean = 0, SD = 1)

^c Higher score indicates more favorable health state

^d Based on log transformed value and standardized value

Table 5

Odds ratios depicting interactions that significantly predict 3-year depression status

	Social Support Levels		
	1 SD below the mean	Mean	1 SD above the mean
Acute financial stress			
Yes	1.66	1.75	1.85
No	REF	REF	REF
Income (annual household)			
<\$20,000	1.30	1.43	1.57
\$20,000–\$49,000	1.02	1.15	1.30
>\$50,000	REF	REF	REF
Acute pain ^a	0.72	0.70	0.68

Note. REF = reference category.

^aBased on standardized value (mean = 0, SD = 1)