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Financial Analysis/Emotional Health

Work Performance of Employees With Depression: The Impact of Work Stressors

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Abstract

Purpose. Depressed employees are vulnerable to adverse work outcomes. We hypothesized that work performance is impaired by depression and is worsened by exposure to psychosocial work stressors.

Design. Longitudinal cohort study with surveys administered at baseline, 6, 12, and 18 months.

Setting. Recruitment in primary care offices.

Subjects. A total of 14,268 were screened; 286 depressed, employed adults (18–62 years) and 193 controls were enrolled.

Measures. At-work limitations (presenteeism) and absenteeism were measured with the Work Limitations Questionnaire (WLQ) and WLQ Work Absence Module, respectively. Work stressors were assessed using a modified version of the Job Content Questionnaire.

Analysis. Univariate and multivariate tests assessed the degree to which at-work limitations were related to depression and/or stressful work.

Results. Presenteeism and absenteeism were significantly worse for the depression group at each time point ($p \leq .001$). In cross-sectional models, presenteeism was associated with more severe depression symptoms, poorer general physical health, psychologically demanding work, the interaction of psychologically demanding work with depression, and less job control (r^2 range = .33–.54). Absences were explained by depression symptom severity and poorer general physical health but not work stressors ($r^2 = .19$). Because of minimal change in the work stressors, their longitudinal effects on outcomes were mostly nonsignificant.

Conclusion. This study found that depression symptoms are related to work absences and impaired work performance, and results partly confirmed that work stressors add to this impact. Results suggest that workers with depression may benefit from care involving medical and vocational interventions. (Am J Health Promot 2010;24[3]:205–213.)

Key Words: Depression, Productivity, Work Stress, Job Performance, Prevention Research. Manuscript format: research; Research purpose: modeling/relationship testing; Study design: quasi-experimental; Outcome measure: productivity, absenteeism; Setting: clinical/health care; Health focus: presenteeism, absenteeism; Strategy: n/a; Target population: adults; Target population circumstances: employed

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PURPOSE

Depression is estimated to cost the United States between \$36.6 and \$51.5 billion annually in lost productivity.^{1–3} Depressed employees exhibit more job loss, premature retirement, on-the-job functional limitations, and absences compared with their nondepressed coworkers.⁴ In patient samples, adverse work outcomes have been associated with higher depression symptom severity, the presence of specific symptoms (e.g., difficulty concentrating), and poorer-quality depression care.^{5–9} Our aim was to describe the impact of depression on work performance and the degree to which impaired work performance is worsened by exposure to psychosocial work stressors.

This study draws upon research concerning the harmful effects of stressful work conditions.^{10–14} Much of this research is based on the job demand-control-support framework, which indicates that work involving high psychologic demands will be harmful to health, whereas work involving control and/or social support will be protective.¹⁰ Psychologically demanding work is hectic and involves features such as a heavy workload, intense concentration, and exposure to conflicting demands. Work that is low in control involves constrained decision latitude and skill discretion. The job strain model suggests that there is an interaction between demands and control, defining the so-called “high-strain” jobs (high demands/low control) as most harmful and the “active” jobs (high demand/high control) as most healthful. Although there is a great deal of variability within occupations, examples of

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high-strain jobs are waitresses and waiters, nurse's aides, and some assemblers. With some exceptions, observational and intervention research confirms that job control is important to health, but results are mixed for psychological demands.^{15,16} Studies based on competing models, such as the Effort-Reward-Imbalance model, which addresses a dimension of fairness, have shown similar results.¹⁷

This is the first study to investigate whether work stressors influence the outcome of workers who have depression. We speculated that a demanding workload, lack of control, and/or unsupportive environment may contribute to functional and productivity losses for the following reasons: (1) it may be difficult for depressed workers to make adjustments that could help them cope with depression symptoms and impairments (e.g., varying the pace of work in relation to energy levels, going to medical appointments, and/or modifying job tasks) and/or (2) the resultant work stress may prolong symptoms and impairments. Recent research documents that work stress is associated with depression.¹⁸⁻²⁰ We hypothesized that, compared with nondepressed workers, those with depression have more impaired work performance and this impairment is further worsened by exposure to psychosocial work stressors (e.g., high psychological demands, limited control, and/or insufficient social support).

METHODS

Design

A longitudinal cohort study was conducted in which the work outcomes of two groups of employed adults were compared: a group with major depression (MDD), dysthymia, or both (known as "double depression" [DD]),²¹⁻²³ and a group of healthy controls. A third group with rheumatoid arthritis was enrolled but is not included in this analysis.

Sample

The study samples were recruited between February 2001 and March 2003. The institutional review boards of all participating sites approved study protocols. After explanation of the

study to eligible individuals, written informed consent was obtained. The study included the following eligibility criteria: between 18 and 62 years of age, working at least 15 hours per week, English speaking and/or reading, not planning to retire within 2 years, no current or pending disability and/or Worker's Compensation claim, no current alcoholism or drug abuse, no pregnancy or childbirth in the past 6 months, and none of 13 disabling medical conditions (e.g., angina, congestive heart failure, stroke, diabetes, chronic obstructive lung disease, and bipolar disorder). In addition, individuals qualifying for the depression group had to screen-in for MDD and/or dysthymia. To be eligible for the control group, the person had to have no more than one depression symptom.

Eligibility assessment involved the following steps: (1) research assistants (RAs) in primary care physician (PCP) offices invited patients, except those in obvious discomfort, to complete a brief self-report screening survey; (2) the PCP was informed of the result and asked to confirm medical eligibility; (3) confirmed depressed patients and a 10% random sample of potentially eligible control patients were mailed a baseline questionnaire, consent form, and opt-out card; (4) if no opt-out card was returned, the RA called to explain the study and ask additional eligibility questions (e.g., recent bereavement and the Patient Health Questionnaire (PHQ-9) depression items^{22,23}). If a patient refused the interview or was unreachable, a message was left inviting him or her to complete the hard-copy forms and send them back; and (5) eligible patients returning their baseline and consent forms were enrolled. Each was asked to answer and return a postage-paid mail survey every 6 months for 18 months. To encourage response, telephone and postcard reminders, survey remailings, and monetary incentives (\$20 for the baseline and \$10 for each follow-up) were used.

The PCP office screening survey was completed by 14,268 patients: 4124 (29%) were ineligible, 8235 (58%) were healthy controls not needed for the study, and 1909 (13%) were potentially eligible. Of the 1909, 437 (23%) were ineligible based on physi-

cian feedback (e.g., the patient had a disabling medical condition not previously reported that excluded him/her from participating), 646 (34%) did not complete the screening procedure, and 826 (43%) were fully screened and eligible, including 716 for the depression and healthy control groups (the rest had rheumatoid arthritis and are not included in this analysis). Of the 716, a group of 237 (33%) declined participation and 479 (67%) enrolled. The enrolled sample consisted of a depression group composed of 286 adults with confirmed dysthymia (based on criteria from the *Diagnostic and Statistical Manual Edition IV*²⁴) (n = 72), MDD (n = 105), or DD (n = 109), and a comparison group of healthy controls (n = 193).

Based on screening results, study participants were similar to those declining participation on mean age, mean general mental and general physical health (based on SF-12 mental and physical component summary scores,²⁵ respectively), and percent with depression. A larger percentage of study participants were male ($p < .001$).

Among participants, attrition was greater in the depression group compared with controls (12.5% vs. 6.6%; $p = .04$). Within the depression group, those who completed the study were similar to the dropouts on depression symptom severity (measured with the PHQ-9), mean age, gender, and mean general mental and general physical health.

Measures

Study outcomes were measured by the Work Limitations Questionnaire (WLQ). The WLQ has been validated for employed samples with and without depression.²⁶⁻²⁹ The WLQ's four work limitation scale scores and productivity loss score are presenteeism indicators. Each scale score indicates the percentage of time in the prior 2 weeks that health problems limited the person's ability to perform four types of work tasks: time management (five items), physical tasks (six items), mental-interpersonal tasks (nine items), and output tasks (e.g., handling the workload and finishing work on time; five items). Scores range from 0 (none of the time) to 100 (all of the time). The

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summary at-work productivity loss score is the weighted sum of the four scale scores.³⁰

The WLQ's Work Absence Module (two items) measures the number of health-related workdays missed in the past 2 weeks (absences). Scores range from 0 to 11 or more workdays. Productivity loss owing to absences reflects the number of absences divided by the number of days usually worked in a 2-week period.

The validated Job Content Questionnaire (JCQ),³¹ modified slightly for a national survey, was used to measure psychological demands (seven items), job control (five items),¹⁰ and physical demands (five items), collectively referred to as "work stressors." Scores range from 0 (low demands or control) to 100 (high demands or control).

Objective measures of occupational demands were imputed from O*NET,³² a national database (labeled the "imputed demands" variable). O*NET variables describe occupational characteristics according to their level of intensity and/or importance. Based on our prior depression research showing that they were related to WLQ scores,⁹ we elected to include 16 O*NET variables describing demands for social interaction, concentration, judgment, and physical stamina.

To create an imputed demands variable for each participant from O*NET data, the following process was used. With each survey administration, employed participants completed standard open-ended questions about their occupation. A study RA read each answer and assigned to it a Bureau of the Census occupational code.³² Using the occupational code to link the study and O*NET databases, 16 variable scores were assigned to each participant. To facilitate analysis, we created an O*NET summary score (the sum of the weighted raw scores for each of the 16 O*NET variables with weights supplied by factor loadings from a principal components factor analysis). The summary imputed demands score was standardized to a mean = 0 and standard deviation = 1, with a higher score reflecting greater demand for higher-order cognitive and communication skills (e.g., learning, problem solving, judgment, decision making) vs. physical skills.

Table 1
Baseline Demographics and Health Characteristics

	Depression Group	Control Group	<i>p</i>
	n = 286	n = 193	
Mean age, y (SD)	38.9 (11.2)	41.1 (10.7)	0.03
Male, No. (%)	48 (16)	51 (26)	0.01
Married, No. (%)	119 (42)	121 (64)	<0.001
White, No. (%)	255 (89)	178 (93)	0.14
Mean years of education (SD)	14.2 (2.1)	15.2 (1.8)	<0.001
Median annual earnings, dollars (IQR)	33,800 (21,840)	43,000 (35,256)	<0.001
Mean weekly work hours (SD)	38.1 (12.8)	39.1 (13.3)	0.40
Self-employed, No. (%)	19 (7)	25 (13)	0.02
Mean years on the job (SD)	2.2 (1.1)	2.5 (1.2)	0.002
Company size, No. of employees (%)			
<25	65 (23)	45 (24)	0.99
25–99	53 (19)	30 (16)	
100–999	76 (27)	52 (28)	
≥1000	86 (31)	60 (32)	
Occupational group, No. (%)			
Professional, administrative, managerial, technical	137 (48)	110 (57)	0.04
Sales, service, support	127 (44)	72 (37)	
Repairs, construction, production, transportation	22 (8)	10 (5)	
Mean No. of jobs since age 18 (SD)	1.2 (0.5)	1.2 (0.5)	0.48
Mean imputed demands (SD)	-0.1 (1.0)	0.1 (1.0)	0.02
Mean depression symptom severity (SD)	13.2 (5.5)	2.8 (2.9)	<0.001
Currently taking antidepressant, No. (%)	127 (45)	19 (10)	<0.001
Mean general mental health score (SD)	33.4 (10.1)	52.1 (7.5)	<0.001
Mean general physical health score (SD)	48.0 (9.3)	51.2 (6.3)	<0.001
Mean No. of comorbidities (SD)	0.2 (0.4)	0.1 (0.3)	0.01

IQR indicates interquartile range.

Health variables included condition group (depression group = 1, control group = 0), presence of depression (yes = 1, no = 0), based on a PHQ-9 depression symptom count (0–4 symptoms = not depressed, 5–9 symptoms = depressed), depression symptom severity (also measured by the PHQ-9) ranging from a score of 0 (no symptoms) to 27 (severe symptoms), currently taking antidepressant medication (yes = 1, no = 0), general mental health (based on the SF-12 Mental Component Summary [MCS-12] score) and general physical health (based on the SF-12 Physical Component Summary [PCS-12] score) (each scored as 10 for worst health to 70 for best health),²⁵ and number of comorbid chronic medical conditions (comorbidities) (0–8 conditions).

Demographics included continuous age, gender (female = 1, male = 0), marital status (married = 1, not married = 0), race/ethnicity (white =

1; nonwhite = 0), years of education (0–17), annual earnings, weekly work hours (observed range, 0–84), self-employment status (self-employed = 1; not self-employed = 0), years on the job (<1, 2–4, 5–9, and ≥10), company size (<25 employees, 25–99, 100–999, and ≥1000), three dummy variables for occupational group (professional, administrative, managerial, and technical; sales, service, and support; and repairs, construction, production, and transportation), and number of jobs held since age 18 (observed range, 1–11).

Analysis

Initially we generated descriptive statistics. Results are presented as means and their standard deviations and percentages. Condition group differences were tested using χ^2 , *t*-tests, or analysis of variance and were represented by *p* values. Results are also expressed as risk ratios. Each risk ratio is the result of dividing the mean score

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for the depression group by the mean score for the control group. For example, the risk ratio of 3.6 for the WLQ time management scale at baseline means that the depression group in general experienced about a 3.6 times higher score than the control group.

Next we investigated the impact of depression and work stressors on the outcomes (four work limitations scale scores and absences) using both cross-sectional and longitudinal multiple linear regression models. Stata version 7.0 (StataCorp LP, College Station, Texas) was used.³³

Models include only those participants who were currently employed and had WLQ data. To reduce confounding owing to changing occupations, only the participants who stayed in their baseline occupation were included. If a participant had stopped working or changed occupations, his or her data were excluded from that point forward.

The cross-sectional analyses address the relationship between the outcomes of interindividual differences in work stressors. The longitudinal analyses address the relationship between the differences in intraindividual-level changes in work stressors on change in outcome. Because occupation does not change, the longitudinal analyses rule out the possibility that change in the work outcomes is related to a change in employment.

With 479 participants, the maximum number of cross-sectional observations was 1916. Of these, we lost 277 (14%) to attrition, 330 (17%) to unemployment or a new occupation, and 194 (10%) to missing data on major independent variables. The final cross-sectional sample ranged from a maximum of 1107 observations for the absence model to 1080 for the time management scale model. Of a maximum 1437 longitudinal observations, losses related to attrition and employment reduced the sample to 830 (58%), and another 203 (14%) were missing major independent variables, leaving a maximum analytic sample of 613 and a minimum of 582. The missing independent variables occurred because a shorter questionnaire was administered to participants who were difficult to reach or late in

Table 2
Characteristics of the Sample by Survey Interval and Change Over Time

	Mean (SD)		Risk Ratio	<i>p</i>		
	Depression Group†	Control Group‡				
Work stressors						
Psychological demands						
Baseline	67.9 (21.6)	64.8 (21.9)	1.05	0.13		
6 mo	65.5 (22.4)	65.5 (20.9)	1.00	0.99		
12 mo	67.2 (22.9)	63.2 (20.5)	1.06	0.17		
18 mo	64.4 (23.7)	66.2 (19.9)	0.97	0.58		
Change over time <i>p</i>	0.53	0.74	—	—		
Per interval change	-1.77 (17.30)	-0.96 (15.54)	—	0.52		
Baseline to last available change	-3.10 (17.81)	-1.66 (17.01)	—	0.17		
Job control						
Baseline	56.3 (21.9)	67.6 (19.8)	0.83	<0.001		
6 mo	60.7 (21.3)	69.5 (19.0)	0.87	<0.001		
12 mo	62.5 (21.8)	71.3 (17.8)	0.88	0.001		
18 mo	59.1 (22.5)	72.1 (18.3)	0.82	<0.001		
Change over time <i>p</i>	0.05	0.18	—	—		
Per interval change	0.23 (16.02)	0.60 (13.72)	—	0.75		
Baseline to last available change	1.15 (17.81)	1.57 (17.18)	—	0.69		
Physical demands						
Baseline	39.1 (29.7)	30.3 (26.0)	1.29	0.001		
6 mo	37.3 (30.0)	30.9 (26.6)	1.21	0.061		
12 mo	35.7 (26.3)	26.4 (24.7)	1.35	0.006		
18 mo	37.9 (27.0)	30.4 (26.5)	1.25	0.058		
Change over time <i>p</i>	0.76	0.49	—	—		
Per interval change	-0.22 (17.19)	-0.25 (14.10)	—	0.98		
Baseline to last available change	-0.38 (17.71)	-1.04 (16.37)	—	0.52		
Depression symptom severity						
Baseline	13.1 (5.5)	2.8 (2.9)	4.68	<0.001		
6 mo	11.2 (5.5)	2.9 (3.3)	3.86	<0.001		
12 mo	10.0 (5.9)	2.8 (3.3)	3.57	<0.001		
18 mo	8.9 (5.4)	2.7 (3.0)	3.30	<0.001		
Change over time <i>p</i>	<0.001	0.96	—	—		
Per interval change	-1.44 (5.78)	0.01 (2.79)	—	<0.001		
Baseline to last available change	-2.82 (6.05)	-0.001 (2.82)	—	<0.001		
Work limitations						
Time management						
Baseline	35.5 (22.1)	9.8 (14.1)	3.62	<0.001		
6 mo	28.1 (21.7)	9.1 (13.5)	3.09	<0.001		
12 mo	27.7 (22.0)	11.3 (17.1)	2.45	<0.001		
18 mo	26.5 (22.2)	8.4 (14.0)	3.15	<0.001		
Change over time <i>p</i>	<0.001	0.44	—	—		
Per interval change	-3.02 (21.29)	-0.46 (16.27)	—	0.06		
Baseline to last available change	-5.56 (20.87)	-0.39 (15.18)	—	<0.001		
Physical tasks						
Baseline	19.5 (20.3)	7.8 (16.7)	2.50	<0.001		
6 mo	15.1 (19.9)	6.2 (14.4)	2.44	<0.001		
12 mo	15.3 (19.0)	6.0 (12.0)	2.55	<0.001		
18 mo	15.4 (21.1)	6.8 (11.8)	2.26	<0.001		
Change over time <i>p</i>	0.06	0.67	—	—		
Per interval change	-1.61 (20.85)	-0.86 (17.30)	—	0.59		
Baseline to last available change	-2.91 (20.78)	-1.65 (17.45)	—	<0.001		
Mental-interpersonal tasks						
Baseline	36.2 (19.7)	9.5 (14.3)	3.81	<0.001		
6 mo	27.4 (19.2)	8.1 (11.4)	3.38	<0.001		

Table 2, Continued

	Mean (SD)			
	Depression Group†	Control Group‡	Risk Ratio	p
12 mo	26.2 (19.7)	8.8 (13.1)	2.98	<0.001
18 mo	25.1 (20.9)	7.5 (10.4)	3.35	<0.001
Change over time p	<0.001	0.56	—	—
Per interval change	-4.3 (20.22)	0.60 (13.12)	—	0.003
Baseline to last available change	-7.37 (20.42)	-1.28 (16.87)	—	<0.001
Output tasks				
Baseline	36.4 (25.1)	8.4 (14.7)	4.33	<0.001
6 mo	24.6 (24.4)	6.4 (11.9)	3.84	<0.001
12 mo	24.2 (22.8)	8.7 (15.1)	2.78	<0.001
18 mo	23.4 (23.6)	9.1 (15.5)	2.57	<0.001
Change over time p-value	<0.001	0.41	—	—
Per interval change	-5.2 (23.50)	-0.18 (15.13)	—	<0.001
Baseline to last available change	-9.53 (23.07)	-0.11 (17.62)	—	<0.001
At-work productivity loss				
Baseline	9.1 (4.6)	2.3 (3.3)	3.96	<0.001
6 mo	6.7 (4.6)	2.1 (2.8)	3.19	<0.001
12 mo	6.6 (4.7)	2.5 (3.4)	2.64	<0.001
18 mo	6.3 (4.9)	2.2 (3.0)	2.86	<0.001
Change over time p	<0.001	0.78	—	—
Per interval change	-1.13 (4.3)	-0.07 (3.15)	—	<0.001
Baseline to last available change	-2.01 (4.34)	0.0 (3.5)	—	<0.001
Absences				
Baseline	1.8 (2.3)	0.6 (1.3)	3.0	<0.001
6 mo	1.5 (2.1)	0.5 (1.3)	3.0	<0.001
12 mo	1.6 (2.3)	0.6 (1.6)	2.67	<0.001
18 mo	1.4 (2.1)	0.6 (1.3)	2.33	0.002
Change over time p	0.37	0.82	—	—
Per interval change	-0.05 (2.76)	-0.05 (1.78)	—	0.99
Baseline to last available change	-0.15 (2.92)	-0.11 (1.77)	—	0.73
Productivity loss owing to absences				
Baseline	17.9 (23.2)	6.2 (12.8)	2.89	<0.001
6 mo	16.9 (34.5)	4.9 (13.6)	3.45	<0.001
12 mo	15.2 (21.0)	5.6 (13.1)	2.71	<0.001
18 mo	12.6 (19.1)	5.8 (14.2)	2.17	0.004
Change over time p	0.33	0.86	—	—
Per interval change	-0.03 (29.84)	-0.38 (16.57)	—	0.85
Baseline to last available change	-1.26 (32.27)	-0.73 (16.89)	—	0.73

† The baseline sample for the depression group was 286. The baseline sample for the control group was 193. The sample sizes for the 6-, 12-, and 18-mo follow-ups were as follows: depression group, 172, 134, and 119, respectively; control group, 158, 133, and 114, respectively.

‡ The risk ratio is the result of dividing the mean score for the depression group by the mean score for the control group.

responding and thus considered at risk of dropping out. This short version did not include the JCQ variables.

Each multiple linear regression model addresses one of the five outcomes (scores for the time management, physical, mental-interpersonal, and output scales, and absences). The dependent variables for the cross-sectional models consist of the score at a specific time point. For the longitudi-

nal models, the outcomes reflect the difference between a follow-up score and the next prior score. Each participant could have a maximum of four time points and three intervals.

Models estimate the association between an outcome and condition group (depression vs. control), depression symptom severity, general physical health, work stressors, imputed demands score, and interaction

terms for condition group by work stressor.

The main effects for psychologic demands, job control, and physical demands were centered to improve the accuracy of the estimates for them. Models control for age, gender, and number of years on the job. Preliminary regression analyses indicated that variables such as marital status, years of education, and annual earnings did not contribute significantly to the models. A study site variable is not included because preliminary analyses indicated that it was not significant. To address the possibility of selecting participants with pre-existing work difficulties, models control for the baseline value of the dependent variable. Regression results are reported as betas, confidence intervals, and *p* values. Clustering is used for the longitudinal models to account for the correlation in successive observations.

Preliminary tests were conducted to evaluate whether the work stressor responses were biased by depression. In a series of linear regression models, scores for psychological demands, job control, supervisor and coworker support (from the JCQ), and physical demands were regressed on a condition group indicator and depression symptom severity score, general physical health score (PCS-12), and imputed demands score, adjusting for age, gender, and years on the job. Cross-sectional and longitudinal models were tested. If a depression variable was significantly related to a self-report work scale, then the scale's items were analyzed. Items significantly related to depression were removed from further analysis, and only the remaining scale variables were rescored (Technical Appendix available from authors).

The social support variables (supervisor and coworker support) were significantly related to depression as were four psychological demands scale items (excessive work, enough time, conflicting demands, and hectic job). These items were excluded from all further analyses.

RESULTS

Compared with controls (Table 1), the depression group was younger (*p* = .03), had a higher percentage of

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women ($p = .01$), unmarried individuals ($p < .001$), lower mean years of education ($p < .001$), and lower mean annual earnings ($p < .001$). Both groups were predominantly white ($p = .14$; Table 1). There were no differences in weekly work hours ($p = .40$), company size ($p = .99$), and number of jobs since age 18 ($p = .48$). The depression group had a smaller percentage of self-employed persons ($p = .02$), fewer mean years on the job ($p = .002$), and fewer workers in the professional/administrative/managerial/technical occupational group ($p = .04$). The depression group had less demanding jobs according to the imputed demands score ($p = .02$).

The depression group had poorer mean general mental and physical health ($p < .001$ for each comparison) and more comorbidities ($p = .01$). There was an 11-point baseline group difference in mean depression symptom severity scores, with the depression group significantly higher ($p < .001$).

Depression symptom severity differences remained at each follow-up ($p < .001$; Table 2). These differences occurred despite significant improvements within the depression group ($p < .001$ across time points).

At baseline, the depression group had lower mean job control and higher mean physical demands than controls (each at $p \leq .001$; Table 2), but psychological demands were not significantly different ($p = .13$). The group difference in the mean scores at baseline was 11 points for job control, nine points for physical demands, and three points for psychological demands.

At each follow-up, the depression group had lower mean job control scores ($p \leq .001$ for each comparison), despite significantly improving over time ($p = .05$). Physical demands scores remained higher in the depression group at each follow-up, although differences were significant only at the 12-month follow-up ($p = .006$). Neither physical nor psychological demands scores changed significantly over time within either group ($p > .05$ for each comparison).

Compared with controls, the depression group had significantly more baseline work limitations and absences ($p < .001$ for each comparison; Table 2). Within the depression group, the average amount of time with work

limitations was 35.5% for time management, 19.5% for physical tasks, 36.2% for mental-interpersonal job tasks, and 36.4% for output tasks. The control group means were 9.8%, 7.8%, 9.5%, and 8.4%, respectively. Thus, the depression group had more than two to four times the amount of work limitations, depending on which aspect of work was measured. Baseline mean at-work productivity loss was 9.1% in the depression group and 2.3% for controls ($p < .001$).

In the 2 weeks before baseline, the depression group averaged 1.8 absence days, and the mean amount of productivity loss owing to absences was 17.9%. In the control group, the mean number of absences was 0.6, and the mean amount of productivity loss owing to absence days was 6.2%. On average, the depression group had three times as many absences and a similar ratio of productivity loss owing to absences ($p < .001$ in both comparisons).

In the depression group, work limitations affecting time management, mental-interpersonal tasks, and output tasks declined significantly ($p < .001$). Within the control group, there were no significant changes in work limitation scale scores over time ($p \geq .41$ or more on each scale). Work limitation scale scores were significantly worse in the depression group at all follow-ups ($p < .001$). Absences were higher for the depression group at all time points ($p \leq .002$) and did not change significantly in either group ($p \geq .37$).

In both the cross-sectional and longitudinal work limitation models, the work stressor variables (psychological demands, job control, and physical demands) made small but significant contributions to explaining several of these work outcomes. Cross-sectionally, the following results were observed (Table 3). Difficulty with time management was greater with greater depression severity ($p < .001$), poorer general physical health ($p < .001$), greater psychological job demands ($p < .001$), interaction of depression and psychological job demands ($p = .005$), presence of depression at baseline ($p = .002$), and lower job control ($p = .02$). The model r^2 was .46 ($p < .0001$). Difficulty performing mental and interpersonal tasks was related to having more severe depression ($p < .001$),

presence of depression at baseline ($p = .002$), greater psychologic demands ($p = .005$), and lower job control ($p = .001$). The model r^2 was .54 ($p < .0001$). Difficulty managing output tasks was related to greater depression severity ($p < .001$), poorer general physical health ($p = .022$), greater psychological demands ($p < .001$), depression by psychological demands interaction ($p < .001$), lower job control ($p = .006$), and presence of depression at baseline ($p = .004$). The model r^2 was .46 ($p < .0001$). Difficulty performing physical tasks was related to more severe depression ($p < .001$), poorer general physical health ($p < .001$), lower job control ($p = .001$), and greater physical demands ($p = .001$). The model r^2 was .33 ($p < .0001$).

In the longitudinal models (Table 4), an improvement in work limitations was predicted by decreased depression symptom severity ($p < .001$ in three models and $p = .04$ in the physical tasks model), and in two models, by change in general physical health ($p = .02$ in the time management model and $p < .001$ in the physical tasks model). The work limitation model r^2 statistics ranged from .11 to .18; $p < .0001$ in all models.

Change in limitations performing physical tasks was predicted by change in job control ($p = .02$; Table 4). Changes in psychological or physical demands did not contribute to the explanation of change in work limitations.

In cross-sectional and longitudinal models (Tables 3 and 4, respectively), absences were predicted by depression symptom severity ($p < .01$) and poorer general physical health ($p \leq .001$). Absences were unrelated to work stressors. The cross-sectional model r^2 was .19 ($p < .0001$). The longitudinal model r^2 was .07 ($p = .004$).

DISCUSSION

This study provided new information about the burden of depression on working adults and provided further evidence regarding the harmful effects of psychologically demanding, low control, and physically demanding work. The results confirm that presenteeism and absenteeism are higher for workers with depression symptoms than healthy controls. Throughout the

Table 3
Relationships of Work Limitations and Absences to Depression and Work Stressors: Cross-Sectional Multiple Regression Analyses (Beta Coefficients, Standard Errors, and p^*)

	WLQ and WLQ Absence Module Scales				
	Time Management	Physical Tasks	Mental-Interpersonal Tasks	Output Tasks	Absences
N	1080	1089	1091	1090	1107
R^2	0.46	0.33	0.54	0.46	0.19
Model p	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Depression present (1, 0)†	4.99 (1.63) ($p = 0.002$)	0.15 (1.46) ($p = 0.918$)	4.40 (1.44) ($p = 0.002$)	4.91 (1.73) ($p = 0.004$)	-0.08 (0.19) ($p = 0.656$)
Depression symptom severity (0–27)	1.61 (0.13) ($p < 0.0001$)	0.68 (0.12) ($p < 0.0001$)	1.83 (0.12) ($p < 0.0001$)	1.81 (0.16) ($p < 0.0001$)	0.10 (0.02) ($p < .0001$)
General physical health (20–70)	-0.37 (0.08) ($p < 0.0001$)	-0.77 (0.08) ($p < 0.0001$)	-0.14 (0.08) ($p = 0.061$)	-0.19 (0.08) ($p = 0.0220$)	-0.05 (0.01) ($p < 0.0001$)
Imputed demands	1.37 (0.71) ($p = 0.053$)	0.33 (0.68) ($p = 0.628$)	0.10 (0.59) ($p = 0.867$)	0.72 (0.78) ($p = 0.359$)	-0.07 (0.07) ($p = 0.280$)
Psychological demands (0–100)†‡	1.34 (0.29) ($p < 0.0001$)	0.14 (0.24) ($p = 0.568$)	0.65 (0.23) ($p = 0.005$)	1.91 (0.29) ($p < 0.0001$)	0.02 (0.03) ($p = 0.480$)
Job control (0–100)†‡	-0.70 (0.30) ($p = 0.020$)	-1.00 (0.30) ($p = 0.001$)	-0.96 (0.29) ($p = 0.001$)	-0.90 (0.33) ($p = 0.006$)	0.02 (0.03) ($p = 0.538$)
Physical demands (0–100)‡	-0.02 (0.29) ($p = 0.954$)	0.79 (0.24) ($p = 0.001$)	0.22 (0.22) ($p = 0.319$)	0.10 (0.29) ($p = 0.717$)	0.00 (0.03) ($p = 0.860$)
Depression × psychological demands‡	1.47 (0.53) ($p = 0.005$)	0.43 (0.47) ($p = 0.361$)	0.76 (0.44) ($p = 0.088$)	2.32 (0.56) ($p < 0.0001$)	0.05 (0.05) ($p = 0.344$)
Depression × job control‡	0.68 (0.56) ($p = 0.230$)	0.05 (0.58) ($p = 0.934$)	-0.14 (0.56) ($p = 0.802$)	0.14 (0.62) ($p = 0.820$)	0.00 (0.06) ($p = 0.957$)

WLQ indicates Work Limitations Questionnaire.

Note: Bold font denotes statistical significance.

* Models were adjusted for baseline age, gender, and years on the job.

† The variables were centered by their overall means.

‡ The coefficients were multiplied by 10.

study, presenteeism rates measured by the WLQ were at least two to three times higher with depression. Absences showed a similar pattern. The study also partly confirmed that specific work stressors add to the burden of depression.

With regard to the role of depression, we found that depressed workers had four times the amount of work limitations as controls and 2.5 times the number of absences; these gaps narrowed but never closed. Also, we found, as have others, that both the presence of depression and depression symptom severity influence ability to work. In this study, presence of depression at baseline had an impact independent of depression symptom severity. The meaning of this result is not completely clear, but it suggests that depression's impact may have started before the present depressive episode. The study also put the importance of depression symptom severity into perspective. Relative to the role of work stressors, we found that the

impact of depression symptom severity is large. A one-point increase in depression symptom severity corresponds to a 1.6% increase in limitations in time management. In comparison, a one-point increase in psychological demands corresponds to a 1.34% increase on the same WLQ scale.

Results from cross-sectional models provide evidence to support the study's hypothesis. In addition to depression, each work stressor predicted one or more outcomes. Psychologically demanding work increased the amount of difficulty workers had managing time and performing mental-interpersonal and output tasks. The impact of having a psychologically demanding job on time management and performing output tasks was significantly worse for workers with depression. Lower job control increased the amount of difficulty workers had managing time and performing mental-interpersonal, output, and physical job

tasks. A physically demanding job increased the amount of difficulty workers had performing physical job tasks.

We also found evidence for the effects of job control in the longitudinal models. A decline in the level of control at work was associated with a decreased ability to perform physical job tasks. None of the other work stressors were important in predicting work limitations or absences longitudinally. We observed that when workers remain in the same occupation (which in most cases meant the same job and company), job conditions remained relatively stable. Without much change in work stressors, they could not have had much of an impact on changes in work limitations or absences.

In the work stressor literature, only one study has investigated the role of work stressors among workers with pre-existing mental health problems. Our results are not entirely consistent with its findings. A study of Finnish workers with

Table 4
Relationships of Work Limitations and Absences to Depression and Work Stressors: Longitudinal Multiple Regression Analyses (Beta Coefficients, Standard Errors, and *p)**

	WLQ and WLQ Absence Module Scale Scores				
	Time Management	Physical Tasks	Mental-Interpersonal Tasks	Output Tasks	Absences
N	582	597	596	596	613
R ²	0.11	0.11	0.18	0.16	0.07
Model <i>p</i>	<0.0001	<0.0001	<0.0001	<0.0001	0.0038
Depression present (1,0)	-0.56 (1.07) (<i>p</i> = 0.600)	-0.36 (1.14) (<i>p</i> = 0.752)	-1.20 (0.84) (<i>p</i> = 0.152)	-2.39 (1.15) (<i>p</i> = 0.038)	-0.04 (0.12) (<i>p</i> = 0.776)
Depression symptom severity change	1.09 (0.25) (<i>p</i> < 0.0001)	0.48 (0.23) (<i>p</i> = 0.039)	1.29 (0.18) (<i>p</i> < 0.0001)	1.37 (0.27) (<i>p</i> < 0.0001)	0.06 (0.02) (<i>p</i> = 0.009)
General physical health	-0.31 (0.14) (<i>p</i> = 0.024)	-0.49 (0.11) (<i>p</i> < 0.0001)	-0.12 (0.11) (<i>p</i> = 0.258)	-0.20 (0.12) (<i>p</i> = 0.102)	-0.05 (0.02) (<i>p</i> = 0.001)
Imputed demands	-0.22 (0.52) (<i>p</i> = 0.670)	0.37 (0.63) (<i>p</i> = 0.550)	-0.35 (0.48) (<i>p</i> = 0.471)	-1.19 (0.69) (<i>p</i> = 0.084)	-0.05 (0.07) (<i>p</i> = 0.439)
Psychological demands change (0–100)†	-0.66 (0.55) (<i>p</i> = 0.224)	-0.22 (0.47) (<i>p</i> = 0.643)	-0.47 (0.36) (<i>p</i> = 0.192)	0.32 (0.44) (<i>p</i> = 0.475)	-0.03 (0.06) (<i>p</i> = 0.613)
Job control change (0–100)†	0.01 (0.43) (<i>p</i> = 0.980)	-1.12 (0.48) (<i>p</i> = 0.018)	-0.34 (0.38) (<i>p</i> = 0.367)	-0.94 (0.52) (<i>p</i> = 0.068)	0.01 (0.06) (<i>p</i> = 0.806)
Physical demands change (0–100)†	1.06 (0.61) (<i>p</i> = 0.083)	-0.19 (0.61) (<i>p</i> = 0.760)	0.69 (0.45) (<i>p</i> = 0.124)	0.21 (0.50) (<i>p</i> = 0.680)	0.08 (0.07) (<i>p</i> = 0.262)

WLQ indicates Work Limitations Questionnaire.

Note: Bold font denotes statistical significance. None of the interaction terms were statistically significant and were excluded from the final models.

* Models were adjusted for baseline age, gender, years on the job, and value of the model's dependent variable.

† The coefficients were multiplied by 10.

identified psychological distress³⁴ found that psychological demands, job control, and high-strain jobs predicted objectively measured sickness absence. Our results were similar for at-work limitations but not for self-reported work absences. The absence results in this study may reflect the relatively low frequency of missed work time in the 2-week time window as well as the influence on absence behavior of workplace policies and practices. This study did not have information about the latter and thus could not address their impact.

This study had several methodologic weaknesses and strengths. We attempted to maximize the study's internal and external validity by removing variables that demonstrated bias. We removed two workplace social support variables (coworker and supervisor support) and four psychological demands scale items (excessive work, enough time, conflicting demands, and hectic job). However, by eliminating these variables, we may have underestimated the influence of psychological demands and social support in our models, and thus we reduced the comparability of this study's results to others'. In contrast,

study advances included its longitudinal design, the comparison healthy control group, eligibility based on employment status, large-scale recruitment to help obtain representation of occupations and industries, extensive measurement of employment characteristics, attention to self-report accuracy, and valid and responsive outcomes measures.^{26–29}

Results suggest that symptom relief and other vocational interventions may benefit employees with depression and their employers. Vocational interventions conceivably could occur at the level of the worker and/or workplace and in various delivery settings. Work stress reduction trials have had more success with individually focused cognitive behavioral therapies than organization-level changes, but the field is relatively new.^{35,36} Studies within vocational rehabilitation and disability prevention suggest the importance of optimizing the fit of the person and the environment.³⁷ Delivery settings such as worksite occupational health clinics and/or employee assistance programs may hold promise for improving outreach and augmenting the care provided in medical settings. New care models

will be needed to help the many working people with mental health problems sustain their ability to work.

SO WHAT? Implications for Health Promotion Practitioners and Researchers

This study indicates that the adverse work outcomes of depression are related to both the severity of symptoms and work conditions. Combined with prior research, results suggest that employees with depression have an unmet need for high-quality depression treatment. However, this study also suggests that there is an unmet need to address work conditions that also contribute to depression-related work limitations.

If assertions about the need to address symptoms and work conditions hold true, then the study has implications for both health promotion professionals and programs. Generally, the medical care settings where adults receive depression treatment do not have the expertise or resources available to provide

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services that address work issues. Additional services might include vocational counseling, job redesign, and/or stress management; strategies that could conceivably help workers maintain their productivity while recovering from depression.

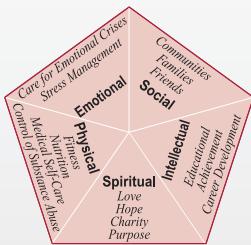
In addition to considering the integration of health promotion services into medical care settings, alternative systems of care such as worksite occupational health clinics and/or employee assistance programs may hold promise for educating employees and employers about depression's impact in the workplace and providing support for workers.

Although services can build upon existing knowledge of mental health improvement strategies, new research is needed to design and test assessment and intervention approaches. There are gaps in both services research, addressing employee-level interventions, and in organizational research, testing innovations aimed at modifying work conditions, policies, and practices. Both avenues have the potential to help working people with mental health problems sustain their ability to work.

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