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Improving work outcomes of dysthymia (persistent depressive disorder) in an employed population

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ABSTRACT

Objective: To test the effectiveness of a work-focused intervention (WFI) on the work outcomes of employed adults with dysthymia.
Method: This subgroup analysis from a randomized controlled trial compares an initial sample of 167 employees (age: ≥45 years), screened for dysthymia using the PC-SAD without current major depressive disorder randomized to WFI ($n=85$) or usual care (UC) ($n=82$). Study sites included 19 employers and five additional organizations. Telephone-based WFI counseling (eight, twice monthly 50-min sessions) provided work coaching and modification, care coordination and cognitive behavioral therapy. Adjusted mixed effects models compared the WFI vs. UC group preintervention to 4-month postintervention change in at-work limitations measured by the Work Limitations Questionnaire. Secondary outcome analysis compared the change in self-reported absences and depression symptom severity (Patient Health Questionnaire PHQ-9 scores).
Results: Work productivity loss scores improved 43.0% in the WFI group vs. 4.8% in UC (difference in change: $P<.001$). Absence days declined by 58.3% in WFI vs. 0.0% in UC (difference in change: $P=.09$). Mean PHQ-9 depression symptom severity declined 44.2% in WFI vs. 5.3% in UC (difference in change: $P<.001$).
Conclusion: At 4 months, the WFI was more effective than UC on two of the three outcomes. It could be an important mental and functional health improvement resource for the employed dysthymic population.
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1. Introduction

Individuals with a range of persistent subthreshold depressive symptoms include those formerly labeled dysthymia and in the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (DSM-5) as persistent depressive disorder [1]. These are common chronic condition associated with a range of depression symptoms and limitations in social and occupational functioning [1–7]. While its symptoms are less severe than those associated with major depressive disorder (MDD), most individuals (50–75%) with dysthymia also experience recurrent episodes of MDD as well as having functional impairments [2–6,8,9]. The *Diagnostic and Statistical Manual of Mental Disorders* revisions reflect both the difficulty involved in classifying individuals with chronic depression who do not meet criteria for MDD and establishing a definition that captures the specific burden this condition places on patients. In this study, which was conducted prior to the DSM-5 revisions, the term dysthymia is used to study individuals who screened positive for dysthymia symptom criteria but who were not currently experiencing MDD.

Research has already demonstrated that, among working age adults in the United States, MDD is a leading source of work disability and diminished work productivity exacting a large cost in quality of life and the nation's economy [10–12]. Compared to the evidence concerning the relationship between depression symptoms and work outcomes for individuals with MDD [13–15], a sparse literature exists regarding individuals with chronic depressive symptoms, much of it focused on dysthymia. In studies comparing individuals with dysthymia to nondepressed control patients, dysthymics have higher levels of unemployment and work outcomes, such as job loss and turnover, similar to those associated with MDD [3]. There is a greater likelihood of comorbid psychiatric diagnoses and problems with substance abuse, which can make it difficult to obtain and retain employment [3,5,6,16,17]. Additionally, compared to healthy control employees, adults with dysthymia have significantly more unstable job histories and lower current earnings [12,18]. Observational studies have found that these individuals have more work productivity loss (PL), disability days and chronic

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restriction of activity [14,19]. Experimental studies have shown that, compared to employed controls without dysthymia, those with dysthymia have poorer work performance and at-work productivity [12,18,20–23].

Despite the availability of effective treatments for dysthymia and the condition's known adverse psychosocial consequences, including those affecting employment, patients with dysthymia are frequently undertreated [3,24]. Conflicting findings regarding the effectiveness of medications and psychotherapeutic approaches for improving symptoms remain a barrier to care. Thase et al. [25] found that antidepressant medication was more effective than placebo in treating depression symptoms in patients with dysthymia [25] and a metaanalysis investigating the efficacy of antidepressant medication for MDD and dysthymia found it effective for both, with a greater margin of efficacy for those with dysthymia vs. MDD [26]. Contrary to these findings, a metaanalysis found that the effectiveness of antidepressant medication was positively correlated to depression symptom severity with little to no benefit for patients at mild or moderate depression symptom levels [27]. Several small randomized controlled trials (RCTs) found promising treatment results for combined antidepressant and psychotherapeutic interventions [7,28–31]. Studies testing Internet and telephonic-based psychotherapeutic interventions [e.g., cognitive behavioral therapy (CBT)] for dysthymia have shown modest improvements in depression symptoms [32,33].

Few studies have addressed the effectiveness of either antidepressant medication or psychotherapy for achieving improvements in functioning, including functioning in employment among individuals with chronic depressive symptoms without current MDD. A focus on this outcome is important because research on treating depressive disorders has shown that functioning may fail to improve despite improvements in depression symptom severity [34,35], suggesting that treating symptoms alone may not be adequate for restoring functioning in employment. Influenced by research on chronic health problems and work disability, such as musculoskeletal pain [36], in which return to effective functioning is regarded as an important goal, and research addressing employment supports for adults with chronic and severe mental illness [37], we considered that employees with probable dysthymia may also benefit from work-focused care addressing the medical, psychosocial and environmental dimensions of functioning in employment. We developed a novel multicomponent work-focused intervention (WFI) program, for employees with depression. Previously, a pilot RCT of the WFI demonstrated its superiority over usual care (UC) for reducing absenteeism, presenteeism and depression symptom severity for individuals with MDD [38]. In a subsequent large-scale RCT for a sample screened for MDD and/or dysthymia, the WFI was superior to UC in reducing presenteeism (at-work PL), absenteeism and depression symptom severity for the total treatment population [39].

The present study is a subgroup analysis of data from the large-scale RCT (which was not specified in the original trial registration: NCT01163890). This analysis focuses on study participants screened for dysthymia not meeting criteria for current MDD. This study tested the WFI in employed adults age 45 years of age or older who may be especially vulnerable to the disabling effects of chronic illness [40]. The primary hypothesis is that the WFI is superior to UC for reducing at-work PL. A secondary hypothesis is that the WFI is superior for reducing absenteeism and depression symptom severity.

2. Methods

2.1. Design overview

Between 2010 and 2013, a population-based RCT enrolled eligible, consenting employed adults screened for MDD and/or dysthymia, randomizing to either the experimental WFI or UC group. Eligibility criteria included the following: age 45 years or older; employed; current MDD using the Patient Health Questionnaire PHQ-9 as a screener [41], dysthymia using the PC-SAD as a screener [42] or double depression (both MDD and dysthymia); with work limitations [39]. In this subgroup analysis, study participants screened for dysthymia and no MDD were included ($N = 167$).

Dysthymia was defined as a minimum of two out of six *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* persistent depressive symptoms lasting 2 years or longer, according to the PC-SAD questionnaire [42]. The PC-SAD has a sensitivity of 87% and specificity of 95%, comparable to the diagnostic accuracy associated with other depression screeners [42]. Work limitations were signified by an at-work PL of score of $\geq 5\%$ from the Work Limitations Questionnaire (WLQ), a validated measurement tool [12,43–45]. The WLQ, used in a variety of healthcare and employment settings, measures the degree to which physical and/or mental health problems (such as depression) interfere with a person's performance of common job tasks and work productivity. A 5% score is consistent with work limitations approximately 20% of the time over the course of 2 weeks. All questionnaires have been validated specifically for depressed groups including the PHQ-9 [41], which was used for determining depressive symptom severity [38,39]. Exclusions were made for psychosis, bipolar disorder, current alcohol abuse [46], non-English speaking and severe physical limitations indicated by an SF-12 physical component score of ≤ 35 [47].

As described elsewhere in more detail [39], eligibility screening on a privacy protected Web site was offered in 24 sites: 13 private sector employers, 6 public sector employers and 5 employee benefits organizations with access to employed populations. Each site disseminated primarily electronic study advertisements inviting employees (and, at some sites, adult dependents) to access the screener, which could be completed at any time convenient to the individual. Screening was voluntary and anonymous and immediate personalized electronic feedback about depression symptom severity and at-work limitation levels was given.

Enrollment required the completion of an electronic informed consent form, a self-report baseline (preintervention) questionnaire and contact information. Randomization to the WFI or UC group occurred next using an automated 1:1 scheme for the overall sample; sample sizes were comparable (85 vs. 82) for the subgroup. All participants were given Web links to depression information and care resources (e.g., EAP, primary care or behavioral health) through their affiliated study site [38,45]. During the study, participants were not restricted from using other services. The final postintervention questionnaire was administered online on the study's Web site 4 months after the baseline. Employees were offered small monetary incentives for completing both questionnaires. The Tufts Medical Center/Tufts University Institutional Review Board reviewed and approved the study protocol.

2.2. Experimental intervention

The WFI is an eight-session, 50-min twice monthly telephonic intervention provided by masters-level counselors with EAP experience (4 month total duration). A team of 11 EAP counselors, employed by Optum, a health services provider headquartered in Eden Prairie, MN, participated in the study and received specialized WFI training and supervision from the study's multidisciplinary team. Counselors documented the WFI care process in the study's electronic information system, which the research team monitored.

The WFI has three integrated modalities. Each one addresses a specific barrier to effective functioning and stresses the acquisition of self-care strategies through a combination of "homework" assignments, counselor feedback and motivational interviewing to optimize functional outcomes using vocational, medical and psychological strategies.

2.2.1. Work coaching and modification

Work coaching/modification reflects disability theory and addresses barriers to functioning due to imbalances between the characteristics of the worker and those within the job and work environment [48]. Specific job performance difficulties related to depression are targeted,

guiding the employee to change modifiable aspects of work methods and/or work conditions with no direct counselor contact with the workplace. Guided by the WLQ questions and knowledge of work organization, the WFI counselor assesses work performance problems, barriers to effective functioning and available resources and supports. Using ideas adapted from diverse fields (e.g., disability management, vocational rehabilitation, supported employment and management), the counselor offers specific recommendations for changing work behaviors, work processes and/or environmental conditions and, in some cases, for adopting compensatory skills or behaviors. Work modifications are informal, not requiring employer approval or formal accommodation.

2.2.2. Care coordination

Care coordination addresses barriers to functional improvement related to a misalignment of goals and expectations among the individual with depression, his or her regular provider and the counselor. Drawing from the collaborative care model [49], counselors provide psychoeducation (filling in gaps in knowledge of depression, treatment and work) and motivational enhancement (promoting active engagement in care). The counselor promotes three-way participant-provider-counselor communication by assessing depression symptom severity, medication effectiveness, emerging medication side effects or adherence issues and work limitations monthly and sharing results. Counselors outreach to the employee and his or her primary care physician or prescribing provider to promote adherence to already prescribed antidepressants and the use of evidence-based depression treatment (including clinical follow-up for inadequate antidepressant response).

2.2.3. Work-focused CBT

Work-focused CBT strategies, based on Beck and others [50,51], addresses psychological barriers to functional improvement. With counselor guidance and a workbook, participants learn to identify the thoughts, feelings and behaviors that are eroding work functioning and respond using more effective coping strategies. This process is guided by *Creating a Balance* [52], a manual providing behavioral and cognitive homework exercises for improving coping skills, which was modified to include work examples. In the WFI, the counselor and employee cocreate a care plan for dealing with each functional problem and review specific assignments and progress at each session.

2.3. Measures

The primary endpoint is a presenteeism measure, the WLQ at-work PL score, measured at baseline and 4-month follow-up. PL quantifies the estimated difference in health-related at-work PL between a person (or group) completing the WLQ and an external benchmark sample of healthy workers. The WLQ is a validated self-report survey tool for assessing the impact of health problems, including depression, on at-work performance (presenteeism) and PL [12,43]. The WLQ generates four at-work performance scale scores reflecting the percentage of time in the prior 2 weeks that emotional and/or physical health problems limited ability to perform specific job tasks: time management, performance of physical tasks, mental-interpersonal tasks and output tasks (e.g., handling the workload and finishing work on time). Scores range from 0% (limited none of the time) to 100% (limited all of the time). To compute PL, scores from each of the four WLQ work performance scales are multiplied by a specific weight and the products are summed. Weights were obtained from validation research in which each WLQ scale score was regressed on objective work output [43]. Hence, weights are regression coefficients obtained from modeling the relationship of WLQ scale scores to actual productivity. The PL score corresponds to the estimated work PL attributable to health problems.

Health-related absenteeism in the past 2 weeks, a secondary endpoint of the study, was measured using the WLQ Time Loss Module. Productivity loss due to absences (APL) is the ratio of hours missed due to health or medical care divided by the number of hours usually spent working.

Depression symptom severity is a secondary endpoint measured by the PHQ-9 [41,53]. Although designed to measure symptoms of MDD and other depressive syndromes, individuals with dysthymia experience depressive symptoms the severity of which can also be evaluated by the PHQ-9 [41].

The main independent variable is the treatment group indicator. Covariates include baseline (preintervention) demographics (e.g., age, gender, education, race/ethnicity, marital status and annual earnings), job descriptors (e.g., occupation), self-reported chronic medical comorbidities, number of medical and mental health provider visits in the past 4 months, current and past antidepressant medication usage and study site.

2.4. Statistical analysis

Prior to hypothesis testing, data quality was assessed and descriptive statistics were computed including means, standard deviations (SDs), medians, interquartile ranges (IQRs), frequencies and percentages. Tests included chi-square, *t* test and analysis of variance as appropriate. Power analysis was conducted at the overall sample level but not at the subgroup level.

Based on recommendations of Lane [54] and others [55], mixed effects modeling was used to assess the baseline to follow-up change in each study outcome by assuming a person-level random effect. The models take the form of $y_{ij}=x_{ij}\beta+u_j+\varepsilon_{ij}$ where y_{ij} is the outcome of *j*th individual at the *i*th time (baseline or follow-up); β is a vector of the fixed effects including a fixed intercept; x_{ij} is the design matrix of observables including the intention-to-treat treatment indicator, time indicator, baseline value of the outcome variable, study site indicators and all other covariates such as baseline age, gender, race/ethnicity, marital status, occupation, number of physical comorbidities and full-time or part-time employment; u_j is a normally distributed random intercept for *j*th individual with mean zero and variance of ψ^2; and ε_{ij} is random error with mean zero and variance σ^2. Adjusted means, confidence intervals, *P* values and effect sizes are reported. Effect sizes for changes within treatment group were defined as the average change within group divided by the *SD* of baseline scores. An effect size of 0.8 or more was considered large (large enough to be observable for each subject) whereas an effect size of 0.2 or less was defined as small [56]. A sensitivity analysis was done on drop-out using a more conservative approach by conducting the last observation carried forward (LOCF). An additional analysis was done testing the sensitivity of the results of individuals with a PHQ-9 severity score of ≤ 9 vs. a PHQ-9 severity score of 10 or more. Stata 9.0 [57] was used for all analyses.

3. Results

Of 18,102 employees screened for the larger study, 1227 (6.8%) were eligible and 431 of those eligible (35.1%) consented to the larger study [39].

The analysis for this study includes the 167 participants screened for dysthymia (WFI=85 and UC=82) (Fig. 1). Seven (8%) employees in the WFI group and 10 (12%) of the UC group did not complete the self-report follow-up questionnaire and were considered lost to follow-up. Although the randomization was not designed to minimize WFI vs. UC differences at the subgroup level, there were no significant baseline differences either between those participants with or without a final questionnaire or between the WFI and UC groups, except that the UC group initially had a higher mean number of chronic comorbid medical conditions than the WFI group (3.2 vs. 2.6, respectively; $P=.03$; Table 1).

In the sample, the mean age was 54.6 years ($SD=6.0$), 73.7% ($N=123$) were female, 87.3% ($N=145$) were White non-Hispanic, 72.4% ($N=121$) earned a bachelor's degree or higher and median annual earnings was $60,000 (interquartile range IQR=38,472). A majority (88.6%; $N=148$) worked full time and 73.7% had white-collar occupations ($N=123$). The mean number of hours worked per week was 42.6 ($SD=10.8$). More than half (58.1%, $N=97$) had their jobs for

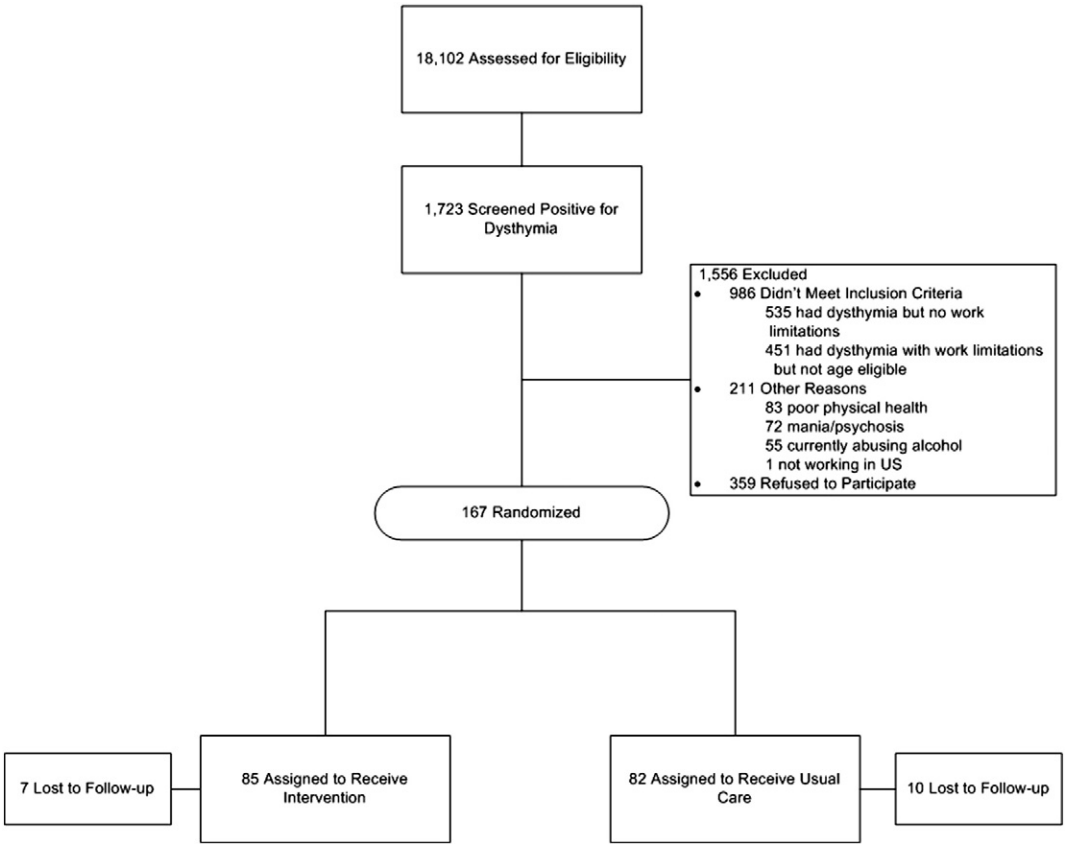

Fig. 1. CONSORT diagram for RCT of an experimental WFI for employed adults with depression and work limitations.

5 years or more, 25.7% ($N=43$) had union positions and 4.8% ($N=8$) were self-employed (Table 1).

The average baseline PHQ-9 depression symptom severity was mild at 9.5 ($SD=2.6$); nonetheless, 82% ($N=137$) reported a history of antidepressant medication use and 60.5% ($N=101$) had a prescribed antidepressant at baseline. In the 4 months prior to baseline, 26.5% had seen a primary care physician, 29.9% visited a psychiatrist or psychiatric nurse specialist and 26.9% visited another mental health counselor for an emotional problem (Table 1).

Both the WFI and UC groups had similar levels of baseline at-work performance and work absences, as measured by the four WLQ scale scores ($.31 \leq P \leq .63$), PL scores ($P=.69$), work absences ($P=.72$) and APL ($P=.88$). The mean amount of time that participants were limited in their ability to perform work tasks was as follows: 34.3% of the time ($SD=18.4$) for time management; 17.9% ($SD=17.3$) for physical tasks; 30.8% ($SD=13.4$) for mental-interpersonal tasks; and 34.8% ($SD=20.3$) for output tasks. Mean PL was 8.5% ($SD=3.6$). Also during this two week period, participants missed a mean 1.1 workdays ($SD=1.7$). Mean APL was 10.6% ($SD=15.8$) (Table 1).

By the 4-month follow-up, based on mixed effects models, between-group testing demonstrated significant improvements in the WFI group vs. UC group (which showed no improvement) on three of the four WLQ scales as well as the PL score. Differences were not statistically significant for the WLQ physical tasks scale (difference in change: $P=.17$), self-reported absences (difference in change: $P=.09$) and APL (difference in change: $P=.16$). Additionally, the WFI group improved significantly on all four within-group outcomes tested ($P<.01$ for all outcomes) whereas the UC group only improved significantly on the mental-interpersonal tasks scale ($P=.02$) (Table 2 and Fig. 2, percent improvement from baseline).

The WFI resulted in large and significant improvements in presenteeism. PL score improved 43.0% ($P<.001$) in the WFI group compared to 4.8% in UC ($P=.41$) (difference in change: $P<.001$). Although the between-group test for the physical tasks scale was not significant, between-group tests were significant in favor of the WFI vs. UC for the other three performance scales (difference in change: $P<.001$). Within the WFI group, scale scores improved from 42.3% to 48.4% ($P<.001$ for all scales). Within the UC group, scale scores had 0% change to 3.3% non-significant worsening on time management, physical and output tasks ($P>.05$) but a 13.7% significant improvement on mental-interpersonal tasks ($P=.02$) (Table 2 and Fig. 2). All of the significant improvements in the WFI group represented moderate to large effects.

Although work absences declined by 58.3% in WFI ($P<.001$) vs. 0% change in UC ($P=.97$), there was no significant difference between the groups. Similarly, even though APL improved in WFI group by 42.3% ($P=.01$) vs. 4.6% worsening in the UC group ($P=.85$), the difference did not reach statistical significance (Table 2).

At follow-up, PHQ-9 depression severity scores also significantly declined within the WFI group but not within the UC group. Mean depression symptom severity scores fell 44.2% ($P<.001$) for WFI vs. 5.3% ($P=.39$) for UC, which resulted in a significant difference between the groups (difference in change: $P<.001$) (Table 2 and Fig. 2).

Sensitivity analyses of at-work PL and depression symptom severity results supported the findings. LOCF models, comparing the difference in outcome change between the groups, yielded slightly smaller, significant effect sizes (Table 2). For PL, the effect size changed from −.91 in the original model to −.88 for the LOCF model. For PHQ-9 depression symptom severity, the parallel change in effect size was −0.89 to −0.83 (data not shown).

Further analyses of the sample were conducted using PHQ-9 severity score cutpoints of ≤9 ($N=82$) to assess the impact of the WFI on depressive symptom levels below those of participants with MDD in the larger sample (95% of the depressed sample from the larger study had PHQ≥13) as well as using PHQ-9≥10 ($N=85$). This yielded slightly larger significant effect sizes with the between-group comparisons and essentially identical results (data not shown).

Table 1
Starting sample baseline characteristics comparing employed adults with dysthymia and work limitations in experimental WFI vs. UC.

Characteristics	Total (n=167)		WFI (n=85)		UC (n=82)		P
	N	%	N	%	N	%	
Age, years ($M\pm SD$)	54.6±6.0		54.3±5.2		55.0±6.7		.46
Female	123	73.7	61	71.8	62	75.6	.58
White non-Hispanic	145	87.3	78	91.8	67	82.7	.08
Marital status							
Married	83	49.7	40	47.1	43	52.4	.49
Not married	84	50.3	45	52.9	39	47.6	
Education							
Less than high school	0	0.0	0	0.0	0	0.0	.13
High school graduate	9	5.4	2	2.4	7	8.5	
Some college, no degree	26	15.6	9	10.6	17	20.7	
Associate's degree	11	6.6	6	7.1	5	6.1	
Bachelor's degree	49	29.3	27	31.8	22	26.8	
Post-bachelor's degree	72	43.1	41	48.2	31	37.8	
Annual income, median (median±IQR)	60,000±38,472		58,192±38,109		64,808±37,246		.38
Works 35 hours/week or more	148	88.6	77	90.6	71	86.6	.42
Weekly hours ($M\pm SD$)	42.6±10.8		43.6±10.7		41.5±10.9		.20
Occupation							
White collar	123	73.7	65	76.5	58	70.7	.18
Blue collar	5	3.0	4	4.7	1	1.2	
Sales, support and service	39	23.4	16	18.8	23	28.0	
In job for 5 years or longer	97	58.1	47	55.3	50	61.0	.46
Union member	43	25.7	21	24.7	22	26.8	.76
Self-employed	8	4.8	4	4.7	4	4.9	.96
Depression ($M\pm SD$)							
Symptom severity score, PHQ-9[a]	9.5±2.6		9.5±2.7		9.4±2.5		.72
Comorbid condition							
Comorbidity present[b]	150	89.8	75	88.2	75	91.5	.49
No. of comorbidities, ($M\pm SD$)	2.9±1.9		2.6±1.8		3.2±1.9		**.03**
Depression treatment history							
Ever had antidepressant	137	82.0	70	82.4	67	81.7	.92
Antidepressant in past month	101	60.5	53	62.4	48	58.5	.62
Healthcare providers seen past 4 months							
Primary care provider	44	26.5	21	25.0	23	28.0	.66
Psychiatrist/psychiatric nurse	50	29.9	25	29.4	25	30.5	.88
Other mental health provider[c]	45	26.9	23	27.1	22	26.8	.98
Percent time with work limitations past 2 weeks, ($M\pm SD$)[d]							
Time management	34.3±18.4		35.0±17.9		33.5±19.1		.61
Physical tasks	17.9±17.3		18.9±17.6		16.8±16.8		.45
Mental-interpersonal tasks	30.8±13.4		30.3±13.1		31.4±13.8		.63
Output tasks	34.8±20.3		36.4±19.8		33.1±20.7		.31
Percentage at-work PL	8.5±3.6		8.6±3.4		8.4±3.8		.69
Absences due to health or medical care ($M\pm SD$)[e]							
Days missed per 2 weeks	1.1±1.7		1.2±2.0		1.1±1.5		.72
Percentage PL due to absence	10.6±15.8		10.4±17.0		10.8±14.6		.88

[a] Symptom severity score was assessed using the PHQ-9. Possible scores on the PHQ-9 range from 0 to 27. Higher scores indicate more severe depressive symptoms.
[b] Based on a chronic condition checklist including up to 12 conditions.
[c] Nurse, psychologist, social worker and/or mental health counselor.
[d] Based on responses to the WLQ. Scale scores indicate the percent of time limited in the past 2 weeks in ability to perform job tasks (e.g., time management). Possible scale scores range from 0 to 100, with higher scores indicating greater percentage of time limited in the past 2 weeks in ability to perform job tasks. Possible PL scores range from 0 to 27, with higher scores indicating greater PL.
[e] Based on responses to the WLQ Time Loss Module. PL is the mean percentage of hours missed in the past 2 weeks divided by the total number of hours usually worked in that time period. Possible days missed range from 0 to 14. Possible percent PL due to absenteeism ranges from 0 to 100, with higher scores indicating greater PL.

4. Discussion

Chronic depressive symptoms have a negative impact on ability to function in important social roles and activities, including employment [1,3,5,6,8,17,20]. This study identified a new telephone-based intervention for achieving functional recovery (including at-work performance, at-work PL and depression severity) in individuals screened for dysthymia. For this subgroup analysis, dysthymia was defined as chronic depressive symptoms lasting two or more years and not meeting current symptom criteria for MDD. With a PHQ-9 symptom severity of 9.5 (in the mild range), the impact on work functioning at baseline was substantial (mean baseline at-work PL: 8.5% and absences: 10.6%). For employers who are aware of the impact of depression on their employees work functioning [33,35], this intervention provides a new tool for improving mental health and work outcomes.

The original power analysis was based on the ability to detect differences between the WFI and UC groups for the overall sample rather than for subgroups [39]. Nevertheless, the outcomes obtained in this study, showing moderate to large effect sizes, are both statistically significant and clinically meaningful. By the 4-month follow-up, the WFI was significantly more effective than UC on five out of the eight between-group work outcomes, with the exception of the WLQ physical tasks scale, self-reported absences and APL. These between-group differences are a result of significant gains within the WFI group and lack of change in the UC group unrelated to power. Despite an absolute difference of 4.3 between WFI and UC in mean WLQ physical tasks, 0.5 days in absences and 4.0 in APL, the differences were not statistically significant due to the large SD of the measure. Furthermore, the WFI improved significantly on all within-group outcomes whereas UC only improved on the WLQ mental-interpersonal tasks scale. In addition, depression severity, as measured by the PHQ-9, also declined in the intervention group by 44% (from 9.5 to 5.3) while not at all in the UC group.

Study strengths include a randomized design with rigorous recruitment and follow-up methods, widely used validated measurement

Table 2
Dysthymia presenteeism, absenteeism and depression symptom severity outcomes: Mixed effects models.

	Experimental intervention						UC								
	Baseline		Follow-up		Change		Baseline		Follow-up		Change				
	$n=85$		$n=78$				$n=82$		$n=72$				Difference in change scores		
	Mean	SD	Mean	SD	Mean	Effect size[a]	Mean	SD	Mean	SD	Mean	Effect size[a]	Change (95% confidence interval)	Effect size[a]	*P*
Presenteeism[b]															
Percent at-work PL (0–27)	8.6	3.4	4.9	3.7	**−3.7**	**−1.09**	8.4	3.8	8.0	4.0	−0.4	−0.11	**−3.3 (−4.6, −2.0)**	**−0.91**	**<.001**
Percent time with at-work limitations by task															
Time management (0–100)	35.0	17.9	20.3	18.5	**−14.8**	**−0.83**	33.5	19.1	34.6	19.9	1.1	0.06	**−15.2 (−21.7, −8.7)**	**−0.68**	**<.001**
Physical tasks (0–100)	18.9	17.6	10.5	17.9	**−8.3**	**−0.47**	16.8	16.9	16.8	16.5	0.0	0.00	−4.3 (−10.4, 1.8)	−0.29	.17
Mental-interpersonal tasks (0–100)	30.3	13.1	17.0	12.7	**−13.3**	**−1.02**	31.4	13.8	27.1	14.6	**−4.3**	**−0.31**	**−11.2 (−15.7, −6.6)**	**−0.83**	**<.001**
Output tasks (0–100)	36.4	19.8	18.8	19.1	**−17.6**	**−0.89**	33.1	20.7	34.1	21.9	1.0	0.05	**−17.5 (−24.4, −10.5)**	**−0.86**	**<.001**
Absences due to health or medical care[c]															
Days missed (0–80)	1.2	2.0	0.5	0.9	**−0.7**	**−0.35**	1.1	1.5	1.1	2.1	−0.0	−0.00	−0.5 (−1.1, 0.1)	−0.31	.09
Percent PL due to absence (0–100)	10.4	17.0	6.0	15.6	**−4.4**	**−0.26**	10.8	14.6	11.3	21.6	0.5	0.03	−4.0 (−9.7, 1.6)	−0.23	.16
Depression[d]															
Symptom severity (0–27)	9.5	2.7	5.3	3.9	**−4.2**	**−1.56**	9.4	2.5	8.9	4.4	−0.5	−0.20	**−3.8 (−5.0, −2.6)**	**−0.89**	**<.001**
Sensitivity analysis (LOCF)															
Percent at-work PL (0–27)	8.6	3.4	5.4	4.1	**−3.2**	**−0.94**	8.4	3.8	8.1	4.0	−0.3	−0.08	**−3.0 (−4.0, −2.0)**	**−0.88**	**<.001**
Depression symptom severity (0–27)	9.5	2.7	5.8	4.2	**−3.7**	**−1.37**	9.4	2.5	9.2	4.2	−0.2	−0.08	**−3.4 (−4.7, −2.2)**	**−0.83**	**<.001**

Models are adjusted for recruitment site, participant mean age, percent male, percent White, percent married, percent white-collar occupation, mean number of comorbidities, percent full-time employed at baseline and baseline mean scores of model-dependent variable.
[a] Effect size was computed as the ratio of the difference of change score and the pooled SD of baseline scores for both groups.
[b] Based on responses to the WLQ. Scale scores indicate the percent of time limited in the past 2 weeks in ability to perform job tasks (e.g., time management). Possible scale scores range from 0 to 100, with higher scores indicating greater percentage of time limited in the past 2 weeks in ability to perform job tasks. Possible PL scores range from 0 to 27, with higher scores indicating greater PL.
[c] Based on responses to the WLQ Time Loss Module. PL is the mean percentage of hours missed in the past 2 weeks divided by the total number of hours usually worked in that time period. Possible days missed range from 0 to 14. Possible percent PL due to absenteeism ranges from 0 to 100, with higher scores indicating greater PL.
[d] Symptom severity score was assessed using the PHQ-9. Possible scores on the PHQ-9 range from 0 to 27. Higher scores indicate more severe depressive symptoms.

tools, a monitored protocol-driven intervention with careful documentation, participation of multiple employer groups and a conceptual model for the WFI program. The present study meets recommended criteria for using subgroup analysis (though it was not specified a prior in the trial registration) [58], and the subgroup effects consistent across two studies are unlikely to be due to chance alone. Study limitations include a brief single follow-up period, the sample size, the lack of administrative work data (e.g., objectively measured productivity and disability claims) and the absence of a diagnosis based on clinical interview (or data about occurrences of MDD within the first 2 years of a dysthymia diagnosis). Screening with the use of the PC-SAD rather than a structured diagnostic interview yielded a sample with probable dysthymia; nonetheless, this sample with persistent subthreshold depressive symptoms responded significantly to the intervention. For some

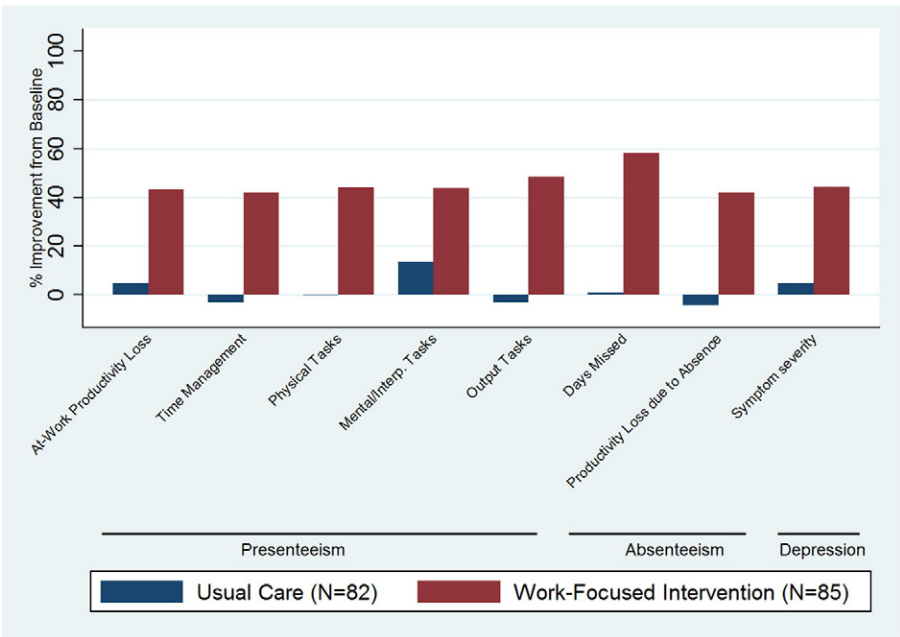

Fig. 2. Percentage change in presenteeism, absenteeism and depression symptom severity: preintervention to postintervention[a,b]. [a]Models are adjusted for study site, baseline mean age, percent male, percent White, percent married, percent white-collar occupation, mean number of comorbidities, percent full-time employed and mean scores of model-dependent variable. [b]The differences in the percent improvement from baseline between the WFI and UC were all significant at the $P<.001$ level, except for APL, which was significant at the $P<.01$ level.

endpoints with large SDs, there was not adequate power. To minimize response bias, all evaluations were completed on line rather than by in-person interview; however, it is possible that study participants who received the WFI were positively biased in their reporting. They were neither blinded to the intervention and the UC group received no direct contact from a study provider. Additionally, the WFI did not address organizational-level changes, which may contribute to a psychologically healthy workplace [59].

Work limitations are both a sign and an outcome of depressive disorders including dysthymia. The severity and chronicity of depressive symptoms in individuals with dysthymia is well known [2,3,5,6,8–10,16,17,20,21,23–27,32]. The extent of work difficulty associated with depressive symptoms observed in this study reminds us of the importance of recognizing and addressing the impact of such a persistent condition on the lives of working individuals. This new intervention holds promise for helping this group of employees, whose milder symptoms are sometimes overlooked and whose work problems may not be widely recognized. Accessible and adequate treatment by the healthcare system is an essential first step in this process. The challenge remains to develop practical interventions for employees with chronic health issues in general and those with chronic depressive symptoms, in particular, to help them manage their work limitations and sustain their productivity.

5. Conclusions

The WFI offers a potential contribution to the collaborative care model seeking to help employed individuals by providing comprehensive, patient-centered care. In addition to advancing employment outcomes and functional improvement research, the study results further support the role for technology-enabled methods for providing effective treatment care that may be accessed from any computer or telephone [60,61]. In the future, employees may be able to access it through physician referral, the workplace or independently. While up to now the picture for helping individuals with chronic depressive symptoms has been bleak, we have taken a first step to help them better manage their work limitations.

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Drs. Lerner, Adler and Rogers had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. The study results have not been published previously in print or electronic format nor submitted for publication elsewhere.

Drs. Lerner and Rogers codeveloped the WLQ, which is used in this study. Dr. Rogers and Adler codeveloped the PC-SAD, which is used in this study. Neither individual receives royalties directly from the licensure of either survey instrument. There are no other conflicts of interest to report.

The NIA had no role in the design and conduct of the study; in the collection, analysis and interpretation of the data; and in the preparation, review or approval of the manuscript or in the decision to submit the manuscript for publication.

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