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Toward Effective Work Accommodations for Depression: Examining the Relationship
between Different Combinations of Depression Symptoms and Work Productivity Losses

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Objective: Heterogeneity of depression experiences has led to suggestions that interventions focus on depression symptom combinations rather than depression severity alone. Our analyses explores the question, "What is the relationship between different combinations of depression symptoms and work productivity losses?"

Methods: These analyses use a population-based sample of 2,219 working adults. Using the PHQ-8 items, cluster analysis methods were used to identify depression symptom clusters. The Work Limitations Questionnaire's four work productivity loss dimensions were regressed on the identified depression symptoms clusters.

Results: The symptoms clusters of workers with mild to moderate depression had significant but similar work productivity losses. However, the symptom combinations within these clusters of workers varied.

Conclusions: To create effective work accommodations, attention should focus on the combinations of depression symptoms and specific job characteristics rather than severity alone.

Between 2%-16% of the workforce experiences depression (1-5). This has made depression one of the most prevalent mental disorders in the working population (6). In addition, it has become the leading cause of disability worldwide (7). Depression-related disability has a significant impact on work productivity through absenteeism and presenteeism (i.e., workers are at work but there is work loss because worker are not able to function at their customary levels when they are healthy) (8-10). For example, based on a global survey of workers from Latin America (Brazil and Mexico), North America (Canada, Mexico, and the US), East Asia (China, Japan, South Korea) and Africa (South Africa), Evans-Lacko and Knapp (10) estimated that annual absenteeism and presenteeism losses in these countries range between USD138 million to USD15 billion and from USD 2 billion to USD 84 billion, respectively. These estimates indicate that depression-related presenteeism losses are 5 to 10 times the costs attributed to absenteeism (10). Thus, the evidence suggests that the largest impact of depression is experienced in presenteeism losses. This means that the heaviest burden of depression is related to workers who are at work.

Presenteeism-related work productivity losses have been attributed to the symptoms of depression. Lerner et al. (11) observed that as symptom severity rises, work performance difficulties also increase. For example, depression has been linked to symptoms such as difficulty concentrating, fatigue, and disrupted sleep (12). As severity of these symptoms grow, so too do difficulties with managing time, completing tasks, and interacting with people at work (11). Eventually, the prolonged and gradual decrease in work productivity draws the attention of managers and supervisors. However, although managers may observe these behavioral changes, they may address them with disciplinary action rather than interpreting them as signs that a worker needs help. Because they occur at work, managers and supervisors have an opportunity

to offer work modifications or accommodations to support workers to be productive while they struggle with their symptoms of depression. Ideally, work accommodations match the worker and the job (13). Ultimately, work accommodations involve modifications to duties and assignments that allow a worker with a mental disorder to fulfill their job requirements (13, 14).

However, workers experiencing depression are less likely to report receiving work accommodations (15). This may be due in part to the fact that they do not recognize the need for help and consequently do not ask for it (16). It may also be related to the fact that obtaining work accommodations requires communication and negotiation between managers and workers (13). But, it is not clear where to begin the conversation – what should an accommodation look like? There is little in the literature that identifies effective accommodations for either mental illnesses or depression in particular (17). Part of the challenge of identifying effective work accommodations is related to the fact that workers can experience depression in a variety of ways (17). Although determining the presence of depression relies on determining whether a person is experiencing a summary number and severity of symptoms, each person with depression may experience the individual symptoms that define depression in a variety of ways. Slebus and colleagues (18) observed that little is known about how the different combination of symptoms affect a worker's ability to function. In turn, if there are different combinations of symptoms affecting workers' functioning, there potentially could be a variety of solutions. This suggests that there may be many rather than a single definitively effective way to accommodate workers with depression.

The picture is further complicated by the fact that even when symptoms are in remission, work limitations can persist (19). This suggests that symptom severity alone does not affect work performance. Rather, the type of symptoms that are experienced and their mere presence

may hinder productivity. Furthermore, given that there are nine key symptoms of major depression which can be connected in 227 unique ways to meet the threshold of clinical depression, different individuals will experience different functional limitations although all may have the same diagnosis of major depression (20). Indeed, guide to workplace rehabilitation emphasize tailoring accommodations to specific symptoms (21). Recognition of the heterogeneity of workers' experiences of depression has led to suggestions to focus on individual depression symptoms and symptom clusters rather than depression severity alone (22). Thus, understanding symptom clusters and their effects may point to ways to more effectively match accommodations and workers experiencing depression. By, recognizing that there may be a variety of underlying symptoms affecting work performance, managers may better understand the nature of depression and how to work with those they supervise.

Purpose

To help guide the creation of accommodations, it may be useful to understand the symptoms and their clusters that underlie the need for work accommodation. Using a population-based sample of 2,219 employed adults living in Ontario, Canada's most populous province, this paper explores the question, "What is the relationship between different combinations of depression symptoms and work productivity losses?" Answers to this question will offer insight into symptom combinations that create work challenges for workers with depression. It is an initial step towards understanding how depression symptoms affect work productivity. This information can lead to the development of effective depression-related work accommodations.

Methods

Population

These analyses are based on data taken from a sample of 2,219 working adults who were identified through random digit dialing. The sample was drawn with replacement with the objective of maximizing the number of working Ontarians surveyed. Between October 2013 to January 2014, respondents either completed a telephone questionnaire that was administered by professional interviewers (n = 2,145) or a web-based survey (n = 74). Inclusion criteria were: (1) ≥ 18 years of age, (2) living in Ontario and (3) workforce participation during the 12 months preceding the survey. The Centre for Addiction and Mental Health's Research Ethics Board reviewed the project protocol.

Lost Work Productivity

The 25-item *Work Limitations Questionnaire* (WLQ) (23) was used to measure work productivity loss. The WLQ has a 2-week recall period. Respondents are asked to use a 5-point scale to rate the difficulty they have meeting job demands. There are four sub-scales that measure four dimensions of work productivity loss. The first dimension is *limitations handling time* (i.e., difficulty with work attendance). An example of items focused on this dimension is, "In the past 2 weeks, how much of the time did your physical health or emotional problems make it difficult for you to do your work without stopping to take breaks or to rests." The second dimension is, *physical limitations* (i.e., difficulty with work-related physical activities). An example of an item included in this dimension is, "In the past 2 weeks, how much of the time did your physical health or emotional problems make it difficult for you to walk or move around to different work locations (for example, to go to meetings?" The third dimension is, *mental-interpersonal limitations* (i.e., difficulty with cognitive tasks and interactions with co-workers).

An example of the types of questions asked in this dimension is, "In the past 2 weeks, how much of the time did your physical health or emotional problems make it difficult for you to keep your mind on your work?" The fourth dimension is *output demands limitations* (i.e., difficulty meeting deadlines and handling workloads). An example of an item from this dimension is, "In the past 2 weeks, how much of the time did your physical health or emotional problems make it difficult for you to handle the workload?" (The scoring algorithm used for the sub-scales is proprietary and available from its developer upon request.) The values of these sub-scales can range between 0 – 100%. The values are interpreted as the percentage of time there were losses during the past 2-weeks for the specific work productivity loss dimension.

The items in the WLQ were developed through focus groups comprised of workers from a diversity of contexts (24). Thus, the WLQ items questions focus on features that are common to a variety of jobs in terms of what workers find important to performing their jobs (24). Since its development, the WLQ has been used and validated for workers in various types of work settings (25-27). Furthermore, the WLQ has been validated using objective productivity measures in two populations: (1) employees at a durable goods distributor and (2) employees at call centers (28). The sub-scales for each productivity loss dimension in this study demonstrated internal consistencies of (1) *limitations handling time* Cronbach's alpha = 0.81, (2) *physical limitations* Cronbach's alpha = 0.92, (3) *mental-interpersonal limitations* Cronbach's alpha = 0.90, and (4) *output demands limitations* Cronbach's alpha = 0.87.

Depressive Symptoms

Information about depressive symptoms and their severity was collected using the 8-item Patient Health Questionnaire (PHQ-8) (29). The PHQ-8 begins with the phrase, "Over the last 2 weeks, how often have you been bothered by any of the following problems?" It proceeds to list

eight key symptoms of depression such as "feeling down, depressed or hopeless" or "little interest or pleasure in doing things?" Choice of responses include: (0) not at all, (1) several days, (2), more than half of the days, or (3) nearly every day. The total score cut-offs for the PHQ-8 are: 5 = mild depression, 10 = moderate depression, 15 = moderate-severe depression, and 20 = severe depression. In this way, the PHQ-8 recognizes that different individuals can experience depression symptoms with different intensities.

The PHQ-8 differs from the more frequently used PHQ-9 by the omission of one item asking about thoughts of death or self-harm. The PHQ-8 based scores correlate very strongly with PHQ-9 scores, r=0.998 was found in a population of primary care patients (29). With regard to the ability to diagnose depression, an area under the curve of 0.95 was found for both measures (30).

Demographic Characteristics

Indicator variables were created to capture respondent sex (male versus female), age (< 30 years, 30-30 years, 40-49 years, 50-59 years, 60-64 years, or $\geq$ 65 years) and marital status (married yes/no).

Work Environment Variables

Questions were asked about the respondent's occupation. From the responses, variables were created to indicate whether a respondent was in a management/professional position (yes/no), and whether the respondent's current employment status was full-time (yes/no).

Analyses

Before identifying the symptom clusters, total PHQ-8 scores were calculated. Based on these scores, three groups were created: (1) Total PHQ-8 scores < 5, (2) Total PHQ-8 scores between 5-14, and (3) Total PHQ-8 scores $\geq$ 15. This was done because groups with either very

low or very high Total PHQ-8 scores do not exhibit sufficient variability in which to identify patterns. For example, according to the PHQ cut-offs, the Total PHQ-8 < 5 group would have been comprised of those with no depression. As a result, the majority of the respondents in this group do not experience depression symptoms. In contrast, the group with Total PHQ-8 $\geq$ 15 is comprised of those who score high on the majority of the symptoms and based on PHQ scores have some level of severe depression (i.e., in PHQ cut-off terms they have moderate-severe to severe depression). Thus, the groups with a PHQ Total score < 5 (i.e., no depression) and those with a PHQ Total score $\geq$ 15 (i.e., severe depression) were grouped into their own clusters, respectively. Subsequently, the sub-sample with Total PHQ-8 scores between 5 and 14 was used to identify symptom clusters for those with mild to moderate depression. This is the group who are less likely to identify they have a need for help. Yet, they are at risk of having their work performance hindered because of symptoms.

To identify the clusters into which respondents with similar symptom intensity group, the k-means cluster algorithm (31) was employed using Stata version 13.1. The cluster analyses followed the example of Makles (32), assuming the number of clusters was unknown. We computed and compared different k-means solutions, increasing the numbers of groups from k = 1 to 20 clusters. A hierarchical structure was not imposed on the clustering. To compute the weighted sum of squares (WSS) of each cluster solution, ANOVAs as described by Makles (32) were run and the relevant information was stored. Results were plotted and used as visual indicators of the optimal cluster solution (e.g., a kink in the WSS and log(WSS), respectively). As a sensitivity analysis, the clustering was repeated three times with different starting points; none of the scenarios affected the number of clusters identified.

Using an ordinary least squares regression model, the scores of the four WLQ dimensions were regressed on the resulting clusters while controlling for sex, age, marital status, managerial status, full-time employment. The coefficients for the clusters were compared based on their point estimates and 95% Confidence Intervals.

Results

Table 1 includes a description of the study sample. The sample was comprised of 64% females with largest proportion being between 40-55 years of age. There were 71% married participants. In addition, 71% worked full-time and 50% were in management positions. Similar patterns were observed among the clusters; the majority were women, middle-aged, and married. The exception was that unlike those in other clusters, less than half of those in MildMod Dep Cluster 1, MildMod Cluster2, MildMod Cluster 3, and Severe Dep were in management positions.

Insert Table 1

Among the sample with Total PHQ-8 scores between 5-14, four clusters were identified. Along with the two clusters comprised of those with Total PHQ-8 scores <5 and Total PHQ-8 scores ≥ 15, there were at total of six clusters. These six clusters were: (1) No Depression Cluster (PHQ-8 scores < 5), (2) MildMod Cluster 1 (PHQ-8 scores 5-14), (3) MildMod Cluster 2 (PHQ-8 scores 5-14), (4) MildMod Cluster 3 (PHQ-8 scores 5-14), (5) MildMod Cluster 4 (PHQ-8 scores 5-14), and (6) SevereDep Cluster (PHQ-8 scores ≥ 15). Figure 1 contains the mean symptom score by individual PHQ-8 symptoms. As expected, the No Depression Cluster had the lowest mean scores across all symptoms with all mean scores of 0.5 or less. In contrast, the SevereDep Cluster had the highest mean scores across all symptoms with mean scores

ranging from 1.2 to 2.7. In the SevereDep Cluster, there were six symptoms that seemed to standout. These were PHQ-2 (feeling down, mean = 2.3), PHQ-3 (experiencing disrupted sleep patterns, mean = 2.7), PHQ-4 (feeling fatigue, exhaustion, mean = 2.7), PHQ-5 (change in appetite, mean = 2.4), PHQ-6 (feeling bad about self, mean = 2.2), and PHQ-7 (difficulties concentrating, mean = 2.3).

Among the remaining four MildMod Clusters, there was variability in the symptoms that dominated. In MildMod Cluster 1, there were three symptoms with mean scores $\geq$ 1. These were PHQ-1 (feeling little pleasure, mean = 1, PHQ-3 (experiencing disrupted sleep patterns, mean = 2.5), and PHQ-4 (feeling fatigue, exhaustion, mean = 1.56). In MildMod Cluster 2, there were four symptoms with means > 1, PHQ-1 (feeling little pleasure, mean = 1.46), PHQ-3 (experiencing disrupted sleep patterns, mean = 2.61), PHQ-4 (feeling fatigue, exhaustion, mean = 1.66), and PHQ-5 (change in appetite, mean = 2.49. In MildMod Cluster 3, there were two symptoms with mean scores > 1; they were PHQ-4 (feeling fatigue, exhaustion, mean = 1.68) and PHQ-5 (change in appetite, mean = 2.36). Finally, in MildMod Cluster 4, two symptoms stood out; they were PHQ-1 (feeling little pleasure, mean = 1.16) and PHQ-4 (feeling fatigue, exhaustion, mean = 1.44).

Insert Figure 1

Table 2 contains the regression results for the four WLQ dimensions. Compared to those for the other clusters, the coefficients for the No Depression Cluster were significantly smaller with between a 9 – 11% work productivity loss across the remaining dimensions. The exception was for the physical limitation work loss dimension. Although there was a significant work

productivity loss related to *physical limitations*, the magnitude of the loss was not significantly different across clusters.

The coefficients for the SevereDep Cluster were greater than the other clusters for all the WLQ dimensions other than the *physical limitations*. For the remaining three dimensions, work productivity loss ranged between 33% for *output demands limitations* to a high of 41% for *limitations handling time*.

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Among the remaining four clusters, the percentage of work productivity loss ranged between 19-29% for the three WLQ dimensions involving *handling time*, *output demands*, and *mental-interpersonal limitations*. Although the percentages of work productivity losses were statistically significant, the magnitudes of the losses among the clusters and among the three dimensions were not.

Discussion

Reducing the burden of work disability related to depression necessitates managing depressive symptoms and work disability that places a high value in a personalized approach that matches specific symptom and disability profiles. In this study, we examined the association between work productivity loss and different combinations of depression symptoms experienced by a population of workers. The greatest work productivity losses were experienced by workers in the SevereDep Cluster who reported that six of eight symptoms disrupted their activities for a week or more during a two-week period. This finding corroborates Lerner et al.'s (11) – there is an association between depression severity and work loss productivity.

Workers with mild to moderate depression who were in the MildMod Clusters 1-4 appeared to experience less work productivity losses than workers in the SevereDep Cluster and more than workers in the No Depression Cluster. But all the MildMod Clusters had similar magnitudes of productivity losses.

However, the types of symptoms experienced by the workers in the four MildMod clusters varied. This suggests that although they experienced the same levels of severity and impairment, the underlying symptoms that contribute to them were not. These results reflect Fried et al.'s (22) proposal that there are differences in how workers experience depression. Up to this point, there has been little work examining the impact of different symptom combinations on functioning (18). These findings begin to explore this relationship and suggest they may be a promising area for future research.

These results suggest that to assist workers with depression to continue working and being productive, a variety of accommodations may be necessary and offered depending on the disruptive symptoms experienced by the worker and their job tasks. In other words, there is no standard approach to providing work accommodations for workers with depression. At the same time, there is a standard goal for all accommodations; that is to support the work ability of the worker (18). To address the varied needs of workers, the implementation of these types of accommodations will differ. Identification of profiles or clusters of disabling symptoms will allow clinicians to tailor more effective treatments, as well as more specific recommendations for accommodation. In order to convey specific recommendations for accommodations, clinicians will benefit from reviewing specific guides to tailoring accommodations and how to communicate to employers (33-35). Examples of specific tailoring of accommodations are discussed below.

A disruption in work ability may have a number of explanations such as difficulty sustaining focus, remembering, or being attentive to details (18). However, because the causes of these performance issues may vary, the solutions will as well. For example, sustaining focus, remembering, or being attentive to details may be the result of sleep disruption or fatigue. There are three main categories of solutions that have been used: (1) scheduling, (2) work assignments, and (3) modified job duties (13, 14, 36).

For instance, when supervisors manage workers who have problems with disrupted sleep, they could modify the work schedule (13). By modifying the schedule, the worker may be able to get adequate sleep. In contrast, because exhaustion is not necessarily related to sleep disruption, a work schedule modification may not be guaranteed to be a helpful accommodation. However, if exhaustion is not constant, it may be effective to change work hours to match periods of peak energy levels.

On the other hand, if exhaustion is constant, the worker may require a modification of workload and deadlines. Workers with exhaustion may also require more work breaks. If a modified work schedule is not effective for a worker who experiences disrupted sleep, s/he may need accommodations similar to those for someone who is fatigued. For workers for whom these accommodations are not effective, reduction in hours might be helpful (17).

For workers burdened with difficulties concentrating, work accommodations need not exclusively rely on scheduling. If a worker struggles with concentration, complexity of work tasks could be reviewed (14). Also, managers could assist workers to manage their time and to prioritize work (14). Job modification could involve temporarily simplifying tasks or exchanging tasks among co-workers (17) as well as modifying deadlines, or assigning a quiet workspace (37).

In MildMod Cluster 4, change of appetite was one of the symptoms that respondents reported as being disturbing. However, there has been little attention to the role of nutrition in productivity. Yet, there is evidence that there is an association between nutrition and work productivity (38). This area may offer an opportunity for further work to identify interventions to help workers address work productivity while struggling with changes in appetite.

Limitations

The results of these analyses should be considered in light of the data limitations. One limitation is that the data are from a sample of employed Ontarians. They are generalizable to other contexts to the extent to which the employed populations within other jurisdictions experience similar depression symptoms.

In addition, these data are cross sectional. Thus, we are not able to follow either the time course of the development of symptoms or how their severity changes over time. It could be useful for future prospective studies to follow the course of symptoms. This could be additional information about which accommodations could be useful at different points during an episode.

Furthermore, participants were recruited via landline telephones. This could have affected the representativeness of the respondents depending on the extent to which landline telephone ownership is a common characteristic of all workers. A survey of Canadians found that households in which all members were under 35 years were less likely to have a landline compared to households comprised of older people (39). This suggests that workers residing in younger households may have been less likely to have been contacted.

Finally, the structure of the dataset did not allow for the identification of the survey mode for the participants. Thus, it was not feasible to determine whether the 74 participants who completed the web-based survey were different in characteristics from the 2,145 participants who were administered the survey by professional interviewers.

Conclusions

Although the impact on work ability may appear to be similar for workers who are experiencing mild to moderate depression, there may be differences in the underlying disruptive symptoms experienced by these workers. This indicates that assisting workers with mild to moderate depression to continue working and being productive requires supervisors and workers to communicate about the types of limitations that the worker is experiencing. Based on the types of difficulties, accommodations can be identified. In addition, future work should focus on identifying the types of effective accommodations based on symptom clusters.

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Table 1. Description of the Study Sample

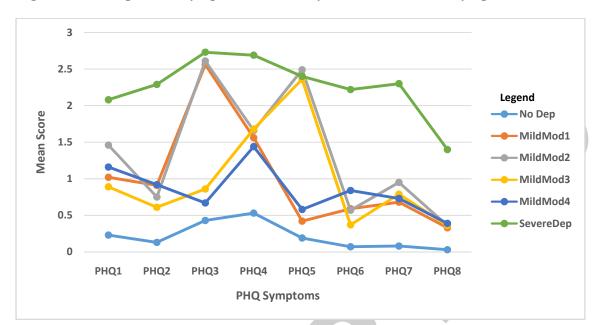| Characteristic	Total Sample %	n	No Dep Cluster %	n	MildMod Dep Cluster 1 %	n	MildMod Cluster2 %	n	MildMod Cluster 3 %	n	MildMod Cluster 4 %	n	Severe Dep %	n
Female	63.9%	1284	62.8%	782	60.9%	112	69.7%	101	64.0%	73	66.2%	153	71.1%	64
Age														
< 30 yrs	7.1%	143	6.2%	77	8.7%	16	9.7%	14	9.6%	11	8.2%	19	6.7%	6
30-39 yrs	16.8%	338	16.1%	200	16.8%	31	17.9%	26	19.3%	22	19.5%	45	14.4%	13
40-49 yrs	29.3%	588	27.0%	337	31.0%	57	29.7%	43	33.3%	38	35.5%	82	35.6%	32
50-59 yrs	32.6%	655	33.5%	418	35.9%	66	31.0%	45	28.1%	32	27.3%	63	33.3%	30
60-64 yrs	9.2%	184	10.6%	132	6.5%	12	9.0%	13	6.1%	7	5.6%	13	7.8%	7
65+ yrs	5.1%	102	6.6%	82	1.1%	2	2.8%	4	3.5%	4	3.9%	9	2.2%	2
Married	72.1%	1450	74.9%	933	67.9%	125	72.4%	105	70.2%	80	68.0%	157	57.8%	52
Management	50.4%	1012	52.0%	648	47.3%	87	46.9%	68	44.7%	51	50.6%	117	44.4%	40
Full-time	70.7%	1421	69.2%	862	71.7%	132	70.3%	102	71.9%	82	76.2%	176	73.3%	66

Figure 1. Description of Symptom Clusters by Individual PHQ-8 Symptoms

Notes: Clusters represented by each line.

PHQ Symptoms Legend: PHQ-1 = feeling little pleasure; PHQ-2 = feeling down; PHQ-3 = experiencing disrupted sleep patterns; PHQ-4 = feeling fatigue, exhaustion; PHQ-5 = change in appetite; PHQ-6 = feeling bad about self; PHQ-7 = difficulties concentrating; PHQ-8 = moving or speaking noticeably slowly.

Mean Score: Mean score of each PHQ item by cluster

Table 2. Productivity Loss by Work Limitation Questionnaire Dimension

	% Work Loss from Limitation Handling Time		% Work Loss from Physical Limitations		% Work Loss from Mental-Interpersonal Limitations		% Work Loss from Output Demands Limitations	
	B	95% CI	B	95% CI	B	95% CI	B	95% CI
No Depression Cluster	10.99	8.46, 13.52	11.26	8.20, 14.32	9.16	7.02, 11.30	8.97	6.40, 11.53
MildMod Cluster 1	22.89	19.44, 26.33	15.28	11.10, 19.46	19.89	16.98, 22.81	19.23	15.74, 22.72
MildMod Cluster 2	29.23	25.47, 32.98	16.15	11.60, 20.71	25.51	22.33, 28.68	24.58	20.75, 28.41
MildMod Cluster 3	22.37	18.35, 26.38	18.50	13.62, 23.39	21.51	18.11, 24.91	21.90	17.83, 25.97
MildMod Cluster 4	23.21	19.92, 24.50	17.00	13.01, 20.99	20.41	17.63, 23.20	20.34	17.00, 23.68
SevereDep Cluster	41.36	36.97, 45.75	22.74	17.46, 28.02	36.88	33.20, 40.57	33.66	29.26, 38.06

Note: Estimates controlled for sex, age, management status, working full-time. The clusters were jointly tested for equality and in all cases, and the null hypothesis of equality was rejected at the 0.01 level.