RESEARCH ARTICLE

Exploring University and Healthcare Workers' Physical Activity, Diet, and Well-Being During the COVID-19 Pandemic

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Abstract: *Background:* The COVID-19 pandemic affected well-being and health behaviors, especially among healthcare workers and employees in other fields. This is of public health concern because health behaviors and well-being influence long-term negative health outcomes. The purpose of this study was to explore health behaviors and well-being among university and medical center staff during COVID-19. *Methods*: EMPOWER (Employee Well-being during Epidemic Response) was a three-wave observational study (wave 1: 1,994; wave 2: 1,426; wave 3: 1,363) measuring health behaviors and well-being of university and medical center staff. Surveys were disseminated online to all employees between April and September 2020. Descriptive statistics explored trends across waves for health behaviors (physical activity [PA], diet), and well-being (mental well-being [MWB], depression, anxiety, and stress). Logistic regressions explored associations between health behaviors and well-being factors adjusting for demographics and clinical role. Interactions explored moderation by clinical role. *Results:* Most participants reported same/healthier changes in PA (54–65%) and diet (57–73%) and decreased MWB across waves (62%–69%). Nonclinical workers were less likely than clinical workers to experience worse MWB and moderate/severe anxiety and stress (odds ratios [ORs] ranged from 0.38 to 0.58 across waves and well-being outcomes). Participants who maintained/increased PA and diet were less likely to experience worse well-being (ORs ranged from 0.44 to 0.69 across waves and well-being outcomes). Interactions by clinical role were not significant. *Conclusion/Application to Practice*: Maintaining/increasing health behaviors during COVID-19 may be protective of mental health/well-being in some healthcare workers. These findings support health promotion efforts focused on maintaining or improving diet and PA.

Keywords: workplace, clinical, fitness, nutrition, population health

Background

From the start of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) virus (COVID-19) pandemic in December of 2019 through July of 2021, around 35 million cases and over 600,000 deaths were confirmed in the United States (The Centers for Disease Control and Prevention, 2020). This high level of COVID-19 illness and death along with public health measures such as stay-at-home orders, mask mandates, and closures of nonessential businesses to prevent the spread of COVID-19, have had significant impacts on daily life and well-being.

Throughout the pandemic, public health restrictions, such as stay-at-home orders, led to limited in-person contact and disruption to daily work, causing increased feelings of loneliness, anxiety, and stress (Brooks et al., 2020; Jewell et al., 2020; Mukhtar, 2020; Newby et al., 2020; Tull et al., 2020). One study by Daly et al. found the percentage of U.S. adults with depression significantly increased from around 9% prior to the pandemic to a little over 14% during the pandemic in the spring of 2020 (Daly et al., 2021). COVID-19 illnesses and deaths have also contributed to psychological and emotional distress, particularly among healthcare workers who have been at an increased risk of exposure to COVID-19 and often been responsible for treating severe COVID-19 cases (Hennein & Lowe, 2020; Sharma et al., 2021; Thomaier et al., 2020). These disruptions to daily life have also led to changes in health behaviors such as physical activity and diet. Limited access to exercise facilities, changes in daily routine, and increased work and parenting responsibilities have decreased levels of physical activity, while increased time at home has changed eating behaviors, resulting in higher calorie

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Applying Research to Occupational Health Practice

This study explored trends in health behaviors (physical activity, diet) and well-being among university and medical center staff during the beginning few months of the COVID-19 pandemic. Using three waves of observational data from the Employee Well-being during Epidemic Response study, we found most university and medical center staff experienced worsening mental health and well-being. We also found significant associations between health behaviors and mental health and well-being across each wave. Our findings suggest the need for workplace health promotion programs to support health behaviors among employees to improve mental health and well-being. Such health promotion programs may help employees maintain or improve health behaviors and mitigate negative mental health and well-being impacts due to the COVID-19 pandemic and beyond.

consumption, fewer fruits and vegetables, and more snacking (Barkley et al., 2020; Dwyer et al., 2020; Farah et al., 2021; Martinez-Ferran et al., 2020; Tison et al., 2020).

The impact of the COVID-19 pandemic on well-being and health behaviors is of public health concern. Decreased physical activity, poor nutrition, and poor mental health and well-being are all influential risk factors for chronic diseases such as obesity, cardiovascular disease, and diabetes, many types of cancer, and even for severe COVID-19 (Butler & Barrientos, 2020; Na & Oliynyk, 2011; Prince et al., 2007; Salleh, 2008; Sallis et al., 2021; U.S. Department of Health and Human Services, 2018; U.S. Department of Health and Human Services and U.S. Department of Agriculture [USDA], 2015). In addition, we know a complex relationship exists between health behaviors and mental health, wherein negative changes in one may negatively impact the other and fuel a cycle of worsening health, potentially leading to even worse health outcomes (Prince et al., 2007; Rossa-Roccor et al., 2021; Salleh, 2008).

Given this complex relationship and potential health outcomes, it is important to build on our still-limited knowledge of how the COVID-19 pandemic has influenced well-being and health behaviors. This is the case for workers both within healthcare and employed in other fields because changes to daily routine and work have been driving some of the changes in well-being and health behaviors (Brooks et al., 2020; Tull et al., 2020). We used data from the EMPOWER (Employee Well-being during Epidemic Response) study to (a) describe changes in health behaviors (physical activity and diet) and well-being outcomes (mental well-being, depression, anxiety, and stress) across three waves of data collection during the first 4 months of the COVID-19 pandemic among staff at a university and associated medical center and (b) to explore the associations between health behavior changes and well-being outcomes and whether these relationships varied by clinical role.

Methods

Study Design and Sample

The EMPOWER study was an observational study conducted at a large university and affiliated medical center from April 17, 2020 to September 8, 2020. Three waves of surveys were conducted, wave 1 (April 17, 2020—May 1, 2020), wave 2 (May 28, 2020–June 23, 2020), and wave 3 (July 20, 2020–September 8, 2020), throughout the study period (Evanoff et al., 2020). Online surveys were sent via email to all benefits-eligible employees at the university and medical school to measure mental health and well-being of faculty and staff during the COVID-19 pandemic. Employees received emails with a link to the anonymous and voluntary survey, which could be completed in 10 minutes. All participants provided written informed consent. Topics in the survey covered demographics, well-being, and health behaviors. The study was approved by the Washington University in St. Louis institutional review board.

Measures

The survey measured demographics by asking participants to describe their race (White, Black, Asian, two or more races, other), their gender (male and female), Hispanic ethnicity (yes/no), age (less than 30 years, 30–39 years, 40–49 years, 50–59 years, 60 years or older), annual household income (less than $40,000, $40,000–$80,000, More than $80,000), clinical role (onsite clinical, onsite nonclinical, working at home), and job type (nursing, clinical support/records, clinical research, basic research, accounting/finance, student/academic services, security, animal care, facilities/transportation/health and safety, administrative support, management/administration, human resources, information technology, library services, public affairs/marketing).

The survey measured health behaviors (physical activity and diet) by asking participants to answer the questions, "Compared to a month ago, my eating habits are . . ." and "Compared to a month ago my exercise habits are . . ." with one of five response options provided (much healthier, somewhat healthier, about the same, somewhat less healthy, and much less healthy). Responses were then dichotomized into same or healthier (much healthier, somewhat healthier, and about the same) and less healthy (somewhat less healthy and much less healthy).

Stress, anxiety, and depression were measured using the Depression, Anxiety, and Stress Scale-21 Items (DASS-21) (S. H. Lovibond & P. F. Lovibond, 1995). The DASS-21 is a validated measure composed of three self-reported scales measuring the presence of symptoms relating to depression, anxiety, and stress. Each scale is composed of 7 items. Participants are asked to indicate how much each item applies to them over the past week. Response options include (0—does not apply to me at all, 1—applied to me to some degree or some of the time,

2—applied to me to a considerable degree or a good part of the time, and 3—applied to me much or most of the time). Scores for each scale are calculated and recommended cut points used to rate normal, mild, moderate, severe, and extremely severe levels of depression, anxiety, and stress (Brumby et al., 2011; John & Julie, 2003). The cut points vary for depression, anxiety, and stress. For depression (normal 0–9, mild 10–13, moderate 14–20, severe 21–27, extremely severe 28+), anxiety (normal 0–7, mild 8–9, moderate 10–14, severe 15–19, extremely severe 20+), and stress (normal 0–14, mild 15–18, moderate 19–25, severe 26–33, extremely severe 37+). Responses were then dichotomized into none/mild (normal and mild) and moderate/severe (moderate, severe, and extremely severe).

Since well-being is not solely the absence of clinical symptoms, a measure of mental well-being was also included in the analysis to assess quality of life relating to psychological, emotional, and cognitive functioning (Huppert, 2014; Linton et al., 2016; Ryan & Deci, 2001). To measure mental well-being, participants were asked to report on changes in mental well-being from before the COVID-19 pandemic to the present time during the COVID-19 pandemic. The survey question, "To what extent have COVID-19 work/life changes impacted your mental well-being?" included response options ranged on a 4-point scale (much worse, somewhat worse, about the same, much better/somewhat better). Responses were then dichotomized into decreased (much worse and somewhat worse) and same or improved (about the same and much better/somewhat better).

Statistical Analysis

All statistical analyses were conducted using SAS version 9.5 (SAS Institute Inc). To compare results across the three waves of data collection, data were only included in this analysis for participants who completed at least two of the three waves. Analysis treated each wave as a cross-sectional sample of the population. Using chi-square tests, we found no significant demographic differences between the samples for each of the three waves. We computed descriptive statistics and chi-square analyses to examine the frequencies of demographics (age, race, ethnicity, gender, clinical role, and income) health behaviors (physical activity and diet) and well-being outcomes (mental well-being, depression, anxiety, and stress) and to explore associations between health behaviors and well-being outcomes. We also ran logistic regression models assessing the relationship between health behaviors and well-being outcomes. In the logistic regression models, the dependent variables were the well-being outcomes of interest (mental well-being, depression, anxiety, and stress) and the independent variables of interest were health behaviors (physical activity and diet). We adjusted the models with the covariates of age, race, income, gender, ethnicity, and clinical role. We then ran the adjusted logistic regressions using interaction terms to explore how the relationship between health behaviors and well-being outcomes might vary by clinical role. Assumptions of sample size were met for chi-square analyses and of multicollinearity for logistic regressions.

Results

The analytic sample consisted of participants who completed at least two of the three waves of the EMPOWER study (Wave 1: 1994, Wave 2: 1426 and Wave 3: 1363; Table 1). Around 85% of the sample were female. Most of the participants were White (90%) and made more than $80,000 (58%–61%). Many of the participants were between the ages of 30 and 59 years old (77%). Regarding clinical role, the majority (75%–82%) worked at home, while 11% to 14% were onsite clinical workers.

Over half of participants reported the same or healthier physical activity (54%) and diet (57%) (Table 2). Across the waves, the proportion of participants reporting the same or healthier physical activity and diet than the month before increased, from 54% in wave 1 to 65% in wave 3 for physical activity and 57% to 73% from wave 1 to wave 3 for diet. The proportion of participants reporting less healthy physical activity and diet decreased from 46% in wave 1 to 35% in wave 3 for physical activity and 41% in wave 1 to 27% in wave 3 for diet.

More than half of participants reported decreased mental well-being across the three waves (62%–68%), while most participants reported none/mild depression (83%–85%), none/mild anxiety (86%–87%), and none/mild stress (87%). Overall, well-being outcomes stayed somewhat stable across the three waves. The proportion of participants reporting a decrease in mental well-being started at 68% in wave 1, dropped to 62% in wave 2, and then to 62% in wave 3. The proportion of participants reporting moderate to severe depression, stayed constant at around 15% to 17% across the three waves, as did participants reporting moderate to severe stress (13%), and moderate to severe anxiety (13%–14%).

To understand the influence of clinical role on well-being outcomes, we also examined the clinical role as a factor in multivariate analyses (Table 3). We observed that onsite nonclinical staff and those working at home were less likely to experience worse mental well-being across most waves, compared to onsite clinical staff. There were no significant associations between clinical role and depression regardless of wave. Only at wave 2 were onsite nonclinical staff and those working at home less likely to experience moderate/severe stress, compared to onsite clinical staff. Onsite nonclinical staff were less likely at wave 2 to experience moderate/severe anxiety compared to onsite clinical staff, while those working at home were less likely to experience moderate/severe anxiety compared to onsite clinical staff at all waves. There was no effect modification of clinical role on the relationship between health behaviors and well-being outcomes.

Significant associations were observed between reported physical activity and all well-being outcomes of mental well-being, depression, anxiety, and stress at each of the three waves. After adjusting for diet, age, race, income, gender, ethnicity, and clinical role, same or healthier physical activity was no longer significantly associated with moderate/severe depression at waves 2 and 3 or stress at waves 2 and 3 (Table 4). Only at wave 1 were participants whose physical activity

Table 1. Demographic and Occupational Characteristics of Participants in Waves 1, 2, and 3 of the EMPOWER Study

Demographics, *n* (%)	Wave 1 (*n* = 1,994)	Wave 2 (*n* = 1,426)	Wave 3 (*n* = 1,363)
Female	1682 (84.35)	1191 (83.52)	1163 (85.08)
Race			
White	1788 (89.67)	1299 (91.09)	1227 (89.76)
Black	104 (5.22)	60 (4.21)	66 (4.83)
Asian	40 (2.01)	26 (1.82)	32 (2.34)
Two or more races	41 (2.06)	25 (1.75)	30 (2.19)
Other	21 (1.05)	16 (1.12)	12 (0.88)
Hispanic/Latino	50 (2.51)	34 (2.38)	43 (3.15)
Age			
Less than 30 years	239 (11.99)	160 (11.22)	163 (11.92)
30–39 years	551 (27.63)	388 (27.21)	380 (27.80)
40–49 years	517 (25.93)	383 (26.86)	367 (26.85)
50–59 years	450 (22.57)	343 (24.05)	315 (23.04)
60 years or older	237 (11.89)	152 (10.66)	142 (10.39)
Income			
$40,000 or less	187 (9.38)	106 (7.43)	105 (7.68)
$40,00–$80,000	735 (32.20)	452 (31.70)	438 (32.04)
More than $80,000	1165 (58.43)	868 (60.87)	824 (60.28)
Clinical			
Onsite clinical	226 (11.33)	191 (13.39)	100 (11.04)
Onsite nonclinical	142 (7.12)	162 (11.36)	91 (10.04)
Working at home	1626 (81.54)	1073 (75.25)	715 (78.92)
Job type			
Nursing	165 (8.27)	120 (8.42)	96 (7.02)
Clinical support/records	116 (5.82)	81 (5.68)	92 (6.73)
Clinical research	301 (15.10)	233 (16.34)	221 (16.17)
Basic research	189 (9.48)	128 (8.98)	137 (10.02)
Accounting/finance	198 (9.93)	153 (10.73)	142 (10.39)
Student/academic services	124 (6.22)	81 (5.68)	80 (5.85)
Security	8 (0.40)	6 (0,42)	3 (0.22)
Animal care	14 (0.70)	11 (0.77)	8 (0.59)

(continued)

Table 1. **(continued)**

Demographics, *n* (%)	Wave 1 (*n* = 1,994)	Wave 2 (*n* = 1,426)	Wave 3 (*n* = 1,363)
Facilities/transportation/health and safety	56 (2.81)	38 (2.66)	34 (2.49)
Administrative support	329 (16.50)	236 (16.55)	232 (16.97)
Management/administration	167 (8.38)	110 (7.71)	103 (7.53)
Human resources	34 (1.71)	29 (2.03)	30 (2.19)
Information technology	147 (7.37)	100 (7.01)	92 (6.80)
Library services	35 (1.76)	24 (1.68)	20 (1.46)
Public affairs/marketing	111 (5.57)	76 (5.33)	76 (5.56)

Table 2. Frequencies of Health Behaviors and Well-Being of Participants in Waves 1, 2, and 3 of the EMPOWER Study

Health Behaviors and Well-being	Wave 1 (*n* = 1994)	Wave 2 (*n* = 1426)	Wave 3 (*n* = 1363)
Health behaviors, *n* (%)			
Physical activity			
Same/Healthier	1070 (53.66)	875 (61.36)	883 (64.59)
Less healthy	924 (46.34)	551 (38.64)	484 (35.41)
Diet			
Same/healthier	1189 (56.63)	969 (67.95)	997 (72.93)
Less healthy	805 (40.37)	457 (32.05)	370 (27.07)
Well-being, *n* (%)			
Mental well-being			
Not decreased	629 (31.54)	537 (37.66)	527 (38.55)
Decreased	1365 (68.46)	889 (62.34)	840 (61.54)
Depression			
None/mild	1680 (84.25)	1206 (84.57)	1,139 (83.32)
Moderate-severe	314 (15.75)	220 (15.43)	228 (16.68)
Anxiety			
None/mild	1736 (87.06)	1241 (87.03)	1175 (85.95)
Moderate-severe	258 (12.94)	185 (12.97)	192 (14.05)
Stress			
None/mild	1735 (87.01)	1235 (86.61)	1184 (86.61)
Moderate-severe	259 (12.99)	191 (13.39)	183 (13.39)

Table 3. Multivariate Analysis of Clinical Role as Correlates of Well-Being (Mental Well-Being, Depression, Anxiety, and Stress) for Participants in Waves 1, 2, and 3 of the EMPOWER Study

	Onsite nonclinical		Working at home	
Well-being[a]	OR[b]	95% CI	OR[b]	95% CI
Decreased mental well-being wave 1[c]	0.63	[0.38, 1.03]	0.64	[0.45, 0.90]
Decreased mental well-being wave 2[d]	0.37	[0.22, 0.60]	0.42	[0.29, 0.62]
Decreased mental well-being wave 3[e]	0.49	[0.31, 0.77]	0.38	[0.26, 0.55]
Moderate/severe depression wave 1	0.93	[0.51, 1.69]	0.91	[0.62, 1.33]
Moderate/severe depression wave 2	0.80	[0.43, 1.48]	0.95	[0.62, 1.47]
Moderate/severe depression wave 3	1.11	[0.65, 1.88]	1.02	[0.67, 1.57]
Moderate/severe anxiety wave 1	0.81	[0.44, 1.50]	0.57	[0.39, 0.84]
Moderate/severe anxiety wave 2	0.33	[0.17, 0.65]	0.45	[0.30, 0.68]
Moderate/severe anxiety wave 3	0.89	[0.53, 1.51]	0.58	[0.38, 0.88]
Moderate/severe stress wave 1	1.07	[0.57, 2.01]	0.93	[0.62, 1.40]
Moderate/severe stress wave 2	0.47	[0.25, 0.89]	0.56	[0.37, 0.85]
Moderate/severe stress wave 3	0.82	[0.46, 1.48]	0.85	[0.54, 1.33]

[a]Reference groups (maintained/improved mental well-being, none/mild depression, none/mild anxiety, none/mild stress, onsite clinical). [b]Odds ratio adjusted for physical activity, diet, income, age, race, gender, ethnicity. [c]Wave 1 (n = 1994). [d]Wave 2 (n = 1426). [e]Wave 3 (n = 1363).

remained the same or was healthier compared to a month prior, 32% less likely to report moderate/severe depression (odds ratio [OR] = 0.68, 95% confidence interval [CI]: 0.52–0.89) and 39% less likely to report moderate/severe stress (OR = 0.61, 95% CI: 0.45–0.81) than participants whose physical activity was less healthy. Physical activity was associated across all three waves with both mental well-being and anxiety. Participants whose physical activity remained the same or was healthier compared to a month prior were 24% to 48% less likely at waves 1 (OR = 0.76, 95% CI: 0.62–0.94), 2 (OR = 0.52, 95% CI: 0.40–0.68), and 3 (OR = 0.55, 95% CI: 0.41–0.73) to experience decreased mental well-being than participants whose physical activity was less healthy. Similar results were found for anxiety, although with decreasing odds across each wave. Participants whose physical activity remained the same or was healthier compared to a month prior were 56% less likely at wave 1 (OR = 0.44, 95% CI: 0.32–0.59), 52% less likely at wave 2, (OR = 0.48, 95% CI: 0.33–0.70), and 56% less likely at wave 3 (OR = 0.54, 95% CI: 0.37–0.79) to report moderate/severe anxiety than participants whose physical activity was less healthy.

Diet was significantly correlated with well-being outcomes of mental well-being, depression, anxiety, and stress at all three waves. After adjusting for physical activity, age, race, income, gender, ethnicity, and clinical role, diet was no longer significantly correlated with anxiety at wave 3. However, at waves 1 and 2 participants whose diet was the same or healthier than a month prior, were 31% (OR = 0.69, 95% CI: 0.51–0.92) and 37% (OR = 0.63, 95% CI: 0.44–0.91) less likely to report moderate/severe anxiety than participants whose diets were less healthy. Mental well-being was associated with diet across all three waves, with decreased odds at each wave. Participants whose reported diet was the same or healthier compared to a month prior were 55% (OR = 0.45, 95% CI: 0.36–0.57), 53% (OR = 0.47, 95% CI: 0.35–0.62), and 39% (OR = 0.61, 95% CI: 0.45–0.83) less likely at waves 1, 2, and 3, respectively to experience decreased mental well-being than participants whose diet was less healthy. We found participants were 40% less likely to report moderate/severe depression at wave 1 (OR = 0.60, 95% CI: 0.46–0.78), 48% less likely to report moderate/severe depression at wave 2 (OR = 0.52, 95% CI: 0.37–0.74), and 35% less likely to report moderate/severe depression at wave 3 (OR = 0.65, 95% CI: 0.45–0.94) if their diet stayed the same or was healthier compared to participants whose diet was less healthy. Finally, we found participants were 37% to 38% less likely at waves 1 (OR = 0.63, 95% CI: 0.47–0.84) and 2 (OR = 0.62, 95% CI: 0.43–0.89), and 47% less likely at wave 3 (OR = 0.53, 95% CI: 0.36–0.78) to report moderate/severe stress if their diet stayed the same or was healthier compared to participants whose diet was less healthy than a month prior.

Table 4. Analysis of Health Behaviors (Physical Activity and Diet) as Correlates of Well-Being (Mental Well-Being, Depression, Anxiety, and Stress) for Participants in Waves 1, 2, and 3 of the EMPOWER Study

	Same/healthier physical activity		Same/healthier diet	
Well-being[a]	OR[b]	95% CI	OR[b]	95% CI
Decreased mental well-being wave 1[c]	0.76	[0.62, 0.94]	0.45	[0.36, 0.57]
Decreased mental well-being wave 2[d]	0.52	[0.40, 0.68]	0.47	[0.35, 0.62]
Decreased mental well-being wave 3[e]	0.55	[0.41, 0.73]	0.61	[0.45, 0.83]
Moderate/severe depression wave 1	0.68	[0.52, 0.89]	0.60	[0.46, 0.78]
Moderate/severe depression wave 2	0.80	[0.57, 1.13]	0.52	[0.37, 0.74]
Moderate/severe depression wave 3	0.80	[0.57, 1.13]	0.65	[0.45, 0.94]
Moderate/severe anxiety wave 1	0.44	[0.32, 0.59]	0.69	[0.51, 0.92]
Moderate/severe anxiety wave 2	0.48	[0.33, 0.70]	0.63	[0.44, 0.91]
Moderate/severe anxiety wave 3	0.54	[0.37, 0.79]	0.73	[0.50, 1.08]
Moderate/severe stress wave 1	0.61	[0.45, 0.81]	0.63	[0.47, 0.84]
Moderate/severe stress wave 2	0.74	[0.51, 1.06]	0.62	[0.43, 0.89]
Moderate/severe stress Wave 3	0.76	[0.52, 1.11]	0.53	[0.36, 0.78]

[a]Reference groups (maintained/improved mental well-being, none/mild depression, none/mild anxiety, none/mild stress, less healthy physical activity, less healthy diet). [b]Odds ratio adjusted for income, age, race, gender, ethnicity, and clinical role. [c]Wave 1 (n = 1994). [d]Wave 2 (n = 1426). [e]Wave 3 (n = 1363).

Discussion

This study aimed to describe changes in health behaviors and well-being during the COVID-19 pandemic among staff at a university and associated medical center. We found most participants reported maintained or improved health behaviors, and while most reported none or mild depression, anxiety, and stress, and maintained or improved mental well-being, the prevalence of worse well-being outcomes in our sample were still higher than national averages and similar to other studies conducted at the time. Well-being outcomes varied by clinical role with higher rates of worse mental well-being and moderate to severe stress and anxiety for onsite clinical workers; however, we did not find that clinical role moderated the relationship between health behaviors and well-being outcomes. Importantly, maintained or improved health behaviors were associated with better well-being outcomes.

We observed a high prevalence of moderate to severe depression and stress and decreased mental well-being in our sample, along with differences in well-being outcomes by clinical role. In general, most participants reported none or mild levels of depression, anxiety, and stress; however, the proportion of participants reporting moderate to severe depression (16%–17%) were higher than the national average of 7%, and similar to other studies assessing mental health during the COVID-19 pandemic (Jewell et al., 2020; National Institute of Mental Health, 2017a, 2017b; Newby et al., 2020). Around 13% to 14% of participants reported moderate to severe stress, which falls in the range of other studies using the DASS-21, which had findings ranging from 9% to 28% of participants experiencing moderate to severe stress during the COVID-19 pandemic (Chew et al., 2020; Mazza et al., 2020; Stanton et al., 2020; Wang et al., 2020). While we did not find anxiety to be reported at the same level as national averages, 13% to 14% compared to 20%, these findings are generally in line with previous research which also found high levels of depression and stress among U.S. adults and healthcare workers during the COVID-19 pandemic (Brooks et al., 2020; Evanoff et al., 2020; Jewell et al., 2020; National Institute of Mental Health, 2017a; Newby et al., 2020; Tull et al., 2020).

We observed differences in well-being outcomes by clinical role. Compared to onsite clinical staff, onsite nonclinical staff and those working at home were less likely to experience worse mental well-being, anxiety, and stress at most waves. Staff working from home were less likely to experience moderate to severe anxiety compared to onsite clinical workers. Even though

most participants reported none or mild depression and stress, depression was still higher than national averages and moderate to severe stress was in line with other research conducted during the COVID-19 pandemic. While anxiety was not higher overall, it was higher for the group of onsite clinical workers. This suggests mental health may be a concern for university and medical staff during the pandemic and that particular attention should be paid to onsite clinical staff who may experience worse anxiety. Ongoing monitoring of mental health in this population will be critical, especially as the pandemic is ongoing, and understanding mental health and well-being trends in this population can inform public health interventions and policies (Bianchi et al., 2015; Bubonya et al., 2017; Prince et al., 2007).

Another important finding from our study was that health behaviors may act as a protective factor for mental health and well-being. Participants whose physical activity and diet stayed the same or increased were significantly less likely to experience worse mental well-being and moderate to severe levels of depression, anxiety, and stress. Our findings around the association between health behaviors and well-being are in line with previous research and lend support to the importance of maintaining or increasing health behaviors during the COVID-19 pandemic (Ball & Lee, 2000; Cerin et al., 2009; Ingram et al., 2020). Given the sample of university and medical staff, one such avenue would be to focus on robust workplace wellness programs that can help workers maintain and improve health behaviors, such as diet and physical activity. Employee wellness programs have been found to improve worker health behavior, promoting well-being and worker satisfaction (Goetzel et al., 2014; Kaspin et al., 2013). As such, access to these programs may not only have long-term health benefits but also aid in making sure employees maintain and improve health behaviors and well-being during times of crisis, such as during the COVID-19 pandemic.

Finally, we found a high proportion of participants reporting maintained or improved health behaviors. These findings are not in line with most of the previous research showing the COVID-19 pandemic led to decreases in physical activity and worse dietary behaviors (Ammar et al., 2020; Dwyer et al., 2020; Gallo et al., 2020; López-Bueno et al., 2020; Robinson et al., 2021; Tison et al., 2020). One potential explanation for our findings is that health behavior change during the pandemic may be influenced by prepandemic diet and physical activity. One study by Barkley et al. found similar changes of increased physical activity in the university setting for participants who had low or moderate rates of physical activity prior to the pandemic (Barkley et al., 2020). We did not collect data on baseline levels of physical activity and diet; however, it is possible variation in prepandemic health behaviors could be driving some of our findings. The health behavior findings may also be due to the measure we used for physical activity and diet change. Since we asked about changes in overall diet and physical activity, we may miss nuances in health behavior change that could affect our results. For example, we do not have information on increases in healthy foods versus decreases in unhealthy foods, snacking, or changes to home cooking and eating out. In addition, we do not have information about changes to the frequency, intensity, duration, or location for physical activity. Future research should explore these more nuanced aspects of health behavior change to better understand if and how the COVID-19 pandemic influences healthy lifestyles in this population.

Our study has a few limitations which are important to note. While we described self-reported changes to health behavior and mental health and well-being outcomes across three waves of data, the cross-sectional nature of this study means we cannot report on causation. This is important to note because the relationship between health behaviors and mental health and well-being are likely bi-directional. In terms of measurement, we asked participants to report on whether physical activity and diet changed through a scale of much healthier to much less healthy. As "healthy" may be interpreted differently by respondents, there is the potential for self-report bias. This is also a limitation for our measurement of Mental well-being, as this term can be perceived differently by different respondents. We also did not ask participants what their health behaviors were like prior to the pandemic, limiting our ability to assess how prepandemic health behaviors and well-being related to changes during the pandemic. In addition, each survey asked participants to report on how their diet or physical activity changed compared to 1 month prior, so changes made and sustained early in the pandemic may not be reflected as changes in later survey waves. As, health behaviors were measured by self-report, there may also be recall bias. In terms of the sample, many participants were working from home, and data on worker roles were collected at a high-level preventing comparison across job types for this analysis. Although unable to explore comparisons across job type, clinical role was adjusted for in the analyses. We also report on the association between clinical role and well-being outcomes from our adjusted models to better capture how clinical role and working from home may relate to well-being. While we adjusted our models for factors that may influence well-being outcomes, we did not account for the potential role of employee wellness programs. This was beyond the scope of our analysis, which focused on describing health behaviors and well-being during the COVID-19 pandemic and the relationship between health behaviors and well-being among staff at a university and medical center. In addition, our sample, although large, is limited to one employer, making it difficult to generalize our findings beyond our study population. Despite these limitations, this study collected data in multiple waves, beginning early in the pandemic from a large group of employees in clinical, academic, and staff positions. This information provides insight into how the pandemic might impact well-being and health behaviors and informs strategies for improvement.

Conclusion

The main finding of our study was the importance of maintaining or increasing health behaviors during the COVID-19

pandemic to mitigate negative influence on mental health and well-being. Participants who maintained or increased healthy physical activity and diet were less likely to experience worse mental health and well-being. This finding is especially salient considering the high prevalence of poor mental health outcomes and decreased mental well-being within the study sample, and specifically among clinical workers. Our findings of the observed relationship between mental health and healthy diet and physical activity during the pandemic support employer-based and public health efforts to promote wellness. Future research should continue to monitor health behaviors and mental health and well-being among workers and the impact of public health and policy intervention.

Implications for Occupational Health Practice

This study provides insight into health behaviors and well-being for clinical and nonclinical staff at a university and medical center during the first few months of the COVID-19 pandemic. Results show the mental health experiences and health behaviors of workers in medical and academic settings over the course of the first few months of the pandemic. Our findings show a relationship between health behaviors and mental health during this time. These findings suggest that healthy eating and physical activity behaviors may have mitigated the negative influence of the COVID-19 pandemic on mental health and well-being in this population. Given these findings, it is important to consider the need for workplace health promotion efforts focused on maintaining or improving healthy eating and physical activity during the pandemic and beyond.

Author Contributions

A.G. conducted data analysis and was a major contributor in writing this manuscript. A.E. provided guidance on data analysis and was a major contributor in writing this manuscript. G.C. assisted in data analysis and contributed to writing this manuscript. J.H. provided guidance around data analysis and reviewed and provided feedback and edits to this manuscript. L.H. conducted data management and provided feedback and edits to this manuscript. B.E. designed the EMPOWER study, provided guidance on data analysis, and provided feedback and edits to this manuscript. All authors read and approved the final manuscript.

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