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RESEARCH ARTICLE

Is work keeping us from acting healthy? How workplace barriers and facilitators impact nutrition and exercise behaviors

Joseph J. Mazzola[1] | J. Taylor Moore[2] | Katherine Alexander[3]

[1] Roosevelt University, Chicago, Illinois, USA

[2] The Mental Health Center of Denver, Denver, Colorado, USA

[3] Bowling Green State University, Bowling Green, Ohio, USA

Correspondence
Joseph J. Mazzola, Roosevelt University, 430 S. Michigan Ave. AUD 827-C, Chicago, IL 60605.
Email: jmazzola@roosevelt.edu

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Abstract

The purpose of this study was to identify common barriers and facilitators to healthy nutrition and exercise behaviors in the workplace and examine their relationships to those actual daily health behaviors. We utilized a concurrent embedded mixed methods approach to collect data from 93 participants over the span of four days. Participants reported 2.80 nutrition and 3.28 exercise barriers on average over the 4 days, while reporting 2.93 nutrition and 1.98 exercise facilitators in the same timeframe. Results indicated that workload and temptations around the office prevented nutritious eating; exercise behaviors were frequently hindered by workload. The most commonly mentioned eating facilitator was proper planning, while having time to exercise facilitated physical activity. Furthermore, the number of barriers reported negatively related to their respective health behaviors (i.e., more nutrition barriers translated to poorer nutrition habits) and facilitators were positively related to them, both overall and more so on the specific day they were reported. The implications of these finding show the importance of barriers/facilitators in the workplace and aid in the creation of more targeted health promotion that could increase positive employee health behaviors by eliminating common barriers and enhancing facilitators.

KEYWORDS

barriers, exercise, facilitators, health promotion, nutrition, physical health

1 | INTRODUCTION

Eating a well-balanced diet and engaging in regular physical activity are important aspects of an overall healthy lifestyle, can lower the risks of physical health problems and help control weight (U.S. Department of Health & Human Services, 1996), and have numerous positive mental health benefits (Akande, van Wyk, & Osagie, 2000). In contrast, poor eating and exercise habits are heavily linked to obesity (e.g., Bassett, Pucher, Buehler, Thompson, & Crouter, 2008; He et al., 2004), a major risk factor for numerous serious health problems such as cardiovascular disease (Krauss, Winston, Fletcher, & Grundy, 1998) and diabetes (Mokdad et al., 2003). Despite these findings, recent surveys show that only 32% of Americans regularly engage in vigorous exercise (Gallup, 2007) and only 24% of them describe their diet as very nutritious (Gallup, 2008). The low frequency of engagement in health behaviors may be partially caused by the fact that even small barriers can impede people from engaging in these important health behaviors, with work organizations recognized as a potential source of many such impediments (e.g., Pridgeon & Whitehead, 2013). Thus, targeting barriers and facilitators at work could produce positive health benefits, as overall health promotion and interventions have proved beneficial (Goetzel & Ozminkowski, 2008).

The current study adds to the current literature by seeking to identify the types and frequency of barriers and facilitators to healthy nutrition and exercise behaviors in the workplace as well as their prevalence while also investigating how these barriers/facilitators relate directly to the frequency of the health behaviors themselves. These findings would allow researchers and practitioners to better recognize aspects of the workplace that help and hinder these healthy behaviors and understand the effects barriers/facilitators have on employees and their health choices.

For this study, "barriers" are defined as factors within the workplace that employees identify as making it more difficult to make healthy nutrition choices or be physically active. "Facilitators" are factors that help or facilitate these behaviors, a construct that has been relatively ignored in the already limited barriers research to date. Unlike previous research, this study focuses on both nutrition and

exercise simultaneously, in adult workers, and makes use of a mixed methods approach (both qualitative and quantitative data) in a longitudinal format to examine these issues. This allows for a multilevel investigation of the barrier/facilitator to behaviors relationship, which has, thus far, been unexplored in the literature.

1.1 | Promoting health through organizations

While many healthy nutrition and physical activity choices may occur during nonwork hours, work definitely plays a large role in people's intentions and behaviors, and an employee's job and workplace can have a profound effect on what nutrition and exercise choices they make. For example, working too many hours or in jobs that are too cognitively draining can leave individuals without the time/energy to exercise and/or to choose healthy foods. Wardle, Steptoe, Oliver, and Lipsey (2000) found that adults in a high-work-stress group (average 47 hr work/7 days) consumed more saturated fat and sugar intake than a low-work-stress group (average 32 hr/7 days). By supporting healthy eating and exercise behaviors, organizations can help their employees maintain a healthy lifestyle that leads to longer and happier lives. Beyond the individual benefits these behaviors provide employees, organizations may also profit from supporting healthy behaviors, as health promotion efforts have been shown to effectively lower health care costs, absenteeism, and turnover (Gebhart & Crump, 1990).

Therefore, many organizations may try to find ways to improve their employees' overall health through targeted workplace initiatives (e.g., Goetzel & Ozminkowski, 2008; Grosch, Alterman, Peterson, & Murphy, 1998), which research suggests can improve healthy nutrition and exercise habits (e.g., Osilla et al., 2012). For example, workers who participated in at least one exercise program provided by their employer had a healthier body mass index (BMI; Grosch et al., 1998), and the presence of health promotion programs has been related to improved health habits and health indicators, such as blood pressure (Goetzel & Ozminkowski, 2008). However, the few reviews that have been conducted on workplace health promotion studies have suggested that the results are, at best, mixed (Dishman, Oldenburg, O'Neal, & Shephard, 1998; Harden, Peersman, Oliver, Mauthner, & Oakley, 1999). A recent review of global promotion efforts examining 58 studies found that just over half the studies of health promotion showed statistically significant changes in physical activity specifically (Malik, Blake, & Suggs, 2014), but also suggested that results were not as positive as most organizations would hope.

This may mean that workplace health promotion may not be reaching its goals of "encouraging the health and safety of all employees" (cdc.gov, 2015). Some researchers have theorized that an inattention to the underlying barriers and facilitators to health behaviors could be the reason that studies examining health promotion interventions often find small effect sizes (Dishman et al., 1998), and thus more research is needed to assist organizations in maximizing their efforts of improving employee health behaviors by identifying and investigating the effects of these barriers/facilitators.

1.2 | Barriers and facilitators to nutrition and exercise behaviors

There are many factors that help determine someone's physical and mental health or well-being, including but not limited to: eating and exercise behavior, stress levels, sleep hours, caffeine and alcohol intake, smoking cessation, and ability to relax and recover. We specifically chose to focus on nutrition and exercise behaviors because of their relevance to almost all employees, their frequent use by individuals seeking to improve or maintain fitness levels (e.g., Prochaska, Spring, & Nigg, 2008), and their strong link to positive physical and mental health (e.g., Akande et al., 2000; Bassett et al., 2008; Warburton, Nicol, & Bredin, 2006). Evidence suggests that physical activity has a linear relationship with health status, and when done regularly, acts as a preventative factor against many chronic diseases (e.g., diabetes, hypertension; Warburton et al., 2006), while eating a nutritious diet can work as a protective factor against various cancers, coronary heart disease, and stroke (U.S. Department of Health and Human Services, 1996; Van Duyn & Pivonka, 2000). The numerous physical and mental health benefits of proper nutrition and exercise have consistently been supported by research, such as aiding individuals to reach or maintain a healthy body mass index (BMI; e.g., Akande et al., 2000; Wang, Patterson, & Hills, 2003; Donnelly et al., 2004).

Barriers/facilitators to healthy nutrition and exercise may come from any number of aspects of the work environment, including physical, psychological, social, and environmental factors. However, minimal research has specifically examined factors, events, and characteristics of work that either hinder or facilitate a person's ability to eat nutritiously and exercise regularly. The few studies that have attempted to identify barriers directly have focused mainly on college students and children under 18, while almost exclusively examining only nutrition barriers (e.g., Holm, 1993). In a study of Danish students, participants indicated monetary (i.e., healthy food tended to be more expensive) and practical (i.e., vegetables are often prepackaged with family portion) problems with trying to maintain a healthy diet (Holm, 1993). In a large scale European study, lack of time was the most common barrier to listening to nutritional advice, especially for younger and more educated participants (Lappalainen, Saba, Holm, Mykkanen, & Gibney, 1997). In that same study, giving up favorite foods and lack of willpower were also cited as barriers to maintaining a healthy diet. Recently, a qualitative study examined barriers and drivers (similar to the facilitators conceptualized here) to nutrition in a small sample of catering workers in the United Kingdom (Pridgeon & Whitehead, 2013). They identified four themes affecting food choices in the workplace: workplace structure, cost and availability of food, institutional responsibility, and food marketing. However, that study focused solely on nutrition and incorporated only one-time interviews with a small group (n = 23). Due to the lack of research in this area and the qualitative nature of our barriers/facilitators questions, we have no a priori expectations for the types and prevalence of both specific and overall barriers/facilitators, but instead present the follow research questions:

Research Question (RQ) 1: What types of workplace barriers/facilitators for nutrition and exercise behaviors are experienced and reported by employees? Which are the most prevalent?

Research Question (RQ) 2: How often do barriers/facilitators for nutrition and exercise behaviors occur during the week?

1.3 | Barriers/facilitators relationship to healthy behaviors

Research to date has not connected the occurrence of nutrition and exercise barriers and facilitators directly to actual health behaviors, although some research has indirectly shown how both these workplace factors can affect the eating and exercising behaviors of individuals. For example, researchers have shown managerial and organizational support as crucial factors in the effectiveness of any health promotion (Pelletier, 2001), and social support has been shown as a predictor for the adoption of health behaviors (e.g., Wynd & Ryan-Wegner, 2004). This suggests support from a variety of different sources can potentially affect whether employees eat nutritiously and exercise. Another potential facilitator is the availability of fruits and vegetables (i.e., healthier nutrition choices). One intervention study showed that by increasing the availability of these options and reducing their cost, the frequency of fruit and salad purchases increased threefold (Jeffery, French, Raether, & Baxter, 1994). However, the frequency of purchases returned to baseline after the intervention, showing the importance of not only removing health behavior barriers but also maintaining facilitation to influence continued adherence to behaviors. These findings imply that environmental and social factors in the workplace have the potential to impair or promote healthy behaviors of employees. Barriers in the organization likely also have the potential to affect health behaviors at the workplace (e.g., not having the time to eat a healthy lunch) and in the nonwork domain (e.g., working too late to complete a planned workout session).

While research linking the number of barriers and facilitators in the workplace to nutrition and exercise behaviors is limited, the Theory of Planned Behavior gives us some insight into why one would expect barriers/facilitators to be related to behaviors (Ajzen, 1991). The theory states that attitudes towards the behavior/s (in this case, eating healthy and exercising), subjective norms, and perceived behavioral control, lead to the intention to perform that specific behavior. These intentions are then the direct precursors to the behavior itself. Barriers may affect the perception of whether employees believe they can perform a healthy behavior. For example, an employee may value exercise, and the prevailing norm among friends/co-workers supports exercise, but work-related time constraints make finding time to exercise difficult. In this case, the employee perceives they do not have control over their ability to perform the healthy behavior. In the Jeffery et al. study (1994) referenced previously, employees may have had the attitude that eating healthy was important, and possibly even intended to eat more fruits and vegetables, but their intended action was impeded by the barrier of having no, limited, or difficult options for actually eating healthy.

Facilitators and barriers may also moderate the relationship between intentions and behavior. An employee who intended to eat a healthy lunch brought from home may experience a barrier when friends ask them to come out for pizza; an employee who intends to exercise may be facilitated by having an hour lunch break and exercise/shower facilities at the office. Payne, Jones, and Harris (2010) recently found that while intention to exercise and perceived behavioral control did predict exercise behavior, job demands interrupted the intention to exercise relationship despite previously measured intentions.

Furthermore, these barriers and facilitators will likely have a greater effect on behaviors on the day they occur, in comparison to a barrier/facilitator that occurred several days ago. For example, as one diary study showed, participants reported job demands having a negative influence on their exercise behaviors on that actual day (Payne et al., 2010). Another diary study showed that daily hassles were associated with increased consumption of high fat/sugar snacks while also reducing vegetable intake on those days (O'Connor, Jones, Conner, McMillan, & Ferguson, 2008). Thus, based on the limited previous research on barriers and facilitators (e.g., Holm, 1993; Pridgeon & Whitehead, 2013), as well as substantial literature on health promotion and healthy behaviors (e.g., Ajzen, 1991), we hypothesize:

Hypothesis 1a: The number of nutrition barriers reported during the week will be negatively related to nutrition behaviors at level 1 (overall person) and level 2 (daily level) of the analysis.

Hypothesis 1b: The number of exercise barriers reported during the week will be negatively related to exercise frequency at the level 1 (overall person) and level 2 (daily level) of the analysis.

Hypothesis 2a: The number of nutrition facilitators reported during the week will be positively related to nutrition behaviors at the level 1 (overall person) and level 2 (daily level) of the analysis.

Hypothesis 2b: The number of exercise facilitators reported during the week will be positively related to total exercise frequency at the level 1 (overall person) and level 2 (daily level) of the analysis.

2 | METHODS

2.1 | Participants

Ninety-three participants took part in this study. Of those who filled out the initial survey and had demographics available, 77.4% were female and 76.2% were White/Caucasian, 7.1% African–American/Black, 9.5% Hispanic, and 7.2% reported "Other". Participants had a mean age of 41.50 (*SD* = 12.46), and 67.9% had at least a Bachelor's degree. The average organizational tenure was 7.40 years, and all participants had to work full-time to be eligible for the study (average hours worked/day during survey = 7.8 hr). Finally, the average BMI for this study was 28.04, meaning participants were, on average, in the "overweight" category and almost exactly at the average for U.S. men (28.6) and women (28.7) as of 2010 (Fryar, Gu, & Ogden, 2012).

Participants were recruited through a large U.S. University's employee and alumni email listserv. An overall response rate could not be calculated because recruitment was partially done through

listservs and open advertisements. They were informed of the time commitment required (twice daily surveys for five consecutive work days) and the compensation (completion of 7 of 10 surveys earned $25 gift card; 10 of 10 surveys earned $40) before deciding whether or not to participate.

2.2 | Procedure

This study utilized a concurrent embedded mixed methods design, in that both qualitative and quantitative data were collected at the same time as part of the overall weekly data collection, and both were used together in the analysis and interpretation (Plano Clark & Creswell, 2008). Each survey took approximately 10–15 min. Starting on the Monday of a regular work week, participants were emailed the morning survey links at approximately 5 a.m. (Eastern Standard Time), and afternoon surveys were emailed at 3 p.m. each day. Participants were asked to fill the surveys out within 6 hrs of receiving the email in order to improve accurate recall, but the links remained open for 24 hr so data could be collected even if participants could not complete them immediately.

On Monday morning, the initial survey was sent out for demographics and other baseline information (e.g., previous nutrition and exercise behaviors). Starting on Monday afternoon (through Friday morning), participants completed the daily surveys that included the qualitative questions about barriers and facilitators (in the afternoon, about that same day) and information about health behaviors and daily physical symptoms (in the morning, asking them about the day before). The rationale for this timing was the study asked about barriers/facilitators in relation to the workplace, so completing the evening survey immediately after work helped to capture what had happened during their work day. On the other hand, the nutrition and exercise behavior questions were in relation to the entire day, and therefore could not be assessed until the day was complete, making early morning the best option for limiting recall bias. The quantitative concluding survey was sent on Friday afternoon.

2.3 | Measures

2.3.1 | Nutrition and exercise barriers/facilitators

These were open-ended, qualitative questions allowing participants to report anything they felt hindered or helped their ability to eat nutritiously and/or complete exercise that day. There were four total items, one for each intersection of nutrition vs. exercise behaviors and barriers vs. facilitators:

1. What things or events at work did you encounter today that made it difficult for you to eat healthy? (#3. "exercise" substituted for "eat healthy")
2. What things or events at work did you encounter today that may have helped you to eat healthy? (#4. "exercise" substituted for "eat healthy")

For each item, participants were asked to "Please take your time and think about all of the events that led to your (eating/exercise) today and if you encountered any (obstacles/facilitators). If after that, you cannot think of any such events, you may put 'none'."

2.3.2 | Nutrition behaviors

In the initial and concluding surveys, nutrition behaviors were measured utilizing the Fat Intake Scale (Retzlaff, Dowdy, Walden, Bovbjerg, & Knopp, 1997), a 10-item measure that taps how often people choose low fat options. Fat intake has been used as a proxy for overall nutrition behaviors in previous research (e.g., Kolodinsky, Harvey-Berino, Berlin, Johnson, & Reynolds, 2007). Each item has its own specific response scale, and higher scores indicate higher fat intake (and thus, lower nutrition behaviors).

For the four daily surveys (Monday–Thursday), nutrition behaviors were measured with a modified version of the eating questions from the Health Promoting Lifestyle Profile II (Walker, Sechrist, & Pender, 1987). Participants were asked if they did each of seven activities on that specific day (e.g., ate 2–4 servings of fruit, limited uses of sugars and foods containing sugars, chose a diet low in fat). The use of this yes/no format kept the survey quick and easy to respond to, given that participants had to complete it four times through the week. While the items are not an exhaustive list of all healthy nutrition behaviors/choices possible, we believe that the overall scale has good construct validity, covers a fair amount of the nutrition domain, was easier to recall, and created a sound behavioral measure. The number of "yes" responses was summed to get a total "nutrition score" for each day.

2.3.3 | Exercise behaviors

For the initial and concluding survey, exercise behaviors were measured with a 7-item scale that asked various questions about how often participants completed specific exercise-related tasks (i.e., I follow a planned exercise program, I exercise vigorously for 20 min or more 3 times a week; Walker et al., 1987). This scale was answered on a 4-point scale (Never, Sometimes, Often, Routinely), and higher scores indicated healthier exercise behaviors. In the initial survey, we asked about exercise behaviors as related to "normal routine" and in relation to the previous week for the concluding survey.

On the daily surveys, a modified version of the Godin Exercise Scale was used to measure actual exercise frequency each day (Godin & Shephard, 1997). This scale is typically used to measure weekly activity with a formula weighting the three types of exercise (mild = 3, moderate = 5, and vigorous = 9) suggested for each time it is done for at least 15 min. Therefore, we multiplied the duration of each type of exercise by its corresponding weight (1 point for each 15 min, up to five for each type) and totaled the three numbers for each day, yielding a daily physical activity score for each participant. This allowed us to measure daily exercise behavior based on the actual amount of daily physical activity reported while still incorporating the intensity of the activities.

2.3.4 | Demographics and additional questions

The demographic information for gender, age, ethnicity, and organizational tenure was collected in the initial survey. Finally, on the daily survey, participants were also asked the number of hours worked that day.

2.4 | Data analysis

The three authors of this paper first independently coded the number of barriers and facilitators present in each participant's daily responses. Raters looked at each individual answer provided to determine how many barriers (or facilitators) had been provided by the respondent using the following criteria: (a) statements must be a stand-alone identifiable barrier/facilitator that could (b) potentially hurt (or help) the respective health behavior, but (c) did not have to actually stop the employee from eating health/exercising, as long as the participant recognized its potential to do so (or help for a facilitator). If "none" was provided as an answer, or no barriers/facilitators fitting the above criteria could be identified in a response, the rater coded the response as a "0". While coders were free to code as many barriers/facilitators as were present in the response, no more than three distinct responses were ever given for one single question by a participant on any given day. All three raters agreed on the exact number of events 91.9% of the time, indicating fairly high interrater reliability (Miles & Huberman, 1994). For the remaining discrepancies, coding was discussed until all three raters agreed on how many barriers/facilitators that participant experienced for each question. This is similar to procedures used in several studies that involved qualitative, open-ended data (e.g., Narayanan, Menon, & Spector, 1999).

The responses were then coded into specific categories of barriers and facilitators by the three authors, using a form of thematic analysis (Braun & Clarke, 2006). In the first step, each author examined 1/6 of the total responses for each barrier/facilitator question and developed an exhaustive list of possible categories. Categories were allowed to emerge naturally from the data while also considering the relevant literature (e.g., Lappalainen et al., 1997), an approach that was both inductive and deductive (Braun & Clarke, 2006). While each overall response that a participant provided for a barrier/facilitator question that day could be coded into as many barriers/facilitators they provided for that question (as coded previously and discussed above), each individual barrier or facilitator provided could only be coded into one category. For example, on Monday, a participant could have said "there were donuts in the break room and had very little time" for nutrition barriers, which is clearly two separate barriers. Thus, this would be coded as two potential barriers in the initial coding, but then each individual barrier would only be allowed to be coded into one barrier type. In this case, "donuts in the break room" clearly falls into the "temptation" category, but "had very little time" would not be allowed to be coded into both "time constraints" and "workload" due to this restriction. Thus, in cases of overlap (i.e., barrier potentially fitting into more than one category), the response was placed into the category that best fit the nature and definition of the barrier/facilitator (a list of the precise category definitions utilized is available upon request from the first author). There was 98.0% agreement for category coding, and the first two authors discussed the few existing discrepancies until a consensus was reached.

For all missing data, pairwise deletion was used, such that if participants did not complete a scale or survey, they were left out of any analysis utilizing that measure but could still be included in other analyses on measures they did complete. All variables used in any analyses were tested for normality, and all fell well within the acceptable range (−1 to 1; Chan, 2003). Repeated measures analysis of variance (ANOVA) was conducted to look for differences in the average number of each type of barrier/facilitator by day of the week (RQ2). Barriers and facilitators were summed across days to get a total for the week for each participant, and then Pearson correlations were performed between these totals and the behavior measures in the initial and concluding survey to test Hypotheses 1 and 2 at level 1.

The daily diary nature of this study resulted in data where daily responses (level 1) were nested within participants (level 2). Such an approach creates multiple data points per person and violates the independence assumption of many statistical analyses, such as regression (Nezlek, 2008). Thus, multilevel random coefficient modeling (MCRM), is the most appropriate analysis, since it takes into account this nesting (Nezlek, 2008). This method was used for testing Hypotheses 1–2 at level 2 regarding daily effects of barriers and facilitators on healthy behaviors during the week, utilizing the PROC MIXED MODEL function (West, 2009) in SPSS 20.0 (IBM Corp, 2011).

3 | RESULTS

3.1 | Descriptives and frequencies

Of the 93 total participants in this study, 84 completed the initial survey and 70 completed the initial, concluding, and all four evening surveys (including the barriers/facilitators questions) for a 75.27% retention rate. Any participant who completed at least one full survey was kept in the sample. There were no significant differences between the participants who filled out only the initial survey and those who completed all the evening surveys on any demographics or study variables, except race (higher percentage of Hispanic individuals did not complete).

We provide the complete list of major categories for each type of barrier and facilitator in Table 1, as well as their overall frequencies (RQ1). The types of barriers and facilitators for both eating and exercise varied widely. The most commonly reported barriers to nutrition behaviors were a heavy workload and temptations to indulge (e.g., office party had unhealthy eating choices), while the most common exercise barriers were, similarly, a heavy workload and time constraints. Other barriers that came up included the lack of healthy eating/exercise options and social influences. The most common facilitators to nutrition were healthy planning and the availability of healthy food options, and the most frequently reported facilitators for exercise were having the time to exercise and making purposeful health behavior decisions, such as taking the stairs. Space constraints prevent us from giving a more thorough description of the rich, qualitative data or providing specific quotes, but this information is also available upon request from the first author.

At least one barrier (either nutrition or exercise) was reported on 80.9% of the days participants filled out the survey, while at least one facilitator was indicated 75.1% of the time. The means and standard deviations for the number of barriers and facilitators reported and coded each day are presented in Table 2, as well as the totals for the week. These are presented as means across the entire sample for that particular day and for the week. For example, participants reported an average of .9 nutrition barriers on Mondays. Over the span

TABLE 1 Barriers to eating and exercise behaviors and their frequencies

Nutrition barriers	Total	Nutrition facilitators	Total
Workload	52(19.92%)	Planning	126(45.00%)
Time constraints	27(10.34%)	Availability of nutritious options	43(15.36%)
Temptation	51(19.54%)	Time availability	27(9.64%)
Nonwork factors	32(12.26%)	Motivation/disposition	25(8.93%)
Social influences	21(8.05%)	Social support	19(6.79%)
Lack of nutritious options	21(8.05%)	Knowledge/awareness	6(2.14%)
Work environment	17(6.51%)	Work environment	5(1.78%)
Boredom	8(3.07%)	Workload	4(1.43%)
Knowledge/awareness	0(0.0%)	Structured schedule	4(1.43%)
Other	32(12.26%)	Other	14(5.00%)
Totals	261	Totals	273
Exercise barriers	**Total**	**Exercise facilitators**	**Total**
Workload	86(26.79%)	Time availability	29(15.68%)
Nonwork factors	70(21.81%)	Making healthy decisions	27(14.59%)
Time constraints	50(15.58%)	Work environment	22(12.97%)
Fatigue	41(12.77%)	Social support	22(11.89%)
Physical ailments	24(7.48%)	Planning	18(9.73%)
Work environment	14(4.36%)	Motivation/disposition	16(8.65%)
Social influences	10(3.21%)	Availability of healthy options	12(6.49%)
Temptation	5(1.56%)	Proper sleep	4(2.16%)
Availability of exercise options	3(0.93%)	Workload	4(2.16%)
Knowledge/awareness	0(0.0%)	Structured schedule	2(1.08%)
Other	3(0.93%)	Knowledge/awareness	1(0.54%)
		Other	22(11.89%)
Totals	306	Totals	181

Note: Percentages are out of that total amount of that barrier/facilitator (e.g., workload by nutrition barriers total)

TABLE 2 Number of barriers and facilitators reported by day and overall

	Monday		Tuesday		Wednesday		Thursday		Total		
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*Range*
Barriers – nutrition	.90	.69	.73	.70	.48	.57	.67	.72	2.80	1.77	0–7
Barriers – exercise	.89	.73	.82	.63	.73	.73	.83	.62	3.28	1.87	0–9
Facilitators – nutrition	.78	.68	.75	.60	.80	.54	.60	.60	2.93	1.67	0–6
Facilitators – exercise	.58	.61	.52	.63	.54	.63	.34	.50	1.98	1.56	0–7

Note: $N = 83$

of the 4 days, respondents averaged a total of 2.80 nutrition and 3.28 exercise reported barriers. The mean for nutrition facilitators was 2.93, but exercise facilitators were the least prevalent at only 1.98 over the course of the week. A repeated-measure analysis of variance showed these difference between the means of total week barriers/facilitators reported by type was significant ($F(3, 246) = 9.29$, $p < .001$), with exercise facilitators being reported significantly less often than the other three types and more exercise barriers being reported than nutrition barriers. These findings help to begin to answer Research Question 2.

3.2 | Person-level analysis: Nutrition and exercise behaviors

The correlation results for the level 1 (i.e., overall person) portions of Hypotheses 1 and 2 are presented in Table 3, as well as means and variances for the main health behavior measures used. Nutrition barriers were significantly related to nutrition behaviors reported in the initial survey but not the concluding survey, providing partial support for hypothesis 1a. Hypothesis 1b was not supported here as exercise barriers were not significantly related to exercise frequency reported either before or after the daily surveys were administered. Both hypothesis 2a and 2b were fully supported with nutrition facilitators negatively related to fat intake and exercise facilitators positively related to reported exercise at both survey points.

While not hypothesized, barrier and facilitator totals had several other interesting relationships to important variables that are worth noting. For one, total nutrition and exercise barriers had only a moderate correlation to each other ($r = .38$, $p < .001$), as did nutrition and exercise facilitators ($r = .47$, $p < .001$). Nutrition barriers and facilitators had no correlation to each other ($r = -.01$, *n.s.*), while exercise barriers

TABLE 3 Correlations between total barriers and facilitators reported and measures of nutrition and exercise

	Fat intake (Initial)	Exercise (Initial)	Fat intake (Conclude)	Exercise (Conclude)
Mean	22.65	15.68	22.58	15.70
SD	4.45	4.54	4.14	4.44
Range	13–33	7–28	13–34	7–24
Barriers – nutrition	.20	−.02	.31**	−.04
Barriers – exercise	.24*	−.06	.26*	−.08
Facilitators – Nutrition	−.37**	.19	−.39**	.20
Facilitators – Exercise	−.20	.28*	−.22	.30*

Note: Ns range start at 67 for weekly measures, 72 for concluding measures, and 78 for initial measures.

*$p < .05$,

**$p < .01$,

***$p < .001$

and facilitators were only slightly correlated ($r = -.22$, $p = .05$). There was also virtually no correlation between any barriers and facilitators totals and hours worked during that week ($r = -.03$ to $.09$, *n.s.*). The implications of these findings are examined further in the Discussion section.

3.3 | Day-level analysis: Nutrition and exercise behaviors

Results from the day-level (Level 2) analyses for the barriers/facilitators to healthy behavior relationships are reported in Table 4. Means for the daily health behaviors on days when participants reported 0, 1, 2, and 3 barriers/facilitators are also presented in Table 4. When these relationships were examined at the day-level using MCRM, hypotheses 1a and 1b were fully supported as the fixed effects for nutrition and exercise barriers had significant effects on nutrition and exercise behavior, respectively. Hypotheses 2a and 2b were also fully supported at this level as the fixed effects for nutrition and exercise facilitators had significant effects on their respective behaviors. The t-scores and mean differences for the analyses suggest a moderate to strong effect of barriers/facilitators to healthy behaviors, but due to the uncertain nature of the proper way to display effect sizes for MCRM (Niehaus, Campbell, & Kurotsuchi Inkelas, 2014), none are reported here. It should also be noted that there were very few days when three barriers or facilitators were reported (especially for exercise), so these means may not be as meaningful as those for the other day totals.

To further explore the combined effect of barriers/facilitators, an exploratory MCRM model was run with the combined effects of number of nutrition barriers and facilitators, as well as the interaction term between the two, on eating habits. In this model, nutrition facilitators remained significant ($B = .36$, $SE = .16$, $t = 2.24$, $p < .05$), but the barriers and interaction terms did not, falling out of the model. A similar model was run for exercise, and facilitators were again significant ($B = 5.55$, $SE = 1.13$, $t = 4.91$, $p < .001$), but the barriers and interaction term were not. This finding preliminarily suggests that facilitators may play a more direct role on daily healthy behaviors than barriers.

Finally, a term was created based on the combination of barriers and facilitators for each participant for each day (one term for nutrition and another for exercise). Each participant was coded on each day for whether no barriers or facilitators occurred at all, barrier(s) occurred but no facilitators, facilitator(s) occurred but no barriers, or both barrier(s) and facilitator(s) occurred. For this analysis, the specific number of barriers/facilitators was ignored. The overall models tested with MCRM were significant, and specific results can be found in Table 5, with means for each category. The general pattern of means shows that for nutrition behaviors, reporting both a barrier and facilitator appear to balance each other out, such that the average nutrition behaviors are the same for no barrier and no facilitator as they are for reporting both a barrier and a facilitator. However, an exercise facilitator appears to potentially compensate for the presence of an exercise barrier, in that less exercise was undertaken when there was no barrier and no facilitator than when both a barrier and a facilitator were present.

4 | DISCUSSION

Participants reported several barriers and facilitators to their healthy nutrition and exercise behaviors throughout the week, and these were significantly related to their daily health behaviors. An interesting finding was that participants reported roughly .70 nutrition barriers and .81 exercise barriers each day, while facilitators occurred at a rate of .73 for nutrition and only .50 for exercise per day, which suggests a few

TABLE 4 MCRM results and means for eating and exercise behaviors scores based on number of barriers and facilitators reported on a given day

					Number of barriers/facilitators			
Outcome	**IV**	**Coeff. (B)**	**SE**	**t-score**	**0**	**1**	**2**	**3**
Nutrition behaviors	Barriers – nutrition	−.41	.10	−4.17***	4.61	3.91	3.92	2.00
	Facilitators – nutrition	.30	.12	2.44*	3.71	4.36	4.70	5.50
Exercise behaviors	Barriers – exercise	−2.30	.68	−3.38**	9.23	4.38	2.34	6.70
	Facilitators – exercise	4.99	.87	5.72***	2.99	9.03	13.1	6.00

Note: The right half of the table contains the means for the respective outcome measure on days where participants reported 0, 1, 2, and 3 barriers/facilitators. Higher scores equal better nutrition behaviors/more exercise.

*$p < .05$,

**$p < .01$,

***$p < .001$.

TABLE 5 MCRM results and means for eating and exercise behaviors scores based on if any barriers and/or facilitators were reported

Outcome	IV	Coeff. (B)	SE	*t*-score	No Barr No Facil	Yes Barr No Facil	Yes Barr Yes Facil	No Barr Yes Facil
Nutrition behaviors	Barriers & facilitators – nutrition	.27	.08	3.24**	4.06	3.56	4.07	4.82
Exercise behaviors	Barriers & facilitators – exercise	2.78	.50	5.55***	4.58	2.57	7.52	11.97

Note: The right half of the table contains the means for the respective outcome measure. Higher scores equal better nutrition behaviors/more exercise.

*$p < .05$,

**$p < .01$,

***$p < .001$.

interesting preliminary conclusions. First, employees experience almost one barrier a day to each of their healthy behaviors (and actually report at least one barrier of either type on over 80% of days). Given that the elimination of even one barrier may be enough to change the health behavior intentions of many people (e.g., O'Connor et al., 2008; Pridgeon & Whitehead, 2013), effort should be put towards eliminating or reducing these in their work (and nonwork) life. The means for nutrition/exercise behaviors on days with one and two barriers from this study support this notion, as well as those in the combined analysis. Second, employees perceived more barriers than facilitators overall, which based on the Theory of Planned Behavior (Ajzen, 1991), might suggest they would be less likely to engage in healthy behaviors. However, based on further analysis in this study looking at how barriers and facilitators combined and sometimes compensated for each other to affect eating and exercise behaviors, the relationship may be more complicated than that, and further research is needed. Finally, exercise facilitators were by far the least prevalent of the four factors measured; thus, organizations have a great opportunity to improve health behaviors by creating facilitators to physical activity because the baseline is currently very low.

This study also identified important types of organizational barriers and facilitators to healthy lifestyle behaviors. Specifically, participants indicated that their workload and temptations around the office often prevented them from eating healthy foods, while workload and time constraints hindered exercise. The temptations aspect falls in line with research by Lappalainen et al. (1997) where participants indicated a lack of willpower affecting their nutrition choices. Planning (here for nutrition habits) was the most common response for any of the four questions and indicates the importance of teaching individuals how to plan their daily food intake beforehand. Also, participants indicated that time availability and social support aided their physical activity efforts, the latter of which matches previous research (Wynd & Ryan-Wegner, 2004). It is interesting that knowledge or awareness (or lack thereof) of health behaviors was very rarely brought up as a barrier or facilitator to either nutrition or exercise, given that so many workplace and community interventions focus on this very thing. While more research is needed, it is possible that in this Internet age, people can find whatever information they might need/want about living healthy, and interventions should focus more on enhancing motivation and/or reducing barriers to behaviors. Finally, although the current study's aim was to understand the work-related barriers and facilitators and the questions specifically asked about workplace factors, nonwork factors came up frequently, highlighting the importance of considering the entire work-life interface in promoting health behaviors.

The fact that barriers and facilitators were only moderately related to one another, even within the same health behavior (e.g., nutrition), supports the notion that facilitators represent their own distinct construct and are not simply the lack of barriers. Thus, supporting better nutrition/exercise habits through the workplace is not simply eliminating the barriers, and organizations (as well as individuals) should seek to both reduce these barriers and find ways to facilitate healthy habits. The lack of a strong relationship between the nutrition barriers and exercise barriers (with the same pattern emerging for facilitators) suggests that overly specific programs (i.e., a physical activity promotion program alone), while certainly helpful, may not be completely successful. Furthermore, while an organization may decide to implement initiatives aimed at changing diet and exercise behaviors, it may not improve nutrition/exercise habits if barriers are not removed, especially after the intervention has ended (Jeffery et al., 1994, Thorndike et al., 2012). No barriers/facilitators totals were related to work hours throughout the week, an interesting finding given the fact that "time constraints" and "workload" were commonly reported barriers. Perhaps this signals that workload is based more on perception of work amount as opposed to pure number of hours worked, or that more qualitative workload is present instead of quantitative workload (Shaw & Weekley, 1985). Similarly, it is possible that outside work factors have a strong influence on feeling "time constrained" at work and/or that poor time management plays a role in the reporting of these barriers, but more quantitative research is needed to parse out these potential influences. The results of this study, however, indicate that an effective health promotion intervention should include separate components that target each behavior specifically.

The general relationship between barriers and facilitators to their respective behaviors were mostly as expected. While exercise facilitators were related to exercise behaviors at both general measurements, exercise barriers were not. Nutrition facilitators were similarly related to nutrition behaviors at both the initial and concluding surveys, but nutrition barriers only initially. However, these correlations were mostly moderate, and while we believe this indicates the importance of these factors in supporting healthy behaviors, we think that the true variance/importance lies in looking at how they affect behaviors *on that day*. This assumption is supported by the significant results for hypotheses 1 and 2 at the day level, and the daily means for these behaviors based on the number of barriers and facilitators reported that day.

A key finding was that exercise facilitators had the strongest relationship to behaviors. In addition, they also seemed to have the ability

to compensate for a barrier when it comes to the amount of physical activity on a given day. That is, participants exercised more on days when they had an exercise facilitator, even if there was a barrier present, than on days when no barriers and no facilitators existed. Thus, considering these findings and the fact that exercise facilitators were the least frequent of the four types of factors investigated, a focus on creating exercise facilitators in the workplace could potentially have a profound effect on increasing exercise behaviors. Furthermore, because barriers and facilitators often mirrored each other (e.g., time constraints and time availability), creating/supporting facilitators may have the dual effect of also eliminating or reducing some barriers.

We believe the present study has at least two major strengths. First, the use of a rigorous mixed-methods approach allowed for the free-response by participants, so that the preconceived notions of the authors did not limit the types or number of events participants could report to be barriers or facilitators, while still providing the greater generalizability and hypothesis testing abilities of the quantitative analyses. The second strength of this study was the daily diary approach, which allowed the collection of information for an entire work week and gathering of information about events as they were happening, rather than having participants try to recall from memory over a longer period of time. This led to a plethora of interesting information that allowed analyzing daily fluctuations, as well as their effects on actual behavior.

4.1 | Practical implications

Given the current study's findings that both workplace barriers and facilitators do relate to nutrition and exercise behaviors, organizations could begin to focus their workplace health promotion efforts more on eliminating barriers and creating facilitators. Moreover, considering that many of the facilitators in particular were personal (e.g., proper planning and/or bringing healthy foods), organizations could seek to focus on not just the work environment and broad health interventions, but also on overall behavioral skill development and motivation to maintain behaviors, if they want their health promotion efforts to be more effective. Also, because barriers/facilitators related to overall nutrition and exercise behaviors for a given day, this should hopefully mean that the effect of workplace health promotion could extend to health behaviors throughout the day no matter when and where these personal health decisions are made (e.g., less time constraints could help employees be active either during work hours or in their home life).

Because of the mixed research findings on the effectiveness workplace health program effectiveness (e.g., Malik et al., 2014), any information that allows organizations to be more focused and successful in their efforts is important to utilize. This study identified several prevalent barriers/facilitators that give practitioners a starting point for new intervention ideas. For example, given the finding that workload and time constraints were very common barriers to both nutrition and exercise behaviors, organizations could seek to lower workload and/or stress levels, or give employees an extra break or longer lunch for walking groups or fitness classes. Some of the more common facilitators expressed by participants, which could be used to target promotion, include available healthy options and simply making small healthy decisions (e.g., parking farther from the building). Organizations could work with their cafeterias and vending machines to enhance healthy options (e.g., Jeffery et al., 1994) or sponsor walking lunch trips to nearby healthy food restaurants.

It may also be useful for organizations to utilize a similar method of asking about barriers/facilitators to that utilized in this study as part of a needs assessment for their own specific health promotion efforts. Furthermore, the fact that facilitators remained significantly related to nutrition and exercise behaviors, even when barriers were included in the model, suggests that they likely have a stronger influence on these behaviors and should be a primary focus in health promotion. Because the current study was able to identify and determine the effects of these barriers and facilitators, researchers and practitioners can work at reducing barriers and increasing facilitators, while feeling confident these changes will have a direct effect on employee health behavior, and thus hopefully, employee health.

4.2 | Limitations and future research

Although we believe the daily diary approach used in this study to be a major strength, it also creates certain challenges. Participants may have become fatigued as the week progressed, or their earlier responses or experiences may have influenced their responses on later surveys. Attempts were made to keep the surveys short, which led to having to utilize quick, and thus not ideal, measures. Nonetheless, we felt that this was the best, and possibly only, way to get the kind of rich, consistent data necessary for the research questions in this study. Furthermore, although we had some attrition of participants, it was no more than other such longitudinal or diary studies (e.g., Payne et al., 2010), and these participants did not differ on any key variables.

Another limitation was the relatively small sample, due to resource constraints for participant incentives, which may have affected our ability to find significant relationships, particularly when those analyses were at the participant-level. However, our sample size was larger than many diary studies (e.g., Payne et al., 2010), and this issue was less of an impediment when looking at day-level variables because multiple data points were available for each participant. Additionally, our recruitment was through a listserv in a specific area, and although the advertisement went out to a variety of people, many of the participants tended to be females in clerical positions. With this in mind, generalizing this study's findings to other populations should be done with care. On the other hand, with our sample being from a traditionally sedentary work environment, it could be the ideal setting for targeting this type of workplace health promotion.

Additionally, all of the measures were self-report, which could have resulted in recall or social desirability bias. However, the diaries were distributed at strategic times, as described in the methods, to try and limit the time between the phenomena being reported on and the surveys themselves. Furthermore, a subjective review of the qualitative narratives actually suggests participants being more open and critical of their behaviors than one might expect. This exclusive reliance on self-report could also lead to problems with common method variance. Many of the measures were at least somewhat behaviorally-based, and some researchers have suggested common

method variance to be less of a problem than previously reported (Spector, 2006), but we cannot rule out this possibility completely.

It can be difficult to find valid scales to measure nutrition, particularly for short surveys. The Fat Intake Scale (used only in the initial and concluding survey; Retzlaff et al., 1997) can be particularly problematic in that not all fat consumption is bad. However, the wording of items of this scale does at least partially compensate for this problem by differentiating types of and source of fats, and over a large sample should discriminate between those who general eat more and less healthy overall. The daily survey questions hit on a more diverse set of nutrition behaviors, but at only seven items, could not possibly cover all aspects of this extensive domain. Thus, these findings should be retested using measures that might be less subject to recall and social desirability bias, such as food diaries and checklists of barriers/facilitators.

Future research should look to test these findings in other samples with different characteristics, while trying to get a larger, more expansive sample. Given that this study only looked at health behaviors, it might be interesting to examine if these barrier/facilitators also related to organizational variables (e.g., productivity) or other personal variables (e.g., mood), as well as actual health indicators. An overall model connecting barriers/facilitators to behaviors and then ultimately to health indicators, possibly tied to the Theory of Planned Behavior (Ajzen, 1991), could also be tested in a longer longitudinal study.

Further, now that the types of barriers are starting to be defined, future research could use checklists or anchors to help participants recall more of the barriers and facilitators that they encounter on a daily basis/in the workplace. Future studies could also examine how specific types of these barriers/facilitators link to the certain behaviors (e.g., does planning lead to the best eating behaviors?, is lack of availability one of the biggest factors inhibiting exercise behaviors?). Finally, another avenue for future research is the development of an intervention and evaluation based on the findings in this study, where participants are required to track and record not only their daily nutrition and exercise behaviors but also the barriers/facilitators they encounter. The organization could then even make an effort to enact real change to help eliminate the specific barriers and/or increase the facilitators. With the rise in popularity of smart phone applications that track some of this information (e.g., MyFitnessPal), there is great opportunity to evaluate the effectiveness of this type of intervention with a thorough program evaluation.

It is critical to understand how factors in the workplace can impact worker's health behaviors given the current obesity crisis (e.g., World Health Organization, 2015) and the resulting social, emotional, and physical problems (e.g., Krauss et al., 1998). This study identified many of these factors and showed they relate to daily health behaviors, namely proper nutrition and exercise behaviors, that could ultimately improve an employee's health and lower their risk for obesity, diabetes, and cardiovascular disease (Krauss et al., 1998; Mokdad et al., 2003) If the ultimate goal is improving employee health, then knowing how organizational barriers and facilitators to these behaviors occur and their relationships to key personal health and organizational variables will be extremely helpful for stakeholders within the human resources and occupational health sector who are trying to improve overall mental and physical health.

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