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Implementation of a Worksite Based 9-Week Micronutrient Dense Nutrition Intervention on Measures of Well-Being in a Cohort of Employees

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Abstract

Objective: To determine the impact of a micronutrient-dense plant-rich diet (mNDPR), when coupled with support to improve employee wellness at the worksite.

Design: Non-randomized pilot study. The intervention utilized the health belief model and the theory of planned behavior to assess the effectiveness of perceived behavioral control. We combined 14 plus hours of in-person lecture and instruction, take home materials, electronic resources and guest speakers to support participants in their transition and adherence to the mNDPR dietary plan.

Setting: Centralized conference room convenient for all participating employees.

Subjects: 51 employees and/or spouses (≥ 18 years) from a regional medical center, a local university, and a behavioral health clinic.

Conclusions: This intervention has proven to be effective at improving employee well-being. Widespread workplace implementation should be considered to improve the overall wellness of employees and increased work productivity, which may help mitigate the increasingly demanding work environment many employees experience daily.

Keywords: Worksite wellness; Plant-based, well-being; Depression; Health promotion; Micronutrients

Abbreviations: Micronutrient Dense Plant-Rich (mNDPR), Northern Arizona University (NAU), Flagstaff Medical Center (FMC), and HCIC (Health Choice Integrated Care), Quality of Life Index (QLI), Patient Health Questionnaire-9 (PHQ-9), Pittsburgh Sleep Quality Index (PSQI), and Work Productivity and Activity Impairment (WPAI), Gastroesophageal Reflux Disease (GERD), Theory of Planned Behavior Survey (TPBS)

Introduction

With the increased dependence on technology for professional production, employees are finding their workday intensifying as well as extending past the historical 8-5 timeframe. This increasingly common lifestyle pattern has blurred the boundary between work, personal time off and family [1]. With patterns of work intensification and work extensification becoming a common pattern, there can be a corresponding decrease in overall well-being as achieving work-life balance becomes more challenging. It is estimated that the average person, across their lifespan, will devote over 90,000 hours to earning a living [2]. However, there is some indication that this may be an underestimate due to so many undocumented hours worked outside the worksite. The investigators' concern is that the influence of modern technology on work and recreational patterns may be negatively influencing overall well-being.

One specific aspect of concern for employee well-being is the incidence of depression. In the United States, depression is one of the top workplace issues for employee assistance programs and reportedly accounts for over $51 billion in absenteeism from work and $26 billion in direct treatment costs [3].

In recent years, awareness regarding the mind-body connection has become more known and accepted. The influence that mental processes and thought patterns have on overall wellbeing is astounding. While establishing the mind-body connection the common emphasis is often on how the mind can influence the body to achieve an improved well-being and quality of life. Since the brain is considered to be the command center of our being, it is logical to investigate factors that provide the brain with the best environment possible in order to have the corresponding benefits of overall well-being [4].

One substantial influencer of brain health, mood and overall well-being can be the quality of a person's dietary intake. The influence of the various macronutrients on wellbeing has been extensively investigated [5,6,7]. However, relatively little has been done to measure the influence of a micronutrient rich dietary plan and its impact on brain health, mood and overall well-being.

Despite the dramatic changes and pressures of the modern worksite, the worksite remains an effective location to introduce lifestyle interventions, largely due to the built-in supportive social networks found at places of employment. We sought to study the influence of a microNutrient-Dense, Plant-Rich (mNDPR) nutrition intervention on overall well-being in a worksite.

Methods

Experimental design

The current study focused on how the overall health and wellness of working adult employees at three worksites in Arizona - Northern Arizona University (NAU), Flagstaff Medical Center (FMC), and HCIC (Health Choice Integrated Care) - were impacted by 9 weeks of nutrition education. Following 6 hours of introductory education, weekly meetings took place for one hour, once per week for nine consecutive weeks. The educational sessions informed the participants on how to implement a mNDPR diet style along with discussion of other lifestyle behaviors. Pre- and post-intervention wellness factors were measured by the following self-reported survey tools: Gastroesophageal Reflux Disease (GERDQ), Quality of Life Index (QLI), Patient Health Questionnaire-9 (PHQ-9), Pittsburgh Sleep Quality Index (PSQI), and Work Productivity and Activity Impairment (WPAI). In addition, pre- and post-intervention anthropometric measurements were made of Systolic Blood Pressure (SBP); Diastolic Blood Pressure (DBP); height; weight; waist and hip circumference, and body mass index (BMI). This intervention was centered upon the Health Belief Model that theorizes individuals will take action when they believe they can successfully avoid or alter a negative health condition. In other words, when an individual feels they have the capability to influence a positive health outcome, they are more likely to alter their personal behavior [8]. In an effort to provide a base for long-term adherence we also introduced components from the Theory of Planned Behavior to assess the effectiveness of perceived behavioral control [9].

Participants

Individuals who met the following criteria were invited to participate: employee, spouse, or adult dependent of an employee at NAU, FMC, or HCIC; 18-80 years of age; self-reported body mass index (BMI) of 28 or greater; self-reported waist circumference >35" for females and >40" for males; ready and willing to make a lifestyle change; not currently participating in a weight-loss program; and not taking any medications that could increase medical risk or that had weight loss as a primary side effect. Participants were recruited through electronic messaging, fliers and website promotion by the Northern Arizona University (NAU) Department of Employee Assistance and Wellness (EAW), Northern Arizona Healthcare (NAH) lifepath, and Health Choice Integrated Care (HCIC). The protocol and study design were approved by the NAH Institutional Review Board (IRB) and all participants provided written informed consent.

There were a total of 51 participants of which 78.4 percent were female; 70.6 percent Caucasian, 15.7 percent Native American, 9.8 percent Hispanic, 2.0 percent Asian and 2.0 percent Black. The age ranged from 30 years to 67 years with the mean age of 47.7, SD 10.1, and a median age of 47 years. Information regarding whether participants were employee, spouse, or dependent was only available for 35 participants. Of these, 86 percent were employees.

Participants did not receive financial compensation but NAU and NAH employees were eligible for incentives through their worksite wellness program, potentially offsetting the cost of their personal health insurance premiums. Upon completion of each phase of the study, participants were eligible to receive a set number of points for each aspect that corresponded to payments to offset insurance premiums. For full credit of points participants were required to participate in the entire study.

Experimental protocol

The study design was as described previously for a 12-week pilot intervention [10] with the addition of the Theory of Planned Behavior Survey (TPBS) and an additional worksite added.

Our evidenced-based microNutrient-Dense Plant-Rich (mNDPR) dietary protocol emphasizes the use of Greens, Beans, Onions, Mushrooms, Berries, Seeds and nuts, plus Tomatoes: GBOMBS+T. The use of a multivitamin containing B12, iodine, zinc, and vitamin D was also encouraged as well as the consumption of a relatively small amount of eicosapentaenoic docosahexaenoic acid from algae to assure consumption of comprehensive and adequate nutrients, given the small amount of animal products recommended by the intervention. The primary principles of this dietary approach are based on these principles: (1) micronutrient rich (i.e. especially high in plant-derived phytochemicals, antioxidants, vitamins, and minerals); (2) nutritionally adequate and diverse; (3) hormonally favorable, avoiding carbohydrates with a high glycemic index that could elevate levels of serum insulin and minimizing animal protein that may invoke an inflammatory response; and (4) encouraging regular intake, with an emphasis on meals and not snacks, with an overnight "fast" of at least 12 hours. In addition, our approach does not generally emphasize macronutrient percentages, portion sizes, or calorie counting. Participants were encouraged to continue their current exercise habits and not to alter their physical activity dramatically during the period of the intervention. Participants were provided contact information for providers of health services at the worksite in the event that they needed those services.

Outcome measures were largely described previously [10], including a medical history and lifestyle questionnaire, the Pittsburgh Sleep Quality Index (PSQI), the Quality of Life Index (QLI), and anthropometric measurements of height, weight, waist circumference, hip circumference, and blood pressure. Additional outcome measures used in the present study were gastroesophageal reflux disease (GERD), using the GERDQ; questionnaires for depression (PHQ-9), and for work productivity and activity impairment (WPA1-GHA, WPA1-GHB, WPA1-GHC, and WPA1-GHD). Attendance was measured in total number of sessions attended. Compliance was measured at the weekly meetings by having participants complete a self-reporting survey that recorded the percentage of the food and meals consumed that adhered to this intervention's dietary guidelines.

Statistical Methods

SYSTAT software version 13.1 was used for all analysis (Systat Software, Inc. San Jose, CA USA). An alpha of 0.05 was used for all determinations of significance. To determine whether significant changes in the outcome measures occurred across time, paired-sample t-tests and Wilcoxon signed ranks tests were used. Wilcoxon tests were used if the dependent variable did not have a normal distribution at either or both times sampled, based on the Shapiro-Wilk test. Change variables were created for each of the outcome variables to examine the association between change and attendance. Neither the attendance, activity or compliance variables had a normal distribution based on the Shapiro-Wilk test, therefore associations were measured using Spearman correlations. (Note: These analyses were conducted in SPSS, which gives p values for Spearman's correlations).

Results & Discussion

Participants were assessed on the Theory of Planned Behavior Scale (TPBS) prior to the start of the intervention. In addition, measures of well-being, work productivity and activity impairment, and the anthropometric variables listed above were obtained pre- and post-intervention. Data were then examined for correlations between the various factors.

Theory of Planned Behavior Scale

On the Theory of Planned Behavior Scale (TPBS), participants had an average score of 91.33 (SD=6.74). The median was 92. Scores ranged from 68-100, indicating some variability in these scores.

Well-Being Measures

Various measures of well-being were obtained (Table 1). In relation to gastroesophageal reflux disease (GERD), participants' median scores on the GERDQ questionnaire changed significantly after the intervention, as indicated by a Wilcoxon signed rank test ($z = -3.109$, $p=.002$). Regarding sleep quality, there was a significant change in PSQI scores after the intervention as indicated by a Wilcoxon Signed Ranks test ($Z = -4.056$, $p<.001$). The quality of life based on a Wilcoxon Signed Ranks test ($z = 5.046$, $p<.001$), reveals there was a significant change in the Quality of Life Index (QLI) after the intervention. In addition, when assessing depressive symptoms, participant scores on both the PHQ9 ($z = -4.799$, $p< .001$) and PHQ10 ($z =-3.13$, $p=.002$) changed significantly after the intervention.

Work productivity and activity impairment

Measures of activity impairment showed significant improvement over the course of the intervention (Table 1). Significant reductions in activity impairment were seen with the WPA1_A, WPA1_B, and WPA1_D, but not with the WPA1_C.

	Median Time 1	Median Time 2	Wilcoxon Z	n
Weight (lbs)	205	190	-5.448 (p<.001)	41
Hips (inches)	45.50	43.50	-4.267 (p<.001)	41
Waist (inches)	43.25	41.50	-5.062 (p<.001)	41
Systolic Blood Pressure (mmHg)	130	126	-2.925 (p=.003)	39
Diastolic Blood Pressure (mmHg)	80	78	-2.874 (p=.004)	39
GERD (GERDQ)	2.00	0.00	-3.109 (p=.002)	37
Quality of Life (QLI)	18.8	23.96	5.046 (p<.001)	37
PSQI (Sleep)	8.00	4.00	-4.056 (p<.001)	37
WPAI_A	0.00	0.00	-2.275(p=.023)	35
WPAI_B	0.20	0.00	-3.614 (p<.001)	35
WPAI_C	0.00	0.00	-1.334 (p=.182)	35
WPAI_D	0.30	0.00	-4.009 (p<.001)	35
PHQ 9 (Depressive Symptoms)	7.00	2.00	-4.799 (p< .001)	37
PHQ 10	1.00	0.00	-3.13 (p=.002)	34

WPAI:GH A2 = Percent activity impairment due to health
WPAI:GH B2 = Percent impairment while working due to health
WPAI:GH C2 = Percent overall work impairment due to health
WPAI:GH D= Percent work time missed due to health

Table 1. Wellbeing and anthropometric measures of variables pre- and post-intervention

Anthropometric measures

Participants' median weight significantly changed after the intervention, as indicated by a Wilcoxon signed rank test (z = -5.448, p<.001). In addition, there was significant change in median hip circumference (z = 4.267, p<.001) and waist circumference (z = -5.062, p<.001). There were also significant changes in both systolic blood pressure (z = -2.925, p=.003) and diastolic blood pressure (z= -2.874, p=.004).

Correlation between well-being measures and attendance at weekly meetings

Changes in weight, waist circumference, and hip circumference were not significantly correlated with number of classes attended, based on Spearman rho correlations. Similarly, blood pressure measurement changes were not correlated with attendance. GERDQ and PSQI score changes were not correlated with class attendance.

Changes in the Quality of Life scale were correlated with attendance (Spearman rho = .348, p =.035, n = 37). Changes in PHQ 9 and PHQ 10 were not significantly correlated with attendance. Changes in WPAI measures were not significantly correlated with attendance. However, WPAI: GH B approached significance (Spearman rho = .331, p = .066, n =35).

Correlation between TPBS scores and attendance at weekly meetings, wellness and anthropometric measures

Scores on the TPBS were not correlated with the number of classes attended. However, there were significant correlations between the TPBS scores and changes in waist circumference (Spearman rho = .383, p = 0.019, n = 37), and between TPBS scores and changes in diastolic blood pressure (Spearman rho = -.350, p = .036, n = 36).

Conclusion

Depression and mood disorders have become a significant public health and societal issue. The impact mental health has on the quality of life as well as resultant health care costs continues to rise [11] workplace dietary intervention program was shown to reduce self-reported symptoms of depression and demonstrated an impact on anthropometric measures. We conclude that workplace wellness programs that include in-person instruction coupled with dietary intervention strategies may reduce activity impairment and depressive symptoms. Non-invasive lifestyle interventions such as the one utilized in this study should be considered as a viable approach to reducing the burden of depressive symptoms. The 71% reduction in depressive symptoms from this relatively inexpensive intervention indicates a potential profoundly efficient way to improve mental health, reduce absenteeism and drastically reduce the costs associated with depression. These findings parallel those found in our 6-week [12] as well as our 12-week intervention [10]. These findings are consistent with those of Akbaraly et al who showed that a highly refined diet of sweetened desserts, fried foods, processed meats and refined grains was associated with depression and conversely, the consumption of whole unprocessed foods was proven to be protective against depression [13].

In relation to the improvement in the GERDQ symptoms, we understand this to be multifactorial. Of primary importance is the spacing of meals to ensure adequate digestion can occur before additional food is introduced into the digestive system. Also, the reduction in waist circumference may have contributed to the reduction in GERDQ symptoms [14]. A key aspect to consider is how to encourage non-participants and/or non-motivated employees to participate in worksite wellness programs. The least healthy employees and those with the riskiest lifestyle behaviors are often the least likely to participate in worksite wellness programs [15].

We are currently developing an approach to expand our efforts to worksites with a large percentage of low-wage workers as they are often not offered wellness incentives and may benefit the most [16]. Further study is needed to determine the ideal length and design of worksite nutrition interventions to determine efficacy and long-term outcomes.

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