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The impact of Dr Barry Sears's diet on employee sleep duration

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Abstract

Sleep is essential for people's health and well-being, contributing not only to the restoration of their energy and the consolidation of their memory, but also in maintaining the balance of their immune system. Diet can affect the quality of people's sleep, especially that of employees. The main objective of this semi-experimental study was to investigate whether Dr. Sears's diet affects employees' sleep duration. Data were collected from a sample of 100 employees who were employed by different companies in the broader area of Attica, once a week, for a period of three weeks. Of those who participated in the study 56% were male and 44% were female. The results showed that Dr Sears' diet had a beneficial effect on the participants' sleep duration, which sleep duration started to increase from the 2nd week of intervention and then stay at normal levels. Sleep duration was considered as the dependent variable, while the duration of the Zone Diet (3 weeks) and the demographic characteristics in relation to the other dependent variables were considered as independent variables.

Keywords

sleep, diseases and work, employees, diet, Zone Diet

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Introduction

As early as 2005, WHO estimates that stress is associated with up to 50% of modern diseases1, as stress is an important mediating factor between the wider social environment and its mental and physical effects on health2 and leads the employee to reduced levels of productivity and efficiency, which, in turn, are associated with both reduced levels of job satisfaction and reduced levels of work engagement3. The results of research, which focus on the harmful effects of occupational stress on the physical well-being and health of employees, support that sleep disorders are among the main consequences of work-related stress4. These results are confirmed by the results of a meta-analysis of 79 studies (2011), according to which sleep disorders are significantly related to physical symptoms, which are due to various occupational stressors5.

The interaction between sleep and work-related behaviors affects many aspects of employee performance, safety, and health, as well as the level of success at the organization level[6]. Therefore, sleep disorders can significantly affect people's professional, physical, cognitive and social performance and impair their quality of life[7, 8]. The interaction between sleep and work-related behaviors affects many aspects such as employee performance, safety, and health, as well as the level of success at the organizational level[6]. Therefore, sleep disorders can significantly affect people's professional, physical, cognitive and social performance and reduce the levels of their quality of life[7, 8]. According to Ohayon et al., achieving good sleep quality refers to reduced number of awakenings (>5 minutes), low wakefulness after sleep onset, good sleep performance[9] and good sleep duration (i.e., 7-9 hours of sleep/day)[10, 11, 12].

Sleep quality is influenced by many factors, including diet[13, 14], as research results show that the processes involved in sleep regulation include nutrient intake, thereby suggesting a link between diet and sleep[12], as proper nutrition involves providing all the necessary nutrients to maintain one's health and well-being. Thus, the foods people consume not only affect waking during the day, but also the quality of their sleep[8, 15]. Dietary intake and sleep have an important role in maintaining long-term health and well-being[16]. However, the nutritional mechanisms that influence sleep regulation are complex[14, 17], as several metabolites of food may be important in regulating sleep through the regulation of other related factors[18]. A prime example is caffeine, which prolongs the duration of sleep induction but reduces overall sleep duration and quality[14, 17].

Sleep is not only affected by the energy performance of the diet, but also by the content of macronutrients, such as proteins, carbohydrates, and fats[19]. Inadequate protein intake can impair sleep quality, while excessive protein intake can lead to difficulties maintaining it[12, 19]. Thus, not only the quantity, but also the quality of the daily nutrients received by humans is important. A sufficient amount of the amino acid tryptophan, which is the precursor to melatonin, has a positive effect on sleep[14, 20]. Scientific evidence also points to the important role of omega-3 fatty acids, which may positively influence the regulation of serotonin secretion[14, 21]. Conversely, foods and meals that contain adequate protein, carbohydrates, and fats are essential for maintaining sleep quality[22].

Therefore, it is easy to understand that, to improve sleep quality, individuals are advised to eat carbohydrate-containing meals with a low glycemic index, low glycemic loads, and high fiber content[23]. We have a lot of information about the impact of sleep duration and quality on food choice and consumption. However, research has paid particular attention to how dietary patterns and the intake of certain foods can affect nighttime sleep, in terms of its structure and quality[15]. These data are confirmed by the results of clinical studies, which show that there is a higher intake of snacks during periods of sleep restriction than normal sleep levels[24]. Also, fat intake is highlighted as a macronutrient of choice during periods of sleep restriction relative to normal sleep[15, 25]. In the international literature, nutrition is a cornerstone in the prevention and treatment of chronic non-communicable diseases[26, 27], while data on whether diet affects burnout is limited[28, 29] and no studies have been performed on the effects of the Zone Diet on employee health and job[28].

This research was based on this literature gap, which applied a specific nutritional model to employees and meets all the aforementioned nutritional requirements, which contribute positively to a good sleep (quality and duration). Specifically, the nutritional program of this research is based on a calorie-restricted diet. This diet is adequate in protein, moderate in carbohydrates[30, 31] and fermentable fiber-rich[32]. This diet is based on the daily consumption of proteins, fats and carbohydrates in a ratio of 30% - 40% - 30% in the recommendation of the daily menu[33, 34] in such a way as to achieve a balance in calorie consumption, as long as certain anti-inflammatory substances are released into the body, which are beneficial for the heart and general human health. The diet in question, because it creates the specific zone, is called The "Zone Diet"[33, 35, 36].

In addition to the above reasons, the choice of the Zone Diet in this research is also due to the fact that this diet meets the American Heart Association's (AHA) guidelines for dietary intervention in the workplace, which suggests well-balanced meals that include low-fat dairy products, low saturated fat and avoiding trans-fats, more fruits and vegetables, whole grains, seafood, lean meats and poultry, as well as salt alternatives[29]. The AHA guidelines on dietary intervention in the workplace also equate Fitzgerald's view that dietary interventions that support low intake of saturated fat, sugar, salt and high intake of fruit and vegetables are considered one of the most important benefits of dietary intervention.

Methodology

Research Strategy

This research is semi-experimental, as the concepts of the physical problems under consideration can be measured and can be accurately measured. Therefore, based on the specific data, the application of a quantitative research was necessary, as the interactions of the variables were sought and the finding of predictive factors[37], as well as that the primary research

is suitable for the direct extraction of information from the protagonists of a study[38].

The study is considered quasi-experimental because the control and intervention groups were not matched for demographic/anthropometric characteristics and dietary habits. The key dependent variable was sleep duration, which was monitored for three weeks (week 1, week 2 and week 3), the period in which participants followed Dr Sears' diet. The group that applied Dr Sears' diet was considered the intervention group, which included participants with poor eating habits. The control group consisted of participants with regular eating habits. The duration of the Zone Diet (3 weeks) and the demographic characteristics in relation to the rest of the dependent variables were considered as independent variables. Difficulty sleeping was defined as physical symptoms.

Data collection tool

The participants were thoroughly informed about the purpose of the research and volunteered to fill out the questionnaires anonymously and confidentially. In the process of completing the relevant questionnaires, no questions arose due to the vagueness of the questions. The average duration for completing the questionnaires was 20 minutes. From the intervention group the return rate of the questionnaires given was 100%, while from the control group 1 or 0.6% did not answer the survey.

The questionnaire included the following scales/questions:

Zone Diet: The intervention group followed a specific Zone Diet program for 3 weeks with weekly monitoring of participants' progress. Of the intervention group of 100% participated in the program for all three weeks fulfilled the questionnaire.

Demographic Characteristics: Demographic characteristics such as gender, age, education level, work experience, working hours per week, height, weight and resting heart rate were also included in the final questionnaire.

Participants completed a 7-question demographic and body measurement tool (1 closed-ended question and 6 short-answer questions) regarding gender, weight (Kg), height (m), age, work experience, hours worked, and pulses at rest. They also completed an 18-question tool, where 14 questions (8 questions were answered on a 4-point Likert-scale and the remaining 6 questions with closed-ended answers) referred to the dietary habits of the control and intervention groups before the implementation of the experiment. The remaining 4 questions were subdivided into 1 question (with multiple-choice answers) about taking nutritional supplements during the intervention and for the 2 groups, into 1 question (with 4-point Likert-answers, where 1=Never, 2=Some times, 3=Often, 4=Always) on the frequency of following the diet for the intervention group only, on 1 question about taking probiotics only for the intervention group, and on 1 question about the eating habits of a typical day only for the control group. It also included 1 question about sleep duration in hours.

Sample

The sample consisted of 100 employees (intervention group) followed Dr Sears' diet for three weeks and a control group of 175 employees who did not follow any specific diet. Both groups answered a questionnaire once per week. In general, the two samples (intervention and control) had no significant differences in height, age, years of work experience and resting heart rate. Differences were observed for gender, BMI and work.

Of the intervention group (N=100) 56% were men and 44% were women. The average weight of the participants was M = 85.15 kg, with standard deviation SD = 21.97 kg, minimum weight Min = 41 kg and maximum weight Max = 175 kg. The mean height of the participants was M = 1.73 m, with standard deviation SD = 0.10 m, minimum height Min = 1.52 m and maximum height Max = 1.93 m. The mean age of the participants was M = 44.67 years, with standard deviation SD = 9.25 years, minimum age Min = 19 years, and maximum age Max = 63 years. Finally, the average heart rate of the participants was M = 69.62, with a standard deviation SD = 25.70, a minimum value of Min = 52 and a maximum value of Max = 130.

Of the control group (N=175) 39.4% were male and 60% female. The mean weight of the participants was M = 75 kg, with standard deviation SD = 17.10 kg, minimum weight Min = 43.60 kg and maximum weight Max = 180 kg. The mean height of the participants was M = 1.75 m, with standard deviation SD = 0.11 m, minimum height Min = 1.52 m and maximum height Max = 1.90 m. The mean age of the participants was M = 46.12 years, with standard deviation SD = 10.58 years, minimum age Min = 20 years, and maximum age Max = 67 years. Finally, the average heart rate of the participants was M = 68.66, with a standard deviation SD = 9.35, a minimum value of Min = 42 and a maximum value of Max = 90.

The employees who made up the control group were selected by the application of convenience sampling, as the researcher approached the people from her known and close environment (i.e. friends, relatives and people she had access to). The employees who made up the intervention group were selected using a combination of convenience and snowball sampling methods, where the researcher approached them and then they, in turn, referred the researcher to the next people[39].

Statistics

The statistical analysis was done with the IBM SPSS 26 statistical program, while the data was indexed in Microsoft Office Excel 2016. Categorical variables were presented with frequencies and percentages, while quantitative variables with mean and standard deviation. Case testing was carried out at a materiality level of 5%. The X2 test was used to compare percentages of categorical variables between the control and intervention group and the independent samples t-test to compare averages of quantitative or operative variables between the 2 groups.

Also, the Repeated Measures ANOVA test was used to compare means of quantitative dependent variables at the different time points (before 1st, 2nd, and 3rd week) and the Friedman test was used for ordinal dependent variables. The regularity of the variables was checked using the Shapiro-Wilk test. The Spearman correlation coefficient was used to check the correlation of quantitative-determinant, abnormal variables, while for finding predictive factors multiple linear regression was used, using as independent variables only correlative factors contributing to the model[40].

Results

The Zone Diet had a beneficial effect, regulating sleep difficulties to normal levels. The duration of sleep difficulties began to increase from the second week of intervention for the participants and then reached normal levels in the third week.

Generally, our analyses showed that the intervention group had a higher percentage of males, body weight, and BMI, and consisted of individuals who worked longer hours compared to the corresponding percentages in the control group, while both groups were similar in terms of height, age, years of work experience, and resting heart rates of their participants.

Table 1. Demographic Characteristics of the Control and Intervention Groups

Demographics	Without SEARS (N=175)	With SEARS (N=100)	Statistic	p-value
Gender	Male: 69 (39,7%) Female: 105 (60,3%)	Male: 56 (56%) Female: 44 (44%)	X2 (1)=6,839	0,009
Weight	74,02 (16,66)	85,11 (21,75)	t (273)=-4,741	<0,001
Height	1,72 (0,10)	1,73 (0,10)	t (272)=-1,271	0,205
BMI (Body Mass Index)	24,93 (4,23)	28,29 (7,20)	t (272)=-4,856	<0,001
Age	45,32 (11,05)	44,67 (9,26)	t (271) =0,491	0,624
Weekly working hours	21,02 (10,36)	20,11 (8,83)	t (233,845) =0,772	0,441
Weekly working hours by week	21,02 (10,36)	39,74 (6,47)	t (270,067) =-18,392	<0,001
Pulses at rest	68,66 (9,35)	69,62 (25,71)	t (114,173) = -0,355	0,724

A statistically significant difference was found in terms of gender ($\chi 2$ (1) = 6.839, p = 0.009), where in the intervention group, the percentage of males was higher (56%), in contrast to the control group, where the majority consisted of females (Figure 1).

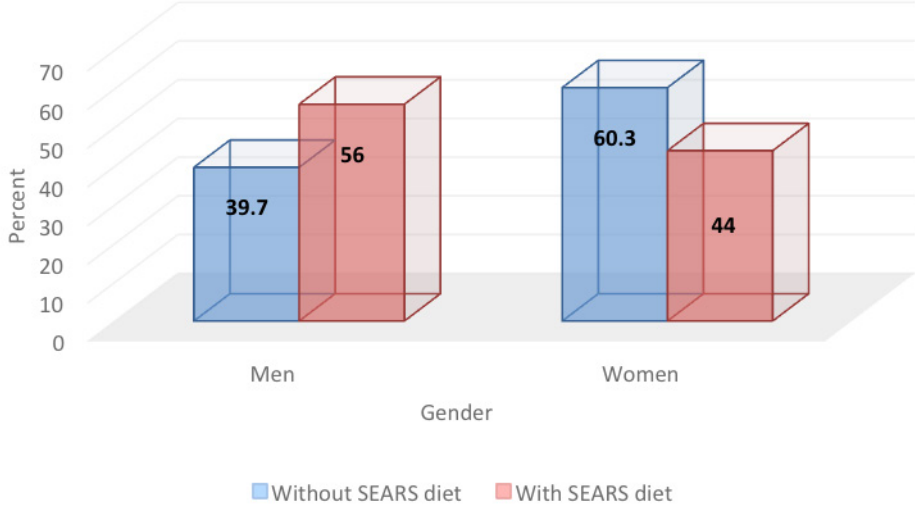

Figure 1. Gender ratio

Further analyses revealed that the Zone Diet had a beneficial effect, regulating sleep difficulties to normal levels. The duration of sleep difficulties began to increase from the second week of intervention for the participants and then reached normal levels in the third week.

Table 2. Results of the normality test for sleep duration

Variable	p-value
Sleep duration (Πριν)	<0,001
Sleep duration (1stweek)	<0,001
Sleep duration (2ndweek)	<0,001
Sleep duration (3d week)	<0,001

Table 2 presents the results of the normality test for sleep duration, where normality was not confirmed in any case.

Table 3. Temporal evolution of sleep duration for the intervention group

Variable	Mean	S.D	F (3,97)	p-value
Sleep duration (Πριν)	6,03	1,11	38,551	<0,001
Sleep duration (1stweek)	6,04	1,06		
Sleep duration (2ndweek)	6,86	0,67		
Sleep duration (3d week)	7,17	0,68		

In Table 3, the results of comparisons for the sleep duration of the intervention group at different time points are presented, where statistically significant differences were detected ($F(3,97) = 38.551$, $p < 0.001$). From Tables 2-3 (Figure 2), it is evident that sleep duration increased in the 2nd and 3rd weeks.

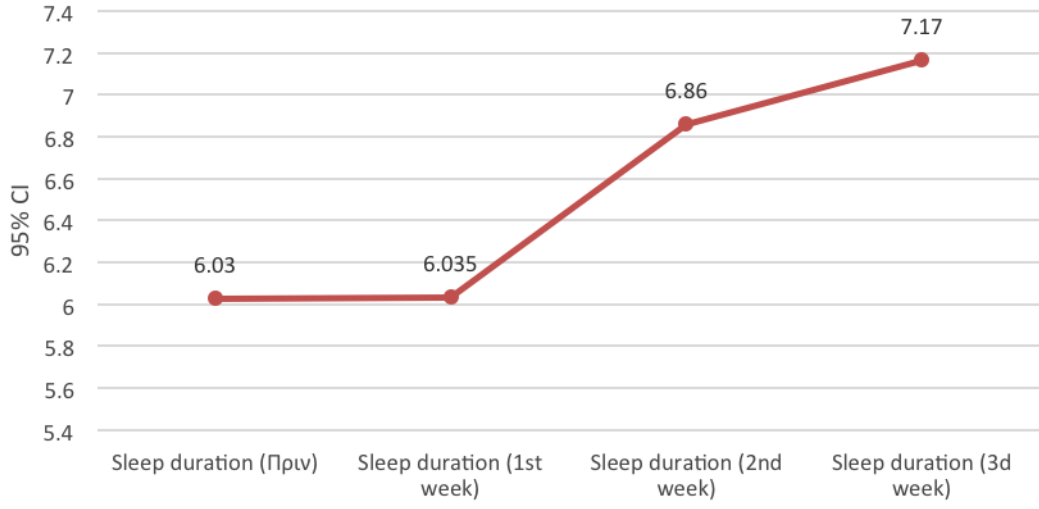

Figure 2. Error bars for sleep duration for the intervention group over time

Table 4. Multiple comparisons of sleep duration for the intervention group over time

Factor	Time (I)	Time (J)	M (I-J)	p-value
Sleep duration	Before	1st week	-0,005	,829
		2nd week	-0,830*	<0,001
		3rd week	-1,140*	<0,001
	1st week	Before	0,005	,829
		2nd week	-0,825*	<0,001
		3rd week	-1,135*	<0,001
	2nd week	Before	0,830*	<0,001
		1st week	0,825*	<0,001
		3rd week	-0,310*	<0,001
	3rd week	Before	1,140*	<0,001
		1st week	1,135*	<0,001
		2n dweek	0,310*	<0,001

Below are the results of comparisons for sleep duration between the control and intervention groups. It is evident that during the 1st week, the intervention group had a shorter sleep duration, which balanced out in the 2nd week (compared to the control group) and increased in the 3rd week (Table 5 and Figure 3).

Table 5. Comparison of sleep duration between the control and intervention groups

Variable	WithoutSEARS	WithSEARS	Statistic	p-value
Sleep duration (1stweek)	6,88 (1,12)	6,04 (1,06)	t (273) =6,113	<0,001
Sleep duration (2ndweek)	6,88 (1,12)	6,86 (0,67)	t (272,169) =0,147	0,883
Sleep duration (3d week)	6,88 (1,12)	7,17 (0,68)	t (271,791) = -2,708	0,007

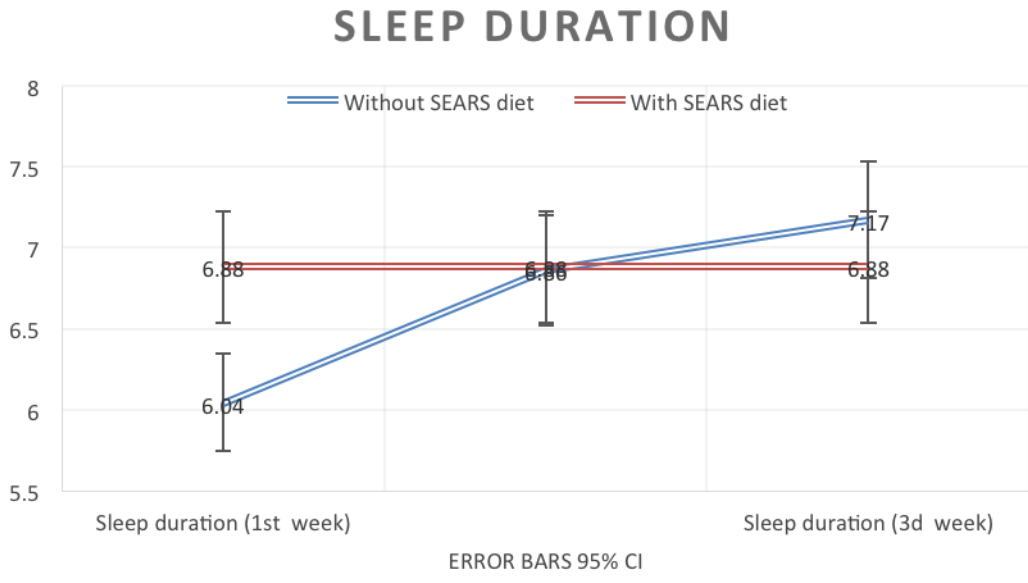

Figure 3. Error bars for sleep duration between the control and intervention groups

Next, we examined the role of physical activity and demographic variables. Table 6 presents the results of Spearman correlations between sleep and independent variables for the intervention group. From the analyses, it is evident that in all three

weeks, physical activity is a possible predictive factor. Resting heart rate was a possible predictive factor in the 2nd and 3rd weeks, while BMI, age, and working hours were possible predictive factors only for the first week.

Table 6. Spearman correlations of sleep duration with independent variables for the intervention group

Independent variables	1st week	2nd week	3rd week
Physical activity	,435**	,380**	,440**
Gender	0,007	0,020	0,064
BMI (Body Mass Index)	-,269**	-0,130	-0,110
Age	-,236*	-0,172	-0,046
Years of work experience	-0,179	-0,160	-0,040
Weekly working hours	-,257**	-0,095	-0,026
Resting heart rate	-0,089	-,234*	-,270**

**p<0,01, *p<0,05

Table 7. Multiple linear regression of sleep duration with independent variables for the intervention group

Independent variables	1st week	2nd week	3rd week
Physical activity	,315**	,330**	,458**
Gender	-	-	-
BMI (Body Mass Index)	-0,159	-	-
Age	-0,096	-	-
Years of work experience	-	-	-
Weekly working hours	-0,162	-	-
Resting heartrate	-	-0,118	-0,065
R^2	0,226	0,138	0,225
df_1	4	2	2
df_2	93	95	95
F	6,778	7,574	13,771
p-value	<0,001	0,001	<0,001

**p<0,01, *p<0,05

Table 7 presents the results of multiple linear regression with sleep duration as the dependent variable and its correlational factors as independent variables for each week. The predictive role of physical activity is highlighted, as it had a positive influence on sleep duration.

Discussion

Data of this study were collected from a sample of 100 employees who were employed by different companies in the broader area of Attica, once a week, for a period of three weeks. The main objective of this semi-experimental study was to investigate whether Dr. Sears's diet affects employees' sleep duration, because Greece is included among the countries with the highest levels of stress, the percentage of which is 55%[41] and because sleep disorders are considered one of the most important harmful effects of occupational stress on the physical well-being and health of the worker[4, 5], as insufficient sleep, either regarding its duration or its quality, can negatively affect many physiological and psychological processes of the working person[12].

In particular, the factors that can negatively affect the quality of sleep include stress, anxiety, the use of stimulants, as well as the use of electronic devices before sleep. Thus, a growing body of evidence suggests that diet, physical activity and sleep hygiene can significantly influence sleep quality[14].

Regarding nutrition, the quality of sleep is affected by it[13], because it can affect the quality of their sleep, as increasing the quality of their diet it also increases the quality of their sleep[8].

Adequate sleep is essential to a person's overall health and well-being, as it helps maintain immune health, restore energy, and consolidate memory, while insufficient sleep (duration and/or quality) can negatively affect many physiological and psychological processes, which makes measuring sleep important for understanding the factors that may influence its outcomes[12].

Also, the prevention of sleep disorders and insomnia is crucial for the prevention of non-communicable diseases, which often start in early childhood. Thus, poor nutrition can lead to inflammation in the long term, which is closely related to insomnia[14, 42].

The results of the present research showed that the Zone Diet worked beneficially by regulating the duration of sleep in the 2nd week to normal levels. Thus its duration started to increase from the 2nd week of employee intervention and then (3rd week) it reached normal levels. Therefore, we can argue that the present findings are statistically significant, as they suggest that the intervention had a strong effect on the participants.

The positive results of this particular research are in line with the positive results of the corresponding international researches, which are directly related to the quality of nutrition and the quality of sleep and to anti-inflammatory food items and the improvement of physical condition, where they contribute to the improvement of the quality of sleep and reducing levels of sleep apnea[43].

The authors of this research have also studied the effect of the specific diet on the stress levels of employee, where the results were encouraging, since there was a positive effect of the Zone Diet on employees stress levels[44].

Conclusion

The results of this research showed that the Zone Diet worked beneficially by regulating the duration of employee sleep in the 2nd week to normal levels. Thus its duration started to increase from the 2nd week of employee intervention and then (3rd week) it reached normal levels.

This study has some elements of originality. It is worth emphasizing that the literature usually refers to generalized interventional nutritional programs for employees and not to specialized nutritional programs as our study did. Having statistically significant findings at a relatively small sample size suggests that our intervention had a strong effect on the participants[44, 45].

Improving the sleep levels of employees is an important issue because sleep disorders can contribute to many health problems[14, 42]. One such problem is daytime cognitive dysfunction due to reduced level of sleep duration associated with reduced levels of REM sleep duration[46].

Thus, an important reason that makes it necessary to continue this research is the fact of not achieving the recommended 7-9 hours of sleep per night by the employees[12, 47, 48]. Hence, poor sleep or sleep problems of employees can induce some negative consequences on the workplace environment such as a decline in in-role performance and poor interpersonal relationships, thereby further negatively affecting on the workplace environment and orderly operation of various organizations[49].

Conflicts of Interest

The authors declare no conflicts of interest.

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