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Effect of Nurses Living Fit™ Exercise and Nutrition Intervention on Body Mass Index in Nurses

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Objective: The hospital-based Nurses Living Fit (NLF) intervention was implemented by nurses to determine its effect on decreasing body mass index (BMI) in nurse participants.
Background: Although there are limited data on obesity rates of nurses working in the United States, more than half are estimated to be overweight or obese.
Methods: The NLF intervention included exercise (12 weekly sessions), yoga and nutrition (4 monthly sessions), and diary completion (exercise/yoga, food/water consumption, and sleep), addressing healthy lifestyle principles.
Results: NLF participants experienced a greater mean reduction in BMI and waist circumference inches. Ninety-three percent of NLF participants recommended the NLF program.
Conclusions: Provision of an evidence-based program such as NLF facilitates nurse education on healthy lifestyle principles.

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More than two-thirds of American adults are overweight or obese.[1] Missing from current adult obesity research are cost-effective, successful means for effectively modifying lifestyle patterns that promote weight reduction among the overweight as well as supporting maintenance of healthy weight based on eating and exercise habits. In healthcare settings, administrators continue to search for interventions supporting healthy living by enabling weight loss in overweight workers and maintenance of normal weight, thus promoting employee wellness and retention. As nursing employees, we have the added burden of being viewed as role models and educators of healthy lifestyles while not always being healthy ourselves.

Obesity is associated with increased risk for premature death, increased healthcare costs, and reduced quality of life. An estimated 112,000 deaths are attributed to obesity annually.[2] The Surgeon General in 2010 reported that obese adults were at increased risk for serious health conditions.[3] These conditions include high blood pressure, increased cholesterol, type 2 diabetes and related complications, coronary heart disease, stroke, gallbladder disease, osteoarthritis, sleep apnea, respiratory problems, and cancers of the endometrium, breast, prostate, and colon. There is a need for effective policies and strategies to promote healthy living through balanced food choice and routine exercise.

American nurses are impacted by the obesity crisis, with a reported 54% obesity rate and mean

body mass index (BMI) of 27.2 kg/m^2.[4] Because nurses are involved with patient healthcare delivery and education, they have a distinct opportunity to role model healthy lifestyles. Nurses are a logical resource for patients and others who seek assistance in attaining healthy lifestyles, including exercise and diet. In our role as health educators, a recent study sought to determine the relationship between nurses' body size and public confidence in their ability to provide health education.[5] Results demonstrated a significant loss of confidence perceived by participants with respect to overweight nurses compared with weight-appropriate nurses. The authors concluded that weight-appropriate nurses had more public confidence in their teaching and that nurses should be conscious of patients' perceptions of them. Therefore, it is essential to empower nurses with strategies to promote their own healthy lifestyle.[6]

A MEDLINE and CINAHL search from 1996 through 2011 yielded minimal results using search terms of nurses or nursing staff and physical fitness, exercise, or exercise therapy. Few studies focused solely on nurses and included BMI measurements. One quasi-experimental study conducted at a medical center in Taiwan demonstrated an improvement for the intervention group in multiple fitness indicators including BMI, whereas the control group did not demonstrate improvement.[7] Research in the United States has used broader pools of medical professionals and has focused data collection on subjective feelings of wellness, assessment of quality of life, and rates of sick-leave days. One published quality improvement project utilized the hospital's physical therapy department equipment to encourage staff members to participate in regular physical exercise.[8] This project demonstrated improved BMI and waist circumference measurements after 1 year and recommended that hospitals advance health promotion activities for employees year-round.

Ideally, healthcare organizations can provide evidence-based programs educating nurses on self-care through the balance of exercise and nutrition, thus achieving and maintaining normal weight. We developed and tested the Nurses Living Fit (NLF) program, an adaptation of the Kids Living Fit (KLF), for this purpose. The KLF program was designated as an innovation of excellence by the Agency for Healthcare Quality and Research.[9] The KLF program is coordinated through schools and hospitals with a goal of educating children, including those overweight, about healthy lifestyle choices regarding fitness and nutrition. A series of 8 to 12 weekly sessions expose children to a variety of independent physical activities. Nutrition sessions focusing on healthy food choices and portion sizes are provided. Participants in KLF experienced reductions in BMI and waist circumference and increases in physical activity.[10-12] The researchers modified the NLF program to include a review of healthy principles at each NLF intervention session. This review highlighted being active, healthy food choices, and the benefit of adequate sleep and water consumption. Meta-analysis of sleep duration and obesity in adults has shown increased risk of obesity among short sleepers. A reduction in 1 hour of sleep per day was associated with a 0.35 kg/m^2 increase in BMI.[13] Data support a positive relationship between increased water consumption and weight loss.[14] Our hypothesis was that the NLF intervention group would experience a significantly greater mean BMI reduction compared with the contrast group not participating in the intervention.

Methods

In this study, we compared changes in BMI between NLF and contrast group convenience samples of nurses drawn from 7 hospitals in 3 states in the mid-Atlantic region. A total of 217 enrolled in the study, with 108 nurses self-selecting to participate in the NLF program and 109 self-selecting to participate in the contrast group (site 1: NLF = 34, contrast = 34; site 2: NLF = 20, contrast = 20; site 3: NLF = 11, contrast = 15; site 4: NLF = 21, contrast = 21; and site 5: NLF = 22, contrast = 19). Resources were combined for administrative efficiency to run 1 NLF program for 2 hospitals in 2 instances. This resulted in a 5 research program sites. Each site received institutional review board approval. All nurses provided signed consent. Study inclusion criteria were (1) nurses employed in the healthcare field and (2) ability to participate in the exercise and yoga sessions if participating in the NLF intervention group. Nurses under treatment for overweight status based on medical therapy and/or dietary restrictive intake of food were excluded from the study.

Study procedures were completed at baseline, weeks 1 to 12, and week 24. The Figure 1 provides the study procedures for both the NLF and contrast groups. Per protocol, all participants were to have measures for BMI and waist circumference at baseline, week 12, and week 24. Body weight was obtained using a designated calibrated scale at each site and recorded in pounds to the nearest 10th of a pound. Waist circumference was measured at the level of the umbilicus and parallel to the floor. The height and waist measures were recorded and rounded to the nearest quarter inch. At baseline, week 12, and week 24, all participants completed

Activity	Baseline	Week												
		1	2	3	4	5	6	7	8	9	10	11	12	24
Signed Informed Consent	I C													
Demographics	I C													
BMI / Waist Circumference	I C												I C	I C
Distribute Food & Activity Diary booklets, pedometers, and water bottles	I													
NLF 1 hr exercise session		I	I	I	I	I	I	I	I	I	I	I	I	
NLF 1 hr yoga session		I			I				I				I	
NLF 1 hr nutrition session		I			I				I				I	
NLF Group Daily Food/ Activity Diaries		I			I				I				I	I
Daily Pedometer Recording		I			I				I				I	I
Food Diary		I			I				I				I	I
Activity Diary		I			I				I				I	I
NLF Program Evaluation													I	I
Evaluation Form	I C												I C	I C

Figure 1. Study procedures NLF intervention group (I) and contrast group (C).

an evaluation form answering the following questions: (1) In the last 3 months, how many hours did you exercise on average per week? (2) In the last 3 months, how many hours did you do yoga on average per week? (3) How satisfied are you with your overall health (ranked by very satisfied, satisfied, or not satisfied)? (4) How satisfied are you with your body size (ranked by very satisfied, satisfied, or not satisfied)? And (5) how would you describe yourself (ranked by too thin, just right, or too heavy)? There were no other procedures for the contrast group participants.

NLF Intervention Group Study Procedures

A pedometer, water bottle, and study diary were distributed to each NLF participant at the beginning of the study by researchers. Participants were asked to complete study evaluations and/or diaries at baseline and during study weeks 1, 4, 8, 12, and 24 (Figure 1).

Once weekly for 12 consecutive weeks during weeks 1 to 12, exercise sessions were led by an exercise trainer over a 1-hour period. These sessions focused on cardiovascular health, strength training, stretching, injury prevention, and general conditioning. The specific focus during weeks 1 to 4 included goal setting, proper shoe fitting for exercise, warming up, general conditioning, interval challenges, cardiovascular training theories and running technique, track circuit training, and either walking or running 1 mile or 5 km. Weeks 5 to 8 focused on mind/body connection, injury prevention, fitness checks, goal setting, event participation for walking or running, and a 3-mile cardiovascular session. Weeks 9 to 12 covered conquering hills, training-for-events, cross training, active rest, running on a track, training for life, and a 4-mile challenge. The training-for-life component focused on encouraging participants to identify personalized physical activities to be incorporated long term into daily living.

At study weeks 1, 4, 8, and 12, yoga sessions were provided for 1 hour on 1 day each week. These sessions focused on physical postures, focused breathing, and meditation. Participants were provided a yoga DVD and CD to facilitate additional yoga independently.

Also during study weeks 1, 4, 8, and 12, nutrition sessions were provided by registered dietitians for 1 hour on 1 day each week. All sessions were interactive to encourage participation. Week 1 focused on food guide pyramid and serving sizes and water intake.[15] Week 4 focused on healthy choices/portion distortion. Week 8 focused on cooking methods and fast healthy options for breakfast, lunch, dinner, and snacks. The last session, week 12, focused on eating food selection in restaurants, and a summary review was provided.

At each session, additional principles for healthy lifestyle were reviewed. These included (1) walk 15,000 steps per day, (2) do yoga once per week at a minimum, (3) limit fast-food meals to 2 per week, (4) drink the recommended amount of water per day and do not mistake being thirsty for hunger, and (5) get 8 hours of sleep per night and so as not mistake being tired for hunger.

Hard-copy reference materials were provided to facilitate learning for the exercise, yoga, and nutrition sessions. Attendance was taken for each of the exercise, yoga, and nutrition sessions. To maintain high fidelity of the intervention adherence by the research team, the study protocol provided detailed guidelines for each of the intervention components inclusive of the exercise, yoga, and nutrition sessions. Prior to the research being initiated, a multisite study meeting was held at 1 location where investigators and study team members received training regarding how the exercise, yoga, and nutrition sessions would be provided. To maintain intervention adherence by the study participants, weekly reminders were sent to participants regarding upcoming exercise, yoga, and nutrition sessions. Participants knew their attendance for each of these sessions was being documented.

Sample Size

The sample size of 126 (63 per group) for this study was based on the ability to detect 2 whole units in BMI reduction over baseline measures. This sample size assumed an error rate of 0.05 and statistical power of 0.80.

Findings

The NLF and contrast groups were comparable with respect to key demographic characteristics, including gender (NLF = 98% female, contrast = 94% female) and race (NLF = 80% white, contrast = 88% white). At baseline, the mean BMI among NLF participants was 30.5 kg/m^2 compared with 27.6 kg/m^2 among the contrast group ($P < 0.001$) (Table 1). Of these 217 participants, week 12 BMI and waist circumference measures were obtained for 70 (65%) in the NLF group and 95 (87%) in the contrast group (Table 2). These NLF group participants experienced a greater mean reduction from baseline to week 12 in BMI than contrast group participants (NLF = −0.494 kg/m^2, contrast = −0.180 kg/m^2) (Table 2). This reduction in BMI

Table 1. Baseline Demographics by Study Group for All Participants

	Total (N = 217)	
	NLF	Contrast
Demographic	n = 108	n = 109
Age, average (range), y	47.6 (22-67)	45.2 (22-67)
Race, n (%)		
White	86 (79.6)	96 (88.1)
African American	6 (4.8)	6 (5.5)
Hispanic	2 (1.9)	1 (0.9)
Asian	11 (10.2)	5 (4.6)
Other	3 (2.8)	1 (0.9)
Females, n (%)	106 (98.1)	102 (93.6)
Education, n (%)		
RN, doctoral degree	2 (1.9)	2 (1.8)
RN, MSN/master's degree	12 (11.1)	23 (21.1)
RN, BSN/bachelor's degree	50 (46.3)	36 (33.0)
RN, associate degree	25 (23.1)	35 (32.1)
RN, diploma	13 (12.0)	10 (9.2)
LPN/LVN	3 (2.8)	0
Clinical nurse tech	2 (1.9)	3 (2.8)
Other	1 (0.9)	0
Employment type, n (%)		
Hospital, management	13 (12.0)	19 (17.4)
Hospital, direct care nurse	62 (57.4)	69 (63.3)
Hospital, other nursing	22 (20.4)	18 (16.5)
College/university	1 (0.9)	1 (0.9)
Clinic/medical office	10 (9.3)	2 (1.8)
Average (SD) years employed as nurse	20.4 (11.9)	18.7 (12.3)
Average (SD) BMI[a]	30.5 (6.8)	27.6 (5.4)
Underweight (<18.5 kg/m^2)	1 (0.9)	0
Normal (18.5-24.9 kg/m^2)	21 (19.4)	38 (34.9)
Overweight (25.0-29.9 kg/m^2)	37 (34.3)	44 (40.4)
Obese (30-39.9 kg/m^2)	37 (34.3)	21 (19.3)
Extremely obese (≥40 kg/m^2)	12 (11.1)	6 (5.5)
Average (SD) waist circumference, in	37.6 (6.5)	34.7 (5.1)

[a]$P < 0.001$.

Table 2. Change in BMI by Study Group for Participants With Week 12 Follow-up Measure

	Baseline		Week 12		Mean Change From Baseline to Week 12	
	NLF	Contrast	NLF	Contrast		
Measure	n = 70	n = 95	n = 70	n = 95	NLF	Contrast
BMI[a]	29.6 (6.6)	27.6 (5.3)	29.1 (6.5)	27.4 (5.4)	−0.5	−0.2
Waist circumference,[b] in	36.9 (5.9)	35.2 (5.2)	36.0 (5.9)	35.1 (5.3)	−0.9	−0.1

Values are presented as average (SD).
[a]$P < 0.05$.
[b]$P < 0.001$.

among participants in the NLF group was significant based on a 1-tailed *t* test ($P < 0.05$). When the NLF intervention was withheld during weeks 13 to 24, this effect was not sustained. The NLF group participants experienced a greater mean reduction in waist circumference (NLF = −0.895 in, contrast = −0.091 in) ($P < 0.001$) from baseline to week 12. The reduction in waist circumference between baseline and week 24 were not statistically significant (NLF = −0.588 in, contrast = −0.110 in). For the primary analysis, 1 outlier was excluded based on their large change between baseline and follow-up BMIs (3 positive SDs from the mean). To evaluate change in BMI from baseline to follow-up (weeks 12 and 24), participants were required to have at least 1 follow-up BMI measure, producing sample numbers at baseline of 167 (NLF = 70, contrast = 97), at week 12 of 165 (NLF = 70, contrast = 95), and at week 24 of 145 (NLF = 62, contrast = 83).

The overall ranking of helpfulness of the NLF program averaged 3.5 (week 12 = 3.7, week 24 = 3.5) on a 4-point scale (1 = did not help, 2 = neither helped nor hurt, 3 = helped a little, and 4 = helped a lot) (Table 3). The top 4 rankings of the NLF program were (1) helping nurses be physically active, (2) exercise, (3) drink recommended amount of water, and (4) eat a balanced diet, take better care of self, and have energy. The rankings of helpfulness were used to evaluate the effect of the review of additional principles for healthy lifestyles upon NLF group participants. Overall, participants ranked the NLF program as helpful regarding exercise and being physically active (defined as 15,000 steps per day), yoga (yoga 1× per week at a minimum), eating a balanced diet and smaller portion size (limit fast-food meals to 2 per week), drinking more water (drink recommended amount of water per day and do not mistake thirst for hunger), and

Table 3. NLF Study Group Participants Program Rankings[a] by Week

	Week 12	Week 24	Overall
Type Evaluated	n = 40	n = 52	n = 92
Exercise	3.7	3.5	3.6
Do yoga	2.9	2.8	2.8
Be physically active	3.8	3.6	3.7
Eat smaller portion sizes	3.3	3.3	3.3
Eat a balanced diet	3.5	3.3	3.4
Get adequate sleep	3.1	2.9	3.0
Feel rested after sleep	3.1	2.9	2.9
Drink recommended amount of water	3.6	3.4	3.5
Have energy	3.5	3.3	3.4
Have overall self confidence	3.1	3.1	3.1
Feel balanced in life	3.2	2.9	3.1
Live a healthy lifestyle	3.5	3.2	3.3
Take better care of self	3.6	3.3	3.4
Provide better care for your family	3.1	2.8	2.9
Facilitate your family to live a healthy lifestyle	3.1	3.0	3.0
Provide better care for patients	2.7	2.8	2.7
Provide better education to patients on healthy lifestyle	2.9	3.0	2.9
Help you overall	3.7	3.5	3.5
Combined overall program helpfulness	3.3	3.1	3.2

[a]Ranking: 1 = did not help, 2 = neither helped, nor hurt, 3 = helped a little, 4 = helped a lot.

getting adequate sleep (8 hours of sleep per night and do not mistake being tired for hunger). Although the study diaries also address these data points, the study diaries were not used for purposes of analysis but to raise awareness among participants regarding the balance between exercise and nutrition and to raise awareness of healthy lifestyle living.

Ninety-three percent of the NLF participants recommended overall that the NLF program should be provided to other nurses (94.9%) and to healthcare professionals (92.3%).

Regarding participant self-evaluations, for both weeks 12 and 24, there were greater improvements for NLF participants over contrast participants for total hours per week exercising and doing yoga on average over the last 3 months. Satisfaction with overall health was greater for the NLF participants.

Changes in BMI were analyzed by hours slept per night, categorized as either less than 7 on average per night per week or 7 or more. For the NLF group, of the 25 (38%) sleeping on average less than 7 hours per night per week, 15 (60.0%) lost weight between baseline and week 12. For those sleeping more than 7 hours, 30 (73.2%) lost weight. This analysis was completed only for the NLF participants who completed study diaries (n = 66 with change in BMI) with sleep data, as contrast group participants did not complete study diaries.

Table 4 provides the analysis of BMI category by study participant self-perception reporting in response to the question: "How would you describe yourself?" Participants were asked to mark 1 of 3 possible response categories: too thin, just right, or too heavy. There were no participant reports of being too thin. Most of the perceptions of body image were consistent with BMI categories. At baseline, the majority of the participants in the overweight category, 25.0 to 29.9 kg/m^2, with follow-up measures rated themselves as being too heavy. This included 92.6% of the 27 NLF group in the overweight category and 82.1% of the 39 contrast group members. There were participants in the obese and extremely obese category who perceived themselves as just right.

Attendance varied at each of the study sessions among the 108 participants who consented in the NLF intervention group. A total of 55 NLF participants (51%) completed at least 50% of the 12 exercise sessions, 31 (28%) of the 4 yoga sessions, and 34 (32%) of the 4 nutrition sessions.

Discussion

A Healthy People 2010 goal was to reduce the prevalence of obesity among American adults to 15% and to develop measures to prevent excess weight and obesity.[16] There are no known research studies specifically targeting exercise and nutrition in the workforce group of nurses. In this research comprised of self-selected convenience samples, although the nurse obesity rates were consistent with the US population (BMI >30 kg/m^2 = 35.0%, BMI >25 kg/m^2 = 72.4%), they are higher than rates previously reported.[5] Nurses, at the forefront of opportunity to educate others on healthy lifestyles, appear to be no healthier than the patients they are caring for, from an overweight and obesity perspective. In this study, overweight nurse participants had identified the need to change and through their participation sought options to facilitate this. As evidenced from the distribution of the significantly greater proportion of overweight and/or obese nurses

Table 4. *Participant's Self-Perception Reporting by BMI Category, Study Group, and Study Week*

	Baseline		Week 12		Week 24	
	NLF = 69, Contrast = 93		NLF = 57, Contrast = 93		NLF = 45, Contrast = 80	
Ranking	Just Right	Too Heavy	Just Right	Too Heavy	Just Right	Too Heavy
NLF study group						
Underweight (<18.5 kg/m^2)	1 (1.4)	0	1 (1.8)	0	1 (2.2)	0
Normal (18.5-24.9 kg/m^2)	7 (10.1)	8 (11.6)	8 (14.0)	3 (5.3)	6 (13.3)	1 (2.2)
Overweight (25.0-29.9 kg/m^2)	2 (2.9)	25 (36.2)	2 (3.5)	21 (36.8)	2 (4.4)	14 (31.1)
Obese (30-39.9 kg/m^2)	0	21 (30.4)	0	19 (33.3)	1 (2.2)	15 (33.3)
Extremely obese (≥40 kg/m^2)	0	5 (7.2)	0	3 (5.3)	0	5 (11.1)
Contrast study group						
Underweight (<18.5 kg/m^2)	0	0	0	0	0	0
Normal (18.5-24.9 kg/m^2)	15 (15.5)	19 (19.6)	16 (17.2)	19 (20.4)	14 (17.5)	18 (22.5)
Overweight (25.0-29.9 kg/m^2)	7 (7.2)	32 (33.0)	8 (8.6)	26 (28.0)	4 (5.0)	20 (25.0)
Obese (30-39.9 kg/m^2)	2 (2.1)	16 (16.5)	1 (1.1)	19 (20.4)	2 (2.5)	19 (23.8)
Extremely obese (≥40 kg/m^2)	0	6 (6.2)	0.0%	4 (4.3)	0	3 (3.8)

Values are presented as n (%).

self-selecting in the study intervention group, healthcare administrators should consider the potential effect that they could have on their employees seeking programs on healthy living through exercise, physical activity, and nutrition.

As a result of this research, a Living Fit program has been implemented at the hospital where this research was conducted. It was modified from the NLF program and includes exercise and yoga and nutrition sessions, open for all hospital employees. Programs should be offered year-round to facilitate employees sustaining positive effects as a result of participation. Additional research is recommended to determine the long-term effect that interventions such as NLF have on educating nurses on exercise, nutrition, and healthy lifestyles when provided year-round. Research evaluating the cost impact of obesity in the nursing workforce is warranted. Additional research is recommended on the potential effect of a program similar to NLF on patients, families, and the community, with respect to achieving and maintaining normal weight.

Limitations

There are several limitations of this research. This was not a randomized study. Because of the logistics of nursing schedules and external commitments of nurses, a randomization design was considered to be impractical. Self-selection bias was a limitation by allowing nurses to choose the NLF intervention group or the contrast group. Nurses participating in the NLF intervention had significantly greater BMIs than the contrast group (NLF = 30.5, contrast = 27.6) ($P < 0.001$). The contrast group participants were on average younger and had more advanced education. The follow-up samples were small because not all NLF and contrast group nurse participants completed follow-up BMI and waist circumference measures. Not all NLF participants participated in all 12 exercise sessions, the 3 yoga sessions, and the 4 nutrition sessions. With nursing schedule variances, prudent and flexible planning is required to facilitate the maximum number of nurses attending sessions during the course of a program. Hospitals from 3 states participated in this research. All were in the mid-Atlantic and Southern regions of the United States; thus, the results may not be generalizable to all nurse populations. In 2 of 3 states where the research was conducted, the baseline obesity rate for all participants was above the state obesity rates for women defined as a BMI of greater than 30 kg/m^2 (Virginia state rate = 25.6%, NLF = 42.6% and contrast = 22.2%; Maryland state rate = 25.9%, NLF = 53.5% and contrast = 27.5%).[15] Participants from South Carolina had a lower baseline obesity rate (NLF = 27.3% and contrast = 26.7%) than the state obesity rate for women of 29.3%.

Conclusions

The NLF program demonstrated a decrease in BMI for nurse participants. Provision of an evidence-based program such as NLF year-round can educate nurses on exercise, nutrition, and healthy lifestyle principles year-round. Ideally, nurses can utilize these principles to achieve or maintain normal weight, to role model healthy behaviors, and to better educate their patients, families, and community on healthy lifestyle principles targeting normal weight.

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