ORIGINAL RESEARCH ARTICLE

Effects of exercise training on health capabilities and life satisfaction among overweight and obese African American women

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Abstract

More importance has been placed on exercise training due to increase in the overweight and obese population. However, few studies have researched the effects of exercise training on the health capabilities and life satisfaction levels of overweight and obese African American women. This study sought to determine the effect of a 12-week exercise training on health capabilities and life satisfaction levels of overweight and obese African American women. Participants, who passed an initial screening and pre-assessment, were measured current health capabilities and life satisfaction levels both prior to, and following, the 12-week exercise training. The results from this study indicated an improvement in health capabilities, although with no significant differences following exercise training, while a significantly higher life satisfaction levels was observed among the overweight and obese African American women. The findings suggest that exercise training can be beneficial to enhance overweight and obese African American women's health capabilities and life satisfaction levels. Exercise professionals should provide the appropriate exercise trainings so that overweight and obese African American women can optimize life satisfaction levels. *(Afr J Reprod Health 2022; 26[3]: 54-62).*

Keywords: African-American; exercise; health capability: life satisfaction; obesity; overweight; women

Résumé

Une plus grande importance a été accordée à l'entraînement physique en raison de l'augmentation de la population en surpoids et obèse. Cependant, peu d'études ont étudié les effets de l'entraînement physique sur les capacités de santé et les niveaux de satisfaction de vie des femmes afro-américaines en surpoids et obèses. Cette étude visait à déterminer l'effet d'un entraînement physique de 12 semaines sur les capacités de santé et les niveaux de satisfaction de vie des femmes afro-américaines en surpoids et obèses. Les participants, qui ont réussi un dépistage initial et une pré-évaluation, ont été mesurés leurs capacités de santé actuelles et leurs niveaux de satisfaction à l'égard de la vie avant et après l'entraînement physique de 12 semaines. Les résultats de cette étude ont indiqué une amélioration des capacités de santé, mais sans différences significatives après l'entraînement physique, tandis qu'un niveau de satisfaction de vie significativement plus élevé a été observé chez les femmes afro-américaines en surpoids et obèses. Les résultats suggèrent que l'entraînement physique peut être bénéfique pour améliorer les capacités de santé et les niveaux de satisfaction de la vie des femmes afro-américaines en surpoids et obèses. Les professionnels de l'exercice doivent fournir les formations appropriées pour que les femmes afro-américaines en surpoids et obèses puissent optimiser leur niveau de satisfaction dans la vie. *(Afr J Reprod Health 2022; 26[3]: 54-62).*

Mots-clés: Afro-Américain; exercer; capacité de santé: satisfaction de la vie ; obésité; en surpoids; femmes

Introduction

The occurrence of obesity among U.S. adults was approximately 40 percent (93.3 million) in 2015-2016, which showed an increase of 10 percent compared to 1990-2000[1,2]. The overweight population rate was around 33 percent, which has been stable for decades[3]. Thus, 69 percent of the U.S. population was either overweight or obese in 2010, and the numbers have increased steadily in the last few decades[4,5]. Individuals who are overweight and obese often report they do not have time to engage in physical activities or exercise[6,7]. It was estimated that the direct and indirect national medical cost of being overweight and obese was approximately $113 billion in the U.S.[8]. Additionally, middle-aged adults had a higher prevalence of obesity than younger adults, and women were more likely to be overweight and obese than men. More specifically, more than half

of African American women (54.8%) showed an age-adjusted prevalence of obesity among adults aged 20 and over, which was the highest percentile regardless of ethnicity and race for 2015-2016[2].

Health capability can be examined as the condition that influence on health functioning and individual's ability to be healthy[9]. According to the evidence report for overweight and obesity clinical guidelines by the National Heart, Lung, and Blood Institute (NHLBI), a body mass index (BMI) determined to be in a range between 25.0 and 29.9 $kg \cdot m^{-2}$ defines 'overweight', and a score higher than 30 $kg \cdot m^{-2}$ defines 'obese'[9]. Unhealthy weight and obesity are growing health problems worldwide. Previous research examined the relationship between being overweight or obese and several significant health risks such as high blood pressure and cholesterol, stroke, type 2 diabetes, heart disease, various cancers and sociological problem[5,10-13]. For example, studies examined that 90 percent of type 2 diabetics have a BMI greater than 23 $kg \cdot m^{-2}$. Eighty five percent of those with BMI of 25 $kg \cdot m^{-2}$ or more were five times more likely to have hypertension. In addition, individuals who were overweight and obese with hypertension were more at risk of an ischaemic stroke[14]. Aronne[15] listed the proportion of disease prevalence that was attributable to obesity including type 2 diabetes (61%), uterine cancer (34%), gallbladder disease (30%), osteoarthritis (24%), hypertension (17%), coronary heart disease (17%), breast cancer (11%), and colon cancer (11%). More specifically, previous research that determined the risks of obesity based on race determined that African Americans had higher rates of hypertension and type 2 diabetes[16,17]. As such, being overweight and obese can influence an individual's morbidity that can be associated to an individual's life expectancy both directly and indirectly[18-21]. Research conducted by Aronne[22] found that more than 80 percent of deaths were associated to comorbidities with obesity with a BMI of 30 $kg \cdot m^{-2}$.

Life satisfaction often refers to be assessed in terms of individual's subjective well-being, affection, happiness, and quality of life[23]. Being overweight and obese is also related to individual psychological disorders or life satisfaction[12,23]. Wadsworth and Pendergast[24] researched the importance of context in the relationship between obesity and life satisfaction. The results indicated that obesity and severe obesity significantly affected life satisfaction in both men and women. Previous research by Ball *et al*.[25] determined a longitudinal relationship between life satisfaction and obesity among women in which obese women showed lower life satisfaction levels such as relationships to partners or study commitments. More specifically, by measuring perceived BMI. Cox *et al*.[26] also determined that body image dissatisfaction was the most significant predictor of quality-of-life levels among African American women.

It has been also well-documented that participation in physical activity or exercise training is one of the best ways to reduce and prevent being overweight and obese[27-29]. A systematic review determined that exercise could achieve weight loss in overweight or obese group by utilizing randomized controlled clinical trials[30]. Among 3,476 participants across 43 studies, exercise resulted in small weight losses and increased exercise intensity was positively associated with the magnitude of weight loss. Weight loss due to exercise significantly reduced serum lipids, diastolic blood pressure, triglycerides, and fasting glucose which showed the positive relationship between exercise participation and their health capabilities. Another study determined that different exercise groups influence on quality of life and health capabilities such as frailty, body composition, bone mineral density, and specific physical functions among older obese adults. The results also suggested that weight loss through exercise training led to greater improvement in physical function[31]. Consequently, the decrease in obesity levels through physical activity or exercise training are positively associated to better quality of life outcomes and life satisfaction levels[32,33].

The importance of physical activity and exercise training has been thoroughly researched by scholars. However, few studies have investigated how exercise training participation effects health capabilities and life satisfaction among overweight or obese individuals. Additionally, there has been

limited research into these differences among overweight or obese African American women. Thus, the purpose of this study was to determine the status of health capabilities through vital signs evaluation, health-related physical fitness tests, and life satisfaction levels among overweight or obese African American women. Following the 12-week exercise training participation period, the differences for overweight or obese African American women's health capabilities and life satisfaction levels between pre and post assessment were measured.

Methods

Study design and participants

This current study was employed the experimental research design. Participants in this study were recruited after an initial screening and pre-assessment of health capabilities from a southeastern city in the United States. A total of 63 African American women volunteered to participate in the exercise training, but eight individuals were removed from the study due to ineligibility for the intervention, and for absence/incompletion of pre-post assessment (Figure 1). Additionally, as BMI results were the main criteria for this intervention, five volunteers were excluded from the study following the pre health assessment because their BMI scores measured within the 'normal' range. 12 individuals were excluded because they did not complete 80 percent (47 classes or less) of the 12-week exercise training. Finally, three participants did not participate in the post- fitness test. Ultimately, a total of 35 overweight and obese African American women from 32 to 65 years old (*M*: 45.37, *SD*: 8.718) were included in the data set (Figure 1). All participants were assured of anonymity, and proper approval was obtained from the Institutional Review Board (IRB) of the researcher's institution prior to conducting the pre-assessment.

Procedures

Health capabilities assessments

Participants were asked to measure the current health capabilities both prior to and following the 12-week exercise training. Participants obtained vital sign measurements such as height, weight, systolic and diastolic blood pressure (SBP & DBP), resting heart rate (RHR), and body composition assessment of body mass index (BMI). Professional health physicians volunteered to measure these vital signs and body composition measurements pre- and post-exercise training. BMI is calculated by dividing body weight in kilograms by height in meters squared ($kg \cdot m^{-2}$).

Additionally, the following physical strength and flexibility tests were applied on the same day by utilizing the description of American College of Sports Medicine[6]:

Push-up test (Modified knee push-up): Counting the repetitions to raise the body by straightening the elbow and returning to the down position.

Curl-up test: Counting the repetitions of each time to flex the subject's spines and reach their hands forward until their finger touches the second strip of tape, which was placed in a mat on the floor at a distance of 12 cm (44 and younger) or 8 cm (45 and older).

Sit-and-reach test: Measuring the maximum scale by reaching forward with both hands as far as possible and staying in the same posture for two seconds.

Life satisfaction level – Satisfaction with life scale (SWLS)

Both prior to and following the intervention phase of exercise training, participants were evaluated in a self-administered questionnaire about life satisfaction levels, which was adapted from the Satisfaction With Life Scale (SWLS). The SWLS was developed by Diener et al.[34] and was composed of the following five questions:

"In most ways my life is close to my ideal"

"The conditions of my life are excellent"

"I am satisfied with life"

"So far I have gotten the important things I want in life"

"If I could live my life over, I would change almost nothing"

Each item was completed by selecting responses on a seven-point Likert-type scale, from "Strongly disagree" (1) to "Strongly agree" (7). The score for each item was summed up to include:

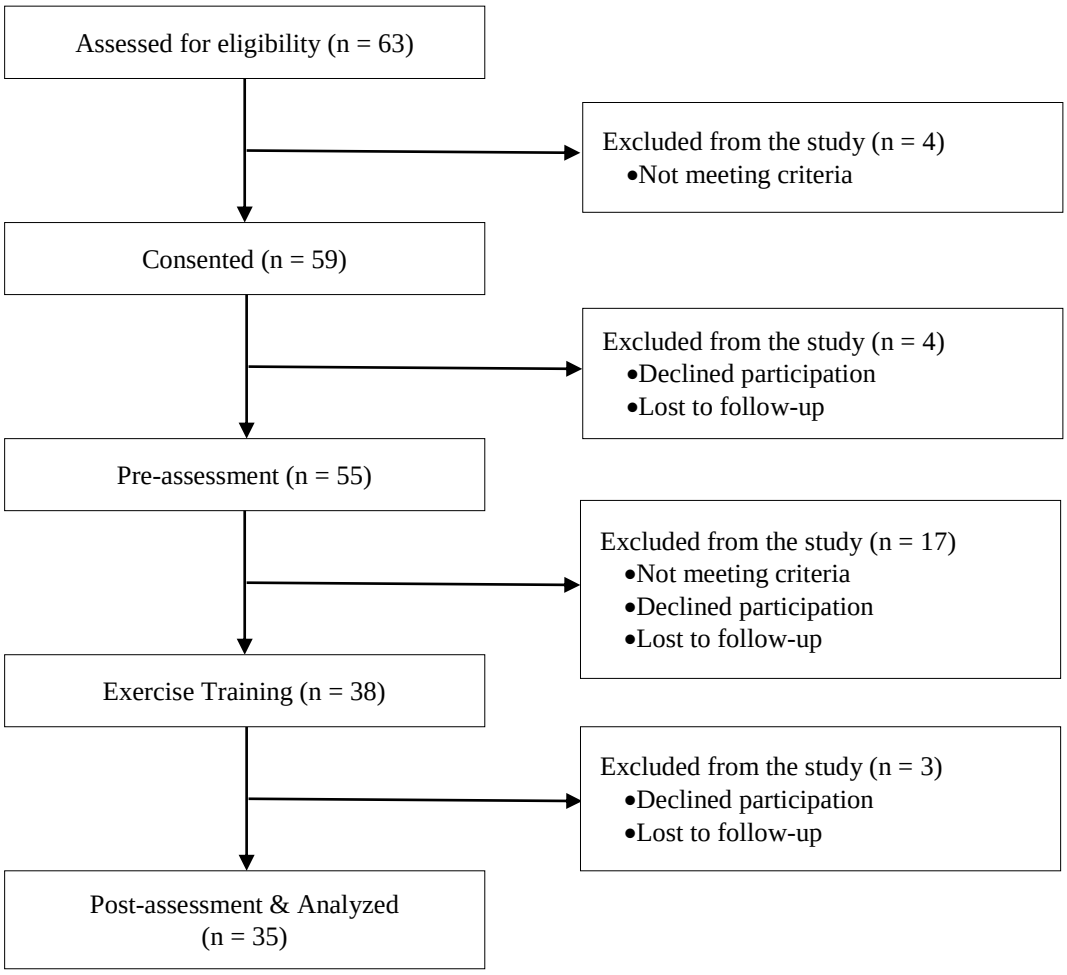

Figure 1: Flowchart of participants' selection

"5-9: Extremely dissatisfied"
"10-14: Dissatisfied"
"15-19: Slightly dissatisfied"
"20: Neutral"
"21-25: Slightly satisfied"
"26-30: Satisfied"
"31-35: Extremely satisfied"

Exercise training

Individuals participated in a 12-week exercise training that was provided by the university wellness program in two classes during the Spring and Fall semesters. Exercise training entailed a twice daily 50 minutes session, within five days a week. Each class consisted of a 10-minute warm-up, 30-minute main program, and a 10-minutes cool-down. The entire training program lasted for 12 weeks. Five different training programs were provided:
Monday: Zumba
Tuesday: Strength & Conditioning
Wednesday: Spinning cycle
Thursday: High-intensity interval training (HITT)
Friday: Yoga
Each class was taught by a certified instructor with an assistant who served as a fitness coordinator. The fitness coordinator managed each day's class, such as preparing equipment and supplies, checking attendance, and assisting instructors. Each class was limited to 15 participants due to the site's safety capacity. Individuals were not allowed to change their scheduled class without permission.

Data analysis

Data analysis was conducted with the Statistical Package for the Social Sciences version 25 (SPSS 25). Descriptive statistics of mean and standard deviation was used to describe the health capabilities and life satisfaction levels of the participants. Wilcoxon signed-rank test of non-parametric measurement was used to compare the mean scores between pre- and post-health capabilities assessment. The alpha level was set at $p < .05$ level of significance. This test allowed the study to compare two related samples without making the assumption that values are normally distributed. The SPSS 25 also indicated that the data reliability for the seven items of health capabilities assessments ($\alpha = .815$) and the five items of life satisfaction levels ($\alpha = .902$) were verified by Cronbach's alpha coefficient measurement.

Results

This study measured health capabilities and life satisfaction levels prior to exercise training. The result of BMI confirmed the evidence that the female African American participants were currently overweight or obese (*M*: 36.066). The results of vital sign assessment indicated that their recorded blood pressure levels averaged 138.46 / 86.43 mmHg and their average resting heart rate was 85.20 beats/min. Fitness test results, collated in Table 1, found that the average number of push-ups was 14.430 reps, the average number of curl-ups 13.60 reps, and the average number of sit-and-reach was 11.009 inches among the participants. Additionally, the life satisfaction levels, utilizing SWLS scores, indicated that the participants were only 'slightly satisfied' (*M*: 24.83).

The same tests were again applied following the 12-week exercise training. The mean values for BMI decreased by 0.435 among the participants who completed the exercise training, which meant that they were still considered 'overweight' or 'obese' but showed slight improvement of BMI reduction. Vital signs also showed improvement: SBP decreased by 0.75 mmHg, DBP by 0.6mmHg, and RHR by 0.31 beats/min. Fitness test results also revealed improvement in push-up (0.26 reps increase), curl-ups (0.23 reps increase) and sit-and-reach (0.125-inch increase). Finally, the women's life satisfaction levels showed an SWLS score increase by 1.74. This result indicated that African American women's life satisfaction improved from 'slightly satisfied' to 'satisfied' (Table 1).

Wilcoxon signed-rank test was conducted to analyze the mean difference of health capabilities and life satisfaction levels between pre- and post-12-week exercise training. As shown in Table 1, life satisfaction levels indicated a statistical difference that overweight or obese African American women had significantly higher mean SWLS scores following exercise training [$Z = -4.357$, $p < .001$], while there were no significant increases in health capabilities.

Discussion

The present study examined the effects of a 12-week exercise training on health capabilities and life satisfaction levels of overweight or obese African American women. The findings from this study indicate that exercise training showed no significant effects on health capabilities among overweight or obese African American women. However, vital signs and physical fitness were enhanced through the 12-week exercise training. More specifically, participants' BMI scores decreased following the completion of exercise training, but the change was insignificant. Previous studies suggested that physical activity or fitness programs might not be the best method of weight loss for ethnic minority women, who might have limited knowledge of effective strategies to lose[28,35,36]. Another possibility might be the lack of control over participants' eating habits. The previous study found that body weight decreased in the diet group and diet–exercise group but did not decrease in the exercise group[31].

Vital signs were evaluated before and after the 12-week exercise regimen. The results for blood pressure indicated that SBP and DBP remained higher than the normal range prior and following

Table 1: Descriptive statistics and wilcoxon signed-rank test between pre and post exercise training on health capabilities and life satisfaction levels among overweight obese African American women

	Exercise Training					
	Pre		Post		*Z*	*P*
	M	*SD*	*M*	*SD*		
Body Composition						
Body Mass Index (kg·m^{-2})	36.066	7.479	35.631	6.812	-1.249	.212
Vital Sign Evaluation						
Systolic blood pressure (mmHg)	138.46	19.116	137.71	17.055	-1.888	.059
Diastolic blood pressure (mmHg)	86.43	11.178	85.83	10.268	-1.177	.239
Resting heart rate (beats/min)	82.20	9.471	81.89	9.006	-.860	.390
Physical Fitness Test						
Push-up (repetition)	14.43	5.782	14.69	5.754	-1.784	.074
Curl-up (repetition)	13.60	5.152	13.83	5.159	-1.406	.160
Sit-and-reach (inch)	11.009	2.812	11.134	2.771	-1.253	.210
Life Satisfaction Level						
SWLS	24.83	3.861	26.57	3.616	-4.357	.000

the exercise training among African American women, but that the severity had declined from hypertension to pre-hypertension levels[6,37]. Conducting meta-analyses on the previous literature supported current findings that endurance, dynamic and isometric resistance training exercises helped to lower SBP and DBP[38]. Also, the average resting heart rate only slightly changed before and after the 12-week exercise training indicated that this sample were 'below average' for the average resting heart rate[39,40]. The findings from this sample nonetheless indicated that resting heart rating was reduced following eight weeks of exercise training among women[41]. However, there were no significant effects for exercise training on participants' vital signs, even if the number showed the enhancement of vital signs. As such, the 12-week exercise training might not be an effective way to enhance overweight or obese African American women's vital signs.

The sample for the current study examined physical fitness abilities including push-ups, curl-ups and the sit-and-reach test. Results revealed that push-ups were rated 'good', but curl-ups and the sit-and-reach test were 'well below average,' both prior to and following the exercise training[6]. However, there was no statistically significant differences between pre- and post-exercise training, but improvements in all fitness tests were measured. Although there was no significant relationship between exercise training participation and health capabilities among overweight or obese African American women, findings in the current study suggest further studies are needed to fully understand this relationship and other possible factors.

It is a fact that obesity negatively influences an individual's life satisfaction level[24,26]. However, the results from the current study indicate that there was evidence that life satisfaction levels were positively associated with participating in a 12-week exercise training. Previous studies examined the effects of resistance exercise training for 12-weeks that resulted in significant increase to life satisfaction levels[42]. The current finding is also supported by previous research that found that the intervention of physical activity among adults with severe obesity was positively associated with life satisfaction[32]. It is interesting result that life satisfaction level significantly increased following the 12-week exercise training, while there were no significant effects on health capabilities. To explain these phenomena, it would be important to understand that one of main intents for overweight or obese African American women to participate in exercise training is to enhance not only their health capabilities but also life satisfaction levels. It can be assumed that participants' main purpose might be enjoyment through exercise training itself, or even socializing with others. Previous studies support the current assumptions that self-generated activities with others contribute to life satisfaction levels[43]. Another possibility might be that overweight or obese African American women might recognize

improvement to health capabilities through participation in the 12-week exercise training and consequently connect it to enhance their life satisfaction levels.

Limitations

Despite significant findings, several limitations should be noted. Participants in this study were recruited by a convenience sampling that should have a limitation of generalizability to all overweight or obese African American women. This study was conducted at a university located in the Southern U.S. A geographical restriction that might not also allow for the results to be generalizable. Future studies might need to include samples from different regions that would bolster generalizability. Another primary limitation is the lack of knowledge about other possible factors that can influence or change participants' health capabilities and life satisfaction levels. For instance, this study did not investigate participants' medical history, food consumption habits, or demographics, such as socioeconomic status, income, social or family status[29,44]. These additional factors would need to be provided for in future studies to produce more accurate findings. Last, the low number of participants was another limitation to this study that might make it hard to generalize the current findings to all overweight or obese African American women. A larger participant pool would strengthen the statistical power of future studies.

Conclusion

The objective of this current study was to gain a better understanding of how a 12-week exercise training potentiate effect on health capabilities and life satisfaction levels of overweight or obese African American women. It was evident that 12 weeks of exercise training can be beneficial to enhance health capabilities, although the findings do not provide changes of any statistical significance. Thus, it suggests that exercise professionals should apply appropriate exercise training to enhance overweight or obese African American women's health capabilities. The findings of this current study also provide insight into the significant benefits of exercise training on life satisfaction levels among overweight or obese African American women. This finding from this study suggests that exercise professionals should learn to recognize and understand significant increases to life satisfaction levels among overweight or obese African American women through exercise training. Exercise professionals should consider what kinds of, and how, exercise trainings can optimize life satisfaction levels. In this respect, the findings of the current study provide an important contribution to showing how exercise training benefits health capabilities and life satisfaction levels among overweight or obese African American women.

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Contribution of authors

Both authors participated in the designing of the study. DC collected the data, and wrote the first draft of manuscript, generated the table and figure as the first author. SKK administrated the study and edited the manuscript as the corresponding author. All authors read approved the final manuscript.

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