The Associations of Dispositional Optimism with Multiple Measures of Obesity among African Americans: The Jackson Heart Study

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Abstract **Objectives:** To examine the cross-sectional associations of dispositional optimism (DO) with multiple measures of adiposity among African Americans (AA). **Methods:** Using the Jackson Heart Study (JHS) data, we analyzed baseline data (2000-2004) for 4624 African-American adults. Multivariable Poisson regression analysis with robust standard error was used to estimate the prevalence ratios (PRs; 95% confidence intervals-CI) of DO by adiposity measures, adjusting for demographics, socioeconomic status (SES), behavioral factors and depressive symptoms. **Results:** After full adjustment, high (vs. low) optimism was significantly associated with a 5% reduced prevalence of WHtR $\geqslant 0.05$ (PR=0.95; 95% CI = 0.91, 0.99; P = .008) in the total sample. High (vs. low) DO was also protective of WC $\geqslant$ 102 cm (male), $\geqslant$ 88cm (female) after adjusting for demographics, SES and behavioral risk factors (PR= 0.94; 95% CI = 0.89, 0.99; P = .028). The association between high (vs. low) optimism and BMI $\geqslant 30$ kg/m^2 was significant (PR= 0.93; 95% CI = 0.87, 0.99; P = .034) after adjustment for demographic factors. **Conclusion:** High levels of DO could be protective against high abdominal adiposity phenotype among AA.

Keywords: cardiovascular disease, obesity measures, dispositional optimism, jackson heart study

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1. Introduction

African-American (AA) adults have higher prevalence of cardiovascular disease (CVD) than Whites. [1] It is also well documented that obesity is a risk factor for CVD. [2,3] Research has shown that 48.1% of AA adults are obese compared with 34.5% non-Hispanic white adults. [4] Chronic accumulation of excess body fat may result in a variety of metabolic changes that increase the prevalence and risk factors of CVD. [5]

Research suggests that positive psychosocial well-being (optimism or the expectation that positive things will happen) is associated with reduced risk of developing chronic disease in AA. [6,7] A study by Kim and colleagues that followed over 6,808 older US adults in the Health and Retirement Study revealed a dose–response relationship between optimism and heart failure, with those in the highest (vs. lowest) quintile of optimism showing 48% lower odds of heart failure (Kim et al.,

2014). [7] Another study examined the association of optimism with progression of atherosclerosis as measured by intima media thickness (IMT) among women, found that optimistic women were less likely than pessimists to have an increase in carotid IMT. [8]

Little research has examined the relationship between optimism and obesity, particularly among AA. Research has examined the association of optimism with the American Heart Association's (AHA) Life's Simple 7 (LS7) metrics, one of which is BMI. [9-11] Using the Jackson Heart Study (JHS) data, a recent study found that high (vs. low) optimism was associated with intermediate BMI in minimally adjusted models, although the association attenuated after full adjustment. [11]

The anatomic dissimilarities arising due to the disproportionate accumulation of fat in different body regions prompted the various methods for assessing and comparing obesity conditions. The methods yield different results when used to estimate morbidity and mortality. Therefore, it was suggested that a simple anthropometric measure of total adiposity such as the BMI should be

refined by measuring additional indices of fat distribution namely WC, WHR or WHtR to discriminate higher-risk individuals (Despres, 2012; Cornier et al., 2011). [12,13] Some of these measures tend to be better predictors or have stronger associations to some diseases than the others (Rivera-Soto & Rodriguez-Figueroa, 2016). [14]

Until now, no study has examined the associations of dispositional optimism with multiple measures of obesity in a large sample of AA. Using data from the JHS, we examined the cross-sectional associations of optimism with multiple measures of adiposity/obesity. One mechanism through which optimism may impact obesity is via health behaviors, since optimism has been linked to eating a balanced diet, exercise, and moderate alcohol consumption. [15-18] It is important to examine whether AA are able to translate positive well-being into normal or acceptable values in measures of adiposity. We hypothesized that greater levels of optimism are inversely associated with adiposity as measured by body mass index (BMI), waist circumference (WC) and waist-to-height ratio (WHtR) among AA.

2. Methods

The researchers requested data from the Jackson Heart Study after the research proposal was approved by the JHS Publication and Presentation committee. The JHS is an observational, community-based cohort study designed to investigate the epidemiology of CVD among AA adults living in the tri-county area (Hinds, Madison and Rankin counties) of Jackson, MS. The baseline recruitment (2000–2004) involved 5306 non-institutionalized, AA adults aged 21 years old and above. Baseline (Exam 1) data were collected via in-home interview and clinic examination, where trained staff administered questionnaires to collect self-reported information on demographics (age, sex), psychosocial measures (optimism), CVD risk factors and behavioral factors (nutrition, physical activity). Staff were trained to collect blood and urine samples and also to measure height, weight, and blood pressure (BP) of participants. Further details about recruitment, data collection, and study variables are described elsewhere. [19,20] The JHS was approved by the institutional review boards of the University of Mississippi Medical Center, Jackson State University, and Tougaloo College. Each participant submitted a signed informed consent form.

The outcome measures include three measures of adiposity assessed at baseline: body mass index (BMI), waist circumference (WC) and waist-to-height ratio (WHtR). JHS investigators derived the participants BMI using each participant's weight (kg) divided by the square of the height (m^2). BMI values were categorized as follows: BMI less than 18.5 kg/m^2 equals underweight; BMI between 18.5 kg/m^2 and 24.9 kg/m^2 equals normal weight; BMI between 25 kg/m^2 and 29.9 kg/m^2 indicates overweight; BMI greater than 30 kg/m^2 represents obesity. We dichotomized the BMI categories as follows: < 30 Kg/m^2 (non-Obese) and $\geq$ 30 Kg/m^2 (Obese). Similar dichotomization has been applied in a previous study. [21]

As part of the anthropometric assessment, WC was determined during the clinic visit and this linear measurement was to the nearest centimeter. [19] The WC measurement was taken at the level of the umbilicus (navel) while the participant was standing with the feet approximately 6 inches apart. The measurement was taken at the point of relaxation end of exhalation. WC was measured as a categorical variable for the cross-sectional analyses. Elevated WC was defined as WC measurement greater than 102 cm in males and 88 cm in females. [22]

The WHtR was computed during data analysis for this study, as the value of each participant's WC in centimeters divided by the corresponding height also in centimeters. A cut-off point for WHtR has been proposed as 0.5 for the general population, irrespective of sex and race. [23] Thus, values greater than 0.5 are classified as obese, while values less than 0.5 are classified as non-obese.

Dispositional optimism was derived arithmetically and its composite score is the summation of six items on the revised Life Orientation Test (LOT-R), with a range of 0 (least optimistic) to 18 (most optimistic). [11,37] Optimism score was created using the six questions, each with four response options. The scale was scored by summation of all six response scores, resulting in a minimum and maximum score of 0 and 18 respectively. The LOT-R scale, a validated measure of optimism, was completed at the first annual follow-up interview. It contains 3 positively-worded items (e.g., "I'm always optimistic about my future") and 3 negatively worded items (e.g., "If something can go wrong for me, it will"). Internal reliability was adequate in this sample ($\alpha = 0.64$). To calculate the total optimism score, the three positively-worded items were reversed coded before summing the negatively worded items. The composite score was categorized into tertiles (low-referent, medium, high) in order to assess for threshold effects (as clinical cut-off points are unavailable), and as a unidimensional scale (continuous variable) in standard deviation (SD) units. [11] The SD derivative (4.5 units) for the participants was achieved by using the standard deviation of the optimism score to divide the participant's total optimism score.

Covariates were selected based on known associations with obesity and include: baseline age (continuous); sex was categorized into: men-referent and women; marital status was grouped into: never married, married, separated, divorced, widowed-referent; depressive symptoms (continuous), and nutritional status has the following categories: poor health, intermediate health and ideal health – referent.

Nutritional status was determined by assessing dietary intake using The Delta Nutrition Intervention Research Initiative containing 158-item food frequency questionnaire validated and designed specifically for the JHS. [25] The AHA guidelines for a healthy diet were based on the following 5 dietary components: (1.) $\geq$4.5 cups/day of fruits and vegetables; (2.) $\geq$2 3.5-ounce servings/week of fish; (3.) $\geq$3 1- ounce-equivalent servings/day of fiber-rich whole grains; 4) $\leq$1500 mg/day of sodium; and 5) $\leq$450 kcal/week of sugar-sweetened beverages. The AHA ultimately established three levels based on the components: (1.) poor - 0–1 component; (2.) intermediate - 2–3 components; and (3.) ideal – referent - 4–5 components.

Education was classified as less than high school, high school graduate to some college, or attended vocational/trade schools or college graduate and above - referent.

Behavioral factors were measured at baseline. Cigarette smoking was dichotomized as yes – referent or no. Using

the validated JHS Physical Activity (JPAC) Instrument, [24] physical activity was measured as poor health, intermediate health and ideal health. Physical activity was measured as a continuous sum of the 4 index scores: Active Living, Work/Occupational, Home Life, and Sport from the JPAC. [23] Based on the physical activity measure of the JPAC, three levels were established: (1.) poor - 0 min/week (min/week) of physical activity; (2.) intermediate - 1–149 min/week of moderate physical activity, 1–74 min/week of vigorous physical activity, or 1–49 min/week of combined moderate and vigorous physical activity; and (3.) ideal - referent - ≥150 min/week of moderate physical activity; or ≥75 min/week of vigorous physical activity; or ≥150 min/week of combined moderate and vigorous physical activity. [11] Physical activity and diet were coded as poor, intermediate, or ideal based on the AHA's Life's Simple 7 guidelines. [11]

To make sure that associations of optimism with adiposity were not primarily due to the absence of negative affect, we adjusted for depressive symptoms using the 20-item Centers for Epidemiologic Studies Depression Scale (CESD). [26] Participants were asked about their mood over the past week, responding to each item e.g., I was bothered by things that usually don't bother me. Item ratings ranged from 0 (rarely/none of the time) to 3 (most/all of the time). This scale ranged from 0 to 60 with higher scores reflecting greater levels of depressive symptoms. Cronbach's alpha was 0.82.

Descriptive statistics were presented where baseline characteristics of the participants were compared across tertiles of optimism by using the Chi square test for categorical variables or the analysis of variance (ANOVA)/Kruskal Wallis Test for continuous variables, depending on the normality of the distribution. Due to the high prevalence of obesity in this population, multivariable Poisson-link regression (Relative Prevalence Regression) with robust standard errors (SEs) was used to generate the prevalence ratios (PRs) and 95% confidence interval (CI) of adiposity measures by levels of optimism. [27] The multivariable regression models were adjusted sequentially for potential confounders. Model 1 was adjusted for age, sex; model 2 adjusted for model 1 + marital status and education; model 3 adjusted for model 2 + current smoking, physically activity and diet. Finally, model 4 adjusted for model 3 + depressive symptoms. Effect modification by age, sex, SES was tested for by performing interactions in the full model; and no significant results were detected for further stratification and analysis. Due to performing multiple test scenarios that put us at an increased risk for type I error, we have implemented the Bonferroni method of correction for all comparisons, and presented the adjusted P values for multiple testing in Tables 2a, 2b and 2c. The following correction for multiple testing was used for the optimism measure: .05/3 = .0167 or .02. Furthermore, sensitivity analyses employing Poisson-link regression treated dispositional optimism also as a continuous standard deviation (SD) score when modeling its association with obesity measures. All reported P values correspond to 2-tailed tests and were significant at the .05 level. Statistical analyses were performed using the SAS 9.4 (SAS Institute Inc., Cary, NC).

3. Results

Table 1 shows the distribution of key variables by levels of optimism. Participants who reported high optimism were younger, married, belonged to higher SES, reported higher ideal physical activity, ideal nutrition, less likely to be current smokers and more likely to report low depressive symptomatology ($P < .05$ for all; Table 1). The means of BMI, WC and WHtR were significantly lower among the participants who reported high (vs. low) optimism (Table 1).

Table 2a presents sex-pooled associations of optimism with categories of BMI. Overall, there was an inverse (though non-significant) association between those who reported medium to high (vs. low) optimism with prevalent obesity. For example, participants reporting high (vs. low) optimism had 7% reduced prevalence of obesity (vs. normal BMI) after adjusting for age and sex (PR = 0.93; 95% CI = 0.87, 0.99, $p = .034$). The association attenuated after adjustments for SES, behaviors, and depressive symptoms. When considering optimism as a continuous variable, a 1-SD unit increase in optimism was associated with a 2.9% reduced prevalence of obesity (PR = -0.029; 95% CI = 0.055, -0.002, $p = .034$). This association attenuated after full adjustment. In sex-stratified analysis, high optimism was associated with reduced prevalence of BMI after adjusting for age among women, but the associations weakened after further adjustment (Table 3a). Results were not significant for men.

High (vs. low) optimistic individuals had an 8% reduced prevalence of high (vs. normal) WC (PR = 0.92; 95% CI = 0.88, 0.97, $p = .003$). This inverse association was maintained after adjusting for SES and behaviors ($P < .05$), but attenuated after adjustment for depressive symptoms (Table 2b). A 1-SD increase in optimism was associated with a 2.2% reduced prevalence of elevated WC after adjustment for behaviors (PR = -0.022; 95% CI = .043, -.007, $p = .042$). This association became non-significant after adjustment for depressive symptoms. After adjustment for multiple testing, high optimism was significant in all models except the fully-adjusted model; the adjusted P value for continuous optimism SD score was also significant in all models except the fully-adjusted model. This pattern of significant results was also seen among women, while significant associations were not detected for men (Table 3b).

High (vs. low) optimism was significantly associated with reduced WHtR in models 1 through 4 ($P < .05$) (Table 2c). Consistent with the above results, there were measurable reductions in the prevalence of high WHtR among participants for each unit SD increase in optimism across all four models, including beyond the effects of depressive symptoms (PR = -0.020; 95% CI = -0.035, -0.004, $p = .013$). The associations remained significant when adjusted P value (P = .02) for multiple testing was considered. In sex-stratified analysis, high (vs. low) optimism was consistently protective of high WHtR in models 1 - 4 among women (Table 3c). Results for men were marginally significant after adjusting for behaviors and depressive symptoms (Table 3c).

Table 1. Demographics by Tertiles of Optimism, Jackson Heart Study (2000-2004)

COVARIATE	OPTIMISM LEVEL BY TERTILES			
	POOLED (N=4624)			
	Low Optimism N=1589	Medium Optimism N=1572	High Optimism N=1463	P-value
Age years, Mean (SD)	57.6 (12.8)	53.7 (12.54)	53.31 (11.98)	<.0001
Age Category (%)				<.0001
21-40	10.39	14.52	13.75	
41-60	41.31	53.29	58.52	
61+	48.30	32.19	27.72	
Marital status (%)				<.0001
Never married	12.78	13.19	10.61	
Married	51.33	56.6	59.69	
Separated	4.75	3.95	3.49	
Divorced	14.18	14.72	16.43	
Widowed	16.96	11.54	9.79	
Educational Attainment (%)				<.0001
<High Sch.	29.24	15.66	10.89	
High Sch./GED	21.39	17.01	13.77	
Voc./Trade Sch./College	49.37	67.33	75.34	
Income Level (%)				<.0001
Poor	17.75	11.32	7.52	
Lower-middle	27.12	17.94	14.76	
Upper-middle	23.60	27.48	25.43	
Affluent	17.24	27.48	36.77	
Missing	14.29	15.78	15.52	
Physical Activity (%)				<.0001
Poor Health	54.25	47.87	41.52	
Intermediate Health	30.81	33.23	33.38	
Ideal Health	14.93	18.91	25.10	
Nutritional status category (%)				.0004
Poor Health	60.01	55.95	51.91	
Intermediate Health	39.28	42.99	46.59	
Ideal Health	0.71	1.06	1.50	
AHA Smoking category				.0002
Poor Health	15.11	11.30	10.45	
Intermediate Health	1.47	0.71	1.18	
Ideal Health	83.42	87.99	88.37	
Current Smoker	15.01	11.22	10.40	.0002
Depression, mean (SD)	13.74 (9.0)	10.18 (7.18)	8.59 (6.60)	<.0001
Body Mass Index (Kg/m^2), mean (SD)	32.06 (7.53)	32.22 (7.59)	31.36 (6.65)	.04
Waist Circumference (cm), mean (SD)	101.97 (16.45)	100.88 (16.51)	99.36 (15.81)	<.0001
Waist - Height – Ratio, mean (SD)	0.61 (.10)	0.60 (.10)	0.59 (.09)	<.0001

Note!
N = Sample Size, GED = General Educational Development, SD = Standard Deviation

Table 2. Prevalence Ratio (PR, 95%CI) Of BMI, WC and WHtR By Levels of Optimism Among African Americans, Jackson Heart Study, 2000 – 2004

TABLE 2a. BMI POOLED BMI (Normal<30kg/m^2 vs. Obese≥30kg/m^2)								
Optimism Tertiles (N=4624)	Model 1 (N=4614)		Model 2 (N=4585)		Model 3 (N=4106)		Model 4 (N=2748)	
	PR (95% CI)	P-Value	PR (95% CI)	P- Value	PR (95% CI)	P- Value	PR (95% CI)	P- Value
Low (Ref.)	1.0 Ref.		1.0 Ref.		1.0 Ref.		1.0 Ref.	
Medium	0.97 (0.09 - 1.03)	.30	0.98 (0.92-1.04)	.48	0.96 (0.90-1.02)	.21	0.99 (0.91-1.08)	.91
High	0.93 (0.87-0.99)	.03[b]	0.95 (0.88-1.01)	.10	0.94 (0.88-1.01)	.09	0.96 (0.88-1.06)	.43
P Trend	.27		.34		.61		.46	
SD units	-0.029 (-.055 – -.002)	.03[b]	-0.021 (-0.048 - 0.006)	.13	-0.021 (-0.050 - 0.008)	.15	-0.009 (-0.046 - 0.029)	.64

TABLE 2a. BMI POOLED				
BMI (Normal<30kg/m² vs. Obese≥30kg/m²)				
Optimism Tertiles (N=4624)	Model 1 (N=4614)	Model 2 (N=4585)	Model 3 (N=4106)	Model 4 (N=2748)

LEGEND:

ABBREVIATIONS: BMI (Body Mass Index). Dispositional optimism is used interchangeably with optimism

BMI Categories: BMI <30 kg/m² (Normal), and BMI ≥30 kg/m² (Obese)

Low, moderate, and high represent the first, second, and third tertile of dispositional optimism at baseline. Sample size (N).

PR estimates for BMI represent the prevalence (risk) of obesity among participants at baseline.

Standardized regression coefficients are presented for BMI per 1-SD increment in optimism.

Model 1 is age and sex adjusted; Model 2 = Model 1 + marital status and education; Model 3 is Model 2 + current smoking, physically activity and nutritional status and Model 4 is Model 3 + depression.

P - Trend represents the p value for linear trend across tertile categories of optimism

[b] Bonferroni-adjusted P value for multiple testing: .02

TABLE 2b. WC POOLED

F: (Normal< 88cm; High ≥ 88cm)

M: (Normal < 102cm; High ≥ 102cm)

Optimism Tertiles (N=4624)	Model 1 (N=4614)		Model 2 (N=4584)		Model 3 (N-4104)		Model 4 (N=2747)	
	PR (95% CI)	P- Value	PR (95% CI)	P- Value	PR (95% CI)	P- Value	PR (95% CI)	P- Value
Low (Ref)	1.0 Ref		1.0 Ref		1.0 Ref		1.0 Ref	
Medium	.98 (.93-1.03)	.43	.99 (.95-1.04)	.81	.99 (.94-1.04)	.63	1.00 (.94 -1.07)	.91
High	.92 (.88-.97)	.003[b]	.94 (.90-1.00)	.03	.94 (.89-.99)	.03	.95 (.89-1.02)	.14
P Trend	.02		.06		.08		.10	
SD units	-.031 (-.050 - -.011)	.002[b]	-.021 (-.010 – -.041)	.04	-.022 (-.043 - -.007)	.04	-.017 (-.044 - .011)	.24

LEGEND:

ABBREVIATIONS: WC (Waist Circumference). Dispositional optimism is used interchangeably with optimism

Female WC < 88 cm (Normal) and Female WC ≥ 88 cm (High)

Male WC < 102 cm (Normal) and Male WC ≥ 102 cm (High)

Low, moderate, and high represent the first, second, and third tertile of dispositional optimism at baseline. Sample size (N).

PR estimates for WC represent the prevalence (risk) of high WC among participants at baseline.

Standardized regression coefficients are presented for WC per 1-SD increment in optimism.

Model 1 is age and sex adjusted; Model 2 = Model 1 + marital status and education; Model 3 is Model 2 + current smoking, physically activity and nutritional status and Model 4 is Model 3 + depression.

P - Trend represents the p value for linear trend across the tertile categories of optimism

[b] Bonferroni-adjusted P value for multiple testing: .02

TABLE 2c. WHtR POOLED

WHtR (Normal<0.5; High≥0.5)

Optimism Tertiles (N=4624)	Model 1 (N=4613)		Model 2 (N=4584)		Model 3 (N=4104)		Model 4 (N=2747)	
	PR (95% CI)	P- Value	PR (95% CI)	P- Value	PR (95% CI)	P- Value	PR (95% CI)	P- Value
Low (Ref)	1.0		1.0		1.0		1.0	
Medium	1.01 (.98-1.03)	.54	1.01 (.99- 1.04)	.34	1.01 (.98-1.03)	.63	1.01 (.98-1.05)	.47
High	.95 (.92-.98)	.0003[b]	.95 (.92-.98)	.001[b]	.95 (.92-.98)	.0005[b]	.95 (.91-.99)	.008[b]
P Trend	<.0001		<.0001		<.0001		.0005	
SD units	-.020 (-.031 - -.009)	.0003[b]	-.018 (-.030 – -.007)	.001[b]	-.019 (-.031 – -.007)	.002[b]	-.020 (-.035 – -.004)	.01[b]

LEGEND:

ABBREVIATIONS: WHtR (Waist-to-Height Ratio). Dispositional optimism is used interchangeably with optimism

WHtR < 0.5 (Normal) and WHtR ≥ 0.5 (High)

Low, moderate, and high represent the first, second, and third tertile of dispositional optimism at baseline. Sample size (N).

PR estimates for WHtR represent the prevalence (risk) of high WHtR among participants at baseline.

Standardized regression coefficients are presented for WHtR per 1-SD increment in optimism.

Model 1 is age and sex adjusted; Model 2 = Model 1 + marital status and education; Model 3 is Model 2 + current smoking, physically activity and nutritional status and Model 4 is Model 3 + depression.

P - Trend represents the p value for linear trend across the tertile categories of optimism

[b] Bonferroni-adjusted P value for multiple testing: .02

Table 3. Prevalence Ratio (PR, 95%CI) of BMI, WC and WHtR By Sex and Levels of Optimism Among African Americans, Jackson Heart Study, 2000 – 2004

Table 3a: BMI (Normal<30kg/m² vs. Obese≥30kg/m²)																
	FEMALE (N=2991)								MALE (N=1633)							
	Model 1 (N=2985)		Model 2 (N=2970)		Model 3 (N=2696)		Model 4 (N=1831)		Model 1 (N=1629)		Model 2 (N=1615)		Model 3 (N=1410)		Model 4 (N=917)	
Opt. Tertiles	PR (95% CI)	P-Value	PR (95% CI)	P-Value	PR (95% CI)	P-Value	PR (95% CI)	P-Value	PR (95% CI)	P-Value	PR (95% CI)	P-Value	PR (95% CI)	P-Value	PR (95% CI)	P-Value
Low (Ref)	1.0 Ref		1.0 Ref		1.0 Ref		1.0 Ref		1.0 Ref		1.0 Ref		1.0 Ref		1.0 Ref	
Medium	.94 (.88-1.01)	.078	.96 (.89-1.03)	.233	.96 (.89-1.03)	.221	.99 (.91-1.09)	.89	1.05 (.92-1.21)	.468	1.04 (.90-1.20)	.622	.96 (.83-1.12)	.644	.99 (.81-1.21)	.91
High	.91 (.84-.97)	.007 [b]	.93 (.87-1.00)	.062	.95 (.88-1.02)	.166	.95 (.86-1.05)	.32	1.01 (.87-1.16)	.938	.97 (.83-1.12)	.671	.90 (.77-1.06)	.197	.96 (.78-1.18)	.70
P-Trend	.332		.233		.820		.333		.506		.622		.363		.757	
SD units	-.032 (-.06 – -.003)	<.033 [b]	-.018 (-.047 – .012)	.239	-.014 (-.045 - .018)	.390	-.010 (-.050 - .030)	.632	-.020 (-.079 - .040)	0.516	-.037 (-.099 - .025)	.239	-.051 (-.118 - .016)	.135	-.036 (-.121 - .049)	.407

LEGEND:
ABBREVIATIONS: BMI (Body Mass Index). Dispositional optimism is used interchangeably with optimism
BMI Categories: BMI <30 kg/m² (Normal), and BMI ≥30 kg/m² (Obese)
Low, moderate, and high represent the first, second, and third tertile of dispositional optimism at baseline. Sample size (N).
PR estimates for BMI represent the prevalence (risk) of obesity among participants at baseline.
Standardized regression coefficients are presented for BMI per 1-SD increment in optimism.
Model 1 is age adjusted; model 2 = model 1 + marital status and education; model 3 is model 2 + current smoking, physically activity and nutritional status and model 4 is model 3 + depression.
P - Trend represents the p value for linear trend across tertile categories of optimism
[b] Bonferroni-adjusted P value for multiple testing: .02

Table 3b: WC																
	FEMALE (Normal< 88cm; High ≥ 88cm)								MALE (Normal < 102cm; High ≥ 102cm)							
	Model 1 (N=2991)		Model 2 (N=2976)		Model 3 (N=2697)		Model 4 (N=1832)		Model 1 (N=1633)		Model 2 (N=1618)		Model 3 (N=1411)		Model 4 (N=917)	
Opt. Tertiles	PR (95% CI)	P-Value	PR (95% CI)	P-Value	PR (95% CI)	P-Value	PR (95% CI)	P-Value	PR (95% CI)	P-Value	PR (95% CI)	P-Value	PR (95% CI)	P-Value	PR (95% CI)	P-Value
Low (Ref)	1.0 Ref		1.0 Ref		1.0 Ref		1.0 Ref		1.0 Ref		1.0 Ref		1.0 Ref		1.0 Ref	
Medium	.97 (.93-1.02)	.344	.99 (.95-1.04)	.801	.99 (.95-1.04)	.810	1.02 (.96-1.09)	.533	1.0 (.87-1.15)	.959	.99 (.86-1.14)	.880	.96 (.82-1.11)	.581	.89 (.73-1.09)	.28
High	.91 (.86-.96)	.0003 [b]	.93 (.88-.98)	.006 [b]	.94 (.89-.99)	.024 [b]	.94 (.88-1.01)	.091	.97 (.84-1.12)	.668	.96 (.82-1.11)	.545	.92 (.79-1.08)	.324	.93 (.76-1.14)	.47
P-Trend	.007		.012		.043		.019		.698		.630		.019		.703	
SD units	-.032 (-.052 - .012)	.002 [b]	-.022 (-.042 – -.001)	.04 [b]	-.019 (-.041 - .003)	.086	-.012 (-.040 - .017)	.414	-.030 (-.089 - .029)	.316	-.038 (-.099 - .024)	.231	-.039 (-.104 - .027)	.248	-.046 (-.131 - .039)	.285

LEGEND:
ABBREVIATIONS: WC (Waist Circumference). Dispositional optimism is used interchangeably with optimism
Female WC < 88 cm (Normal) and Female WC ≥ 88 cm (High)
Male WC < 102 cm (Normal) and Male WC ≥ 102 cm (High)
Low, moderate, and high represent the first, second, and third tertile of dispositional optimism at baseline. Sample size (N).
PR estimates for WC represent the prevalence (risk) of high WC among participants at baseline.
Standardized regression coefficients are presented for WC per 1-SD increment in optimism.
Model 1 is age adjusted; model 2 = model 1 + marital status and education; model 3 is model 2 + current smoking, physically activity and nutritional status and model 4 is model 3 + depression.
P - Trend represents the p value for linear trend across the tertile categories of optimism
[b] Bonferroni-adjusted P value for multiple testing: 0.02

	FEMALE (N=2991)								MALE (N=1633)							
	Model 1 (N=2991)		Model 2 (N=2976)		Model 3 (N=2697)		Model 4 (N=1832)		Model 1 (N=1633)		Model 2 (N=1618)		Model 3 (N=1411)		Model 4 (N=917)	
Opt. Tertiles	PR (95% CI)	P-Value	PR (95% CI)	P-Value	PR (95% CI)	P-Value	PR (95% CI)	P-Value	PR (95% CI)	P-Value	PR (95% CI)	P-Value	PR (95% CI)	P-Value	PR (95% CI)	P-Value
Low (Ref)	1.0 Ref		1.0 Ref		1.0 Ref		1.0 Ref		1.0 Ref		1.0 Ref		1.0 Ref		1.0 Ref	
Medium	.99 (.97-1.02)	.743	1.00 (.97-1.03)	.871	.99 (.97-1.03)	.862	1.01 (.97-1.05)	.513	1.04 (.99-1.09)	.152	1.03 (.98-1.09)	.207	1.02 (.96-1.07)	.503	1.00 (.94-1.07)	.956
High	.93 (.90-.96)	<.0001 [b]	.94 (.91-.97)	.0006 [b]	.94 (.91-.98)	.001 [b]	.95 (.90-.99)	.023 [b]	.98 (.93-1.04)	.536	.97 (.92-1.03)	.300	.95 (.89-1.00)	.068	.93 (.86-1.00)	.073
P-Trend	.0003		.0005		.002		.003		.044		.020		.010		.038	
SD units	-.025 (-.037 – -.012)	<.0001 [b]	-.021 (-.033 – -.008)	.001 [b]	-.021 (-.034 – -.008)	.002 [b]	-.018 (-.035 – -.0004)	.045 [b]	-.010 (-.032 - .013)	.394	-.016 (-.039 - .007)	.162	-.019 (-.043 - .005)	.112	-.030 (-.061 – -.002)	.067

Table 3c: WHtR
WHtR (Normal<0.5; High≥0.5)

LEGEND:
ABBREVIATIONS: WHtR (Waist-to-Height Ratio). Dispositional optimism is used interchangeably with optimism
WHtR < 0.5 (Normal) and WHtR ≥ 0.5 (High)
Low, moderate, and high represent the first, second, and third tertile of dispositional optimism at baseline. Sample size (N).
PR estimates for WHtR represent the prevalence (risk) of high WHtR among participants at baseline.
Standardized regression coefficients are presented for WHtR per 1-SD increment in optimism.
Model 1 is age adjusted; model 2 = model 1 + marital status and education; model 3 is model 2 + current smoking, physically activity and nutritional status and model 4 is model 3 + depression.
P - Trend represents the p value for linear trend across the tertile categories of optimism
[b] Bonferroni-adjusted P value for multiple testing: .02

4. Discussion

This study investigated the cross-sectional associations of optimism with measures of adiposity among a large sample of AA. We found that high (vs. low) optimism was associated with reduced prevalence of adiposity (as measured by BMI, WC or WHtR) in AA. Therefore, our hypothesis was partially supported. To our knowledge, this is the first study that investigated multiple measures of adiposity and optimism in a large sample of AA. Most of the studies on positive psychological well-being and cardiovascular health examined BMI as the only adiposity measure.

Our finding that high optimism was protective of high BMI in the pooled sample, in the age and sex-adjusted models, is consistent with results from previous work on optimism and cardiovascular health among AA adults in the JHS although, optimism was associated only with intermediate BMI (overweight: 25.0 – 29.9 kg/m^2) in that study. [11] Our study differs as optimism is protective of high BMI (Obese: ≥ 30 kg/m^2). The difference in the findings may be due to variation in classification – the current study grouped individuals with intermediate BMI as normal.

Our findings support a study of elderly Dutch men that reported no link between high optimism and cardiovascular risk factor - obesity measured with BMI. [28] Although, the manner by which obesity was measured across both studies were different the findings are similar. While our study dichotomized BMI into "obese" and "non-obese," their study considered BMI as a continuous variable. This however, did not impact the level of significance obtained with the BMI results compared to the robust association seen with the results for WC and WHtR. Also, as BMI does not distinguish between weight due to excess adipose tissue and that resulting from high muscle mass, [29] therefore, optimism may not impact those participants with high BMI due to increase in muscle mass, which is likely to be men who engage in more physical activity which is protective of obesity. This may also explain the non-significant result found in the men cohort. A study of optimism and health behavior among community sample of adult men and women revealed association between optimism and healthful behaviors among women only. [18]

Few studies have examined the association of optimism with WC. One cross-sectional study of a multi-ethnic sample of 97,253 women (89,259 white, 7,994 AA, age 60 to 79 years old) in the Women's Health Initiative, reported from an unadjusted analysis that optimists were less likely to have a high WC. [30] This is consistent with our unadjusted results. However, we found that high (vs. low) optimism was protective of high WC, after adjustment for demographic, socio-economic and behavioral covariates, but attenuated after adjustment for depressive symptoms.

We found that after full adjustment, high optimism was associated with reduced prevalence of obesity, defined by WHtR ≥ 0.5. Although some authors have suggested that there is no difference between BMI, WC and WHtR in relation to cardio metabolic risk, [31,32] others have shown that WHtR is a better estimate than BMI in predicting obesity-related cardiovascular risk. [29] Findings from our study show that high optimism is protective of abdominal obesity (WC and WHtR), therefore may reduce the risk of cardiovascular disease.

In sex-stratified analysis, we found that optimism was protective of high adiposity levels for women. Findings

were not significant for men, although estimates were in the hypothesized direction. Research has also shown that women report higher levels of optimism than men, which may be due to the social support and social networks that provide women with mechanisms for coping with stress and ultimately result in an optimistic orientation. [11] Men are less obese than women in our sample across the three measures of adiposity. This may further account for the relatively more significant results found among women than men in the multivariable analyses. It is also possible that higher positive orientation in women enables them to engage in more healthy behaviors, such as healthy diet and adequate physical activity. Furthermore, men and women may perceive differently the challenges of obesity and its associated complications, such as immobility, physical discomfort and social stigmatization and thus, use different coping strategies.

The mechanisms through which optimism impact adiposity may operate through behavioral and physiological pathways. Evidence from a recent meta-analytic study suggests that optimism is modestly associated with greater physical activity, eating healthier food, and being less likely to smoke cigarettes in both healthy and patient populations. [33,34] A recent study using JHS data found that high optimism was positively associated with ideal physical activity, smoking, and intermediate diet. [11] Regarding the physiological pathway, low optimistic orientation may trigger the activation of the hypothalamic-pituitary-adrenal (HPA) axis as well as downstream factors such as high cortisol levels, abdominal fat distribution and/or the metabolic syndrome. [35,36]

Furthermore, future work on the relationship between obesity and dispositional optimism will focus on time-variant/changes in the obesity measures in relation to optimism.

Limitations and Strengths

This study has limitations. It was conducted in an all-AA cohort from a single-site, which limits its generalizability to other AA. Our study design was cross-sectional, which means that inferences about causality cannot be made. Additionally, bidirectional associations between optimism and adiposity measures may explain our results. It is also likely that the baseline obesity measures might have a reduction effect on the level of dispositional optimism which was measured subsequently during the annual follow up. This would be considered and addressed in a longitudinal study design. The strengths of this study include utilizing the JHS, the largest study of CVD among AA, and the inclusion of multiple dimensions of adiposity that assess general and abdominal adiposity. We also tested the extent to which sex modified the association of optimism and adiposity.

Conclusions

This study found a graded and protective associations between optimism and abdominal obesity measures in a community-based sample of AA. These associations with measures of abdominal obesity were discernible especially among women. The unique contribution of this study to the CVD, positive psychological well-being and obesity literature is that having a positive optimistic orientation may help to maintain healthy body weight in AA.

Financial Disclosure

Declaration of Competing Interest

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Disclaimer

The views expressed in this manuscript are those of the authors and do not necessarily represent the views of the National Heart, Lung, and Blood Institute; the National Institutes of Health; or the U.S. Department of Health and Human Services.

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