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DIET AND BODY COMPOSITION OUTCOMES OF AN ENVIRONMENTAL AND EDUCATIONAL INTERVENTION AMONG MEN IN TREATMENT FOR SUBSTANCE ADDICTION

Jennifer A Cowan, PhD^{1,§} and Carol M Devine, PhD, RD¹

¹Division of Nutritional Sciences, MVR Hall, Cornell University, Ithaca, New York 14853- 4401

Abstract

Objective—To determine the effect of an educational and environmental intervention on diet, body mass index (BMI) and waist circumference (WC) of men in substance addiction treatment

Methods—103 racially/ethnically diverse men in 6 urban substance addiction residential treatment facilities in Upstate New York participated in weekly nutrition and food classes and food environment changes to increase healthy food choices. The main outcomes of this controlled, quasi-experimental, pre-post evaluation study, were diet, BMI and WC.

Results—43 (42%) participants with complete data reported significantly greater intakes of fruits and vegetables, lower intakes of calories from sweets and desserts, and a reduction in waist circumference ($p < 0.05$) following the intervention, compared to the control period.

Conclusions and Implications—An educational and environmental intervention can be effective in promoting positive dietary behavior and reducing waist circumference among men in residential treatment. These results need to be confirmed in a larger randomized trial.

Keywords

environmental & educational intervention; substance abuse treatment; diet; waist circumference; body mass index

INTRODUCTION

Poor diets and high rates of overweight and obesity have been reported among people in recovery from substance addiction.^{1–4} Poor diets in this population may be related to a lack of nutrition knowledge and food preparation skills as well as food environments in treatment facilities that do not support healthy eating behaviors.^{5, 6}

More than twenty-two million Americans are substance-dependent; four million of these receive treatment at specialty substance abuse settings including residential treatment programs.⁷ Residential treatment facilities provide a unique environment to promote healthy eating and build food preparation skills that could be transferred to independent living.

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[§]Corresponding author: jac39@cornell.edu, tel: 607-255-2633; fax: 607-255-0178.

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Research on interventions to promote healthy eating and reduce excess weight gain among residents of treatment facilities is sparse. A literature review revealed one study showing the effectiveness of nutrition education and physical activity on reducing body mass index (BMI) among substance-addicted adolescents.⁸ No dietary intervention study in adult residential treatment facilities was found. The Recovery Healthy Eating and Active Learning in Treatment Houses (RHEALTH) program used a combined educational and environmental intervention design to promote healthy eating and weight among men in treatment for substance addiction. This paper reports the main outcomes of the RHEALTH intervention on participants' dietary intake, BMI and waist circumference (WC).

METHODS

The RHEALTH intervention was guided by formative research and theory. Formative research reported that men in recovery consumed few fruits and vegetables and high levels of energy, fats and sweets. Men in residential treatment were often responsible for preparing meals, but most lacked the confidence to choose and prepare healthy meals. Many of these men reported large weight gains during treatment.⁴ A social ecological framework and social cognitive theory guided the intervention and evaluation design, with a focus on improving health behaviors (exposure, practice), self-efficacy about healthy eating and food preparation (skill building), and the food environment (policy) to support healthy choices.^{9, 10} It was hypothesized that a combined educational and environmental intervention would enable the study participants to: 1) increase daily servings of fruits and vegetables, 2) reduce total energy intake and percent of calories from fats, sweets and desserts, and 3) reduce BMI and WC.

Design

A quasi-experimental design was used with a 6 week control period followed by a 6 week intervention period. Participants served as their own controls. The primary investigator collected data in personal interviews at six study sites. There were three data collection points: 1) a baseline assessment before a 6 week control period 2) a pre-intervention assessment before a 6 week intervention, and 3) a post-intervention assessment. At baseline, data were collected on socio-demographic characteristics and addiction history. Dietary intake, height, weight, and WC were measured at all three points. Participants' consent was obtained using procedures approved by the University Institutional Review Board.

The sample included adult men residing in one of six urban residential addiction treatment facilities in Upstate New York between June 2007 and June 2008. The study sites were recruited through prior research connections. Participants were recruited through personal contacts, peer recruiting, fliers and community site meetings. All site residents were eligible to participate.

Measures

Participant socio-demographic characteristics assessed included age, race/ethnicity, education, marital status, and employment before treatment. Addiction history was assessed with a modified Addiction Severity Index.¹¹

The study outcomes were dietary intake, BMI and WC. Dietary intake was assessed using the Block 2005 Food Frequency Questionnaire¹² and analyzed by the Block Dietary System (NutritionQuest®). Weight, height (used to calculate BMI), and WC were measured using standard protocols.¹³

Intervention

The RHEALTH intervention was implemented in all six sites. The educational and environmental components included weekly nutrition and food preparation classes for participants and policy changes in the house food environment to increase opportunities for healthy eating. The latter were made in collaboration with staff at each site. Both intervention components focused on increasing fruit and vegetable consumption and reducing the consumption of total energy, total fat, and added sweets.

Two-hour weekly classes were conducted by the primary investigator for six consecutive weeks in each site. The classes engaged residents in active learning, practice and sharing of food preparation knowledge, skills and strategies, and tasting easy and inexpensive and healthy dishes.¹⁴ The program, adapted from previous interventions,^{15–17} was guided by a learner-centered approach.¹⁸ Topics included calorie, fat and fiber content of foods, food labels, increasing fruits and vegetables, reducing portion size, fats and sweets including sweetened beverages, and diet-related weight management. Weekly challenges encouraged participants to try and track new dietary behaviors and win supermarket gift cards.

The environmental component targeted food policy changes to provide healthy foods at intervention sites through menu development, food procurement, food availability, and access. Each site was asked to: limit fried foods; use more non-meat dishes; purchase lower-fat milk; substitute water and 100% fruit juices for sweetened drinks; provide more fruits and vegetables, include at least one vegetable or fruit salad with low-fat dressings at each dinner; purchase fewer sweet snacks; and provide healthy snacks. Details about the environmental component are available elsewhere.⁵

Analysis

Data analysis was conducted using the Statistical Package for the Social Science (SPSS version 16.0, SPSS Inc., Chicago, IL, 2008). Data were assessed for normality using scatter plots and histograms. Log transformations of outcomes were conducted where applicable and later back transformed for reporting. T-tests were used to assess mean differences at baseline, pre-intervention, and post-intervention in dietary intake, BMI and WC. Pearson's correlations were calculated to examine relationships between socio-demographic and addiction history characteristics and intervention outcomes. A significance level of $p < 0.05$ was used in all analyses.

Change variables were created for dietary intake, BMI and WC for all participants who completed both baseline and post assessments. Mean differences in dietary intake, BMI, and WC in the control and the intervention periods were calculated using two-sided t tests for paired samples for all participants who completed the three assessments.¹⁹ Program effect size was then calculated. Participants were grouped as high and low scorers (by the median) on baseline dietary and anthropometric measures to assess possible regression to the mean in the control period.²⁰

RESULTS

43 men (42%) completed baseline, pre-intervention and post-intervention assessments. The racially/ethnically diverse participants had a mean age of 45 years (Table 1). Alcohol, crack or cocaine, and heroin or other opiates were the primary substances of addiction. These men reported an average of 9 months of sobriety and 4.6 months in the current treatment program.

Of the 103 men assessed at baseline, 32 (31%) dropped out of the treatment program due to substance-use relapses, and 16 (16%) left because of graduation or completion of treatment.

The men who relapsed or graduated were younger (mean age = 39 years, SE= 2.0) and had been in active addiction a shorter time (mean = 18.7 years, SE= 1.9) than those who remained in treatment and completed the RHEALTH program.

Bivariate analyses revealed no statistically significant correlations between outcomes and socio-demographic characteristics or addiction history, with one exception. A smaller WC was correlated with less time in the treatment program ($r = -.34$, $p = 0.01$) and longer years in addiction ($r = 0.19$, $p = 0.05$).

Control Period

Participants consumed significantly more total calories at baseline than at the end of the control period ($p = 0.011$). No significant differences were found during the control period in other dietary measures, BMI, or WC. When participants with high and low baseline scores were compared, possible evidence for regression to the mean was observed in the control period for percent calories from sweets (High scorers = -4.7 ± 7.0 %, Low scores = 5.3 ± 6.9 %) and in daily servings of fruits (High scorers = -0.44 ± 1.0 servings, Low scorers = $0.20 \pm .61$) and vegetables (High = $-0.73 \pm .95$ servings, Low = 0.22 ± 1.3 servings). High scorers reduced their consumption during the control period, as indicated by the negative values, while the low scorers increased intakes in percent calories of sweets, daily servings of fruits and vegetables.

Treatment Period

Study participants reported significantly lower percent of calories from sweets and desserts ($p = 0.044$), and higher daily servings of fruits ($p = 0.003$) and vegetables ($p = 0.020$) following the intervention, compared to the control period (Table 2). No treatment effect was found for other dietary outcomes.

Mean WC was significantly smaller ($p = 0.038$) after the intervention compared to the control period (Table 2). No treatment effect on BMI was detected. It is possible that physical activity (not reported here) played a role in these differences.

DISCUSSION

Participation in the six-week pilot RHEALTH intervention was associated with modest positive improvements in both dietary behaviors and WC among men in residential treatment for substance addiction. Outcomes included significant increases in fruits and vegetables, reduced percent of calories from sweets and desserts, and lower WC, with medium to large effect sizes. The increases in fruit and vegetable consumption are important because of the protective effects of fruits and vegetables intake against CVD events, blood pressure and some cancers,²¹ conditions for which substance-addicted individuals are at an increased risk.^{22, 23} Supplementary post-intervention assessments would determine whether immediate treatment effects are maintained over time.

Mean calorie intake fell during both the control and intervention periods (364.14; -305.15 respectively), although the calorie reductions in these two periods were not significantly different. The change in the control period suggests that there may be a normative reduction in calories over the course of residential treatment for substance addiction, not related to the intervention. This lends support to previous reports that changes in eating behavior may occur over time as the substance-addicted person recovers,^{2, 3, 8} and dysfunctional eating such as food-hoarding and overeating decline.⁴ Health promotion in this population should be tailored to recovery stage and time in treatment.

A possible “regression to the mean” effect was observed for percent of calories from sweets and daily servings of vegetables and fruits during the control period.²⁴ The use here of three assessments diminishes this effect.²⁵ Because there was no significant change in the control period (between baseline and pre-intervention assessments), but significant changes in the intervention period (between the pre- and-post interventions), it is unlikely that maturation or testing effects explained the reported changes.

The reduction in WC is of clinical importance and thereby is a step toward better health because WC is a good predictor of future metabolic syndrome.²⁶

No treatment effect was observed for BMI. Limited power to detect a BMI difference means that this effect will need to be tested in a larger sample. Because weight gain may be associated with longer sobriety and time spent in residential treatment,⁴ longer-term interventions and follow-up will be needed to assess long-term changes in weight.^{27, 28}

To our knowledge, this is the first reported dietary intervention with adult men in residential drug treatment facilities, an understudied population. The study incorporated multiple assessments and included measured height, weight and waist circumference conducted during face-to-face interviews to reduce inaccuracy. Each participant served as his own control, which adds to the validity of the study. The inclusion of a validated and comprehensive food frequency questionnaire and measures of addiction history are strengths.

Study limitations include a non-random sample of men in a small number of residential treatment facilities. Study findings cannot rule out differences due to non-comparable study sites.³⁰ While the sample size provided greater than 80% power to detect differences between intervention and control periods in percent calories from sweets, daily servings of fruits and vegetables and WC; the small sample size meant that we lacked power to detect differences in other outcomes or multivariate analyses.

Recall, error in reporting food consumption, and a social desirability effect should also be considered because the primary investigator conducted all aspects of the intervention and evaluation. It is possible that there was a testing effect because the control preceded the intervention period. The use of an expanding across time design may have reduced some of the potential maturation or testing threats.²⁵

The high enrolment rate (90%) argues against selection bias. The attrition from baseline to the post intervention period was 47%, comparable to the national rate (40%) for long-term residential substance abuse treatment, reflecting the fluid nature of this population.²⁹ The men who were lost were younger than those who completed, consistent with reports that older men are more likely to complete treatment.³⁰ In bivariate analyses of socio-demographic characteristics and outcomes there were no significant differences by age. The effects of drop outs cannot be determined in this small sample.

IMPLICATIONS FOR RESEARCH AND PRACTICE

These findings suggest that men in residential treatment facilities may benefit from dietary interventions, but these interventions need to consider addiction and treatment history. Because people in recovery from substance addiction tend to have poor dietary patterns^{1–4} and are at an increased risk for chronic health conditions, additional studies are warranted to address dietary concerns in this population. These results add to the growing evidence that environmental factors impact dietary behaviors and subsequently obesity³¹ as well as support the importance of skill development in healthy eating demonstrated by previous successful programs with diverse groups.^{32–34} Treatment facilities have tremendous

potential for providing healthy food options and skill development to improve resident dietary behaviors. Further research is necessary to determine the sustainability of these behavioral and environmental changes over time.

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Table 1

Characteristics of study participants

n = 43 men with complete data	
Age (years) mean (sd)	44.9 (8.1)
	n (%)
Race/ethnicity	
Black	19 (44)
White	15 (35)
Other	5 (12)
Hispanic	4 (9)
Marital status: Single, separated, and divorced	37 (86)
Education: High School or GED	29 (67)
Not employed before treatment	33 (77)

Table 2

Change in Diet, BMI, WC in Control vs. Intervention Period: Mean (SD) (n=43)

Dietary Intake	Baseline T ₁	Pre- Intervention T ₂	Post- Intervention T ₃	Control Δ^1	Inter- vention Δ^2	Mean Difference $\Delta^2 - \Delta^1$	t	p	Effect Size
Energy (kcal) [§]	3358.75 (1311.80)	2994.61 (1425.70)	2689.46 (1293.37)	-364.14 (851.57)	-305.15 (937.10)	58.99 (1570.61)	.246	.807	.04
% kcal Fat	38.19 (4.10)	36.91 (5.29)	36.75 (4.43)	-1.27 (5.24)	-0.17 (5.23)	-1.11 (9.25)	.784	.437	.12
% kcal Sweets [*]	21.70 (10.09)	22.13 (7.79)	18.36 (9.05)	0.42 (8.51)	-3.77 (9.43)	4.19 (13.23)	-.079	.044	.32
Daily Servings Fats, Oils, Sweets, Sodas	5.95 (2.80)	5.43 (2.63)	4.86 (2.67)	-0.52 (1.60)	-0.58 (2.01)	-0.06 (2.80)	-.142	.888	.02
Daily Servings Vegetables [*]	2.66 (1.45)	2.49 (1.57)	3.52 (2.57)	-0.17 (1.25)	1.03 (2.50)	1.20 (3.25)	2.428	.020	.37
Daily Servings Fruits [*]	1.19 (0.74)	1.11 (0.70)	1.89 (1.13)	-0.08 (0.87)	0.79 (1.21)	0.87 (1.80)	3.172	.003	.48
Anthropometric Measures									
BMI	29.79 (7.17)	29.98 (7.15)	30.07 (7.48)	0.19 (0.77)	0.09 (1.09)	-0.10 (1.16)	-.554	.582	.09
WC [*]	103.68 (17.69)	103.94 (17.34)	101.80 (18.03)	0.26 (4.12)	-2.14 (4.85)	-2.14 (7.37)	-.140	.038	.33

Control: $\Delta^1 = T_2 - T_1$; Intervention: $\Delta^2 = T_3 - T_2$;

[§] Mean difference in control Δ^1 p = 0.05;

^{*} Mean differences in intervention Δ^2 p = 0.05