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Factors Contributing to Weight Gain among Female Inmates:
A Review of the Literature

A Case Report of *Healthy Bodies on the Inside*: A Pilot, Weight Management
Intervention in Women's Medium Security Prison in Rhode Island

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Thesis

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VITA

Allegra Scharff received her Bachelors of Arts from Bates College in May of 2011. Her undergraduate thesis on the alcohol use at Bates College and its effect on the college's relationship with the Lewiston, ME community was presented at both the Bates College Mount David Academic Summit and at Dartmouth College. She moved home to Rhode Island for a position establishing and running youth programs on sustainable agriculture and food access and spent the next four years running these programs. At this time, she also received her Permaculture Design Certificate from the Resilience Hub and presented her youth programming framework at the Sustainable School Summit at Rhode Island College. Her thesis work results from over a year of formative research and intervention design.

PREFACE AND ACKNOWLEDGEMENTS

This thesis is the summation of a year and half of intervention design, implementation and evaluation. It was inspired by the work of the Center for Prisoner Health and Human Rights, and supported by the Center along with the Brown University TRI-Lab and the Damiano Foundation. It would have been impossible to complete without this support and further without the help of my advisor, Samantha Rosenthal, PhD, who provided me with feedback throughout the writing process that has helped me gain a deeper understanding of scientific writing. I am also incredibly thankful for the ongoing mentorship and guidance of my reader, Alexandria Macmadu, MSc. Alexandria worked with me tirelessly over the past year and half to effectively design each detail of the intervention and evaluation. Her enthusiasm for and strength in designing and assessing public health programs inspires me to continue this work in the future.

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Part I: Factors Contributing to Weight Gain among Female Inmates: A Review of the Literature

INTRODUCTION

The literature on weight gain among incarcerated females is not expansive, but among the body of work that is available, there is near consensus that women in high income countries gain weight behind bars.¹⁻³ This weight gain is neither minimal nor insignificant, with some inmates gaining over a pound a week from the first week that they are incarcerated and up to 20 pounds between the first six months to two years.^{1,2} Despite these statistics and that women in prison “cite nutrition and weight gain in prison as leading health concerns,” efforts to prevent weight gain are almost non-existent.² This is alarming because being overweight or obese is linked to poor long term health outcomes. In fact, adults who are obese are at higher risk for all causes of death according to the CDC and are more likely to get chronic diseases such as coronary heart disease, type 2 diabetes, and some cancers.⁴

A lack of literature and intervention may, in part, be due to a lack of understanding of what causes this significant weight gain in female inmates: with researchers suggesting everything from the effects of substance abstinence and uptake to limited physical activity in prison. Therefore, the aim of this review is to amass the potential causes of weight gain in this population. The findings are grouped by overarching themes from the literature including: *Substance Abstinence*, *Mental Health Status*, *Physical Health Status*, and *Structural Barriers*. Collectively, these findings will

be beneficial for health educators and other professionals for creating and tailoring weight management interventions for this population.

SUBSTANCE ABSTINANCE

The connection between former substance use and weight gain among female inmates is widely cited in the literature. Of the 14 articles reviewed for this paper, five address the relationship between weight gain and previous drug use, both legal and illicit, among incarcerated women. *Elwood et al.* assessed the effects of a six-week prisoner-led nutrition and exercise intervention among 16 women in medium-security prison.⁵ The authors speculated that former drug use could be both a protective factor and a risk factor, noting that while drug withdrawal can cause metabolic changes that lead to weight gain, some women cope with drug withdrawal by increasing their physical activity level which could protect against weight gain.⁵ However, while changes in weight were assessed through objective measures, no objective measures were used to assess former drug use. Instead, conclusions on drug abstinence and weight were drawn from the answer to the qualitative question “have you noticed improvements since you started participating in the fitness program” to which one inmate replied “I learnt that when I am exercising every day I don’t crave drugs as much.”⁵ Whether this woman or any of the other 15 women in the study lost or maintained their weight because they coped with their former drug use by exercising is unknown.

All of the remaining authors that connect weight gain to substance abstinence cite it as only a risk factor. *Clarke et al.*, *Drach et al.*, and *Cropsey et al.*, state that tobacco

cessation in particular may be associated with weight gain among women.^{1,2,6} *Clarke et al.* assessed weight change among 109 women incarcerated in Rhode Island, stratified into two groups: women who had been in prison for less than two weeks and women who had been incarcerated for longer than two weeks. Along with objective body measures, study participants took part in individual interviews and were asked about the number of cigarettes that they smoked daily before they were incarcerated. *Clarke et al.* notes that 80% of the sample of incarcerated women in Rhode Island smoked in the month prior to incarceration and that forced abstinence from smoking once in prison may have elevated their risk of weight gain.¹ To substantiate this, at the two-week measurement, women in the recently incarcerated group had gained more weight than women who had been incarcerated for longer, which could be explained by the immediate effects of this forced abstinence. However, statistical analysis of weight gain among former smokers and non-smokers in both groups was not conducted which would have elevated these results from educated speculation to concrete findings.

Drach et al. measured weight gain and former drug use among 151 incarcerated Oregonian women. Unlike *Clarke et al.*, *Drach et al.* not only collected information on former tobacco use but also compared weight gain among former smokers to weight gain among those who did not smoke before entering prison. In this study, the current weight of women who had been incarcerated between six and twenty-four months was compared to their weights when entering the prison. While there was no significant difference between time incarcerated and weight gain, the study did find that the inmates who had used tobacco in the three months prior to incarceration (81%) had gained more weight on

average than those who did not, 22lb to 11lb respectively.² This was a strong study because *Drach et al.* was able to quantify the effects of former tobacco use on weight gain and account for an abundance of potential confounding factors such as physical activity, nutrition, general health and disordered eating.² However, potential modifying effects that incarceration could have on weight gain among former smokers were not considered.

Cropsey et al. also assessed the impact of smoking cessation on weight gain among female inmates adequately. This study looked at 360 incarcerated women in a medium and maximum security prison in the southeastern United States who were enrolled in an intervention to help them quit smoking.⁵ It compared women who abstained from smoking to women in the waitlisted control group who continued to smoke and found that abstainers gained significantly more weight at the three and six-month follow ups.⁵ Like *Drach et al.*, *Cropsey et al.* also did not consider how this weight gain could result from systematically different relationships of former smokers to their prison environment. *Cropsey et al.* also failed to account for confounding behaviors such as eating habits and level of physical activity.

Authors also attribute weight gain while incarcerated to illegal substance use prior to incarceration. However, no studies address metabolic changes due to abstinence from these substances but instead they focus on behavioral changes. A similar relationship is seen in literature surrounding women in residential treatment facilities, particularly African American and Latina women, whose unhealthy weight gain is attributed heavily to poor diet options and exercise habits while in recovery.⁷ *Drach et al.* found that

women who abused illegal substance in the three months prior to incarceration gained more weight than those women who did not, 21 lbs. to 12 lbs. respectively.² *Drach et al.* also cited that this is likely due to women using food to cope with the symptoms of withdrawal.² *Smith et al.*, through extensive interviews and group discussion of 50 incarcerated women in England, qualitatively measured eating habits in prison in relationship to former illicit drug use. The study similarly describes that women were using food as a coping mechanism. This behavior is highlighted through the testimonials of inmates, such as one woman who described herself as a “comfort eater” and attributed her behavior to protecting her from turning to drugs while incarcerated.⁸

Smoyer et al. had similar findings through interviews of 30 formerly incarcerated female drug users on food in prison. In this study, weight gain among formerly incarcerated drug users was also attributed to behavior changes. Women reported eating sparsely prior to incarceration because they were consumed by their drug use and further suggested that once they were drug free in prison they ate more.⁹ While both *Smith et al.* and *Smoyer et al.* unearthed behavioral causes of weight gain with extensive qualitative methods, neither substantiated weight gain with objective measures nor monitored behavior prospectively, which may have hindered the accuracy of their results.

MENTAL HEALTH STATUS

Seven of the fifteen articles reviewed for this paper link mental health status to weight gain while incarcerated, including the risk associated with psychiatric medication and the risk associated with having a formally diagnosed mental illness or undiagnosed symptomology. Below, they are described in more detail.

Psychiatric Medication

Several authors also connect weight gain to an increase in psychiatric medications during incarceration. This is a plausible hypothesis since weight gain due to psychiatric medication, particularly antipsychotics and antidepressants, is highly cited throughout the literature for the general population.¹⁰⁻¹³ However, only one article, *Gates et al.*, actually studied the correlation between these medications and weight.¹⁴ *Clarke et al.* noted that 40% of women in their study took obesogenic medications which could have contributed to their overall weight gain but did not compare weight gain of those who took them to those who did not.¹ Similarly, *Gates et al.*, using a retrospective longitudinal design, cited that atypical antipsychotic medications that are shown to cause weight gain are prescribed through the mental health services at the east south central United States DOC, but did not describe differences in weight gain between those who took them and those who did not.³ In another, co-occurring study, *Gates et al.* used retrospective descriptive design and the same east south central DOC population to assess variations in weight gain by gender and race of prisoners who are prescribed psychiatric medication. This study provided the only explicit comparison of the use of psychiatric medications and weight gain in incarcerated women. Findings showed no statistically significant changes in weight gain between women who took antidepressants or antipsychotics, compared to those on “other medications” or no medications at all.¹⁴ However, notably, all groups of women gained weight and those on antipsychotics gained the most (19 lbs./4.5 years) followed by those on antidepressants (14 lbs./4.5 years) compared to those on “other medications” (9.5lbs/4.5 years) and those on no medications (8 lbs./4.5 years).¹⁴ While

methodologically strong because of the use of objective measures of weight and an expansive sample size of 2728 (25% of the population), *Gates et al.* failed to account for other potential causes of weight gain including food choices and physical activity.¹⁴ Additionally, the participants had to have two weight measurements to be included in the study which may have biased the results. Aside from when an inmate first enters the prison, weight measurements are only taken if inmates are already reporting to the medical office for something else and the reason for seeking medical attention could potentially explain their weight gain.

Diagnosed Mental Illness

Along with psychiatric medication use, whether an inmate is formally diagnosed with mental illness may also have an impact on weight gain. *Wolff et al.* found that incarcerated people in general, and female inmates in particular, were no more likely to gain weight if they had a poor mental health diagnosis than if they did not.¹⁵ They were also no more likely to be overweight or obese than their counterparts. These findings do not match patterns in the general population in which people with diagnosable poor mental health are more likely to be obese.¹⁵ However, Wolff's methodology could have led to biased results. Findings came from a one-time survey of inmates from 11 state prisons who were going to be released in the next 24 months. The sample size was large, including 217 women, but weight and change in weight since first being incarcerated, were self-reported measures. Self-reported measures, particularly of weight, are often unreliable.

Untreated Symptomology

Other studies pointed to untreated poor mental health symptomology as a risk factor for weight gain. *Drach et al.* reported that for relief from the stress and trauma of being incarcerated, some women would “eat to forget” and that these women gained more weight than those who did not feel stressed (24 lbs. to 15 lbs. respectively).² *Drach et al.* also found that “24% [of women in his study] reported going on eating binges in the past sixth months where they felt unable to stop”.² *Smith et al.* reported similar findings, stating “when talking about how they handle the stress and anxiety, women prisoners suggest that food and dietary practices, *inter alia*, provide an important self-help mechanism”.⁸ Findings from this study not only highlighted disordered eating practices among female inmates but further attributed these to being incarcerated:

*I do have a problem with eating. I never used to before coming into prison. I can't stand fat and I go on binges now . . . (An awful lot of girls in here have eating problems). I honestly can't put my finger on why I do it. Whether it's because of the life sentence. Whether it's the separation from my children . . . I don't know.*⁸

Like *Drach et al.* and *Smith et al.*, *Milligan et al.* found that undiagnosed poor mental health symptomology could relate to weight gain in prison. Findings from this study noted that levels of anger and the underlying relationship between anger and impulsivity may result in weight gain.¹⁶ These findings came from validated surveys of 91 incarcerated women in one prison in the United Kingdom who volunteered for the study. Inmates verbally provided answers to two assessment tools: the SCOFF questionnaire, which identifies disordered eating, and the State-Trait Anger Expression Inventory (STAXI), which “measures the experience and expression of anger”.¹⁶ Their answers revealed patterns in binge eating associated with some forms of anger. They also found

that incarcerated women were more likely to have an eating disorder than women who are not incarcerated.¹⁶ While these results suggest a likelihood of weight gain, weight gain was not measured objectively in this study.

PHYSICAL HEALTH STATUS

Unlike mental health status, physical health status was rarely assessed in the articles reviewed. Only one study discussed physical health problems and their relationship to weight gain among incarcerated women. According to *Gates et al.*, inmates with hypertension and diabetes were less likely to gain weight than those without these physical health problems which does not match the general population.³ In fact, inmates with diabetes who were prescribed medication for the condition actually saw a reduction in weight (Δ BMI of -0.39).³ *Gates et al.* also provides a justification for this, noting that having a diagnosed physical condition brings inmates in contact with medical care more often which in and of itself can help inmates manage their weight.³ Additionally, this contact may increase their likelihood of being put on a restricted and healthier diet.³

STRUCTURAL BARRIERS

Nine of the 14 articles reviewed for this paper discussed structural barriers as a potential cause of weight gain among female inmates citing lack of healthy food options at the cafeteria or “chow”, lack of healthy food options available for purchase at the commissary, and limited opportunity for physical activity as risk factors for weight gain.

Chow

Seven of the 14 studies discuss unhealthy options at the cafeteria or “chow” as a potential cause of weight gain. *Firth et al.* used quasi experimental design, to assess the effects of a calorie-reduction intervention on female inmates in Oregon with diabetes.¹⁷ Using biometrics and commissary receipts, *Firth et al.* looked at glycemic index, weight and caloric intake. This study was motivated by preliminary findings that in two women’s facilities in Oregon, inmates were being served 3000 calories each day on average and that this food was not nutritionally adequate.¹⁷ This study further acknowledged that if a woman was sedentary and only ate three-fourths of the food each day she would still gain close to 50 pounds in a year.¹⁷ *Firth et al.* found that a reduction in calories served not only lead to lower hemoglobin A1c, or blood sugar concentration, among women but also did not result in extra calories being purchased from the commissary, providing strong justifications for structurally-centered causes of weight gain.¹⁷

Clarke et al. and *Herbert et al.* cited similarly excessive diets. *Clarke et al.* noted that female inmates in Rhode Island were receiving an average of 2900 calories each day which is more than most women need to lose or even maintain their weight—particularly if they are not getting much physical activity.¹ *Herbert et al.*, a systematic review of the “risk factors for non-communicable diseases in prison populations worldwide”, cited that these diets may be so caloric because the correctional system predominantly serves men and the menus have not been tailored to the female community.¹⁸ *Herbert et al.* further suggested that behavioral interventions were implemented more readily only because

they are more appealing to prison officials than the needed structural interventions.¹⁸ While this systematic review of diet and exercise among thousands of female inmates in the US, UK and Australia¹⁸ was lofty, this article disregarded how personal choice factored into what was consumed.

In addition to exceeding calorie limits, prison diets may also be unnecessarily high in macronutrients that further impact weight gain. *Herbert et al.* found that nine studies of prison food throughout Australia, the UK and the US described diets with salt contents that were two times what is recommended and that had too much fat and carbohydrates.¹⁸ This sentiment was echoed by *Wolff et al.* that noted that prisons “routinely feed [their inmates] diets high in fat, salt, and complex carbohydrates”.¹⁵

The disproportionate servings of fat, salt and complex carbohydrates may also be at the expense of other, healthier and less-caloric options. *Leigey et al.* and *Gates et al.* both acknowledge that these calorie-dense, nutrient-poor diets are often lacking in fruits and vegetables.^{19,3} *Leigey et al.* noted this despite finding that among 458 aging female inmates (50 to 95 years old) in the Georgia DOC database, the prevalence of overweight and obesity were similar to the non-incarcerated population. Similarly, *Harner et al.* cited an inadequate amount of vegetables but, antithetically, a sufficient amount of fruit.²⁰ Using qualitative methodology, specifically 12 focus groups with a total of 65 women from an American maximum security prison, *Harner et al.* identified what inmates believed caused their poor health while in prison. In this study, an inmate stated that she was served an ample amount of fruit but that she gets no vegetables.²⁰ This inmate further acknowledged that it was not a lack of feasibility because there was a farm right on site,

but instead the result of the prison staff taking the vegetables that should be going to the inmates.²⁰ Another inmate in this same study expressed similar discontent noting that the “the menu looks good on paper, but that is not what you actually get”.²⁰ This study was distinct methodologically because it openly asked incarcerated women throughout the United States what caused them to have poor physical health, and the structural focus was born from their responses. However, these women may feel less inclined to talk about personal behaviors than to talk about the aspects of being incarcerated that were not within their control and may need outside pressure to reform.

Lastly, *Smith et al.* discussed food options as a concern. This study cited an inmate saying, “all the food you get here is fatty and stodgy”.⁸ In this qualitative study among incarcerated British women, *Smith et al.* nodded to small budgets as a cause of these menus suggesting that the quality of food could only go so far with the limited budget allocated to it.⁸ Both the quality of the food and the discussion of budget were subjectively derived and not substantiated with objective assessments of the diets or finances of the prison.

Commissary

Many women also have access to commissary, or the ability to order additional food weekly. Five articles of the 14 reviewed cite that the commissary could be a source for excess caloric intake and the resulting weight gain among incarcerated women. By looking at the commissary receipts of women in their study, *Firth et al.* found that women could eat an average of 1094 additional calories daily from the commissary in addition to their meals from chow.¹⁷ *Herbert et al.*, *Gates et al.*, and *Clarke et al.*, noted

that these foods are, like their cafeteria counterparts, high in salts and fat and are nutritionally poor.^{18,14,1} *Smoyer et al.* and *Harner et al.* give examples of the items available including “candy, cakes, chips, crackers, pre-cooked rice and pastas, condiments (e.g., peanut butter, jelly, mayonnaise), and processed meats, cheese and fish” and “ramen noodles, soda, nuts, pastries, cheeses, cookies, and candy” respectively.^{9,20} Although healthy alternatives are available, *Leigey et al.* found that inmates felt that they were incentivized to buy less healthy foods because they were cheaper than the healthy options.¹⁹ *Harner et al.* spoke of other inmates who noticed that healthy options had been removed and who speculated that it was due to the bottom line: men were not buying these healthier options and therefore, because there are more incarcerated men than women to profit off of, healthy options were subsequently removed.²⁰

Physical Activity

Despite their high calorie diets, prisons may be neither equipped nor interested in facilitating physical activity. Five articles reviewed cited this lack of equipment of interested in facilitating physical activity as a risk factors for weight gain. *Herbert et al.* found that a “barren concrete exercise yard” made it difficult for women to exercise and *Gates et al.* and *Harner et al.* cited inadequate gym facilities.^{18,2,20} In addition to inadequate facilities, *Wolff et al.* and *Gates et al.* both noted that security was a barrier to physical activity, *Gates et al.* stating that physical activity is limited because “security concerns regarding offender and staff safety necessitate restricting and controlling movement”.^{15,3} *Herbert et al.*, *Harner et al.* and *Gates et al.* all noted that conflicting

work schedules and minimal physical activity classes created little opportunity to exercise.^{18,20,3}

Even those women who can find time to exercise may be uncomfortable doing so. *Harner et al.* found that prisons neither encourage nor promote exercise that women can do while they are in their cells but instead gear exercise towards group settings or in common spaces that may be uncomfortable and/or deter some women.²⁰ Additionally, *Harner et al.* noted that the shoes provided to the women upon entering prison were not adequate for “vigorous” exercise and that if an inmate cannot afford to buy sneakers from the commissary, she will not be able to exercise comfortably.²⁰

CONCLUSION

The aim of this review was to compile the potential causes of weight gain among incarcerated women in high income countries so that interventions could be more easily tailored to address this public health issue. In doing so, important issues surrounding weight gain among incarcerated women were identified. Structural barriers, including exceedingly unhealthy and caloric diets, unhealthy commissary options, and limited ability to engage in physical activity, were cited most often and are worrisome in this setting where alternatives cannot be sought. Therefore, environmentally-based interventions that address these risk factors may be worthwhile such as increasing healthy options at the commissary, reducing calories at chow and providing more time, space and opportunity for physical activity.

Additional attention should also be paid to known causes of weight gain such as forced abstinence¹ of smoking cigarettes and the use of obesogenic psychiatric medication. While abstaining from cigarette smoking is also important for health and additionally necessary for the safety of the prison population, preparing women to handle this abstention to prevent excessive weight gain may be beneficial. Also, while not all antipsychotics and antidepressants cause weight gain, this review highlighted that the ones used in prison tend to. Interventions that work with the physical and mental health providers at the prison to better choose psychiatric medications and utilize alternative treatments for mental health problems may reduce the risk of weight gain among this population.

Along with intervening on structural barriers, smoking cessation and psychiatric medication, more research should be done on behavioral level factors of weight gain among incarcerated women. This research should identify which behaviors are significantly different from the non-incarcerated population and therefore explanatory of the disproportionate weight gain of incarcerated women. While many of the studies in this review focused on inmate behavior, these studies were often small in scale, not generalizable to the rest of the inmate population, and confounded by structural and physical risks of weight gain. Validated food and exercise questionnaires and measures of disordered eating pathology such as the SCOFF scale should be part of a national prison survey. This will help to identify the extent to which personal choice is causing weight gain in prison and illuminate areas where it is best to intervene.

PART II: A Case Report of *Healthy Bodies on the Inside*: A Pilot, Weight Management Intervention in Women's Medium Security Prison in Rhode Island

ABSTRACT

BACKGROUND: Incarcerated women are disproportionately at risk of being obese and are gaining weight behind bars. However, few interventions to stop weight gain and/or encourage weight loss have been run in women's correctional facilities. This case report describes the establishment, implementation and evaluation of a new intervention to encourage weight loss among incarcerated women entitled *Healthy Bodies on the Inside*. In addition, it highlights the barriers to conducting research in correctional facilities. **METHODS:** After conducting formative research with incarcerated and formerly incarcerated women from the Rhode Island Department of Corrections, a 6-week intervention targeting exercise and eating habits of incarcerated women was created and conducted by the authors. This intervention's effect on weight loss for each of the women who completed the study was then evaluated using objective measurements such as body weight and waist circumference. Additionally, changes in eating and exercise habits were measured using pre- and post-intervention questionnaires and data collected from weekly tracking sheets of intervention behavior. **RESULTS:** Three women completed the intervention. All three women lost weight: 4.5lbs, 3.5lbs and 1lb respectively. Adjusted for typical weight gain among incarcerated female, these women had a net weight loss of 13.3lbs, 12.3lbs and 9.8lbs respectively. All or some of the three cases also saw an increase in daily steps (n=3), a reduction in calories purchased from the commissary (n=2), improvements in mindful eating (n=1) and reduction in sweetened beverage consumption (n=1). **CONCLUSION:** *Healthy Bodies on the Inside* and other cost-effective, behavioral weight-management interventions may

be successful among females who are incarcerated. However, barriers to research in the prison environment may affect study enrollment and retention, decreasing generalizability of results.

BACKGROUND

More than 37% of adults in the United States are considered obese, which is defined as having a body mass index of greater than 30 kg per m².²¹ This is alarming, as being overweight or obese increases one's risk of developing chronic diseases such as coronary heart disease, type 2 diabetes and some cancers.⁴ The financial burden of obesity is also staggering. In 2008, when the prevalence of obesity was 33.9%, the national "estimated annual medical cost" was \$147 billion dollars, and individuals who were obese spent \$1,429 more on healthcare costs than those who were not.²¹

As a result of the health and financial burdens of obesity, it has become a national priority to increase the number of adults over the age of 20 who are at a healthy weight and to reduce the percentage of adults who are obese by 2020.²² Just three years before 2020, it appears that neither goal will be met, as the prevalence of healthy weight among adults continues to decrease and the prevalence of obesity among adults has continued to increase since 2008.²² However, this prevalence is not evenly distributed, as some subgroups of the population are at higher risk than others. Adults are more likely to be obese if they are Hispanic (42.6%) or Non-Hispanic, Black (48.4%) than if they are Non-Hispanic, White (36.4%).²³ They are also more likely to be obese if they are female (40.4%) compared to male (35.0%).²³ Among women, those who have indicators of low

socio-economic status, including less than a college degree or earnings below the poverty line, are more likely to be obese than their counterparts.²¹

The population of incarcerated women in the United States is disproportionately more Hispanic and Non-Hispanic, Black compared to the general population.²⁴ They are also more likely to have incomes below the poverty line and to have obtained less than a college degree.²⁵ As a result, in addition to their gender, these demographic characteristics put them at high risk for obesity. On top of this, there is near consensus that women in the U.S. and other high income countries gain weight behind bars, increasing the risk of the comorbidities associated with obesity.¹⁻³ This weight gain is not minimal nor insignificant, with some inmates gaining over a pound a week from the first week that they are incarcerated and up to 20 pounds between the first six months to two years.^{1,2}

In spite of the national weight-reduction goals and evidence of weight gain among female inmates, interventions to reduce weight gain/increase weight loss among incarcerated women are not highly documented in the literature.² This is not due to a lack of concern among female inmates, as women who are incarcerated identify nutrition and weight gain while they are behind bars as “leading health concerns.”² It is increasingly important, since incarcerated women is the “fastest growing correctional population,” having increased from 68,1000 to 100,940 women between 1999 to 2013 or 3.4% annually.²⁶

This case report evaluates three inmates who took part in a pilot program created by the authors in partnership with the Brown University Tri-Lab and the Center for

Prisoner Health and Human Rights. This pilot program was created to help incarcerated women in Rhode Island maintain or lose weight. Their resulting health outcomes, and lessons learned from conducting research in a correctional facility, can inform the use of this and similar interventions among incarcerated women in the future.

METHODS

After receiving approval from Brown University's Institutional Review Board and the Medical Research Advisory Group at the Rhode Island Department of Corrections, women residing in the sentenced wings of Rhode Island's Women's Medium Security prison (i.e., those who were already convicted of a crime) were recruited via flyers and word of mouth for a 6-week intervention entitled *Healthy Bodies on the Inside* and this co-occurring evaluation. The women who volunteered met in a group with the authors who read allowed a consent form. Directly following the group meeting, each woman met with the authors individually to address any questions about the form before giving their written and informed consent. Then, after providing their consent to the authors, their weight was measured (in pounds with shoes and prison uniform on using a Conair TH203 Thinner Digital Scale), and their height was collected by self-report. Body Mass Index (BMI) was then calculated from weight and height measurements. If women were considered underweight by NIH cut-offs ($BMI < 18.5$), they were ineligible to continue the study. Women were also considered ineligible if they were pregnant or did not speak English. Eligible participants were enrolled in the 6-week intervention

The Intervention

Formative Research: After the Director of Medical Programs at the Rhode Island Department of Corrections found that women in Rhode Island were gaining weight rapidly while they were incarcerated⁷, a qualitative research study sponsored by the Warren Alpert Medical School of Brown University and the Rhode Island Department of Corrections was established to identify the behavioral and structural reasons for this weight gain. Through interviews of 11 women who had been incarcerated in Rhode Island for over a year, this study identified themes surrounding the causes of weight gain while behind bars, including: 1) unnecessary calories consumed from the commissary, 2) excessive carbohydrates served and consumed at the cafeteria, 3) eating as a means to cope with emotions, and 4) embarrassment of exercising in front of others. These themes were again identified by the authors through their formative research in January 2016 - August 2016. During this time, the authors ran three focus groups with incarcerated and formerly incarcerated women, along with conducting interviews with two formerly incarcerated women, the Director of Medical Programs and the nutritionist from the ACI. Through their formative research, in addition to reaffirming the themes previously described, the authors identified themes surrounding sweetened beverage consumption including the excessive use of both sweetened Kool-Aid powder and of creamers and sugar in coffee.

Format: From the themes identified through this formative research and further supported in the literature, *Healthy Bodies on the Inside* was developed. In this 6-week intervention, participants were asked to gradually change their eating and exercise habits

with the intention of losing weight. On week one, participants were provided with a deck of exercise cards, specifically created for the intervention, and were instructed on how to use them with guidance from a physical therapist at the ACI. Participants were also given the first of five weekly tips to help them change their eating habits. Lastly, participants were provided with a tracking sheet and a pedometer to reinforce the intervention's behavioral change goals.

Following this first week, participants met with the authors once weekly for an hour to discuss their achievements, strategies, and struggles in completing the exercises and following the eating habit tip(s). During these weekly meetings, the authors also provided additional motivation for the women to continue the program by rewarding the participant who most thoroughly completed and tracked the behavioral change goals with a "cheat day card". This card could be used as a one-day pass for following the exercise and eating tips for the next week. Participants were also permitted to check their weight on the study scale and, on several occasions, check their body fat percentage using Omron Fat Loss Monitors. Lastly, the authors provided the participants with an additional healthy eating habit tip to track for the following week.

Materials: Each of these eating habit tips and the deck of exercise cards were created in response to themes derived from the formative research. The deck of exercise cards was created so that inmates could complete the exercise in the privacy of their own cell because women identified that embarrassment of exercising in front of other inmates and the correctional guards was a barrier to physical activity. The deck consisted of 7 warm-up cards, 15 "work-it" (cardio) cards and 8 cool-down cards, all of which were co-

created and reviewed by a certified physical trainer from Brown University and a certified physical therapist from the Rhode Island Department of Corrections. After they were developed, these cards were further tested among incarcerated women and edited per their suggestion. In one example, several women identified that they wanted to know which body part each exercise targeted so the authors edited the cards to include which area of the body each exercise worked. Figure 1 provides an example of the final cards.

The five nutrition tips were also developed based on themes from the formative research. On the first week the authors provided women with *Tip 1: Go to the Cafeteria: Even if you don't like the meal* (Fig 2). This tip was created because themes from the formative research identified that women were choosing to skip lunch and dinner (breakfast is required) and fill up on unhealthy commissary items instead. The aim of this tip was to increase their attendance at meals and in doing so increase their access to and consumption of healthier options such as fruits and vegetables not available to them through the commissary. This tip also provided the women with multiple ways to use meal time wisely, even if they did not want to eat what was being served. Productive use of meal time included drinking milk or water to feel satiated without eating extra empty calories, or planning out what they will order from the commissary later in a setting where they cannot impulsively purchase commissary items.

On the second week, the authors provided women with two tips for reducing sweetened beverage consumption, *Tip 3: Become a Coffee and Purist* and *Tip 3: Lose the Sweetened Kool-Aid* (Fig 3). Both tips encouraged women to gradually reduce the calories consumed in these beverages by slowly decreasing the amount of sugar, creamer,

and spoonful's of sweetened Kool-Aid, which they used in each cup. These tips were created because of themes surrounding sweetened beverage consumption identified in the formative research. During this research, former inmates noted that women at the Rhode Island Correctional facility drank what they termed, "Prison Coffee," which was approximately five teaspoons of sugar and half a mug of creamer in each 16-oz cup of coffee. This adds over 300, nutrient poor, calories to their diet per cup of coffee per day. Current inmates also identified that women were adding Kool-Aid to all of their water because the water at the facility did not taste good. In light of this knowledge and of Kool-Aid's empty calories, the tip on reducing spoonful's of Kool-Aid was created. **Note:** Initially authors intended to provide the Kool-Aid tip as a substitute for women who did not drink coffee, but through the pre-intervention survey it was identified that most women drank both coffee and Kool-Aid.

On the third week the authors provided the women with *Tip 2: Eat your Grains Last* (Fig 4). In the formative research, inmates identified that excessive grains were served and consumed at the cafeteria, including eight pieces of white bread served daily on top of other grains. They also noted that vegetables were scarce. This tip encouraged women to eat their fruits and vegetables first in order to satiate themselves with high nutrient, low calorie food and help them decrease excessive grain intake. It also provided a quick serving size guide so that women could monitor how many servings of grains they were eating.

On the fourth week, the authors provided the women with *Tip 4: Practice Mindful Eating* (Fig 5). This tip encouraged women to identify if they were truly hungry or eating

because they were bored, emotional or tired. It was created because themes from the formative research identified that women were consuming extra calories by eating for “comfort” from emotional strain. The tip itself highlighted that “comfort” eating can make you feel physically and mentally worse. It further provided ideas for dealing with feeling bored, emotional, or tired that do not include overeating and are additionally feasible in prison. These suggestions included: writing down emotions and/or talking to friends, going for brisk walk and/or running through the exercise cards, reading a book, taking a short nap, or having a glass of water.

Finally, on the fifth week, the authors provided the women with *Tip 5: Plan your Commissary Order when you're full* (Fig 6). This tip encouraged women to plan and write down their commissary order for the week with a full stomach so they would be less likely to order unhealthy and highly caloric food impulsively. It was created because through the formative research women identified that impulsive and unhealthy commissary orders were a significant contributor to excessive weight gain while in prison. This tip also provided several healthier options to satisfy some popular food cravings such as the desire to eat something filling, salty, or sweet. It listed items that met these cravings while also being healthier and/or less caloric than other options on the commissary list.

As noted earlier, to keep track of their progress and further reinforce the intervention's behavioral change goals, the women were provided with weekly tracking sheets and a pedometer. The tracking sheets collected information on daily cards completed, steps taken, and eating habit tips followed throughout the course of the week.

During weekly meetings, the authors collected the tracking sheet from the previous week and provided the participants with a new tracking sheet that included the additional eating habit tip. Figure 7 exemplifies a tracking sheet for week 5 and 6 that includes all of the eating habit tips. On the left, lines indicate where tracking sheets from week one and two ended as an example of what stayed constant and what varied on each sheet throughout the intervention.

Measures

Physical body measurements including, weight and height as collected during the consenting process, waist circumference (measured in inches with prison uniform on directly over the navel) and blood pressure (using a standard cuff) were collected pre and post-intervention. Participants also completed both a pre and a post intervention questionnaire. The pre-intervention questionnaire collected information in four distinct sections: 1) demographics, 2) exercise and eating habits, 3) mental health, and 4) physical health and substance use.

Demographic information including age, biological sex at birth, education level, and race/ethnicity was collected using questions adapted from validated national surveys including the Behavioral Risk Factors Surveillance System when appropriate. One example, race/ethnicity, was defined through two questions: “Which one of the following would you say is your race?” with response options White, Black or African American, American Indian or Alaska native, Asian, Pacific Islander or other and, “Do you consider

yourself to be Hispanic, Latino, or of Spanish Origin?” with response options yes, no, don’t know/not sure.

Eating and exercise habits were assessed using questions on the specific behaviors targeted in the intervention including: cafeteria attendance, grain intake, sweetened-beverage intake, commissary ordering habits, prevalence of emotional eating habits, and exercise type and amount. *Cafeteria attendance* was defined as the number of days in the past seven days that they ate at the cafeteria for lunch, and number of days in the past seven days that they ate at the cafeteria for dinner with response options 0, 1-2, 3-4, 5-6, 7 for each meal. *Grain intake* was defined as servings of grain consumed on a typical day with response options 0, 1-3, 4-6, 7-9, 10-12, 13+. *Sweetened beverage intake* included both the daily amount of creamer and sugar used in coffee and the daily amount of Kool-Aid consumed. The daily amount of creamer and sugar was identified first by the typical number of cups of coffee consumed per day with response options 0, 1, 2, 3, 4+ and then the typical teaspoons of sugar in each cup of coffee with response options 0, 1-2, 3-4, 5+ and, amount of cream in each cup of coffee with response options most of the mug, half of the mug, $\frac{1}{4}$ of the mug and just a splash as depicted on a corresponding diagram (Fig 3, all inmates are provided a standard, 16-ounce mug). Amount of sweetened Kool-Aid consumed was defined by typical cups of Kool-Aid daily with response options 0, 1, 2, 3, 4+ and number of spoonful’s of Kool-Aid powder used in each cup with response options 1, 2-3, 3-4, 5+. Mindful eating was defined by how often the participant ate because she felt bored, emotional, or tired with response options: never, rarely, sometimes, most of the time, and always for each category. Lastly,

commissary ordering habits were defined by whether or not they ordered from the commissary on a typical week with binary response option yes or no. It was additionally defined by when they ordered from the commissary with response options: when I'm hungry, when I'm full, when I'm neither hungry nor full and don't know/not sure and by what they ordered from the commissary on a typical week with an open-ended response option.

Exercise habits were measured through four questions on moderate and vigorous exercise. Amount of moderate exercise was defined as the number of times doing exercise such as brisk walking or high-movement yoga on a typical day with response options of 0, 1-2, 3-4, 5+ and the amount of time typically spent doing each moderate exercise with response options: less than 10 minutes, 11-20 minutes, 21-30 minutes, 31 to 40 minutes and 40+. Amount of vigorous exercise was described as number of times doing exercises such as running, jogging, basketball or aerobics on a typical day and for how long each exercise was done with response options identical to those used to measure moderate exercise.

Mental Health was assessed through the mental health screener from the Rhode Island Young Adult Prescription Drug Study (RAPiDS) and through the identification of obesogenic medication use through modified questions from *Clarke et al.*, a study conducted in the same correctional facility in 2007/2008.⁷

Physical health and former substance use was assessed through modified questions from *Clarke et al.* including pre-existing medical conditions and pre-incarceration drug use.⁷

Two-weeks after the end of the intervention, participants completed the post-intervention questionnaire. This questionnaire had the same assessments of eating and exercise habits, use of obesogenic medication, and mental health status (Appendix A) At this point, intervention participants also had their weight, waist circumference and blood pressure measured again using the same assessment tools and measured by the same member of the research staff as baseline. The pre and post intervention questionnaires and the pre and post body measurements, which were initially hand-written, were then entered into Qualtrics by the research staff. Data were exported into excel version: 15.13.1. Due to a limited enrollment (n=8) and loss to follow-up (n=5) we will review this study as a case report with lessons learned for future interventions.

RESULTS

Table 1 describes baseline characteristics of the women who initially enrolled in the study in addition to the characteristic of the women who were lost to follow up and of the women who remained in the study. Eight women originally enrolled and completed the pre-test and body measurements. The average age among these women was 39 years old, ranging from 26-52 years old. Participants were most likely to identify as white (37.5%) or other (37.5%). They were unlikely to identify as Hispanic/ Latino/ Spanish (25%). A majority of the women who enrolled in the study had been incarcerated for more than 90 days (75%). Half of the women reported doing moderate exercise (50%) on a typical day and a quarter reported doing vigorous exercise (25%) on a typical day. Most women were considered to be obese (62.5%) followed by overweight (25%) and normal weight (12.5%) according to NIH cut-offs.

Five of these eight women were lost to follow up. Among those lost to follow up, the average age was 35 years old ranging from 26-48. They were most likely to identify as white (40%) and then equally as likely to identify as Black (20%), other (20%) or American Indian or Alaska Native (20%). No women lost to follow up identified as Hispanic/Latino/ Spanish. On average, according to NIH cut-offs, a majority of these women were considered obese (60%) followed by overweight (20%) and normal weight (20%). A majority of these women had also been incarcerated for more than 90 days (60%). Less than half of these women reported doing daily moderate exercise (40%) on a typical day and only a fifth of them reported doing vigorous exercise (20%) on a typical day.

The women who completed the study (cases 4, 6 and 7) were more likely to identify as Hispanic/Latino/Spanish (66.7%) compared to those who were lost to follow up. Racially, they were also more likely to identify as “other” (66.7%). All three cases had been incarcerated for more than 90 days, compared to 60% of the women who did not complete the study. The women who completed the study were more likely to report doing moderate daily exercise (66.7%) and doing vigorous exercise (33.3%) than the women who were lost to follow up. However, they were also more likely to be obese (66.7%).

Case Descriptions: Due to limited retention, the three women who completed this study, Cases 4, 6, and 7, will be described individually for the duration of this case study. Case 6 was a 46-year-old woman who identified as Hispanic/Latino/Spanish and had been incarcerated for more than 90 days. She was 236 pounds and 5’6” resulting in a

BMI of 38.1 kg per m² which is considered obese. Case 4 was the oldest woman in the intervention at 52 years old. She identified as Hispanic/Latino/Spanish and had been incarcerated for more than 90 days. She was 5' tall and weighed 161.5 pounds giving her a BMI of 31.4 kg per m² which is considered to be obese. Case 7 was a 38-year-old woman who identified as white, and not as Hispanic/Latino/Spanish. She had been incarcerated for more than 90 days and was 167 pounds. At 5'6" her BMI was 27.8 kg per m² which is considered overweight.

Program Adherence: Case 6 had the highest adherence to the intervention. She filled out and returned all five of the tracking sheets and completed an average of 19 of the exercise cards daily by the last week of the intervention. By the last week of the intervention, she was also walking an average of 11,426 steps each day, an increase of 7,740 steps from her first week. Case 4 had the second highest adherence to the program filling out and returning four of the five tracking sheets and completing an average of 12 exercise cards a day by the end of the intervention. By the end of the intervention, she was walking an average of 9,754 steps each day, an increase of 5,761 steps from the first week tracked. Case 7 adhered least to the intervention turning in 2 of the 5 tracking sheets. The last time she turned in her tracking sheet she was inconsistently completing an average of 2 cards daily and walking an average of 7,984 steps daily. This was an increase of 3,400 average daily steps from her first week.

Change in Weight: Post intervention, Case 6 lost 4.5 pounds. Adjusted for typical weekly weight gain among women who have been incarcerated for more than 90 days at the Women's Correctional Population in Rhode Island³, she saw an adjusted weight loss

of 13.3 pounds (4.5 pounds + [1.1lbs * 8 weeks]). Case 4 lost 3.5 lbs. post intervention with an adjusted weight loss of 12.3 pounds. Case 7 lost 1 pound with an adjusted weight loss of 9.8 lbs.

Change in Eating Habits: Both Case 6 and Case 7 reported no change in daily sweetened Kool-Aid consumption between baseline to post-intervention, but Case 4 saw a decrease from 5 daily spoonful's (2 cups of 2-3 spoonful's) to 0. Neither case 6 nor case 4 changed in their mindful eating habits, but Case 7 decreased her emotional eating and eating while bored from "most of the time" to "sometimes". Cases 7 and 4 reduced the number of calories they purchased from the commissary as seen through their reduction of food purchased in a typical week and replacement of high-caloric food with lower caloric food.

DISCUSSION

Through the literature on weight gain among incarcerated women, we identified several behavioral and structural factors that may contribute to weight gain such as excess calories purchased from the commissary,¹⁷ emotional eating,^{2,8} and deterrents to physical activity such as lack of facilities.^{2,18,20} Then, through formative research with current and former inmates from the Women's Correctional Facility in Rhode Island, we validated these themes for the specific correctional facility and identified additional barriers such as the excessive consumption of sweetened Kool-Aid and a lack of privacy in the day room which made some women embarrassed about exercising publicly. From there we created a 6-week pilot intervention that addressed these sources of weight gain and conducted it

in the Rhode Island Women's Medium Correction Facility. Due to a limited enrollment (n=8) and loss to follow-up (n=5) we chose to report our findings as a case study. These findings, and the process around collecting them, may be lessons for both future weight loss interventions and conducting research generally in women's correctional facilities.

Lessons from our Cases

Despite a lack of statistical power, there is a lot to be learned by our three cases. Most poignantly, is the appearance of a dose-response effect among the three cases. Case 6, who adhered most closely to our study for tracking sheets completed, daily steps taken and exercise cards completed also lost the most weight (4.5 lbs.) compared to Case 4 who had the second highest adherence level and lost (3.5 lbs.) and Case 7 who lost 1 pound. Level of commitment to the program was also evident in the weekly meetings where Case 6 consistently attended with her tracking sheet fully completed and Case 4 did similarly and even proclaimed that she "loved the [exercise] cards!". Case 7, while she completed the study, waived in her adherence to the program citing a lack of personal motivation. This lack of motivation and adherence were also evident in the two of five tracking sheets she submitted. These sheets were missing data for several days on the number of cards completed or steps walked; gaps which were sometimes highlighted with written explanations such as "I forgot".

Apart from the dose-response effect, several promising findings in each of our cases were identified. Two of the three cases, 4 and 6, were ordering less caloric options from the commissary by the end of our intervention as suggested by our tip on and

tracking of commissary purchasing habits. For instance, case 6 reduced her regular commissary menu from pretzels, chocolates and crackers at baseline to just pretzels at follow up. Regular commissary purchases have been found to increase average daily calories consumption by 1,094¹⁷ among female inmate's, who's diets are already highly caloric.¹⁷ Following our tip, "*Tip 5: Plan your Commissary Order when you're full*" (Fig 6) may be a cost effective way to help female inmates to decrease their caloric intake.

Neither case 6 nor case 7 needed to reduce their sweetened Kool-Aid intake because they were not consuming any at baseline. However, following our tip on Kool-Aid powder reduction, case 4 reduced her daily Kool-Aid cups from 2 (which, according to her each consisted of 2-3 spoonful's of Kool-Aid powder) to 0. While not represented among our cases, our formative research identified that Kool-Aid consumption is prevalent among incarcerated women in Rhode Island. In one of our focus groups, a woman from the ACI noted that she had to use Kool-Aid because the tap water tasted so bad on its own. Helping women to break this Kool-Aid habit is not only beneficial for their health and weight because of the reduction in empty calories but also, affords them more money to buy healthier foods from the commissary which is more expensive.

Case 4 was mindful about her consumption habits at baseline; however, both case 6 and 7 admitted to eating because they were *bored* or because they were *emotional*. Eating as a coping mechanism for both the stress of being in prison and the trauma from life outside of prison is cited in the literature as a source of weight gain.^{2,8} Therefore, targeting this behavior is important for weight loss among incarcerated women. Using *Tip 4: Practice Mindful Eating* (Fig 5), case 6 did not see a reduction in eating while

bored or *tired*, noting at baseline and at follow-up that she did both of these “sometimes”. However, this tip may have been helpful for case 7. At baseline, she reported eating because she was *bored* “most of the time” and eating because she was *emotional* “most of the time” however, at follow up she reported “sometimes” for both of these mindful eating categories. While addressing the underlying feelings of being bored or emotional may be most effective in decreasing these unhealthy eating habits, promoting a mindful eating tip in a weight loss intervention among incarcerated women may reduce caloric intake among participants.

Significance of Weight Loss Behind Bars

In an intervention amongst the general population, the weight loss seen at the 8-week follow up post intervention may seem minimal. However, among incarcerated women, consistent weight gain is normal. In fact, a study on women incarcerated in Rhode Island found that overall, 71% of women were gaining weight and women who had been incarcerated for more than 2 weeks were gaining over a pound (1.1 lbs.) each week on average.¹ All of the cases in the final sample were incarcerated for more than 90 days, and thus at risk for gaining 1.1 pounds per week. In light of this we adjusted pre- to post-intervention weight change to account for the additional weight they would likely have gained over this same time period. These adjusted weights, 13.3 pounds lost for Case 6, 12.3 pounds lost for Case 4, and 9.8 pounds lost for Case 7, demonstrate how a low-cost behavioral intervention such as this may have significant impact on weight among incarcerated women.

Preventing weight gain and encouraging healthy weight loss habits is also particularly important in prisons because of the potentially unhealthy weight loss practices that women may engage in after they leave. For instance, one woman in our study who was lost to follow up at week five and currently on methadone treatment noted that she plans to use illegal drugs to lose weight when released from prison, increasing her likelihood of being re-incarcerated. The use of illicit drugs to lose weight is cited in multiple studies surrounding substance abuse and women.^{27,28} In one study of 297 women going through substance abuse treatment, 30% of the women noted that they “were concerned about using drugs to lose weight after leaving treatment.”²⁷ In this same study, 34% of the women acknowledged that they “often, usually, or always used drugs with the intent to lose weight.”²⁷ Similar findings come from a study of 350 methamphetamine users. In this study, 19% of the total sample made up of both men and women cited using methamphetamine to lose weight.²⁸ When divided by gender, the use of methamphetamine to lose weight was much higher among women than men (36% v. 7%).²⁸ If indeed weight gain leads to illegal drug use, interventions to decrease weight gain while in prison might reduce drug intake after release and in turn decrease recidivism among offenders.

Limitations & Barriers of Conducting Research in Correctional Facilities

The two largest limitations of this study were a lack of enrollment and a low retention rate. In part, these limitations may be attributed to barriers of conducting

research in correctional facilities. In fact, such limitations are often cited in literature surrounding research in correctional facilities.²⁹⁻³¹

Enrollment: Research studies conducted within correctional facilities often have a hard time enrolling participants due to a lack of compensation for them.²⁹ This lack of compensation may result from a state-wide correctional policy that does not allow inmates to be compensated for research.³⁰ However, often times it instead results from either a researcher's misunderstanding of their ability to compensate inmates and/or discretionary practices of the prison's administration who chose which programs can provide compensation and which cannot be on a "case-by-case" basis.³⁰ We were instructed by the administrative staff at the prison that we could not offer "good time," or a slight reductions in sentence length, for each meeting that participants attended. This may have been a disincentive for women to participate in our study, particularly when competing with most other programs at the ACI that do offer "good time". Additionally, it was our understanding that under Brown's IRB regulations we were not allowed to provide any monetary compensation to inmates due to of concerns of unethical coercion. This misinterpretation may have also been to the detriment of our enrollment.

In addition to a lack of compensation, our enrollment may have been limited due to miscommunication between the prison's administrative staff and the research team on the study protocol. Such miscommunications have previously been cited as sources of recruitment error in studies in correctional facilities.²⁹ Women who were interested in taking part in our study were required to send a letter to the prison administrators to express their interest in enrolling. While letter requests are common practice among

inmates, the administrator receiving them misunderstood the recruitment plan and told women that the study was fully enrolled before it actually was. When we asked this administrator if we could contact these women she told us that we could not because she no longer knew who they were. Had we more effectively communicated with the prison's administration on our recruitment and enrollment timeline, we would have had several additional women in our study.

Lastly, our limited enrollment may have been influenced by restrictions placed on our recruitment process from prison administrators. When we began our recruitment period we did not yet have the pedometers which we knew would inspire women to sign up for the study due to our formative research. However, when we got them, the administrators would not allow us to continue recruiting. Also, again without a clear justification, prison administrators significantly decreased our population size by only allowing us to recruit from the sentenced wings, or among those women who had already been convicted of a crime. Although they reside in the same building, we were unable to recruit from the other wings housing women who were still awaiting trial. While the exact number of women in each of these wings often changes slightly, the percentage of women in the sentenced wings is only around 60% of the total population. In the first week of April of 2017, the sentenced wings at this facility had just 59 women and the awaiting trial wings had 45.

Retention: Lack of retention, was more surprising though not completely unexpected. There were several factors within the prison environment, which may have attributed to our loss to follow up. Research studies conducted in correctional facilities

have difficulty retaining participants because inmate's schedules are often out of their control.^{29,31} This results in intervention meeting hours conflicting with work, recreation and other programming.^{29,31} We saw these scheduling conflicts repeatedly during our intervention. For instance, one of our participants informed us that she had dropped out because she was assigned work at the same time as the weekly meetings. Another woman told us, on the last day of the intervention, that our meeting ran at the same time (and only time) that sentenced women were permitted in the yard on Tuesdays. Further, in addition to top-down scheduling from the prison administration, some loss to follow up may be the result of discretionary practices of the surrounding correctional officers. At least 5 of the 8 women who started our study worked in the cafeteria and if a truck came in with a food delivery they are required to stay in the kitchen until the truck was unpacked making them late for our meeting. While we were fine with this, we learned near the end of our intervention that the guard outside of the classroom had turned a woman away for being late without our knowledge. This and other correctional officers may have impacted our retention by keeping women from coming to our meetings without our knowledge.

Apart from prison staff, inmate's personal motivations and beliefs surrounding us as a research team may have influenced program retention. Women cited that a lack of personal motivation kept them from finishing the program but when we asked what could be done to motivate them the response we heard multiple times was "it has to come from within". A belief that researchers are associated with the prison administrative system and therefore cannot be trusted and/or does not have the best interest of the participants at

heart in cited in prison populations and may have attributed to the belief that we, as a research team, could not help them adhere to the program.²⁹ While we were not working with the prison administration we did not distance ourselves from them and further we acknowledged our communication with prison administrators in conversations with participants. This may have caused women to drop our study.

Limitations due to Intervention Design

The design of our intervention itself also may have impacted program retention. Our baseline data illustrated that people who stuck with the intervention were more likely to already exercise, suggesting that the intervention may have been more effective for people who were already motivated to exercise as opposed to those who were not yet motivated to do physical activity. Additionally, our weekly meetings were designed to discuss the success and failures of the use of the previous week's tracking sheet and to provide a new eating habit tip to track. However, at least one woman seemed eager to have a more detailed discussion on nutrition and exercise physiology that we were not prepared to provide. Lastly, the pedometers that we purchased should have been quality tested. Some women found that these pedometers undercounted steps and at least one broke which aggravated some of the participants.

Conclusion

From our findings, this case study provides good insight into conducting weight loss interventions with incarcerated women. The weight loss and behavioral changes

among our three cases suggest that even small, cost effective behavioral interventions such as this may prevent excessive weight gain in prisons and help inmates to lose weight. Doing so may be additionally beneficial for incarcerated women by protecting them from the use of unhealthy weight loss practices upon re-entry.

Despite these findings, future studies that implement *Healthy Bodies on the Inside* must have a larger sample size. This may mean sampling from multiple correctional facilities since individual facilities are often times small. Regardless, increasing sample size is essential to test the efficacy of the program and to generalize the results to all incarcerated women. Additionally, this sample should be more representative of the demographic characteristics of incarcerated women. This includes larger representation of African American and Non-Hispanic White women who were underrepresented in our sample. Lastly, this sample should also include women who have been incarcerated for less than 90 days, a sub population that is represented in women's correctional facilities but was not represented among our cases.

In addition to improving the sample for better evaluation of the interventions effect, a process evaluation should be created and run on this intervention. There are many components of the program that may have had an effect on the weight loss of our participants including the eating tips, the pedometers, exercise cards and the social support garnered from the intervention's weekly meetings. Identifying which of these components had the most impact on weight loss may help to both streamline the intervention and to highlight the root causes of weight gain among incarcerated women.

In addition to limitations resulting from our intervention design, there were barriers to conducting research within a correctional facility that may have affected our study's enrollment and retention. To decrease the barriers, we propose the following recommendations for researchers who seek work with correctional populations:

- 1) *Understand and negotiate for participant compensation:* In our study we identified that a lack of compensation for the women's time may have decreased enrollment and retention. However, while we initially believed that this compensation was not allowed by the oversight committee (IRB) nor the prison's administrators, we later identified that this was not the case for either institution. For the prison specifically, compensation was allowed on a case-by-case basis and prison administration, without ample justification, decided not to allow it. Before conducting research in a correctional facility, researchers should be aware of specific state policy's surrounding compensating inmates for research.²⁹⁻³¹ If compensation is up to the prison administration, researchers should advocate for the use of minimal compensation to ethically increase enrollment and retention.
- 2) *Educate prison administration and staff on study protocol:* Overall, the prison administration and staff were both aware and supportive of our intervention, but miscommunication on study protocol consistently hindered our study. Without a clear understanding of when our recruitment period ended or who could participate in our weekly meetings, administrators and staff members

unintentionally effected our enrollment and retention. This could be easily resolved with increased understanding of the research protocol among the prison administrators and staff. Researchers should share the study protocol with the prison staff and administrators up front, get their feedback, and keep lines of communication open for unresolved issues during the study period.

- 3) *Precisely schedule regular meetings with inmates:* Inmates have very little control over their own schedule and as a result, finding a time to meet with them is difficult. Working with the administrative staff to schedule intervention meetings and pre and post evaluations that do not conflict with other popular programs is imperative to getting enough enrollment and retention. Researchers should work with the administration to make sure that intervention meetings do not conflict with existing programs such as GED class or bible study, particularly if these programs compensate inmates with “good time” and the study does not. These meetings should also not occur at the same time that women have recreation time or are allowed in the yard which is usually only once a day for an hour. Lastly, researchers should do what they can to encourage administrators to not assign work to inmates during meeting hours or alternatively, researchers should schedule multiple meeting times to reach more inmates.

As illustrated, there are many barriers to conducting research in correctional facilities. However, researchers should not be dissuaded from this research, because there is a need

for health literature of this marginalized population. Following the recommendations provided above will not only improve future implementation and evaluation of *Healthy Bodies on the Inside* but further improve the capacity of researchers to run effective interventions in correctional facilities.

Figure 1: Example Exercise Cards

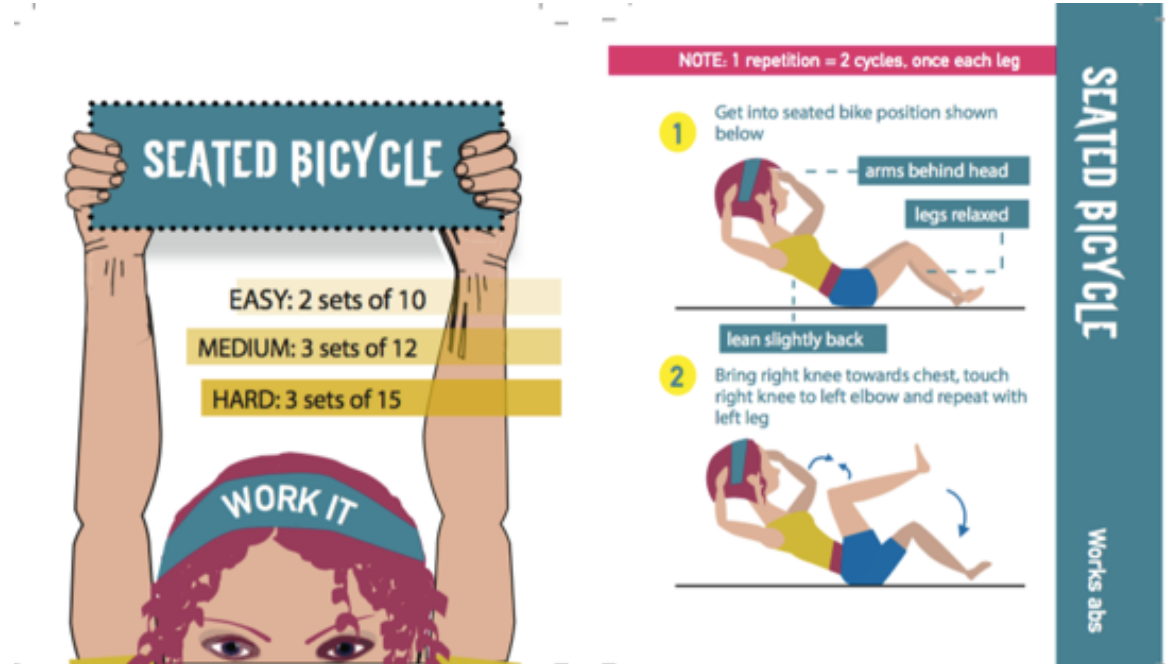


Figure 2: Eating Habit Tip Card on Increasing Cafeteria Attendance



Figure 3: Eating Habit Tip Cards on Reducing Sweetened Beverage Consumption

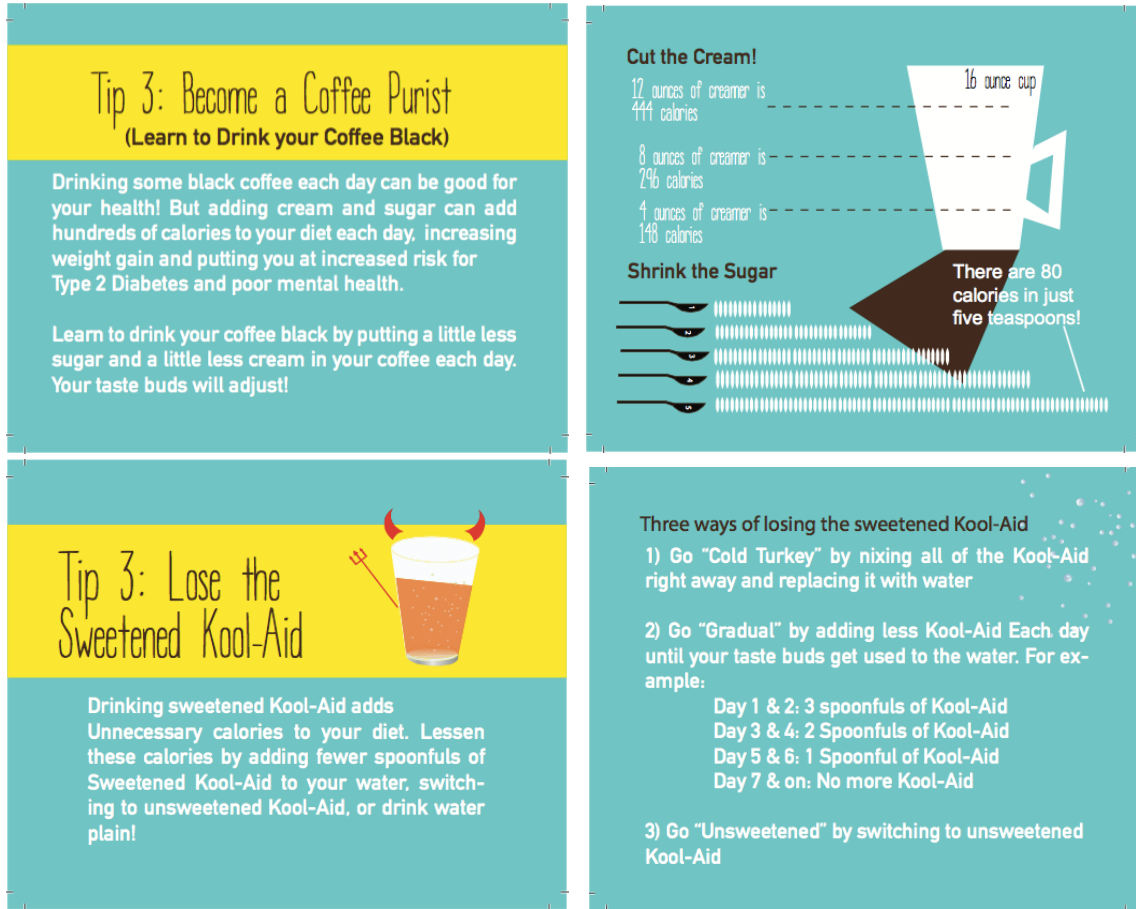


Figure 4: Eating Habit Tip Card on Decreasing Excess Grain Consumption

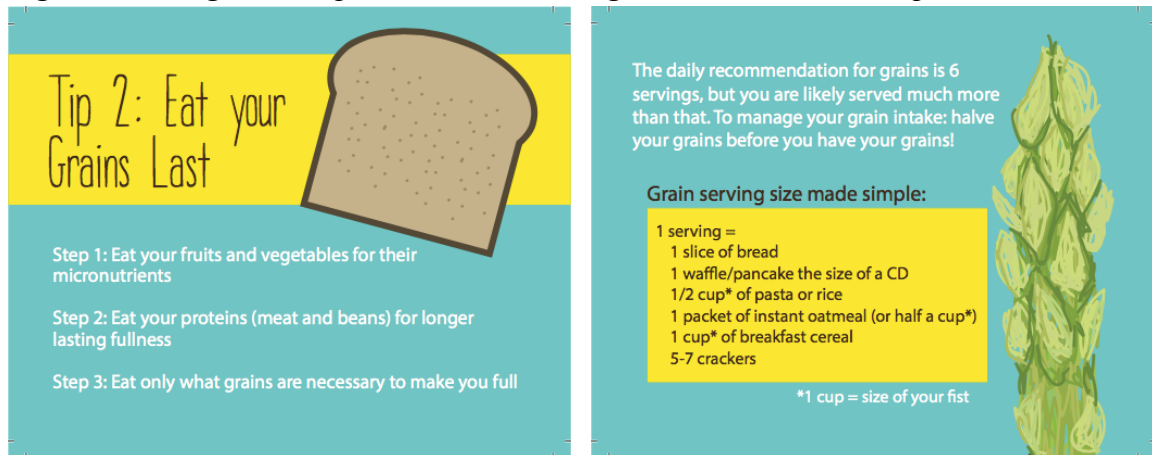


Figure 5: Eating Habit Tip Card on Using Mindful Eating Principles

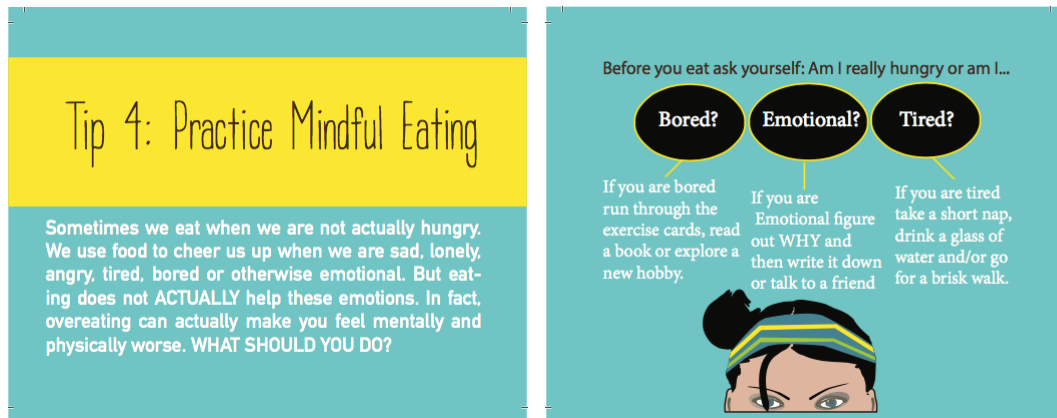
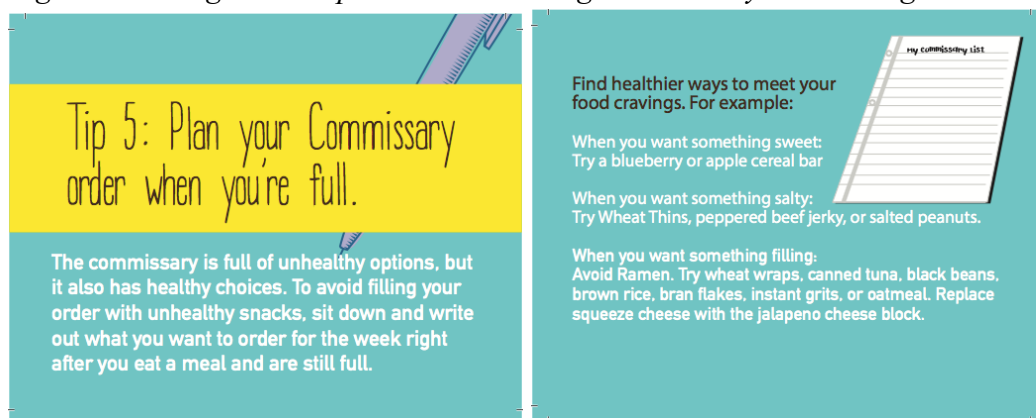


Figure 6: Eating Habit Tip Card on Planning Commissary Purchasing



Week 2

Week 1

	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Monday
How many steps did you take today?							
How many exercise cards did you do today?							
Did you go to the cafeteria for lunch today?	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No
Did you go to the cafeteria for dinner today?	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No
Did you drink coffee or tea today?	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No
How many ounces of cream did you put in your coffee or tea?	0 / 1-4 / 5-8 / 9-12 / 13+	0 / 1-4 / 5-8 / 9-12 / 13+	0 / 1-4 / 5-8 / 9-12 / 13+	0 / 1-4 / 5-8 / 9-12 / 13+	0 / 1-4 / 5-8 / 9-12 / 13+	0 / 1-4 / 5-8 / 9-12 / 13+	0 / 1-4 / 5-8 / 9-12 / 13+
How many spoonfuls of sugar did you put in your coffee or tea?	0 / 1-2 / 3-4 / 5+	0 / 1-2 / 3-4 / 5+	0 / 1-2 / 3-4 / 5+	0 / 1-2 / 3-4 / 5+	0 / 1-2 / 3-4 / 5+	0 / 1-2 / 3-4 / 5+	0 / 1-2 / 3-4 / 5+
Did you drink sweetened Kool-Aid today?	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No
How many spoonfuls of sweetened Kool-Aid did you use?	1 / 2-3 / 4-5 / 5+	1 / 2-3 / 4-5 / 5+	1 / 2-3 / 4-5 / 5+	1 / 2-3 / 4-5 / 5+	1 / 2-3 / 4-5 / 5+	1 / 2-3 / 4-5 / 5+	1 / 2-3 / 4-5 / 5+
Did you drink unsweetened Kool-Aid today?	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No
Did you eat your grains last at lunch today?	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No
Did you eat your grains last at dinner today?	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No
Did you practice mindful eating today?	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No

Did you plan your commissary menu when you were full this week?
Yes / No

What did you order for healthy "sweet," "salty," or "filling" options?

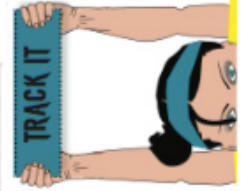


Figure 7: Intervention Tracking Sheet

Table 1: Baseline Characteristics of Women Enrolled in Healthy Habits Pilot Program at Rhode Island's Medium Security Women's Correctional Facility

	Baseline Sample (n=8)	Lost to Follow Up (n=5)	Final Sample (n=3)
Mean Age	39	35	45
Race			
<i>White</i>	37.5% (n=3)	40% (n=2)	33.3% (n=1)
<i>Black</i>	12.5% (n=1)	20% (n=1)	0% (n=0)
<i>Amer/Alask</i>	12.5% (n=1)	20% (n=1)	0% (n=0)
<i>Other</i>	37.5% (n=3)	20% (n=1)	66.7 (n=2)
Hispanic/Latino/Spanish	25% (n=2)	0% (n=0)	66.7 (n=2)
Mean Time Incarcerated			
<i>>90 days</i>	75% (n=6)	60% (n=3)	100% (n=3)
<i>31-90 days</i>	15% (n=2)	40% (n=2)	0% (n=0)
BMI Status			
<i>Obese</i>	62.5% (n=5)	60% (n=3)	66.7% (n=2)
<i>Overweight</i>	25% (n=2)	20% (n=1)	33.3% (n=1)
<i>Normal</i>	12.5% (n=1)	20% (n=1)	0% (n=0)
Daily Moderate Exercise*			
<i>Yes</i>	50% (n=4)	40% (n=2)	66.7% (n=2)
<i>No</i>	50% (n=4)	60% (n=3)	33.7% (n=1)
Daily Vigorous Exercise**			
<i>Yes</i>	25% (n=2)	20% (n=1)	33.7% (n=1)
<i>No</i>	75% (n=6)	80% (n=4)	66.7% (n=2)

*defined as exercises such as brisk walking or high-movement yoga

**defined as exercises such as running, jogging, basketball or aerobics

Table 2: Program Adherence as Measured by Tracking Sheets Completed, Exercise Cards Used, and Steps Taken

	Tracking Sheets turned in	Mean Daily Cards Use	Increase in Daily Steps
Case 6	100% (5)	19	7740 (32% increase)
Case 4	80% (4)	12	5761 (41% increase)
Case 7	40% (2)	2	3400 (57.4% increase)

Table 3: Change in Weight and Adjusted Change in Weight of Case 6, 4 and 7 Post intervention

	Change in Weight (lbs.)	Adjusted Change in Weight (lbs.)
Case 6	4.5	13.3
Case 4	3.5	12.3
Case 7	1	9.8

Table 4: Eating Habits described at Baseline and Post-Intervention

Nutritional Habit			
	Case 6	Case 4	Case 7
Daily Sw. Kool-Aid Consumption (spoonful's)			
Baseline	0	5	0
post-Intervention	0	0	0
Eating when Emotional			
Baseline	Sometimes	Never	Most of the time
post-Intervention	Sometimes	Never	Sometimes
Eating when bored			
Baseline	Rarely	Never	Most of the time
post-Intervention	Rarely	Never	Sometimes
Weekly commissary Calories Purchased			
Baseline	Pretzels, Crackers, Chocolate	Unsalted Crackers & Creamer	Noodles, Cheesy Rice, Blue Cheese
post-Intervention	Pretzels	Coffee and Sweet mate*	Coffee, Ramen, Chips

*Artificial Sweetener

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Appendix A: Pre & Post Intervention Questionnaires

Healthy Bodies on the Inside Pre-intervention Survey

ID # _____

Section 1 - Basic Info

1. What is your age? _____
2. What was your biological sex at birth? (check only 1)
 - ☐ Male
 - ☐ Female
3. What is the highest grade or year of school you completed? (check only 1)
 - ☐ Never attended school or only kindergarten
 - ☐ Grades 1 through 8 (Elementary)
 - ☐ Grades 9 through 11 (Some high school)
 - ☐ Grade 12 or GED (High school graduate)
 - ☐ College 1 year to 3 years (Some college or technical school)
 - ☐ College 4 years or more (College graduate)
4. Which one or more of the following would you say is your race? (check all that apply)
 - ☐ White
 - ☐ Black or African American
 - ☐ American Indian or Alaska Native
 - ☐ Asian
 - ☐ Pacific Islander
 - ☐ Other: _____
5. Do you consider yourself to be Hispanic, Latino, or of Spanish origin? (check only 1)
 - ☐ Yes
 - ☐ No
 - ☐ Don't know/Not sure
6. How long have you been incarcerated? (check only 1)
 - ☐ Less than 7 days
 - ☐ 8 to 30 days
 - ☐ 31 to 90 days
 - ☐ More than 90 days

Section 2 - Exercise and Eating Habits

7. In the past 7 days, how many times did you eat lunch at the cafeteria? (circle your answer)

0	1-2	3-4	5-6	7
---	-----	-----	-----	---
8. In the past 7 days, how many times did you eat dinner at the cafeteria? (circle your answer)

0	1-2	3-4	5-6	7
---	-----	-----	-----	---
9. On a typical day how many servings of grain do you eat? One serving of grain is a pile of pasta or rice that is the size of your fist, one piece of bread, or one pancake/waffle. (circle your answer)

0	1-3	4-6	7-9	10-12	13+
---	-----	-----	-----	-------	-----
10. On a typical day, how many cups of coffee do you drink? (circle your answer)

0	1	2	3	4+
---	---	---	---	----
11. If you typically drink coffee, how many teaspoons of sugar do you put in your coffee? (circle your answer)

0	1-2	3-4	5+
---	-----	-----	----
12. If you typically drink coffee, how much creamer do you put in your coffee? Do not include milk. (check only 1)



- ☐ A (Most of the mug)
 - ☐ B (Half of the Mug)
 - ☐ C (1/4 of the mug)
 - ☐ D (Just a splash!)
13. On a typical day, how many cups of sweetened Kool-Aid do you drink? (circle your answer)

0	1	2	3	4+
---	---	---	---	----

14. If you typically drink Kool-Aid, how many spoons of Kool-Aid powder do you put in each cup? (circle your answer)

1 2-3 3-4 5+

Question 15 looks at reasons that you may eat besides being hungry. Check the box that corresponds to how often you eat for the reason listed.

15. How often do you...

	Never	Rarely	Sometimes	Most of the Time	Always
Eat when you are bored					
Eat when you are emotional					
Eat when you are tired					

16. In a typical week, do you order from the commissary? (check only 1)

- ☐ Yes
☐ No

17. If you order from the commissary, what item do you order the most in a typical week?

18. If you order from commissary, when do you order? (check only 1)

- ☐ When I am hungry
☐ When I am full
☐ When I am neither hungry or full
☐ Don't know/ not sure

19. On a typical day, how many times do you do moderate exercise such as brisk walking or high-movement yoga? (circle your answer)

0 1-2 3-4 5+

20. When you do moderate exercise, how many minutes do you typically spend doing it? (circle your answer)

Less than 10 11-20 21-30 31-40 40+

21. On a typical day, how many times do you do vigorous exercise such as running, jogging, basketball or aerobics? (circle your answer)

0 1-2 3-4 5+

22. When you do vigorous exercise, how many minutes do you typically spend doing it? (circle your answer)

Less than 10 11-20 21-30 31-40 40+

Section 3 – Mental Health

23. These next statements are about how you have felt in the past week. For each statement, please answer how often you have felt this way in the past week by checking the box that corresponds with your answer.

	Rarely or none of the time (0 days)	Some or little of the time (1-2 days)	Moderate amount of time (3-4 days)	Most or all of the time (5-7 days)
I felt depressed.				
I felt that everything I did was an effort.				
My sleep was restless.				
I was happy.				
I felt lonely.				
People were unfriendly.				
I enjoyed life.				
I felt sad.				
I felt like people disliked me.				
I could not get going.				

Note: If you are feeling depressed you should request mental health counseling by getting a medical request slip and checking "Mental Health".

Section 4 - Physical Health & Substance Use

24. Have you had in the past or do you currently have any of the following medical conditions? *(check all that apply)*

- ☐ Cancer
- ☐ Polycystic Ovarian Disease
- ☐ HIV/AIDS
- ☐ Thyroid Problems
- ☐ Asthma
- ☐ Chronic Pulmonary Obstructive Disorder
- ☐ Emphysema
- ☐ Joint Problems
- ☐ Severe Arthritis
- ☐ Diabetes
- ☐ Hypertension
- ☐ Hyperlipidemia

25. Have you gone through or are you currently going through menopause? *(check only 1)*

- ☐ Yes
- ☐ No
- ☐ I don't know/ Not Sure

26. Are you currently taking any of these psychiatric medications? *(check all that apply)*

- ☐ Quetiapine or Seroquel
- ☐ Risperidone or Risperdal
- ☐ Haloperidol or Haldol or Serenace
- ☐ Amitriptyline or Elavil
- ☐ Topamax
- ☐ Clozapine or Clozaril
- ☐ Olanzapine
- ☐ Symbyax or Zyprexa
- ☐ Valproic acid
- ☐ Other: _____

27. In the 3 months before incarceration, how often did you use each of the following drugs? *(check the box that corresponds with your answer)*

	Never	Once or a couple of times	About 1 time per month	At least every week	Every Day
Tobacco (nicotine)					
Alcohol (any use at all)					
Alcohol (to intoxication or being "drunk")					
Marijuana					
Prescription painkillers (Vicodin)					
Benzodiazepines (Xanax) or barbiturates					
Heroin					
Cocaine or crack					
Methamphetamine					
Other: _____					
Other: _____					

END

Healthy Bodies on the Inside

Post-intervention Survey

ID # _____

Section 1 - Exercise and Eating Habits

1. In the past 7 days, how many times did you eat lunch at the cafeteria? (circle your answer)

0 1-2 3-4 5-6 7

2. In the past 7 days, how many times did you eat dinner at the cafeteria? (circle your answer)

0 1-2 3-4 5-6 7

3. On a typical day how many servings of grain do you eat? *One serving of grain is a pile of pasta or rice that is the size of your fist, one piece of bread, or one pancake/waffle.* (circle your answer)

0 1-3 4-6 7-9 10-12 13+

4. On a typical day, how many cups of coffee do you drink? (circle your answer)

0 1 2 3 4+

5. If you typically drink coffee, how many teaspoons of sugar do you put in your coffee? (circle your answer)

0 1-2 3-4 5+

6. If you typically drink coffee, how much creamer do you put in your coffee? Do not include milk. (check only 1)



- ☐ A (Most of the mug)
- ☐ B (Half of the Mug)
- ☐ C (1/4 of the mug)
- ☐ D (Just a splash!)

7. On a typical day, how many cups of **sweetened** Kool-Aid do you drink? (circle your answer)

0 1 2 3 4+

8. If you typically drink Kool-Aid, how many spoons of Kool-Aid powder do you put in each cup? (circle your answer)

1 2-3 3-4 5+

Question 15 looks at reasons that you may eat besides being hungry. Check the box that corresponds to how often you eat for the reason listed.

9. How often to do you...

	Never	Rarely	Sometimes	Most of the Time	Always
Eat when you are bored					
Eat when you are emotional					
Eat when you are tired					

10. In a typical week, do you order from the commissary? (check only 1)

- ☐ Yes
- ☐ No

11. If you order from the commissary, what item do you order the most in a typical week?

12. If you order from commissary, when do you order? (check only 1)

- ☐ When I am hungry
- ☐ When I am full
- ☐ When I am neither hungry or full
- ☐ Don't know/ not sure

13. On a typical day, how many times do you do moderate exercise such as brisk walking or high-movement yoga? (circle your answer)

0 1-2 3-4 5+

14. When you do moderate exercise, how many minutes do you typically spend doing it? (circle your answer)

Less than 10 11-20 21-30 31-40 40+

15. On a typical day, how many times do you do vigorous exercise such as running, jogging, basketball or aerobics? (circle your answer)

0 1-2 3-4 5+

16. When you do vigorous exercise, how many minutes do you typically spend doing it? (circle your answer)

Less than 10 11-20 21-30 31-40 40+

Section 2 – Medications

17. Are you currently taking any of these psychiatric medications? (check all that apply)

- ☐ Quetiapine or Seroquel
- ☐ Risperidone or Risperdal
- ☐ Haloperidol or Haldol or Serenace
- ☐ Amitriptyline or Elavil
- ☐ Topamax
- ☐ Clozapine or Clozaril
- ☐ Olanzapine
- ☐ Symbyax or Zyprexa
- ☐ Valproic acid
- ☐ Other: _____

Section 3 – Mental Health

18. These next statements are about how you have felt in the past week. For each statement, please answer how often you have felt this way in the past week by checking the box that corresponds with your answer.

	Rarely or none of the time (0 days)	Some or little of the time (1-2 days)	Moderate amount of time (3-4 days)	Most or all of the time (5-7 days)
I felt depressed.				
I felt that everything I did was an effort.				
My sleep was restless.				
I was happy.				
I felt lonely.				
People were unfriendly.				
I enjoyed life.				
I felt sad.				
I felt like people disliked me.				
I could not get going.				

Note: If you are feeling depressed you should request mental health counseling by getting a medical request slip and checking "Mental Health".

Appendix B: IRB Proposal and Approval

Summary

Prisoner health is community health because almost all incarcerated people return to the community. However, many prisons do not tailor their menus to women, feeding them up to 3000 calories each day. This does not include additional food that women purchase from the commissary. Incarcerated women are 18% more likely to be obese than the general US population. They are also more likely to be obese than incarcerated men (43% of female prisoners compared to 27% of male prisoners are obese). A study from Rhode Island indicated that incarcerated women gained a pound a week.

Over the past two years, students from Brown Medical School have been working with the Medical Programs Director at the Rhode Island Department of Corrections to both quantify and qualify weight management among inmates in women's medium security prison. Informed by their work, previous national and international research, and our own qualitative exploration this summer, students in the Brown TRI-lab course "Designing Education for Better Prisoner and Community Health" created a 6-week intervention that will start in mid-October 2016. During the course of this intervention, women who are enrolled will receive a deck of exercise cards, nutrition tips, and a pedometer and will track their use of each item on a tracking sheet we provide.

This study will have both a control group and an intervention group of 20 women. We will administer surveys before and after the intervention and collect biological measures of weight, waist circumference, height, blood pressure and percent body fat as well. We will also collect self-reported daily steps that women will track with a pedometer and self-reported exercise and eating behavior that women will also track daily with a checklist that we provide. We will consider other factors that may affect a women's weight when collecting and analyzing our data including time already spent in prison, smoking status and date of last cigarette and other drug use. At the end of the six weeks, we will offer the intervention to the control group but only the data collected from the first 6 weeks will be analyzed in this study.

Following the 6-week intervention we will compare body weight measurements taken before the intervention to those taken after it and see if this change is significantly different from the group that does not participate in the intervention. We will also look at the change in behaviors and attitudes towards exercise and nutrition. Lastly, we will compare the women's pre and post intervention stress level using a validated scale.

Protocol

Aims & Methodology

Obesity is now considered epidemic in the United States and is a high priority for preventive and therapeutic interventions (1,2). Obesity and the resulting negative health effects disproportionately affect women, minorities and the less educated (3,4). The problem of obesity and weight gain is even more challenging for incarcerated populations. Weight gain among women during periods of incarceration has now been well documented (5,6). Pilot data collected by Dr. Jennifer Clarke revealed that less than 1% of women at the RIDOC were underweight and overall women gained an average of 2.9 pounds over a two-week period (7). To our knowledge, only scant research guides weight loss/weight maintenance programming in correctional facilities. Recently collected data at the RI Department of Corrections women's facilities suggests that both staff and incarcerated women agree that weight gain among inmates is an issue and identified areas of overlap in staff and inmate intervention (8). Specifically, both women and staff suggested that effective interventions would both broaden the exercise opportunities available to incarcerated women as well as address both cafeteria and commissary eating. The present study seeks to implement a collaborative health intervention that is tailored to the specific needs of incarcerated women.

Based on the data collected in a previous study conducted with female inmates and prison administration and staff at the RI Department of Corrections, we have documented why women disproportionately gain weight while incarcerated, what is needed from a weight loss / weight maintenance intervention, and what is feasible to implement within a correctional facility. The present study builds from this data to implement a tailored, feasible, sustainable pilot intervention for weight loss / weight maintenance among women incarcerated at a medium security facility. To this end, our specific aims are:

- To collect quantitative data on changes in body mass index, waist circumference, blood pressure, and body fat percentage in incarcerated females □
- To collect quantitative data on health-behavior changes including number of steps taken, number of visits to the cafeteria, and number of exercise cards used □
- To collect quantitative data on changes in perceived stress □ *Enrollment* □ Subjects will be enrolled from the population of sentenced female inmates incarcerated at the Gloria McDonald Awaiting Trial and Medium Security Facility. Recruitment will be limited to women with a BMI ≥ 18.5 (including BMIs considered normal, overweight, and obese). To be eligible to participate in this intervention, the following criteria must be met: □
 - Residing in sentenced wing ○ English-speaking ○ Age 18 or older ○ Non-pregnant
 - BMI ≥ 18.5 (normal) ○ No current or past medical condition deemed unsafe for participation by a physician

Study Design

This study will have a waitlist comparison group. Participants who meet eligibility criteria and are randomly enrolled in the control group will have the opportunity to participate in the intervention after all data has been collected from the experimental group. Participants in the control group will wait 6 weeks from enrollment to begin the intervention. If there is more interest than availability for participation, we will first enroll women on the basis of sentence length. Women with the longest sentence remaining will be enrolled first, and enrollment will continue until study capacity is reached. Sentence length will be randomized between the control and experimental groups.

At Week 0, interested inmates will meet individually with a research assistant. Study procedures will be explained and informed consent will be given. Height and weight will be measured to determine eligibility (individuals with BMI < 18.5 will be ineligible for participation). Eligibility will be reviewed and eligible participants will be randomized. Participants enrolled in both groups will complete a pre-test questionnaire and biological measurements at Week 0. The pre-test questionnaire will gather information on substance use, medical conditions related to weight change, obesogenic medication use, current health-behaviors surrounding diet and exercise and perceived stress. Biological measures will include height, weight, waist circumference, blood pressure, and percent body fat. All biological measures will be conducted by a single researcher to prevent bias.

After collecting baseline data at Week 0, women in the intervention group will be given an “intervention pack” including exercise cards, nutrition tip 1, a pedometer, and “tracker sheet.” The tracker sheet will encourage gradual behavioral change and provide a way to monitor progress. Women will meet each week with intervention leaders to discuss successes and challenges of the week related to the intervention. Points will be calculated based on habits recorded on the tracker sheet and participants will be notified of their weekly points. We expect that accumulating points from engaging in healthy habits will motivate

participants and allow easy tracking of personal progress. The intervention leaders will provide a new “tracker sheet” and an additional nutrition tip.

At Week 6, participants in the intervention and control groups will complete a post-test questionnaire and biological measurements. The post-test questionnaire will gather quantitative data on exercise and eating habits, current medications, and perceived stress. Participants in the experimental group will be able to keep the intervention pack and copies of their tracker sheets. Participants in the control group will be offered the intervention.

	Week 0	Week 1-5	Week 6
EXP	Consent and eligibility Pre-test questionnaire Physiological measures Provide with intervention tools and Calendar Week 0	Provide calendar Provide weekly tip cards	Post-test questionnaire Physiological measures
CNTRL	Consent and eligibility Pre-test questionnaire Physiological measures	--	Post-test questionnaire Physiological measures Provide with intervention tools and Calendar Week 6

Specific Procedures or Treatments

Physiological measures taken at Week 0 and Week 6 will include height, weight, blood pressure, waist circumference, and percent body fat. These measures will be collected by the same research assistant (a second-year medical student) for all participants. The pre-test and post-test questionnaires will include questions regarding substance use, medical conditions related to weight change, obesogenic medication use, current and post-intervention health behaviors and perceived stress (via the validated 10-item Perceived Stress Scale).

Data Analysis

Using multivariable regression to control for substance use status, medications, pre-existing medical conditions and time since commitment, mean change in percent body fat, weight, blood pressure and waist circumference from week 0 to week six in the intervention group will be compared to the mean change in of those variables in the control group using a two-sided t-test of differences of means and a p- value of .05. All things held constant, the change in the mean perceived stress level among the intervention group will also be compared to the change in the in the mean perceived stress level of the comparison using a two-sided t-test of differences of means and a p-value of .05.

Using pre- and post-test measures, the mean change in healthy behaviors and attitudes towards nutrition and exercise among the intervention group will also be quantified and compared to the mean change in healthy behaviors and attitudes of the control group using a two-sided t-test of differences of means and p-value of .05. Additionally, data from the tracking sheet including steps taken, exercise cards used and number of nutrition tips completed will be compared at 6 weeks to baseline using a paired t-test and a p-value of .05 within the intervention.

Protection of the Subject/Confidentiality of Data

We anticipate that any risks will be minimal and related to increased exercise. The physical therapist, dietician, and medical director are aware of this project and will coordinate follow-- --up care as needed.

All information collected will be kept completely confidential. Participants will be assigned a unique research number. Participant names and research numbers will be placed in one location (The Center for Prisoner Health and Human Rights in Providence, RI) that will be locked at all times except when they are being used by selected research staff. Materials containing participant names will never be located in the same place as data collected with research numbers. Thus, none of the study information will be made known to the ACI, parole boards, and other authorities. However, if participants indicate that they are **a threat to the security of the prison, we will have to be report this to the prison authorities. Also, any participant threats or intent to harm themselves or others must be reported. In addition, if participants reveal any information about a child being abused, exploited, or neglected, the researchers will report this information.** However, it is the policy of these agencies and these investigators that every attempt will be made to resist demands to release information that identifies participants.

Informed consent procedure

Participants will be recruited from adult females (age 18 or older) incarcerated in the Rhode Island Department of Corrections Gloria McDonald Awaiting Trial and Medium Security Facility. Enrollment will be limited to women who have a BMI ≥ 18.5 (including BMIs considered normal, overweight, and obese). Individuals with a current or past medical condition deemed unsafe for participation in an exercise/nutrition intervention will be excluded. We plan to enroll 40 women in this pilot study: 20 participants will be randomly enrolled in the intervention group and 20 participants will be enrolled in the wait list comparison group. If there is more interest than availability for participation, we will first enroll women on the basis of sentence length. Women with the longest sentence remaining will be enrolled first, and enrollment will continue until study capacity is reached.

Flyers will be posted in C and D wings (the wings for sentenced inmates) and sign-up sheets will be placed nearby. On Day 0 of the protocol, brief, individual meetings will be scheduled with inmates and one of two research assistants (a second-year Masters of Public Health student and a second-year medical student) where informed consent will be given. If eligible and consented, Week 0 procedures will begin.

Risks and Benefits

We do not expect participation to pose any risks beyond those of everyday living, and we don't anticipate that follow-up care will be necessary. However, the physical therapist, dietician, and medical director are aware of this project and will coordinate follow-up care as needed.

When performing bodyweight exercises, incorrect form can lead to pain or injury. Although risks are expected to be minimal and similar to any physical exercise, the exercises may be challenging for some women. The cards include suggestions for modifying exercise difficulty as recommended by a physical trainer. We will recommend that all participants use warm up cards and cool down cards. Additionally, participants will be encouraged to gradually increase number of exercise cards completed and to stop performing an exercise if it causes pain. We will encourage walking as an appropriate alternative for women who cannot do some of the bodyweight exercise.

This intervention is intentionally not focused on weight to avoid encouraging unhealthy strategies for weight loss, and individuals with a BMI < 18.5 (considered underweight) will be excluded from participation as a precautionary measure.

While adverse events are unlikely, research participants may report any events that arise to research assistants during a weekly meeting so that it can be brought to the PI. Additionally, participants may report to the medical staff directly for consultation. Any incident reported to the research team or the medical team will be documented for evaluation of the intervention. The medical team will decide in consultation with the participant whether or not it is safe for them to continue participating in the study.

If participants complete the study, they will be able to keep the cards, pedometer, and copies of their tracking sheets. Information they provide will enable researchers to better understand how to encourage incarcerated women to use healthy living habits.

Risks posed in this study are no greater than those posed by moderate intensity exercise. The risk of participation is minimal and related only to misuse or overuse of the exercise cards. The potential benefits of this study include strategies for the development of long-term, sustainable healthy eating habits and exercise practice. We believe that these strategies and tools (exercise and healthy eating tip deck, pedometer) will not only benefit participants while they are incarcerated, but also may be useful to participants once they have been released.

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8. Baldwin, N., Clarke, J.G. Healthy Bodies (on the) Inside: Qualitative Groundwork for a collaborative health intervention. (in prep)
9. Cohen, S., & Williamson, G. (1988). Perceived stress in a probability sample of the United States. In S. Spacapan & S. Oskamp (Eds.), *The social psychology of health: Claremont Symposium on applied social psychology*. Newbury Park, CA: Sage.

Appendix C: IRB Approval, Medical Research Advisory Group Approval & Letter of Support



BROWN

Office of Research Integrity
Box 1986
Providence, RI 02912
Tel: (401) 863-3050
Fax: (401) 863-7292

All pertinent Federal and University policies and guidelines related to the involvement of participants in research can be obtained through the Human Research Protection Program at <http://www.brown.edu/research/institutional-review-board-irb>. This includes the *Belmont Report*, 45 CFR 46, and the Brown University Federal Wide Assurance #00004460.

Memorandum

To: Allegra Scharff, Box G-S121-3
Samantha Rosenthal, Box G-S121-2
From: Human Research Protection Program
Date: October 17, 2016
RE: Protocol Entitled: Healthy Bodies on the Inside: A Pilot Intervention for Developing Healthy Eating and Exercise Habits (PRISONERS) (#1608001592).

The above referenced protocol received a full board review and approval by the Brown University IRB on September 15, 2016. IRB approval is valid for 1 year from September 15, 2016 through September 15, 2017.

Should the research continue, the next progress report must be submitted two months prior to the expiration date for review and approval.

Any amendments or changes to the research protocol including changes to the consent documents and questionnaires/surveys must be submitted to the IRB for review and approval prior to implementation. Also, any change in the status of participants to any of the vulnerable populations (as identified in 45 CFR 46) including, pregnant women, prisoners, or those with diminished capacity, requires IRB review and approval prior to their continuing in the study.

The IRB anticipates that investigators will employ recruitment procedures that allow for the equitable recruitment of women and minorities into research studies.

Note: All research staff must successfully complete the Brown University Education Program in the Protection of Human Research Participants (CITI) at <http://www.citiprogram.org> prior to beginning work on the project.

*** For Your Information ***

The next deadline for submission of new protocols, amendments to protocols, and annual progress reports requiring full board review is October 31, 2016.

Renzi, Jeff (DOC) Jeff.Renzi@doc.ri.gov via rigov 11/21/16 ☆

to me ▾

Hello Allegra;

I wanted to let you know that your request submitted to the Medical Review Advisory Group for Healthy Bodies on the Inside: A Pilot Intervention for Developing Healthy Eating and Exercise Habits was reviewed on November 15, 2016. The Medical Review Advisory Group recommended approval and your request was subsequently approved by Director A.T. Wall on November 18, 2016.

I will forward a more formal letter regarding approval, but I wanted to let you know via e-mail that the request has been approved. If you have questions at all, please contact me.

Jeffrey Renzi
Associate Director Planning and Research

Appendix D: Consent Form

CONSENT FOR BROWN UNIVERSITY RESEARCH STUDY

Project Title & Number:
Healthy Bodies on the Inside: A Pilot Intervention
For Developing Healthy Eating and Exercise Habits
(#1608001592)

Principal Investigator:
Allegra Scharff

You have been asked to take part in a research project described below.

The research assistant will explain the project to you in detail. You should feel free to ask questions. If you have more questions later, Allegra Scharff, the person mainly responsible for this study, (Phone: 401-484-1459) will discuss them with you.

1. The Study:

You have been asked to take part in the following study:

You are being asked to participate in this study because you are currently in a women's prison. We plan to ask 40 women in the ACI to participate in this study over a 12-week period.

The person in charge of this study is Allegra Scharff. Amber Cardoos will be helping to explain the exercises and to analyze the results of the surveys. The purpose of this study is to test a program that encourages healthy eating and exercise habits among incarcerated women.

2. What Will Be Done:

If you decide to participate in the study, here is what will happen:

If you decide to participate in this study, you will be asked to complete a questionnaire where you will provide information on your current exercise and eating habits, stress levels, medication use, drug use and smoking, and demographics (such as age and race/ethnicity). In addition, we will measure how tall you are, how much you weigh, your blood pressure, your percent body fat, and what size your waist is. The questionnaire and measurements will take about 30 minutes to complete. These will help us determine if you are eligible to take part in the study. If you are eligible, you will be randomly assigned to a group. One group will start the study right away, and the other group will wait 6 weeks before starting.

When you begin the study, we will give you a deck of cards that will provide information on exercises and healthy eating habits. Research staff will teach you how to use these exercise cards correctly. We will also give you a pedometer, or a device that counts steps. We will ask that you track your use of the cards and pedometer on a calendar that we give to you. We will

meet once per week for 6 weeks to give you a new calendar and collect your old calendar. At the end of the study, we will take the same body measurements that we took at the beginning of the study. Two weeks after the end of the study, you will be asked to complete another questionnaire and have measurements taken again. You will be able to keep the cards, pedometer, and copies of your calendars even if you decide to leave the study.

3. What is Experimental:

The parts of the study that are experimental are:

If you decide to participate in this study, we will give you a deck of cards with exercise tips and healthy eating habits. These cards have not been used before.

4. Risks or Discomforts:

These risks or discomforts have been known to happen; they could happen to you:

We do not expect your participation in this project to pose any risk to you beyond those of everyday living. When performing bodyweight exercises, incorrect form can lead to pain or injury. If you experience pain, you should stop performing that exercise. On the questionnaires, you do not have to answer any questions that you are uncomfortable answering. However, if you tell us that you are a **threat to the security of the prison, we will have to report this to the prison authorities. Also, any threats to harm yourself or others must be reported.**

5. Benefits:

The benefits of this study are:

There are no direct benefits for study participants. However, the information you provide may enable us to better understand how to encourage women to use healthy living habits.

6. Alternatives:

You do not have to participate in this study.

Taking part in this project is entirely voluntary. You are free to decide not to participate and there is no penalty for deciding not to participate. Also, if you initially decide to participate, you may change your mind at any point and may quit at any time. If you decide not to participate it will not affect the health care services, you normally receive. On the questionnaires, you do not have to answer any questions that you are uncomfortable answering. **Study participation will not affect probation or parole status and will not affect inmate privileges. Also, "Good Time" (days earned off your sentence) will not be earned by participating in this study.**

7. Confidentiality: Your part in this study is confidential. None of the information will identify you by name. The information gathered from the study may be used for medical publication. The information that you will provide will be kept completely confidential. Your name and research number will be placed in one location that will be locked at all times

except when they are being used by the research staff. Thus, none of the study information will be made known to the ACI, parole boards, and other authorities. If you tell us that you are **a threat to the security of the prison, we will have to report this to the prison authorities. Also, any threats or intent to harm yourself or others must be reported. In addition, if you reveal any information about elder abuse or a child being abused, exploited, or neglected, the researchers will report this information.** However, it is the policy of these agencies and these investigators that every attempt will be made to resist demands to release information that identifies you.

8. Your Decision and Right to Quit at Any Time: The decision whether or not to take part in this study is up to you. You do not have to participate. If you decide to take part in the study, you may quit at any time. If you quit you will still be able to keep the study materials you were given including exercise cards, pedometer, nutrition tip cards and calendars.
9. Rights and Complaints: If you are not satisfied with the way this study is performed, you may report your complaints (anonymously, if you choose) to the Brown University Human Research Protection Program, **1-866-309-2095**. You can call them collect. You may discuss any questions about your rights as a research subject with Allegra Scharff (Phone: **401-484-1459**)
10. Compensation in Case of Injury: If this study causes you any injury, you should request **medical attention from the prison so you can be treated for your injury. You should also inform Allegra (401-484-1459).**
11. Your Consent: Your signature on this form means that you understand the information, and that you have decided to participate in the study.

A copy of this form will go to:

_____ You _____ Researcher
_____ Other (Specify)

I HAVE READ THE CONSENT FORM AND UNDERSTAND IT. ALL MY QUESTIONS HAVE BEEN ANSWERED TO MY SATISFACTION. I AGREE TO TAKE PART IN THE STUDY.

Signature of Participant

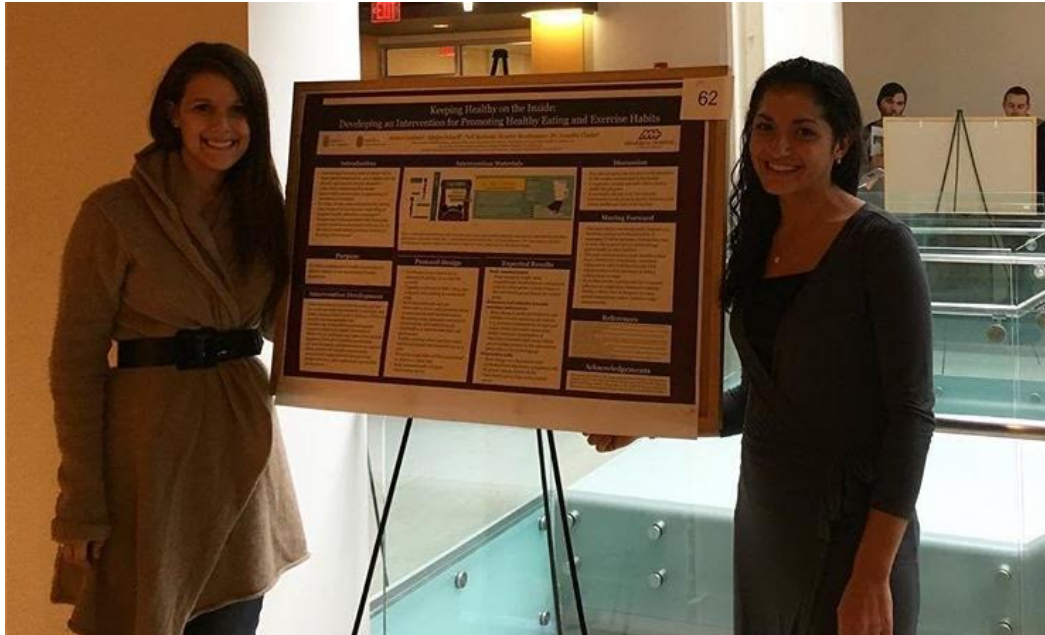
Name of Person Explaining the Study
(Print or Type)

Date

Signature of Person Explaining Study

Appendix E: Presentations of Formative Research and Intervention Design

Presenting at the 2016 Warren Alpert Medical School Summer Research Showcase



Presenting at the 2016 American Public Health Association conference



Appendix F: Additional Exercise Cards



Jog in place while lifting knees as high as possible towards belly



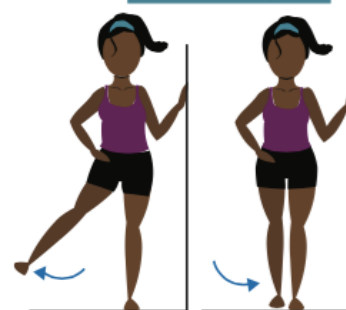
HIGH-KNEES



NOTE: do one leg at a time to feel the burn!

- 1 Raise one leg to the side while squeezing your butt
- 2 Bring leg back towards the ground and let it hover just above the floor

hold wall for support



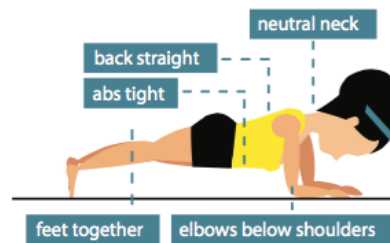
- 3 Repeat with one leg, then switch to other leg

SIDE KICKS

Works glutes, quads



- 1 Get into Plank position below



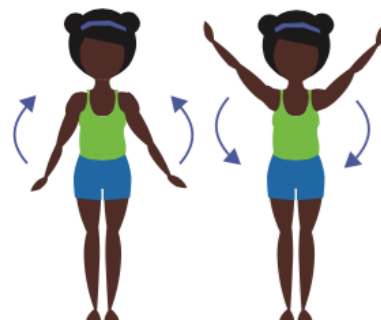
- 2 Hold this position and feel the burn in your core! Make sure to put even weight across forearms and toes while working core

PLANKS

Works entire body, especially core



Slowly breath in while bringing arms above head. Hold position for 3 seconds



Slowly exhale while bringing arms down to your side

BREATHING STRETCH