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Kvist, Kristi C. *The Effect of Nutrition and Nutrition Education on Alcohol Cravings*

Abstract

The annual cost of alcohol abuse in the US is estimated to be approximately \$180 billion (Rice, 1999). Alcohol intoxication is the third leading cause of preventable deaths (Mokdad, Marks, Stroup, & Gerberding, 2004). Traditional methods of recovery have not been very successful with about 90% of alcoholics experiencing at least one relapse within 4 years after alcohol treatment (National Institute of Alcohol Abuse and Alcoholism, 2000b). Most of the traditional treatments consist of talk therapy in the form of counseling and group therapy. Due to the high cost and relapse rate it is necessary to investigate other strategies, such as nutrition, to reduce these numbers.

This study examines whether a modified diet and in depth nutrition education is effective in reducing alcohol cravings during recovery (an indicator of relapse rate). A pre- and post-Alcohol Cravings Questionnaire (ACQ) was collected from volunteers in the experimental group at “A Woman’s Way” drug and alcohol treatment center and a post-ACQ was collected from volunteers at Wayside treatment center, the control. Weekly nutrition education and a specific nutrition prescription were given to the woman at “A Woman’s Way” treatment center. The modified diet and weekly nutrition education was found to be effective in lowering the alcohol cravings in the treatment group.

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Chapter I: Introduction

The Cost of Alcohol Abuse

The human cost of alcohol abuse is high. Intoxication is the third leading cause of preventable deaths in the United States. (Mokdad, Marks, Stroup, & Gerberding, 2004). In 2001, Minnesota suffered 1,324 deaths attributable to alcohol (see Figure 1, Minnesota Department of Health, 2004). Hunting and fishing accidents, motor vehicle crashes, fires, falls, and drowning are among the injuries and deaths associated with alcohol. Alcohol also contributes to violence such as child abuse, homicide, suicide, and assault (Centers for Disease Control and Prevention, 2010). In addition, long term excessive alcohol use can lead to chronic health problems such as liver disease, including alcoholic hepatitis and cirrhosis, neurological and psychiatric disorders, cancer, and cardiac diseases (Centers for Disease Control and Prevention, 2010).

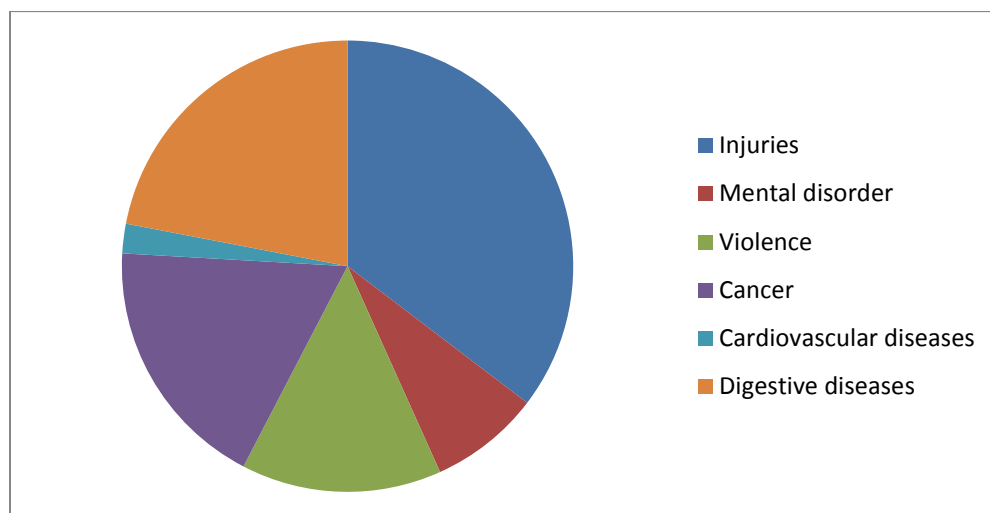


Figure 1. Alcohol attributable deaths by cause, Minnesota, 2001

The economic cost of alcohol abuse is also high. In 2001, Minnesota lost an estimated \$4.5 billion mainly due to loss of productivity (65%). Table 1 (National Institute on Alcohol

Abuse and Alcoholism, 2000a) shows the breakdown of those costs. Most of that loss was due to illness, injury, and premature death. Other costs can be ascribed to hospitalizations, insurance, repair or replacement of property (such as automobiles), social welfare administration, fire destruction, attorney fees, and other criminal justice system costs of alcohol related crime.

Table 1

Estimated Economic Costs of Alcohol Abuse in Minnesota, 2001

Health care expenditures	Costs associated
Alcohol use disorders: Treatment, prevention, and support	\$180,000,000
Medical consequences of alcohol consumption	\$469,000,000
Total	\$649,000,000
Productivity impacts	
Lost productivity due to alcohol related illness	\$2,002,000,000
Lost future earnings due to premature deaths	\$885,000,000
Lost productivity due to alcohol related crime	\$62,000,000
Total	\$2,949,000,000
Other impacts on society	
Motor vehicle crashes	\$424,000,000
Crime	\$94,000,000
Fire destruction	\$155,000,000
Social welfare administration	\$290,000,000
Total	\$963,000,000
Total costs	\$4,561,000,000

Most of the cost of alcohol abuse is borne by persons and organizations other than the alcohol abusers themselves. About 20% is absorbed by the Federal government and 18% by state and local governments. Another 10% is picked up by private insurance, and 6% by victims

of alcohol-related crimes and non-drinking victims of alcohol-related motor vehicle crashes (National Institute on Alcohol Abuse and Alcoholism, 2000a). The abusers and their families pay for about 45%, almost all due to lost or reduced earnings.

Alcohol Treatment

Alcoholics Anonymous (AA) is the most widely recognized treatment methodology for alcoholics. AA was founded by Bill Wilson and Bob Smith in 1935, and is based on the 12 steps with the premise that turning one's life over to a "higher power" is the key to recovery (Huebner & Kantor, 2011).

The Minnesota Model of addiction treatment was developed in the 1950's by the Hazelden Foundation (Huebner & Kantor, 2011). This model of care focuses on a 28-day individualized inpatient treatment plan that also includes involvement of family members. The Minnesota Model also applies the 12-step principles of AA and encourages people in recovery to continue AA during and after treatment. This is also called the twelve-step facilitation therapy (TSF). Hazelden took the position that alcoholism is a disease and not a character defect of individuals who lacked will power (Huebner & Kantor, 2011). Hazelden also believed that alcoholism affects people physically, mentally, and spiritually, and that treatment is needed to address all three of these aspects of an individual in order to achieve full recovery.

The majority of treatment in the Minnesota model is talk therapy in the form of counseling and group therapy (Huebner & Kantor, 2011). The concept behind the Minnesota Model is that people drink to deal with painful, emotional or psychological problems, and when those problems are identified and resolved, the person will no longer be motivated to drink excessively. Treatment for the alcoholic is group therapy and individual counseling sessions, and this process of self-discovery is thought to help the alcoholic stay sober after treatment.

Unfortunately, the success rate in these talk therapy treatment centers is relatively low (20% success rate) long term. Alcoholics who receive no treatment also have about a 20% success rate in overcoming their addiction (Larson, 1992).

In the 1980's outpatient treatment became more prevalent as the treatment of alcoholism in an attempt to contain the cost. Outpatient treatment programs have focused on behavior therapy where the main objective was to change the behavior of the patient (Coombs, 2004). Two examples of these therapies are cognitive behavior therapy (CBT) that includes relapse prevention and motivational enhancement therapy (MET).

The Project Match study focused on matching patient characteristics with different treatment approaches. The idea was to help people in the addiction field match patients with a specific treatment that would give the most benefit. The three therapies that were tested were twelve-step facilitation therapy (TSF), cognitive behavior therapy (CBT), and motivational enhancement therapy (MET). All three therapies had low rates of success after one year. Twenty-four percent of the TSF treated outpatients stayed abstinent for 1 year after treatment. Fifteen percent of the CBT treated outpatients stayed abstinent for 1 year after treatment, and 14% of the MET treated outpatients stayed abstinent for 1 year (Fuller & Hiller-Sturmhofel, 1999).

Medications such as disulfiram, naltrexone, and acamprosate are other forms of treatment for alcoholism, although medication-assisted treatment accounts for only a small percentage of ongoing substance abuse treatment in this country (O'Mailey & O'Connor, 2011). Disulfiram (Antabuse) is an alcohol sensitizing drug that causes a person to have a physical reaction to alcohol that includes flushing, nausea, vomiting, and headaches. Naltrexone (ReVia) is a drug that is an opiate receptor blocker and can help reduce the urge to drink. Acamprosate (Campral)

is used to help reduce alcohol cravings. Some of these medications have been shown to be useful in the treatment of alcohol dependence, but they also have their limitations. With disulfiram medication compliance is a problem. Naltrexone can cause side effects such as nausea, headaches, and dizziness, and two studies conducted in the United States did not find overall efficacy for acamprosate (O'Malley & O'Connor, 2011).

Evidence suggests that about 90% of alcoholics experience at least one relapse within 4 years after alcohol treatment (National Institute of Alcohol Abuse and Alcoholism, 2000b). The National Institute on Alcohol Abuse and Alcoholism (2000a) reports a 185 billion dollar cost to our country every year due to alcoholism. Due to the high cost and relapse rate, it is a necessity to investigate other strategies, such as nutrition, to reduce these numbers.

Medical nutrition therapy is not typically provided in substance abuse treatment centers specifically for reduction of cravings or increased recovery rates. One study showed that nutrition services, especially nutrition education, showed an improvement in the Addiction Severity Index (ASI) with psychological, medical and family/social areas ranging from 55% to 99%. The control program in this study that did not offer nutrition education services showed ASI scores that had declined by a range of 67% to 104% (Grant, Haughton, & Sachan, 2004).

Statement of the Problem

The purpose of this study was to examine if nutrition therapy through a modified diet and four weekly nutrition classes was effective in reducing alcohol cravings for women who are receiving inpatient substance abuse treatment.

Research Objective

1. To investigate whether a modified diet and weekly nutrition education can reduce cravings for alcohol in a substance abuse treatment center.

Definition of Terms

The following words are defined in order to lend clarity to the content of this study:

Alpha-linolenic acid: ALA, 18:3n-3, 18:3w3. Essential fatty acid with eighteen carbon atoms and three double bonds at carbons 9, 12 and 15, and the last double bond is at the 3rd carbon from the terminal methyl end. It is a minor component of vegetable oils (Gunstone & Herslog, 2000).

Arachidonic acid (AA) 20:4n-6, 20:4w6. A polyunsaturated fatty acid with a carbon chain of twenty carbon atoms and four double bonds at carbons 5, 8, 11 and 14, so that the last double bond is at the 6th carbon from the terminal methyl end. It is the most abundant polyunsaturated fatty acid in mammals, except in the brain and retina (Gunstone & Herslog, 2000).

Bipolar disorder. Bipolar Disorder is a mental illness characterized by the presence of one or more of the following: manic episode, mixed episode or hypomanic episode. Only one of these episodes needs to occur just once during the lifetime of an individual in order for that individual to be considered as suffering from Bipolar Disorder. (American Psychiatric Association, 2000).

Docosahexaenoic acid (DHA), 22:6n-3, 22:6w3. One of the two major omega-3 polyunsaturated fatty acids found abundantly in fish oils, and the most abundant polyunsaturated fatty acid in the brain and retina. It has a carbon chain with twenty-two carbon atoms and six double bonds at carbons 4, 7, 10, 13, 16 and 19, and the last double bond is at the 3rd carbon from the terminal methyl end (Gunstone & Herslog, 2000).

Dopamine. “Dopamine is a neurotransmitter that is derived from the amino acid tyrosine, and is structurally related to norepinephrine. Dopamine produces inhibitory postsynaptic potentials. It is involved in movement, learning and motivation” (World Health Organization, 2004, p. 34).

Dyslipidemia. “An abnormality in any one of the lipoprotein fractions” (Mahan & Escott-Stump, 2008, p. 884).

Eicosapentaenoic acid (EPA) 20:5n-3, 20:5w3. One of the two major omega-3 polyunsaturated fatty acids, which is found abundantly in fish oils. It has a carbon chain with twenty carbon atoms and five double bonds at carbons 5, 8, 11, 14 and 17, and the last double bond is at the 3rd carbon from the terminal methyl end (Gunstone & Herslog, 2000).

Essential fatty acids (EFA). Are a group of polyunsaturated fatty acids which are necessary for health in mammals. They cannot be synthesized, so must be supplied in the diet. Two groups are recognized, omega-3 polyunsaturates and omega-6 polyunsaturates (Gunstone & Herslog, 2000).

Hedonic pathway. “A pathway localized to the ventral tegmental area (VTA) and the nucleus accumbens (NA) which regulates pleasurable and motivating responses to stimuli. The hedonic pathway responds to drugs of abuse, such as nicotine and morphine. Food intake is also responsive to activation of the hedonic pathway” (Lustig, 2006).

Hepatic steatosis. “A fatty liver” (Mahan & Escott-Stump, 2008, p. 707).

Hypoglycemic. “Low blood glucose level (70 mg/dl or less) caused by the administration of excessive insulin or insulin secretagogues, too little food, delayed or missed meals or snacks, increased exercise or other physical activity, or alcohol intake without food” (Mahan & Escott-Stump, 2008, p. 765).

Insulin resistance. “An impaired biologic response (sensitivity) to either exogenous or endogenous insulin; involved in the etiology of type 2 diabetes” (Mahan & Escott-Stump, 2008, p. 765).

Linoleic acid: (LA) 18:2n-6, 18:2w6. Essential fatty acid with eighteen carbon atoms and two double bonds at carbons 9 and 12, and the second double bond is at the 6th carbon from the terminal methyl end. It is a major fatty acid of vegetable oil (Gunstone & Herslog, 2000).

Neurotransmitter. “A chemical substance that is released synaptically from one neuron and that affects another cell in a specific manner” (World Health Organization, 2004, p. 32).

Nucleus accumbens. “The nucleus accumbens is a very important brain area involved in motivation and learning, and signaling the motivational value of stimuli” (World Health Organization, 2004, p. 24).

Omega 3 (w 3 or n-3). Convention used to number the carbon atoms in a fatty acid chain from the terminal methyl end. Thus omega-3 polyunsaturated fatty acids have the last double bond located at the 3rd carbon from the methyl end. The remaining double bonds follow sequentially with one CH₂ between them (Gunstone & Herslog, 2000).

Omega-6 (w6, n-6). Same as omega-3, but with the last double bond is at the 6th carbon from the methyl end (Gunstone & Herslog, 2000).

Saccharin. “A nonnutritive sweetener” (Mahan & Escott-Stump, 2008, p. 449).

Assumptions and Limitations

This study makes two important assumptions. First, women in the research treatment center would be willing participants in this study through filling out the questionnaires and history honestly, participating in weekly nutrition education classes, and following the prescribed diet to the best of their ability. Second, the research treatment facility provided and prepared the

food that was required for the study and provided the time and space for weekly nutrition education classes. It was assumed that the participants ate the food provided.

The limitations of this study are as follows: First, the concept of cravings is subjective and is therefore hard to collect and analyze concrete data for examination. Second, the study was designed to have the women complete the 26 question history and the pre-ACQ (Alcohol Craving Questionnaire) during admittance. Often at this time the women were in a state of withdrawal which may have affected how the forms were filled out. Third, the population in the study was small and may be non-representative of the entire population. Fourth, the study was specific to alcohol abuse in the literature review and data collection. In reality most women entering an inpatient treatment are poly-substance abusers and their cravings may be different.

Chapter II: Literature Review

Introduction

The annual cost of alcohol-related problems in the US is 179.9 billion dollars which is more than the cost associated with hard drugs and tobacco combined (Rice, 1999). Evidence suggests that about 90% of alcoholics experience at least one relapse within 4 years after alcohol treatment (National Institute of Alcohol Abuse and Alcoholism, 2000b). Due to the high cost and relapse rate it is necessary to investigate other strategies, such as nutrition, to reduce these numbers.

Alcohol and Nutrient Deficiencies

Heavy drinking can cause nutrient deficiencies through inadequate intake of regular meals and an appetite-suppressing effect of large amounts of alcohol. Inadequate absorption due to damage in the lining of the stomach and the small intestines is also a factor, as is damage to the liver and pancreas. Poor intake and decreased absorption can lead to mineral and vitamin deficiencies, including mineral deficiencies of calcium, magnesium and zinc, and the vitamin deficiencies of thiamin, folic acid, pyridoxine, riboflavin, and vitamins A, E, D, and K (Lieber, 1995). Excessive drinking and malnutrition can also lead to a variety of health problems such as liver and pancreas damage, alcoholic cardiomyopathy, stroke, increased blood pressure, and an increased risk for certain types of cancers such as mouth, esophagus, liver, and breast cancer (National Institute of Alcohol Abuse and Alcoholism, 2010).

Alcohol and Diet

Dr. Rosalind Breslow, an epidemiologist at the National Institute of Alcohol and Alcohol Abuse (NIAAA), studied some of the connections between diet and alcohol (National Institute of Alcohol Abuse and Alcoholism, 2011). She analyzed data collected from the National Health

and Nutrition Examination Survey (NHANES), a large research study designed to assess the health and nutritional status of people living in the United States. Dr. Breslow also analyzed information from scores on the Healthy Eating Index-2005 (HEI). The HEI is managed through the United States Department of Agriculture (USDA). The HEI examines the diet quality of people living in the United States and how well these individuals are following the 2005 U.S. Dietary Guidelines for Americans (National Institute of Alcohol Abuse and Alcoholism, 2011)

Dr. Breslow found that heavier drinkers ate less fruits and consumed more calories in the form of alcoholic beverages and foods high in unhealthy fats and added sugars. Overall as the number of drinks people consumed daily went up, their HEI scores went down (National Institute of Alcohol Abuse and Alcoholism, 2011)

One study, created to show the relationship between diet and alcohol consumption, was designed to test the effects of a teenage-type diet (known to be marginal in nutrients) and the free choice consumption of alcohol in rats. In addition to the marginal nutrients in the diet, coffee and spices were also added. The rats ate the teenage-type diet that contained the same calorie count as the control diet, but was higher in fat and lower in protein and carbohydrates. The diet was also lower in vitamin A, thiamin, riboflavin, niacin, ascorbic acid, iron, and calcium. The results showed the rats on the teenage-type diet ingested large amounts of an unsweetened 10% ethanol solution, but when the rats were fed the control diet, alcohol consumption was significantly reduced. This study also showed that coffee significantly increased alcohol consumption in rats. Caffeine is thought to be the active ingredient in the coffee, since decaffeinated coffee did not significantly affect the rat's alcohol consumption. Spices also showed no significant relationship to alcohol consumption (Register et al., 1972).

Another study using human subjects was set up to analyze the differences in alcohol craving, hypoglycemic symptoms, nutrient intake, and length of sobriety of two treatment groups enrolled in an inpatient alcohol rehabilitation program. The control group consumed a regular hospital diet and had a basic nutrition class. The research group included a diet that was higher in complex carbohydrates, restricted in simple sugars, and no caffeine. The research group also included three individualized nutrition counseling sessions. Four months after discharge from treatment the research group reported no alcohol intake, less alcohol craving, and less sugar intake than the control group. Alcohol cravings and sugar intake was significantly correlated. Alcohol cravings decreased from 80% before treatment to 17% after treatment in the research group. The control group had an increase in alcohol cravings from 50% before treatment to 80% after treatment (Biery, Williford, & McMullen, 1991).

Alcohol and Sugar

Individuals who are in recovery, especially people who are in early stages of recovery, notice that their cravings and intake of sugar increase. Individual reports also include that the cravings and intake of sugar decrease when drinking alcohol resumes. Colditz et al. (1991) showed that women who drink alcohol decreased their carbohydrate consumption when compared to women who abstain mainly due to a decrease in sugar consumption. In simpler words, the more a woman drank, the less sugar she consumed. Also, overall energy consumption, excluding alcohol, was similar between men who drank and abstainers but sucrose intake also decreased in men when alcohol intake increased (Colditz et al., 1991).

An article by Robert Lustig examined the similarities between fructose and alcohol, since alcohol is made by the fermentation of fructose (2010). When Lustig looked at how fructose is metabolized in the liver and how fructose acts on the brain, he found metabolic parallels to

alcohol (See Table 2, Lustig, 2010). First, fructose metabolism in the liver is similar to alcohol, which means both can lead to hepatic insulin resistance, dyslipidemia, and hepatic steatosis with chronic ingestion. Second, both stimulate the hedonic pathway of the brain which leads to habit forming behaviors and possible dependence. Furthermore, both sugar and alcohol are legal and abundantly available in society (Lustig, 2010).

Table 2

Similarities of Chronic Alcohol Exposure to Chronic Fructose Exposure

Chronic ethanol exposure	Chronic fructose exposure
Hematologic disorders	
Electrolyte abnormalities	
Hypertension	Hypertension
Cardiac dilatation	
Cardiomyopathy	Myocardial infarction (dyslipidemia, insulin resistance)
Dyslipidemia	Dyslipidemia (de novo lipogenesis)
Pancreatitis	Pancreatitis (hypertriglyceridemia)
Obesity (insulin resistance)	Obesity (insulin resistance)
Malnutrition	Malnutrition (obesity)
Hepatic dysfunction (ASH) ^a	Hepatic dysfunction (NASH) ^b
Fetal alcohol syndrome	
Addiction	Habituation, if not addiction

^a ASH = alcoholic steatohepatitis

^b NASH = non-alcoholic steatohepatitis

One possible cause behind the sugar and alcohol connection is that sugar and alcohol work by the same mechanism in the brain and share similar behavioral and neurotransmitter activity. Alcohol and other drugs of abuse increase dopamine in the brain's nucleus accumbens (NA) which is an important area for learning and motivation. The NA is referred to as the pleasure center of the brain and is receptive to morphine, nicotine, and ethanol. Other stimuli that release dopamine in the NA are food, water, and sex (World Health Organization, 2004). Alcohol intake and even the anticipation of alcohol consumption produce a dopamine release in the NA (Weiss, Lorang, Bloom, & Koob, 1993). The release of dopamine in the NA is thought to be a significant contributor to alcohol dependence. "Psychological dependence on alcohol develops because alcohol related stimuli acquire excessive motivational properties that induce an intense desire to consume alcohol containing beverages (i.e., craving)" (Di Chiara, 1997, p. 113). Natural stimuli, such as palatable food, increase dopamine by 45%. Excessive alcohol intake increases dopamine by 500% (Hernandez & Hoebel, 1988). Furthermore, alcohol increases dopamine with every use, whereas palatable food causes dopamine to decline during a long meal and disappears with repetition (Rada, Avena, & Hoebel, 2005).

Studies have shown that sugar, under certain circumstances can have a similar effect on dopamine release in the NA as alcohol. These studies show that when rats binge on sugar NA dopamine is released each time the rat binges. The control rats fed sugar on a non-binge schedule or the rats with intermittent access to chow have a blunted dopamine response that is seen with the intake of regular food. Rats that were fed a diet of intermittent access to chow and a 10% sucrose solution were found to increase their intake over a 21-day period. The rats consumed a large quantity of the sucrose solution within the first hour of access which is referred

to as a binge (Rada et al., 2005). These articles suggest that an intermittent diet of sugar or a sugar binge is more related to alcohol than to food with regard to dopamine release in the NA.

Another symptom of alcohol addiction is withdrawal. Dopamine decreases in the NA of rats with the abrupt disruption of alcohol administration which is thought to be the neural basis of dysphoria (Melis, Spiga, & Diana, 2005).

The physiological aspects of withdrawal in humans and rodents usually last up to 48 hours following termination of alcohol exposure and may include convulsions, motor abnormalities, and autonomic disturbances (e.g., sweating, higher heart rate, and restlessness). Additionally, withdrawal is associated with a negative affective state characterized by anxiety, dysphoria, and irritability that typically develops during early stages of withdrawal and can be very long lasting. Perhaps the most reliable of these disturbances across species is an increase in anxiety. (Gilpin & Koob, 2008, p. 188)

Studies have shown that sugar-addicted rats show physical signs of withdrawal and a decrease in dopamine release in the NA when the sugar solution is removed (Avena, Rada, & Hoebel, 2008). Behavioral changes in rats when sugar was removed include nervous behavior, chattering teeth, shaking bodies, and biting tendencies not seen in the control group (Wideman, Nadzam, & Murphy, 2005). Avena et al. (2008) reported that in rats that are sugar-dependent, aggressive behavior and anxiety were present when sugar was removed from the diet.

Studies with rats have also shown a direct correlation between sugar and alcohol intake. Rats that are alcohol-preferring tend to consume more sucrose solution far beyond what their normal fluid intake would be when compared to non-alcohol preferring rats. Similarly, rats that are genetically bred to prefer alcohol have a tendency to also prefer higher concentrated solutions

of sugar compared to rats that do not prefer alcohol (Kampov-Polevoy, Garbutt, & Janowsky, 1999).

An experiment was designed to see if alcohol-dependent rats consumed greater quantities of sugar after alcohol was removed and vice versa to see if rats on a high sugar diet consumed greater quantities of alcohol when the sugar solution was removed. The conclusion was that the alcohol-dependent rats consumed significantly greater amounts of sugar than the rats that had no prior intake of alcohol. In the next experiment, four groups of rats were fed either a diet of intermittent access to sugar and chow, free access to sugar and chow, intermittent access to chow, or free access to chow for 21 days. The rats were then switched to intermittent access to alcohol in concentrations of 1%, 2%, 4%, 7% and 9%. The rats that were on an intermittent access to sugar and chow consumed the most 9% alcohol solution supporting the suggestion that sugar dependence “alters a rat’s proclivity to drink alcohol” (Avena, Carrillo, Needham, Leibowitz, & Hoebel, 2004, p. 203).

The same relationship with sugar and alcohol was also found with alcohol preferring rats and saccharin. Rats fed a high saccharin solution consumed considerably more 2% and 6% alcohol than the low saccharin rats (Gosnell & Krahn, 1992).

The above studies linking alcohol intake with sugar intake suggest that when alcoholics are new in recovery, the increased craving for and intake of sugar is helping to reduce their cravings for alcohol. A study that followed 64 newly sober patients at an alcohol treatment center analyzed their dietary choices for calories, carbohydrates, sucrose, sugar added to beverages, protein, fats, vitamin, and minerals. The study found that the group who stayed sober the longest chose diets containing twice as much sugar added to beverages and more overall carbohydrates (Yung, Gordis, & Holt, 1983). Alcoholics Anonymous also publishes a booklet

entitled *Living Sober* that suggests using sweets to reduce cravings for alcohol (Alcoholics Anonymous World Services, 1998).

Alcohol and Fatty Acids

Alcoholism leads to nutritional deficiencies. Starting in the 1950s, nutritional deficiencies have been researched as a possible etiology of alcoholism. One of the first researchers on this subject was Roger Williams who wrote the article “Alcoholism as a Nutritional Problem.” Williams wrote that alcoholism and cravings are linked to inadequate nutrition and nutrient deficiencies, and that improving nutrition would reduce the cravings and intake of alcohol (1952). The most recent nutritional deficiency to be researched in alcoholism is the omega-3 (n-3) long chain fatty acids (LCFAs).

Polyunsaturated fatty acids (PUFAs) are divided into two groups, the n-3 fatty acids and the n-6 fatty acids. The fatty acid α -linolenic acid (ALA) is the precursor to the two main n-3 LCFAs, eicosapentaenoic acid (EPA), and docosahexaenoic acid (DHA). Linoleic acid (LA) is the precursor to arachidonic acid (AA), the main n-6 LCFA. Humans are limited in their ability to convert EPA/DHA from ALA and AA from LA; however, humans can absorb directly the LCFAs EPA/DHA and AA from animal sources. The foods highest in EPA/DHA are fish, especially cold water fatty fish such as salmon, herring, and sardines. The n-6 PUFAs are high in seed oils such as corn, soy, and sunflower oil (Muskiet, Fokkema, Schaafsma, Roersma, & Crawford, 2004).

The two groups of PUFAs, the n-3 and n-6, are metabolized by the same enzymes, making them competitive for enzyme binding. A diet high in n-6 LCFAs will decrease the availability of the n-3 LCFA. Research suggests that humans evolved on a ratio of n-6 to n-3

essential fatty acids of about 1:1. Currently in the United States the ratio is about 15:1 of n-6 to n-3 (Simopoulo, 2002).

Deficiencies in n-3 LCFA are known to increase the risk of coronary heart disease, stroke, and cardiovascular disease (Hibbeln, Nieminen, Blasbalg, Riggs, & Lands, 2006).

Deficiencies in n-3 LCFA have also been attributed to an increased risk of some psychiatric disorders such as bipolar disorder, and major, and post partum depression (Schachter et al., 2005).

The International Society for the Study of Fatty Acids and Lipids (ISSFAL) recommends an intake of 500 mg per day of EPA and DHA. This recommendation is based on cardiovascular health (International Society for the Study of Fatty Acids and Lipids, 2004). Joseph Hibbeln, a researcher of psychiatric disorders for the National Institute of Health, recommends a much higher intake of the long chain n-3 fatty acids EPA/DHA of 3.5 g per day for a 2000 kcal diet as a protective measure against heart disease and psychiatric disorders. The recommendation of 3.5 g per day of EPA/DHA would most likely be reduced to one tenth of that by consuming fewer n-6 fatty acids (Hibbeln, Nieminen, Blasbalg, Riggs, & Lands, 2006).

More studies are now being done on the correlation between low n-3 LCFAs intake and plasma levels and substance abuse. A study published in *The Journal of Nutrition* reported that rats that were fed a combination of fish and palm oil with an n-6/n-3 PUFA ratio of 0.14 to 6.19 had cerebral membranes that were higher in n-3 fatty acids and lower in n-6 fatty acids than the control group fed a peanut and rapeseed oil. The rats fed the fish oil also had a 40% higher level of dopamine in their frontal cortex than the control group (Chalon et al., 1998). A lower level of the neurotransmitter dopamine is associated with withdrawal in alcoholics, and is thought to

increase relapse rates (Melis, Spiga, & Diana, 2005). A dopamine deficit is also correlated with alcohol craving, which is associated with a high relapse risk (Heinz et al., 2005).

A diet with sufficient n-3 fatty acids increases the amount found in the plasma and cerebral membranes. Conversely, studies have found that a diet low in essential fatty acids coupled with daily alcohol decreases DHA levels. A study with felines showed that a diet low in essential fatty acids with chronic alcohol exposure significantly decreased the DHA in the plasma and feline livers compared to the control group that were not exposed to alcohol (Pawlosky & Salem, 1995). Another study involving rhesus monkeys on a controlled diet of LA and ALA as 1.4 and 0.08% of the calories plus alcohol of 2.6 g/kg per day also had become depleted in DHA in their livers and plasma compared to the rhesus monkeys in the control group with no alcohol exposure (Pawlosky & Salem, 1999).

Studies involving human subjects found that substance abusers that are low in DHA have an increased rate of relapse compared to substance abusers with higher amounts of plasma DHA. Buydens-Branchey and coworkers followed 35 patients admitted into a substance abuse treatment center for one year. The substances abused were alcohol, cocaine, and heroin or a combination of the three. Dietary questionnaires and blood samples were taken at the start of treatment and also every four months. Relapse rates were examined monthly. The study found that the patients who did not complete the treatment presumably because of relapse and the patients who relapsed had lower levels of DHA than the patients who did not relapse (Buydens-Branchey, Branchey, & Hibbeln, 2009).

Another study involving cocaine addicts found that lower n-3 and n-6 fatty acid levels at the start of substance abuse treatment were significantly correlated with relapse rates. PUFA

levels were actually found to be better predictors of relapse rates than socio-demographic or clinical factors (Buydens-Branchey, Branchey, McMakin, & Hibbeln, 2003).

Even though there is evidence that nutrition can have a significant impact on the recovery rates for alcoholics, medical nutrition therapy and in-depth nutrition education is not typically provided in substance abuse treatment centers. Biery, Williford, and McMullen (1991) have shown in a study with human subjects that a diet that was high in complex carbohydrates, restricted in simple sugars, and had no caffeine caused alcohol cravings to decrease from 80% before treatment to 17% after treatment. The control group, on the other hand, that had consumed a regular hospital diet had an increase in alcohol cravings from 50% to 80%.

Nutritional educational services provide the tools to the patients to make informed nutritional choices when discharged from the treatment facility. Grant, Haughton, and Sachan (2004) have shown that nutrition education facilitated an improvement in the Addiction Severity Index (ASI) in the psychological, medical, and family/social areas ranging from 55% to 99%. The control program in this study that did not offer nutrition education services showed ASI scores that had declined by a range of 67% to 104%.

Due to the high cost and relapse rate of alcoholism, it is necessary to investigate other strategies, such as nutrition, to reduce these numbers. This present study examined whether a modified diet and in depth nutrition education is effective in reducing alcohol cravings during recovery (an indicator of relapse rate). The methods for conducting the study are found in Chapter 3. Chapter 4 provides details of the results and Chapter 5 provides a discussion of the findings.

Chapter III: Methodology

The reason for this study was to investigate if a specific nutritional prescription and nutrition education could help reduce alcohol cravings for women who were in an inpatient drug and alcohol treatment facility. In 2010 and 2011 a pre- and post-Alcohol Craving Questionnaire (ACQ) was collected from volunteers at “A Woman’s Way” drug and alcohol treatment center and a post-ACQ was collected from volunteers at Wayside House treatment center, both located in the Minneapolis area. Weekly nutrition education and a specific nutrition prescription were given to the women at “A Woman’s Way” treatment center.

The nutrition prescription used at “A Woman’s Way” treatment center was based on the nutrition prescription for alcoholism used in the American Dietetic Association’s Nutrition Care Manual with some adjustments (American Dietetic Association, n.d.). The adjusted diet calls for the elimination of all alcohol, even in cooking, because not all of the alcohol is burned off. Limited amounts of sugar and limited amounts of processed and refined carbohydrates such as white flour and white rice were used in meals. There were limited amounts of caffeine with a reduced caffeine coffee provided in the mornings only. Complex carbohydrates such as vegetables, fruit, and whole grains were provided regularly. Three regularly well spaced meals and three snacks, mid morning, late afternoon, and before bed time with no more than 3-4 waking hours between eating were provided. A sufficient amount of protein was included at each meal and snack based on a daily 1 to 2 grams of protein/kg of body weight.

The diet prescribed by the American Dietetic Association in the Nutrition Care Manual advocates a moderate to low fat intake. The diet used at “A Woman’s Way” was a specific fat diet of about 30% of total daily calories. The amount of hydrogenated and partially hydrogenated fat was restricted. The amount of vegetable oil high in omega-6 fatty acid was

also limited. Omega-3 fatty acids in animal and plant forms were recommended as well as monounsaturated fat such as olive oil, peanut oil, and canola oil.

For the duration of the study at “A Woman’s Way,” nutrition education in the form of a Saturday morning class was provided. The classes have four cycling topics: 1) Why sugar can affect sobriety, 2) The benefits of protein for your recovery, 3) Why omega-3 fats are needed in recovery, and 4) A balanced diet for optimal sobriety. All of the women at “A Woman’s Way” treatment center followed the same menu and were required to participate in the nutrition classes on Saturday morning regardless of participating in the study.

Subject Selection and Description

All participants in this study were 18 years or older. All of the participants were women who were staying in an inpatient facility designed to treat alcohol and drug addictions for a minimum of 28 days. Two separate treatment facilities were used for the purpose of this study: The women participating in the research group were staying at “A Woman’s Way” in Burnsville, Minnesota, and the participants in the control group were staying at Wayside in St. Louis Park, Minnesota.

During the admission process the women who designated alcohol as a substance of abuse prior to coming into “A Woman’s Way” were recruited for this study. Those who were interested in participating in the study were provided with a consent form titled *Effect of Nutrition on Alcohol Cravings* for their consideration and signature (Appendix A). Women in the control group at the Wayside House were also recruited for this study if they designated alcohol as a substance of abuse prior to coming into the facility. Those who were interested in participating in the study were provided with a consent form titled *Examination of Alcohol Cravings* for their consideration and signature (Appendix B). Both consent forms provided a

description of the study, risks and benefits of participating, time commitment involved, assurance of confidentiality, and the participant's right to withdraw from the study at any time.

Instrumentation

The participants in both groups completed the twenty-six question history pertaining to their demographics and patterns of alcohol use (Appendix C). The women in the research group completed a pre-and post-Alcohol Craving Questionnaire (ACQ-NOW) (Singleton et al., 1995) (Appendix D). The women in the control group completed a post-Alcohol Craving Questionnaire. The control group completed a post questionnaire with no pre questionnaire due to a miscommunication. The questionnaire was a self-administered measure of alcohol cravings. The questionnaire consisted of 47 questions on cravings and was also available in a short version with 12 questions. The version used for this study was the short version. The questionnaire was designed for a reading level of seventh grade or above.

Data Collection Procedure

The individuals who agreed to participate in the research group completed the short version of the pre-ACQ during their admission into the treatment facility. Along with the ACQ the women completed the 26 question history. A substance abuse counselor was available for the participant during this process. A post-ACQ short version questionnaire was completed by the participant at the end of their program, which was typically 28 days.

The individuals who agreed to participate in the control group completed the 26 question history during their admission into the treatment facility. A post-ACQ short version questionnaire was completed by the participant at the end of their program which was typically 28 days.

Data Analysis

The 26 question demographic and pattern of alcohol use questionnaire was analyzed for descriptive statistics such as mean, median, standard deviation, minimum and maximum for the research and control group. The data from this questionnaire was then tested to see if there were any differences in demographics or patterns of alcohol use between the research and control group. The tests used to determine any differences were the Levene's test for equality of variances, t-test for equality of means, and chi-square tests.

The data obtained from the ACQ post test between the research and control group was analyzed using the Levene's test for equality of variances and the t-test for equality of means. The data was tested for the intensity of alcohol cravings.

The ACQ pre- and post-test within the research group was analyzed using a paired sample t-test. The data obtained was analyzed for the intensity of alcohol cravings.

Limitations

The most significant limitation to this study is that the concept of cravings is very subjective and, therefore, the data that was collected through the ACQ is also subjective. One participant's interpretation of what an alcohol craving is may be completely different from that of another participant which makes measuring the cravings with consistency very difficult. The relatively small sample size exacerbates the subjective nature of cravings.

The majority of women entering the inpatient treatment center had some form of physical withdrawal from alcohol and or other drugs of abuse. The women at both treatment centers were given the 26 question history during the initial intake process and the women in the research group were also given the pre ACQ at this time. Another limitation would be how accurately these forms were filled out due to being in alcohol withdrawal at this time.

The study was specific to alcohol in the literature review, as was the data that was collected from the history and the ACQ. Most women entering the treatment programs had multiple chemical addictions and it would have been very difficult to include only women who had used alcohol alone. The study was also limited due to the small sampling from both the research and the control group.

Had the control group completed the pre-ACQ as was the design of the study, the overall data would have been more complete and would have given a stronger understanding of the relationship between nutrition and alcohol cravings.

Chapter IV: Results

This chapter contains data retrieved from women participants in a research group and a control group. Each group resided in separate inpatient drug and alcohol treatment facilities in the suburbs of Minneapolis, Minnesota. During admission, both groups completed a 26 question history related to their demographics and patterns of alcohol use. At this time the women in the research group completed a 12 question pre-Alcohol Craving Questionnaire (ACQ) pertaining to their cravings for alcohol and a post-ACQ at the end of their treatment program. The women in the control group completed a post-ACQ at the end of their treatment program or at the end of 28 days.

History and Demographics

The number of participants in the research group was 16, with a mean age of 36.94 ± 10.804 . The age range was from 20 to 56 years. The number of participants in the control group was 13, with a mean age of 35.85 ± 10.180 . The range of ages was 21 years old to 54 years. All 16 women in the research group filled out the questionnaire and the pre- and post-ACQ. All 13 participants in the control group completed the 26 question history and 10 completed the post-ACQ.

Table 3 shows that the two treatment groups were similar in employment status, with only one in each group employed full time. Unemployment in both groups was high with 31.3% in the research group and 69.2% unemployed in the control group. In the treatment group about 50.1% were students, while in the control group only 15.4% were students.

Table 3

Employment Status

Treatment type	Employment	Frequency	Percent
A Woman's Way	Employed full time	1	6.3
	Employed part time	2	12.5
	Unemployed	5	31.3
	Full-time student	5	31.3
	Student	3	18.8
	Total	16	100.0
Wayside House	Employed full time	1	7.7
	Employed part time	0	0.0
	Unemployed	9	69.2
	Full-time homemaker	1	7.7
	Student	2	15.4
	Total	13	100.0

Table 4 shows that the two groups were similar in education status. The “some college” category was highest in both groups with the research group at 37.5% and the control group at 38.5 %. The research group had one participant in the “some grade school” category and one participant in the “completed grade school” category. In the control group all completed at least some high school.

Table 4

Education Status

Treatment type	Education	Frequency	Percent
A Woman's Way	Some grade school	1	6.3
	Completed grade school	1	6.3
	Some high school	1	6.3
	Completed high school	4	25.0
	Some college	6	37.5
	Completed college	3	18.8
	Some graduate work	0	0.0
	Total	16	100.0
Wayside House	Some grade school	0	0.0
	Completed grade school	0	0.0
	Some high school	2	15.4
	Completed high school	1	7.7
	Some college	5	38.5
	Completed college	4	30.8
	Some graduate work	1	7.7
	Total	13	100.0

Ethnicity of the two groups was similar, with the highest percent in both groups being white, not of Hispanic origin. Of the 16 participants in the research group, 12 were white, not of Hispanic origin; one was black, not of Hispanic origin; one was Hispanic, and one was American

Indian. Of the 13 participants in the control group, 10 were white, not of Hispanic origin; two were black, not of Hispanic origin, and one was in the “other” category.

Table 5 shows some differences between marital status among the two populations. In the research group, 31.1% of the women were married and none were married in the control group. The “single” category was highest in both groups.

Table 5

Marital Status

Treatment type	Marital status	Frequency	Percent
A Woman’s Way	Single	7	43.8
	Married	5	31.3
	Divorced or separated	4	25.0
	Total	16	100.0
Wayside House	Single	9	69.2
	Married	0	0.0
	Divorced or separated	4	30.8
	Total	13	100.0

A question in the drinking history asked how old the participant was when they had their first drink. The range of ages was from 9 to 19 years old. The participants in the research group had a mean age of 14.25 ± 1.844 when they had their first drink. The women in the control group had a mean age of 14.85 ± 3.078 years.

Table 6 shows that the type of alcohol generally consumed by both treatment groups was hard liquor. The research group shows 87.5 % generally consumed hard liquor and the control group showed 61.5 %. In the control group, 12 of the 13 participants responded to this question.

Table 6

Type of Alcohol Generally Consumed

Treatment type	Type of alcohol	Frequency	Percent
A Woman's Way	Beer	2	12.5
	Wine or wine cooler	0	0.0
	Hard liquor	14	87.5
	Total	16	100.0
Wayside House	Beer	1	7.7
	Wine or wine cooler	3	23.1
	Hard liquor	8	61.5
	Total	12	92.3

A question in the history asked how many drinks of hard liquor are generally consumed in one day. The participants in the research group had a range of 0 drinks per day to 32 drinks per day, with a mean of 9.14 ± 8.439 . The participants in the control group had a range from 0 drinks per day to 16 drinks per day with a mean of 6.18 ± 6.911 .

Another question in the history asked the responder to indicate if “A craving for alcohol is only a strong urge or desire to drink,” or “A craving for alcohol is any urge or desire to drink alcohol, even a weak one.” The two treatment groups were similar in how they answered this question. Some 37.5% of the participants in the research group and 38.5% of the participants in the control group responded that a craving is only a strong urge to drink. Some 56.3% of the women in the research group and 61.5% of the women in the control group reported that a craving is any urge to drink even a weak one. One participant from the control group did not respond to this question.

When asked if they had ever tried to quit drinking, a large percent of participants at both of the treatment centers answered “yes,” with the research group at 93.8% and the control group at 76.9%.

Table 7 shows the highest percentage of women in both groups that reported no previous inpatient treatments, with 37.5% in the research group and 53.8% in the control group. In the research group, 18.8% of the women reported having six or more prior inpatient treatments, and zero participants in the control group reported six or more previous inpatient treatments.

Table 7

Number of Inpatient Treatments

Treatment type	Previous inpatient treatment	Frequency	Percent
A Woman’s Way	None	6	37.5
	1	5	31.3
	2	0	0.0
	3-5	2	12.5
	6+	3	18.8
	Total	16	100.0
Wayside House	None	7	53.8
	1	2	15.4
	2	2	15.4
	3-5	2	15.4
	6+	0	0.0
	Total	13	100.0

Table 8 shows the highest percentage of women in both groups reported no previous outpatient treatments, with 43.8% in the research group and 53.8% in the control group. The participants in the research group again had a higher percentage of previous outpatient treatments at 15.4%, reporting 3-5 previous outpatient treatments. Zero participants in the control group reported 3-5 previous outpatient treatments.

Table 8

Number of Outpatient Treatments

Treatment type	Previous outpatient treatments	Frequency	Percent
A Woman's Way	None	7	43.8
	1	3	18.8
	2	4	25
	3-5	2	12.5
	Total	16	100.0
Wayside House	None	7	53.8
	1	5	38.5
	2	1	7.7
	3-5	0	0.0
	Total	13	100.0

The women in both groups were asked at what age drinking first became a problem. They could respond by indicating that it was never a problem, or they were provided a space to write in the age. Fifteen of the 16 women in the research group responded with a specific age. The range of ages was 13 to 44 with a mean age of 23.93 ± 9.498 . Eleven of the 13 woman in

the control group reported a specific age to this question. The range of ages was 13 to 36 with a mean age of 24.36 ± 7.762 .

Results from Post-Alcohol Craving Questionnaire between Research and Control Groups

The research group and the control group both filled out Alcohol Craving Questionnaires on their exit from their treatment program. One question showed a statistical difference. The question was “drinking would put me in a better mood.” The scoring ranged from 1, strongly disagree to 7, strongly agree. Sixteen women in the research group responded with a mean score of 1.44 ± 0.892 on the post-alcohol craving questionnaire. Ten women in the control group responded with a mean score of 2.70 ± 1.567 . An independent sample t-test was conducted to compare the cravings for alcohol between the research and control group. There was a significant difference in the scores for cravings on question 12 (Drinking would put me in a better mood), $t(12.70) = -2.32, p = 0.037$.

Results from Pre- and Post-Alcohol Craving Questionnaire within the Research Group

The results within the research group between the pre- and post-Alcohol Craving Questionnaire showed a significant difference with a p value of .05 or less on the following five statements: “If I had some alcohol, I would probably drink it,” “I would feel less restless if I drank alcohol,” “If I were using alcohol, I would feel less nervous,” “It would be easy to pass up the chance to use alcohol”, and “Drinking would put me in a better mood.” See Table 9. Question 4 (I could not stop myself from drinking if I had some alcohol here) and question 7 (If I used alcohol, I would feel less tense) had a tendency toward a significant difference with a p value of .052 and .058, respectively. The women in the research group had fewer cravings when completing the post-ACQ than the pre-ACQ. The overall average of the 12 questions showed a significant difference with a p value of .016.

Table 9

Paired Sample T-test for Pre- and Post-Alcohol Craving Questionnaire

Pre and post test questions	Mean	Std. Dev	t	df	Sig.(2 tailed)
1. If I had some alcohol I would probably drink it.	2.88 ^a 1.69 ^b	1.708 1.078	2.643	15	.018 ^c
2. I miss drinking	2.81 2.13	1.940 1.500	1.842	15	.085
3. I am not making any plans to drink.	5.81 6.44	1.940 1.548	-1.775	15	.096
4. I could not stop myself from drinking if I had some alcohol here.	2.63 1.56	2.125 0.964	2.109	15	.052
5. I want to drink so bad I can almost taste it.	.169 1.56	1.401 0.892	.397	15	.697
6. I would feel less irritable if I used alcohol now.	2.38 1.75	1.893 1.342	1.346	15	.198
7. If I used alcohol, I would feel less tense.	3.56 2.19	2.220 1.797	2.052	15	.058
8. Drinking would not be very satisfying.	5.50 6.06	1.751 1.436	-1.315	15	.208
9. I would feel less restless if I drank alcohol.	3.06 1.94	2.016 1.569	2.293	15	.037
10. If I were using alcohol, I would feel less nervous.	3.07 1.60	2.086 1.121	2.475	15	.027
11. It would be easy to pass up the chance to use alcohol.	4.31 5.19	1.922 1.834	-2.150	15	.048
12. Drinking would put me in a better mood.	2.38 1.44	1.360 0.892	2.328	15	.034
Pre and post average	3.33 2.80	0.744 0.554	2.729	15	.016

^aPre-test^bPost-test^cSignificant when $p = <0.05$

Chapter V: Discussion

This study assessed whether or not a modified diet with weekly nutrition education sessions would reduce cravings for alcohol among women residents at an in-patient treatment center for substance abuse. The study consisted of a research group where the women ate from a specially-designed menu and attended weekly nutrition education classes. A control group was served the usual institutional food with one lecture on nutrition during their stay. The two treatment facilities included only female participants. Both groups completed a questionnaire that determined their pattern of alcohol use and personal history. The study called for the research group and the control group to fill out a pre- and post-Alcohol Craving Questionnaire (ACQ). The research group completed the pre- and post-ACQ. The control group completed a post- questionnaire but no pre-questionnaire due to a miscommunication.

Limitations

The subjective nature of the concept of cravings is a limitation. One participant's interpretation of a craving may be completely different from that of another. The relatively small sample size exacerbates the subjective nature of quantifying cravings. While the study is designed specifically for alcoholics, most patients had other chemical addictions in addition to alcohol. The veracity of the answers given in the questionnaire is somewhat dubious since some patients seem to be in denial of the severity of their addiction.

Discussion

When comparing the post-ACQ between the research group and the control group, question 12, "Drinking would put me in a better mood" is the only question that showed a significant statistical difference with a p value of 0.037. The response to question 12 would indicate that the research group had fewer or less intense cravings than the control group. Since

the major difference between the research group and the control group was the meal plan and the nutritional instruction, the experimental treatment must have played an important part in this significant difference. This agrees with the study of Biery, Williford, and McMullen (1991) in which the patients received three sessions of individualized nutritional counseling and were prescribed a diet that was high in complex carbohydrates, restricted in simple sugars, and with no caffeine. The alcohol cravings of the participants of this study decreased from 80% before treatment to 17% after treatment. The control group, on the other hand, that had consumed a regular hospital diet and received a basic nutrition class had an increase in alcohol cravings from 50% to 80%. Another reason for the decrease in alcohol cravings in the research group could be found in the fact that their diet had less omega-6 fatty acids and was fortified with omega-3 fatty acids through weekly portions of salmon and tuna. Buydens-Branchey, Branchey, and Hibbeln, (2009) found that substance abusers with low omega-3 fatty acid DHA had an increased rate of relapse as compared to substance abusers with higher amounts of plasma DHA. And since the risk of relapse is associated with intense cravings (Heinz et al., 2009), it is likely that omega 3 fatty acid DHA can reduce cravings.

Many statistical differences appeared when comparing the pre- and post-ACQ within the research group. Questions 1 (If I had some alcohol, I would probably drink it), 9 (I would feel less restless if I drank alcohol), 10 (If I were using alcohol, I would feel less nervous), 11 (It would be easy to pass up the chance to use alcohol), and 12 (Drinking would put me in a better mood) showed a statistical difference with a p value of 0.05 or less. Question 4 (I could not stop myself from drinking if I had some alcohol here) and question 7 (If I used alcohol, I would feel less tense) had a tendency toward a significant difference with p values of .052 and .058, respectively. The overall average of the 12 questions showed a significant difference with a p

value of .016. All the responses to the 12 questions had a change towards fewer cravings whether or not the differences were statistically significant. This finding agrees with the study of Biery, Williford, and McMullen (1991) in which the patients who received nutrition education and a prescribed diet plan had a decrease of alcohol cravings from 80% before treatment to 17% after treatment. In the Biery et al. research, the cravings in the control group actually increased from 50% to 80% (1991).

Conclusion

People entering substance abuse treatment typically have marginal nutrient levels due to poor intake and decreased absorption (National Institute of Alcohol Abuse and Alcoholism, 2010). The women in the research group who went through the substance abuse program at “A Women’s Way” were fed a nutrient dense diet and had weekly nutrition education. Research has shown that a nutritious diet with the restriction of simple sugars combined with in-depth nutrition education leads to the reduction of alcohol cravings (Biery, Williford & McMullen, 1991). Recent studies have also indicated that increased levels of omega-3 fatty acids decrease cravings, and therefore relapse rates in substance abusers (Buydens-Branchey, Branchey, & Hibbeln). Based on all current research the decrease of alcohol cravings in the research group during treatment, is not surprising. The menu plan used at “A Woman’s Way,” with the inclusion of nutrition education, was shown to be beneficial and should be recommendable to other substance abuse treatment centers as part of their treatment plan.

Recommendations for Further Studies

High relapse rates are the biggest problems in the treatment of alcoholism. This study indicated that better nutrition and nutrition education have the effect of lowering cravings and possibly lowering the relapse rate in alcoholics. A recommendation for further investigation

would include a long term study of a larger research group that would follow the patients for several years to determine whether nutrition and nutrition education has a positive effect on the relapse rate. A further area of study would be the supplementation of the patient's diet with fish oil to increase their plasma EPA/DHA to see if the increased levels of EPA/DHA can lower the relapse rates in alcoholics in the long term. Studies have shown that the level of DHA in the plasma is a good indicator of relapse rates. The lower the DHA levels in the plasma the higher the relapse rate (Buydens-Branchey, Branchey, & Hibbeln, 2009).

Recommendations for Change in Practice

It is well known that alcoholics have very poor nutritional habits and often come into treatment with severe nutritional deficiencies. This alone should be reason enough for every treatment center to have a registered dietitian on staff. With the emerging evidence that medical nutrition therapy and intensive nutrition education can have a positive influence on the outcome of the treatment of alcoholism, nutrition should have a more essential role in treatment centers for substance abuse.

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Appendix A: Consent Form Research Group

This research has been approved by the UW-Stout IRB as required by the Code of Federal Regulations Title 45 Part 46.

Consent to Participate In UW-Stout Approved Research

Title: Effect on Nutrition on Alcohol Cravings

Description:

This research study exams the role that nutrition plays in reducing cravings for alcohol in women attending in-patient chemical dependency treatment. Your involvement in this study will be attending and participating in four nutritional education classes and two individualized nutrition counseling sessions provided by a registered dietitian. You will follow a whole foods eating plan consisting of 5- 6 small nutrient dense meals though out the day. A questionnaire on alcohol cravings will be given at the beginning of treatment and at the end. This questionnaire will take about thirty minutes to complete each time.

Risks and Benefits:

This study requires that the River Ridge treatment center serve low caffeine and low sugar foods and beverages. Coming into the program you may have some discomfort in the beginning from sugar and caffeine withdrawal. You may also experience some uneasiness with the food choices if you do not like the food provided (meats, vegetables, fruit, and complex carbohydrates). When filling out the alcohol cravings questionnaire you may have feelings of discomfort due the questions asked about the frequency and intensity of your alcohol cravings. A chemical dependency counselor will be available to you when you are filling out the questionnaire to help alleviate any feelings of discomfort that may arise. The most important benefit that you may experience is a reduction in alcohol cravings. The reduction of cravings may support you in long term sobriety. The knowledge and education obtained from the nutrition education classes and counseling sessions may lead to an improvement in other areas of health.

Special Populations:

This study is not part of your treatment plan. Your treatment plan is in no way affected by whether or not you participate in this study.

Time Commitment:

Your time commitment would consist of four 1 hour weekly nutrition counseling sessions and two 1 hour small group educational classes. Your time would also be required to fill out a cravings for alcohol questionnaire at the beginning of treatment and once again at the end of treatment. The questionnaire will take about 30 minutes to complete each time.

Confidentiality:

Your name will not be included on any documents. We do not believe that you can be identified from any of this information. This informed consent will not be kept with any of the other documents completed with this project

Right to Withdraw:

Your participation in this study is entirely voluntary. You may choose not to participate without any adverse consequences to you. Should you choose to participate and later wish to withdraw from the study, you may simply discontinue your participation at this time without incurring any adverse consequences.

IRB Approval:

This study has been reviewed and approved by The University of Wisconsin-Stout's Institutional Review Board (IRB). The IRB has determined that this study meets the ethical obligations required by federal law and University policies. If you have questions or concerns regarding this study please contact the Investigator or Advisor. If you have any questions, concerns, or reports regarding your rights as a research subject, please contact the IRB Administrator.

Investigator: Kristi Kvist
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Statement of consent: By signing this consent form you agree to participate in the project entitled, Effect of Nutrition on Alcohol Cravings.

Signature _____ Date _____

Appendix B: *Consent Form Control Group*

This research has been approved by the UW-Stout IRB as required by the Code of Federal Regulations Title 45 Part 46.

Consent to Participate In UW-Stout Approved Research

Title: Examination of Alcohol Cravings

Description:

This study examines alcohol cravings in women attending an in-patient chemical dependency treatment. A questionnaire on alcohol cravings will be given at the beginning and at the end of treatment. This questionnaire will take about 30 minutes to complete each time.

Risks and Benefits:

When filling out the alcohol cravings questionnaire you may have feelings of discomfort due the questions asked about the frequency and intensity of your alcohol cravings. A chemical dependency counselor will be available to you when you are filling out the questionnaire to help alleviate any feelings of discomfort that may arise. You may gain some useful insight into your intensity and frequency of alcohol cravings.

Special Populations:

This study is not part of your treatment plan. Your treatment plan is in no way affected by whether or not you participate in this study.

Time Commitment:

Your time commitment will be approximately 30 minutes in completing a pre and post questionnaire on alcohol cravings each time.

Confidentiality:

Your name will not be included on any documents. We do not believe that you can be identified from any of this information. This informed consent will not be kept with any of the other documents completed with this project

Right to Withdraw:

Your participation in this study is entirely voluntary. You may choose not to participate without any adverse consequences to you. Should you choose to participate and later wish to withdraw from the study, you may discontinue your participation at this time without incurring adverse consequences.

IRB Approval:

This study has been reviewed and approved by The University of Wisconsin-Stout's Institutional Review Board (IRB). The IRB has determined that this study meets the ethical obligations required by federal law and University policies. If you have questions or concerns regarding this study please contact the Investigator or Advisor. If you have any questions, concerns, or reports regarding your rights as a research subject, please contact the IRB Administrator.

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Statement of Consent: By signing this consent form you agree to participate in the project entitled, Examination of Alcohol Cravings.

Signature _____ Date _____

Appendix C: Alcohol Craving Questionnaire History

GENERAL DIRECTIONS: ON THE FIRST PAGE OF THE **ACQHISTORY** WE ASK SOME GENERAL QUESTIONS ABOUT YOU LIKE YOUR SEX, YOUR AGE, AND SO ON. THEN WE START ASKING SOME MORE SPECIFIC QUESTIONS ABOUT ALCOHOL, LIKE WHEN YOU LAST DRANK, ABOUT HOW MUCH YOU ARE USING THESE DAYS, AND SIMILAR QUESTIONS. THESE QUESTIONS GO ON FOR A FEW PAGES AND ARE FOLLOWED BY THE ALCOHOL CRAVING QUESTIONNAIRE. WHEN YOU GET TO THAT PAGE IT IS IMPORTANT THAT YOU READ THE INSTRUCTIONS ON THE TOP OF THE PAGE VERY CAREFULLY. THEY WILL TELL HOW TO FILL OUT THIS QUESTIONNAIRE. IN THE **ALCOHOL CRAVING QUESTIONNAIRE (ACQ-NOW)** WE ARE INTERESTED IN WHAT YOU ARE THINKING OR FEELING ABOUT ALCOHOL RIGHT NOW AS YOU COMPLETE THE QUESTIONNAIRE. THAT IS, WE WANT TO KNOW WHAT YOUR CRAVINGS ARE LIKE RIGHT AT THIS MOMENT. THEY MAY BE SOMEWHAT MILD, OR THEY MAY BE STRONGER, OR THEY MAY DIFFER DEPENDING ON HOW YOU GET A CHANCE TO DESCRIBE THEM. IN ORDER TO DESCRIBE WHAT YOU ARE THINKING OR FEELING ABOUT ALCOHOL, WE WOULD LIKE YOU TO RATE EACH OF THE FOLLOWING SENTENCES. READ EACH SENTENCE AND THEN PUT A CHECKMARK IN ONE OF THE SPACES BETWEEN STRONGLY DISAGREE AND STRONGLY AGREE THAT TELLS US HOW MUCH YOU AGREE OR DISAGREE WITH THE SENTENCE AT THAT MOMENT. FOR EXAMPLE, USE THE MIDDLE SPACE LIKE THIS,

STRONGLY DISAGREE ___:___:___: x :___:___:___: **STRONGLY AGREE**

TO SHOW THAT YOU DON'T REALLY AGREE OR DISAGREE WITH THE SENTENCE; YOU FEEL KIND OF NEUTRAL ABOUT IT. IF YOU AGREE A LITTLE WITH THE SENTENCE, YOU CAN MOVE YOUR CHECK ONE OVER TO THE "AGREE" SIDE LIKE THIS,

STRONGLY DISAGREE ___:___:___:___: x :___:___:___: **STRONGLY AGREE**

OR IF YOU FEEL THAT YOU STRONGLY DISAGREE WITH THE SENTENCE, THEN CHECK THIS SPACE HERE LIKE THIS,

STRONGLY DISAGREE x :___:___:___:___:___:___: **STRONGLY AGREE**

THE IMPORTANT THING WITH THIS QUESTIONNAIRE IS THAT YOU DON'T HAVE TO CHECK "STRONGLY AGREE" OR "STRONGLY DISAGREE" ON EVERY SENTENCE, UNLESS YOU FEEL THAT WAY. WE ARE GIVING YOU A CHANCE TO TELL US YOUR LEVEL OF AGREEMENT OR DISAGREEMENT WITH EACH SENTENCE. TRY THE **PRACTICE SHEET** ON THE NEXT PAGE TO MAKE SURE YOU UNDERSTAND HOW TO ANSWER THE QUESTIONS. PLEASE READ EACH QUESTION CAREFULLY. YOU NEED TO PAY CLOSE ATTENTION BECAUSE SOME OF THE SENTENCES MIGHT BE TURNED AROUND. FOR EXAMPLE,

NUMBER 2 SAYS, "DRINKING ALCOHOL WOULD NOT BE PLEASANT RIGHT NOW." IT DOESN'T SAY THAT YOU THINK DRINKING WOULD BE PLEASANT NOW, BUT THAT YOU THINK DRINKING WOULDN'T BE PLEASANT. ALL YOU HAVE TO DO IS READ EACH SENTENCE CAREFULLY AND MAKE SURE YOU UNDERSTAND WHAT IT IS SAYING BEFORE YOU TELL US HOW MUCH YOU AGREE OR DISAGREE WITH IT. AFTER YOU FINISH THE PRACTICE QUESTIONS, TURN TO THE TOP OF THE NEXT PAGE AND BEGIN.

PRACTICE SHEET

PRACTICE SHEET INSTRUCTIONS: Please practice indicating how much you agree or disagree with each of the following statements by placing a single checkmark (like this: X) along each line between STRONGLY DISAGREE and STRONGLY AGREE. The closer you place your checkmark to one end or the other indicates the strength of your disagreement or agreement. Please complete every item. We are interested in how you are thinking or feeling right now as you are filling out the questionnaire.

RIGHT NOW

1. If there was alcohol right here in front of me, it would be hard not to drink it.
STRONGLY DISAGREE ___:___:___:___:___:___:___: STRONGLY AGREE
2. Drinking alcohol would not be pleasant right now.
STRONGLY DISAGREE ___:___:___:___:___:___:___: STRONGLY AGREE
3. I would feel better if I could drink alcohol.
STRONGLY DISAGREE ___:___:___:___:___:___:___: STRONGLY AGREE
4. If I had the chance to drink alcohol, I think I would use it.
STRONGLY DISAGREE ___:___:___:___:___:___:___: STRONGLY AGREE
5. Drinking alcohol would be wonderful.
STRONGLY DISAGREE ___:___:___:___:___:___:___: STRONGLY AGREE
6. Even if it were possible, I probably would not drink alcohol right now.
STRONGLY DISAGREE ___:___:___:___:___:___:___: STRONGLY AGREE
7. Right now, I miss drinking alcohol.
STRONGLY DISAGREE ___:___:___:___:___:___:___: STRONGLY AGREE
8. I am going to drink alcohol as soon as I possibly can.
STRONGLY DISAGREE ___:___:___:___:___:___:___: STRONGLY AGREE

THE PRACTICE IS OVER!

ACQHISTORY

FIRST, WE NEED TO GET SOME GENERAL INFORMATION ABOUT YOU. PLEASE ANSWER THE FOLLOWING QUESTIONS.

1. Your sex: (Circle the number of your answer)
 1. MALE
 2. FEMALE

2. Your present age: _____ Years

3. Are you presently: (circle all numbers that apply)
 1. EMPLOYED FULL- TIME
 2. EMPLOYED PART - TIME
 3. UNEMPLOYED
 4. RETIRED
 5. FULL - TIME HOMEMAKER
 6. STUDENT

4. What is the highest level of education you have completed?
 1. NO FORMAL EDUCATION
 2. SOME GRADE SCHOOL
 3. COMPLETED GRADE SCHOOL
 4. SOME HIGH SCHOOL
 5. COMPLETED HIGH SCHOOL
 6. SOME COLLEGE
 7. COMPLETED COLLEGE
 8. SOME GRADUATE WORK
 9. A GRADUATE DEGREE

5. What is your race/ethnicity? (circle one number)
 1. WHITE, NOT OF HISPANIC ORIGIN
 2. BLACK, NOT OF HISPANIC ORIGIN
 3. HISPANIC/LATINO/LATINA
 4. ASIAN
 5. AMERICAN INDIAN
 6. OTHER (please specify)_____

6. Are you: (circle one number)
1. SINGLE
 2. MARRIED
 3. DIVORCED OR SEPARATED

NEXT, WE NEED TO GET SOME INFORMATION ABOUT YOUR EXPERIENCES WITH ALCOHOL. PLEASE ANSWER THE FOLLOWING QUESTIONS.

7. When did you last drink an alcoholic beverage? (circle one number)
1. TODAY
 2. YESTERDAY
 3. WITHIN THE LAST TWO DAYS
 4. WITHIN THE LAST FOUR DAYS
 5. WITHIN THE LAST WEEK
 6. WITHIN THE LAST TWO WEEKS
 7. WITHIN THE LAST MONTH
 8. WITHIN THE LAST TWO MONTH
 9. WITHIN THE LAST THREE MONTHS
 10. WITHIN THE LAST FOUR MONTHS

IF TODAY:

- A. WHAT TIME? ____ : ____
- B. WHEN (circle one number)
1. AM (morning)
 2. PM (afternoon or evening)

8. About how old were you when you first drank an alcoholic beverage?

AGE: ____

9. About how many times in your life have you consumed alcohol? (circle one)
1. 1 OR 2 TIMES
 2. 3 TO 5 TIMES
 3. 6 TO 10 TIMES
 4. 11 TO 49 TIMES
 5. 50 TO 99 TIMES
 6. MORE THAN 99 TIMES

10. During the past 30 days, on about how many days did you drink alcohol?

NUMBER OF DAYS: _____

11. On the average, how often in the last six months did you drink alcohol?
(circle one number)

1. MORE THAN ONCE EACH DAY
2. ONCE A DAY
3. FOUR TO SIX DAYS A WEEK
4. TWO OR THREE DAYS A WEEK
5. ONCE A WEEK
6. TWO OR THREE DAYS A MONTH
7. ONCE A MONTH
8. SEVERAL TIMES, BUT LESS THAN ONCE A MONTH
9. ONCE OR TWICE

12. Now tell us the different types of alcoholic beverages you have ever consumed.
(circle all the numbers that apply).

1. BEER
2. WINE OR WINE COOLERS
3. HARD LIQUOR
4. OTHER (please specify) _____

13. What type of alcoholic beverages did you generally drink over the last six months?
(circle one number)

1. BEER
2. WINE OR WINE COOLERS
3. HARD LIQUOR
4. OTHER (please specify) _____

14. How many drinks do you typically have at one time ?

A. Beer (12 oz. can, bottle)

1. None
2. ___ Drinks

B. Wine (glass or bottle)

1. None
2. ___ Drinks

C. Liquor (1oz., shot, drink)

1. None
2. ___ Drinks

D. Other (specify) _____

1. None
2. ___ Drinks

15. How many drinks do you typically have in one day (a 24-hour period) ?

A. Beer (12 oz. can, bottle)

1. None

2. ___ ___ Drinks

B. Wine (glass or bottle)

1. None

2. ___ ___ Drinks

C. Liquor (1oz., shot, drink)

1. None

2. ___ ___ Drinks

D. Other (specify) _____

1. None

2. ___ ___ Drinks

16. Which sentence best describes what you mean by "craving for alcohol?"
(circle ONLY one number)

1. A CRAVING FOR ALCOHOL IS ONLY A STRONG URGE OR DESIRE
TO DRINK ALCOHOL

2. A CRAVING FOR ALCOHOL IS ANY URGE OR DESIRE TO DRINK
ALCOHOL, EVEN A WEAK ONE

17. On a scale of 0 to 10 where 0 is not at all, and 10 is the most imaginable, how
much do you _____ crave an alcoholic beverage when you've gone
without a drink for 1-2 days?

_____ craving

18. On a scale of 0 to 10 where 0 is not at all, and 10 is the most imaginable, how
much do you _____ crave an alcoholic beverage right now?

_____ craving

19. On the line below, please make a mark between "NOT AT ALL" and "A GREAT
DEAL" to _____ indicate HOW STRONG, on the average, your craving for alcohol
has been DURING THE _____ PAST WEEK.

INTENSITY - HOW STRONG HAS AN AVERAGE URGE BEEN?:

NONE/

A GREAT

NOT AT

ALL _____!_____!_____!_____!_____!_____!_____!_____!_____ DEAL

20. On the average, HOW FREQUENTLY (how many times a day) have you experienced craving for alcohol DURING THE PAST WEEK.

FREQUENCY - HOW MANY TIMES PER DAY: (Circle one number)

1. NONE
2. 1
3. 2
4. 3-5
5. 6-10
6. 11-20
7. More than 20

21. On the average, How LONG has the craving for alcohol lasted DURING THE PAST WEEK?

DURATION - HOW LONG DOES AN AVERAGE URGE LAST: (Circle one number)

1. Less than one Minute
2. 1-5 Minutes
3. 6-10 Minutes
4. 11-15 Minutes
5. 15-30 Minutes
6. 31-45 Minutes
7. 46-60 Minutes
8. 1-2 Hours
9. More than 2 Hours.

22. Have you ever tried to quit drinking? (circle one number)

1. NO
2. YES

IF YES: A. How many times have you tried to quit?

_____ TIMES

B. What is the longest period of time that you've been able to quit? _____ days

23. Number of previous Inpatient treatments for alcohol (Circle one Number)

1. No previous inpatient treatment
2. 1
3. 2
4. 3-5
5. 6 or more

24. Number of previous outpatient treatments for alcohol (Circle one number)

1. No previous outpatient treatment
2. 1
3. 2
4. 3-5
5. 6 or more

25. Age at which drinking first became a problem

1. Never been a problem
2. (Age): _____

26. If you would try to quit drinking now, how confident are you that you could go for one year without drinking? (circle one number)

1. NOT CONFIDENT
2. A LITTLE CONFIDENT
3. MODERATELY CONFIDENT
4. VERY CONFIDENT
5. EXTREMELY CONFIDENT

Appendix D: Alcohol Craving Questionnaire

ALCOHOL CRAVING QUESTIONNAIRE-SHORT FORM-REVISED (ACQ-SF-R)

INSTRUCTIONS: Please indicate how much you agree or disagree with each of the following statements by placing a single checkmark (like this: X) along each line between STRONGLY DISAGREE and STRONGLY AGREE. The closer you place your checkmark to one end or the other indicates the strength of your disagreement or agreement. We are interested in how you are thinking or feeling right now as you are filling out this questionnaire. Please complete every item.

RIGHT NOW

1. If I had some alcohol, I would probably drink it.
STRONGLY DISAGREE ___:___:___:___:___:___:___ STRONGLY AGREE
2. I miss drinking.
STRONGLY DISAGREE ___:___:___:___:___:___:___ STRONGLY AGREE
3. I am not making any plans to drink.
STRONGLY DISAGREE ___:___:___:___:___:___:___ STRONGLY AGREE
4. I could not stop myself from drinking if I had some alcohol here.
STRONGLY DISAGREE ___:___:___:___:___:___:___ STRONGLY AGREE
5. I want to drink so bad I can almost taste it.
STRONGLY DISAGREE ___:___:___:___:___:___:___ STRONGLY AGREE
6. I would feel less irritable if I used alcohol now.
STRONGLY DISAGREE ___:___:___:___:___:___:___ STRONGLY AGREE
7. If I used alcohol, I would feel less tense.
STRONGLY DISAGREE ___:___:___:___:___:___:___ STRONGLY AGREE
8. Drinking would not be very satisfying.
STRONGLY DISAGREE ___:___:___:___:___:___:___ STRONGLY AGREE
9. I would feel less restless if I drank alcohol.
STRONGLY DISAGREE ___:___:___:___:___:___:___ STRONGLY AGREE
10. If I were using alcohol, I would feel less nervous.
STRONGLY DISAGREE ___:___:___:___:___:___:___ STRONGLY AGREE

11. It would be easy to pass up the chance to use alcohol.

STRONGLY DISAGREE ___:___:___:___:___:___ STRONGLY AGREE

12. Drinking would put me in a better mood.

STRONGLY DISAGREE ___:___:___:___:___:___ STRONGLY AGREE