Green tea and weight loss in overweight and obese adults

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Obesityhas become a growinghealthissue which is associated with increased risk of chronic diseases such as coronary heart disease, hypertension, type 2diabetes, osteoarthritis, stroke, sleep apnea, and certain cancers (Auvichayapat et al., 2008; Maki et al. , 2009; Nagao et al. , 2005). In the United States, there are an estimated 72 million overweight or obese adults (as cited in Maki et al. , 2009). Currently, the most effective treatment for obesity is a combination of reducing energy intake and increasing energy expenditure, yet the most popular treatment is pharmacotherapy (Auvichayapat et al. , 2008, Diepvens, Kovacs, Nijs, Vogels, & Westerterp-Plantenga, 2005).

Recently, researchers have found antiobesity effects in green tea (Maki et al. , 2009). The objective of this term paper is to depict the claim of green tea and its effectiveness on weight loss in overweight and obese adults. Review of the Literature Overweight and Obese and Weight LossThe basic reasoning of overweight and obese individuals is an imbalance between energy consumption and energy expenditure (Diepvens et al. , 2005). To achieve weight loss, a negative energy balance must occur and can be achieved by decreased energy consumption or increased energy expenditure (Auvichayapat et al. , 2008; Diepvens et al., 2005).

Genetics may also be linked to obesity in several ways. Genetics may be associated with susceptibility to fat-storing and the controllability offoodintake (as cited in Shepherd, 2009). It has been inferred that green tea may reduce body weight and increase satiety which will positively affect body composition (Auvichayapat et al. , 2008; Diepvens et al. , 2005; Maki et al, 2008; Nagao et al. , 2005).

Components of Green Tea Green tea contain two major active ingredients which may be contributed to combating obesity: catechin and caffeine (Auvichayapat et al. , 2008; Diepvens et al. , 2005). Research has suggested that green tea catechins block the enzyme catechol O-methyltransferase, thereby stimulating the sympathetic nervous system (Auvichayapat et al. 2008; Belza et al. , 2009). The stimulation of the sympathetic nervous system may be responsible for increased thermogenesis, fat oxidation and satiety (Auvichayapat et al., 2008; Belza et al. , 2009).

Green tea catechins may also contribute to increased antioxidant, antiviral, antiplaque-forming, anticancer activities, and decreased blood pressure and total cholesterol (as cited in Nagao et al. , 2005). Research has suggested that caffeine may promote thermogenesis and fat oxidation that positively affect body composition (Auvichayapat et al. , 2008; Belza et al. 2009; Diepvens et al. , 2005).

Caffeine obstructs the degeneration of intracellular cyclic adenosine monophosphate, leading to increased norepinephrine release (Auvichayapat et al. , 2008). The increased norepinephrine may lead to thermogenesis and may enhance satiety (Auvichayapat et al. , 2008). Effects of Catechin and Caffeine Supplementation on Overweight and Obese Adults Maki et al. (2009) conducted a study to investigate whether green tea catechin intake increased exercise-induced abdominal adiposity loss in overweight and obese adults in the United States.

The researchers supported previous claims of green tea catechins' positive effect on general weight loss, but further investigation was needed to conclude that green tea catechin consumption has a positive effect on body composition and abdominal adiposity. The study was a randomized, double-blind, controlled clinical trial that took place in two clinical research sites – Bloomington, Indiana and St. Petersburg, Florida. The male and female participants were of good general health and sedentary. The participants were between the ages of 21 and 65, had a waist circumference of 87 centimeters or greater (women) or 90 centimeters or greater (men), and a total cholesterol of 5. 2 mmol/L or greater. Participants agreed to consume no more than two caffeinated drinks a day and avoid medication or supplements that contained caffeine or catechin.

The eligible participants were randomly assigned a beverage of catechins (625 mg) or a control beverage (0 mg) per day. Both the catechin and control beverage contained the same amount of carbohydrates, sodium, as well as caffeine (39 mg). Since this was a double-blind trial the eligible participants and staff were unaware of the assigned beverages. The eligible participants were asked to maintain caloric consumption and required to increase their activity level by attending three, one-hour supervised exercise sessions a week for a total of 12 weeks. The Maki et al. (2009) study yielded 107 participates that completed the entire trial and met the set requirements. The average age of the participants was 48 years, about onehalf were males (catechin, 49. 2%; control, 55. %), and most participants were of non-Hipic white ethnicity (91%). Maki et al. (2009) found that the catechin group experienced (P = 0. 079) a greater loss of body weight than the control group at week 12. This supports the results of other trials (Auvichayapat et al. , 2008; Belza et al. , 2009; Nagao et al. , 2005).

The results of the Maki et al. (2009) study showed no difference in percentage changes in fat mass (P = 0. 208) or intra-abdominal fat area (P = 0. 125). However, total abdominal adipose area (P = 0. 013) and abdominal subcutaneous adipose area (P = 0. 19) decreased at week 12 (Maki et al. , 2009). Maki et al. (2009) concluded that catechins (625 mg/day) may have positive effects on exercise-induced loss of abdominal adiposity. Auvichayapat et al. (2008) conducted a randomized, controlled, experimental study to investigate green tea and its effect on weight loss in obese Thais.

The study included 60 Thai participates who were between the ages of 40 and 60 and had a body mass index of 25 kg/m2 or greater. Forty-two participates were females and 18 were males. The participants were required to have a good health history with no current or prior metabolic or systemic diseases and not currently taking prescribed medication. The participants were randomized into two groups, a green tea group and a placebo group. The participants in the green tea group consumed a 250 mg green tea (100 mg catechin) tablet after breakfast, lunch, and dinner. The participants in the placebo group also received a tablet after breakfast, lunch, and dinner containing cellulose which was identical in appearance to the green tea tablets. The participants' heights were determined by the use of a wall-mounted ruler and body weight was determined by the use of a digital scale.

Body mass index was calculated by body weight (kg) divided by height (m) squared. Body fat percentage was measured by the use of a calibrated skinfold calipers. The sum of the triceps, subscapular, and iliac skinfolds were compared based on sex and age from the Jackson study to determine body fat percentage (as cited in Auvichayapat et al. , 2008). Resting energy expenditure was measured by the use of the Douglas bag system by indirect calorimetry (as cited in Auvichayapat et al. 2008). The air expired by the participants was analyzed by a computerized data acquisition system from which resting energy expenditure was calculated with the use of Weir's formula (Auvichayapat et al., 2008).

Body mass index, body fat percentage, and resting energy expenditure were measured at baseline, and during the fourth, eighth and twelfth weeks of the study. In comparison, the green tea treatment group exhibited a significant difference (P < 0. 05) in weight loss during the eighth and twelfth weeks of the study as compared to the placebo treatment group. Auvichayapat et al. (2008) concluded that green tea can increase energy expenditure and therefore increase weight loss in obese Thais. Nagao et al. (2005) conducted a random, double-blind, controlled, experimental 12-week study to examine the effects of catechins on body fat loss.

The researchers included 25 healthy Japanese men between the ages of 24 and 46 who ranged from normal to overweight according to body mass index (as cited in Nagao et al. , 2005). The 25 participants were randomly placed into two groups, a catechins group (n = 17) and a placebo group (n = 18). The requirements for the individuals were to consume 90% of the calculated energy intake requirement, to withhold from consuming large amounts of catechins, polyphenols, or caffeine, and to maintain their current level of exercise. Anthropometric measurements and computed tomography were administered by trained physicians at baseline and every four weeks thereafter for the 12-week study. Waist circumference was measured at the umbilical level while the participants were standing in accordance with the Japan Society for the Study of Obesity (Nagao et al., 2005).

The participants' body fat percentages were measured by the use of a bioimpedance analyzer and skinfold caliper method. Body fat percentage and lean body mass were derived from the ratio of total body weight to body fat. The skinfold caliper method utilized measurements at the lower end of the scapula and the intermediate region on the lateral side of the arm, and the sum of the two values was recorded. The measurement of fat was calculated by computed tomography. Computed tomography imaging was performed for visceral fat measurement by utilizing FAT SCAN software developed on the method developed by Tokunaga et al. as cited in Nagao et al., 2005).

The use of the FAT SCAN software, subcutaneous fat area and visceral fat area were obtained from abdominal computed tomography image. Subcutaneous fat area and visceral fat area were summed together to obtain the total fat area. The results of the Nagao et al. (2005) study showed that the reduction in waist circumference (P < 0. 01), skinfold measurements (P < 0. 05), and total fat area (P < 0. 05) was significantly greater in the catechin group (690 mg) than that of the placebo group.

In conclusion, catechins (690 mg/day for 12 weeks) decrease total body fat and may be useful in preventing and combating obesity. Belza et al. (2009) conducted a randomized, double-blind, controlled study consisting of 12 healthy and normal weight male participants (age: 23. 7, ±2. 6 years). Each participant was instructed to maintain their daily dietary and physical activity habits throughout the study.

The treatments being analyzed were in the form of tablets containing 500 mg green tea extract (125 mg catechins), 400 mg tyrosine, 50 mg caffeine, or placebo. Each treatment was separated by a minimum of three days. The main focus of Belza et al. (2009) was to examine the compounds tyrosine, green tea extract, and caffeine, and their individual effects on thermogenesis, appetite sensations, and ad libitum energy intake. A ventilated hood that was tested weekly to ensure reliability was used to assess the resting metabolic rates of each participant. Participants were instructed to fast the evening prior to, as well as refrain from medication, alcohol, and strenuous physical activity 24 hours before respiratory assessments. A baseline respiratory measurement was acquired for each participant during the first 25 minutes of each assessment.

The assessment then continued with 30-minute intervals in which respiratory measurements were recorded for a total of four hours. Each respiratory assessment for each individual was executed on the same time of day and on an identical schedule. The participants' appetite sensations were analyzed using the Visual Analogue Scales which included subjective questions about sensations of hunger, satiety, prospective consumption, and fullness (Belza et al. 2009). Each participant completed the Visual Analogue Scales prior to the respiratory assessment to obtain a baseline measurement, and subsequently throughout the respiratory assessment. Another test each participant completed was the ad libitum meal. The participants were instructed to consume the ad libitum meal at a constant pace and to terminate consumption when satiety was reached.

The amount of ad libitum meal consumed was used as the assessment of ad libitum energy intake. Belza et al. 2009) found that caffeine produced a thermogenic response of 6% above the baseline assessment as compared to the placebo (P < 0. 0001). No significant difference was found for the thermogenic response with the tyrosine and green tea extract treatments as compared to the placebo (Belza et al. , 2009). Belza et al. (2009) stated that too small of sample size was tested to conclude any appetite suppressant value of the treatments administered, and additional investigation with large sample size is needed. Deepens et al. 2005) administered a study to investigate the effects of green tea and a low-calorie diet on resting energy expenditure and body weight in overweight females.

The researchers hypothesized that green tea would increase resting energy expenditure and decrease body weight. The study was an experimental, double-blind, parallel-design, placebo-controlled trial including 46 overweight females between the ages of 19 and 57 and a body mass index between 25 and 31 kg/m2. All participates were of good health and moderate caffeine-users (200-400 mg of caffeine a day). Two groups were randomly assigned to each treatment: a green tea treatment (n = 23) and placebo treatment (n = 23).

All 46 participants consumed a low-calorie diet consisting of 60% of estimated energy expenditure and consumed three tablets daily (9: 00 a. m. , 1: 00 p. m. , 6: 00 p. m.) of either placebo or green tea (75 mg caffeine, 375 mg catechins).

Diepvens et al. (2005) utilized an open-circuit, ventilated-hood system to assess energy expenditure, as well as fat and carbohydrate oxidation. Anthropometric measurements were assessed using a digital balance (body weight) and a wall-mounted stadiometer (height). BMI was calculated by dividing body weight in kilograms by height (m) squared. Diepvens et al. (2005) concluded that there was not a significant difference between green tea and placebo groups in reducing body weight.

Deepens et al. (2005) contribute to the low thermogenic effectiveness of green tea to the low-caloric diet because of the reduction of sympathetic activity caused by the low-calorie diet. The reduced sympathetic activity reduces noradrenaline release which is partially responsible for thermogenesis (as cited in Diepvens et al. , 2005; Auvichayapat et al. , 2008). Summary In summary, the effects of green tea on weight loss may be attributed specifically to the catechins and caffeine, the active components of green tea.

The researchers found that a positive correlation occurred between the consumption of green tea and energy expenditure, fat oxidation, total fat area loss and satiety which will contribute to the prevention and reduction of obesity. Although several studies found that there was not a significant difference in energy expenditure, fat oxidation, total fat area loss and satiety between the green tea and control groups, there was nevertheless a difference.

Perhaps with the long term consumption of green tea, the benefit will be exponentially larger. It is beneficial to note that while the consumption of green tea is not a solution by itself, it can be used as part of the process for weight loss and optimizing health for currently overweight or obese adults.

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