

# Weight Reduction Through Inhalation of Odorants

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**Abstract.** Despite the pervasive problem of obesity and the expenditure of billions of dollars devising methods of losing weight, no studies have been published on the role of the olfactory sense in determining weight. To assess the effect of inhalation of certain aromas upon weight control, we studied 3193 overweight volunteers. Their average age was 43 years, average height 65 inches, and average weight 217 pounds. Each was given an inhaler containing a blend of odorants and instructed to inhale three times in each nostril whenever feeling hungry. New inhalers containing a new blend of odorants were supplied each month over a period of 6 months. Those subjects whose test scores showed they had good olfactory abilities and who use their inhalers frequently, ate 2 to 4 meals a day, felt bad about overeating, but did not feel bad about themselves lost nearly 5 pounds, or 2% of body weight per month. It appears possible that inhalation of certain aromas can induce sustained weight loss over a 6-month period.

**Key Words:** Obesity—Smell—Weight reduction

## Introduction

With a third to a quarter of the American population overweight, obesity is rampant in contemporary society. At any given time, 40% of women and 24% of men are trying to lose weight and of these, 84% of women and 76-78% of men are dieting for this purpose. In the USA, losing weight has become a national obsession. Furthermore, over 30 billion dollars are spent each year devising a plethora of new diets and methods for losing weight, many of which are ineffective [1].

States of hunger and satiety are known to be of crucial importance in the regulation of weight, and the perception of hunger is multivariant; environmental stimuli, psychological substrate, and internal physiology all contribute a share. Everyday experiences attest to the influence of ambient aromas on our appetites; we salivate at the smell of freshly baked cookies and feel nauseated at a whiff of sewer gas. When we are hungry, foods smell better and therefore taste better. Conversely, olfactory

ability wanes when we are satiated, lessening the hedonics of further gustation [2].

Anatomic connections of the olfactory bulb to the ventromedial nucleus of the hypothalamus, the satiety center, authenticate these observations [3], as does the presence of cholecystokinin, a gastric satiety factor, as a neurotransmitter in the olfactory bulb [4]. The fact that patients with acute anosmia often gain weight suggests that a failure of the olfactory-satiety feedback mechanism may be involved [5].

Thus it is perhaps surprising, that amid the proliferating studies of weight regulation, no reports have been published assessing the role of olfaction. The purpose of our investigation was to explore the effect of odors in regulating body weight—specifically, to determine whether inhaling certain sweet aromas would facilitate weight loss in overweight subjects.

## Materials and Methods

### Subjects

We selected 3193 volunteers for this study who were at least 10 pounds overweight, between the ages of 18 and 64 years, had no history of asthma, were not pregnant, breast-feeding or planning to become pregnant during the 6-month period of the study.

### Procedure

Subjects were given inhalers containing blends of aromatic ingredients and instructed to inhale three times in each nostril whenever hungry. They were told not to deviate from their usual diet and exercise habits. Then each month for a period of 6 months, the subjects were given new inhalers containing a new aromatic blend in a sequence of peppermint, banana, and green apple. Subjects were weighted monthly.

### Instruments

Subjects' olfactory abilities were measured using the Chicago Smell Test [6] and the thiophane-odor-threshold test of Amoore [7]. Odor hedonics were rated using a visual

analog scale. All subjects completed demographic questionnaires and psychological tests. Beck Depression Inventory [8], and Zung Depression Scales [9].

### Statistical Analysis

Data were analyzed using Pearson Correlation coefficients and t tests for the difference of two proportions.

## Results

### Subject Population

A typical volunteer subject was a 43-year-old white woman, about 5'5" tall with a medium-sized frame, weighing 217 pounds and whose ideal weight was 129 pounds. She was a Catholic separated from her husband and either an unskilled worker or unemployed. She exercised 9 minutes a day, used alcohol moderately, and did not smoke or use drugs.

The group was predominantly female—86.4% female and 13.6% male. Physical characteristics are shown in Table 1. Three quarters of the subjects were unskilled workers or unemployed. Only 13% were married. Social characteristics are shown in Table 2.

Slightly more than half the subjects exercised and their average time spent exercising was 9 minutes per day. Most of the group used alcohol moderately, about one quarter smoked, and one fifth used diet pills. Nine percent used sleeping pills and almost 10% used other nonprescription drugs. Behavioral traits are shown in Table 3.

Slightly over half the subject population consumed three meals a day; almost a third ate fewer than three

Table 1. Physical characteristics

	% of Subjects (n = 3193)
Sex	
Female	86.4%
Male	13.6%
Frame size	
Small	11.9%
Medium	57.9%
Large	30.2%
Race	
White	67.9%
Black	25.4%
Hispanic	4.6%
	Average
Age	42.9 yrs.
Height	64.7 in.
Initial weight	216.9 lbs.
*Ideal weight	129.0 lbs.

\* Based on basal metabolism index.

Table 2. Social characteristics

	% of Subjects (n = 3193)
Marital status	
Separated	44.5%
Single	23.2%
Divorced	15.4%
Married	13.3%
Employment status	
Unskilled or unemployed	75.0%
Skilled workers	25.0%
Religion	
Catholic	48.8%
Jewish	7.0%
Protestant	6.8%

meals a day. Over a third had four to nine snacks a day. Almost all liked chocolate. Almost half were subject to binge eating and over half craved certain foods. Almost 80% said they ate more when they were nervous. The eating behavior of those in the study is shown in Table 4.

Psychological difficulties were prominent among our subjects. Impaired sex life, bad feelings about overeating, fatigue, and poor self-image were very common with more than three quarters of subjects so affected. Over half the subjects said they hated themselves. Indecisiveness, guilt feelings, and loss of interest in others affected about a third of the group. Eight percent said they wished for suicide. Psychological factors upon admission into the study are shown in Table 5.

The age of onset of weight problems averaged 20.8

Table 3. Behavioral traits

	% of Subjects (n = 3193)
Exercised	50.9%
Smoked	25.1%
Daily	17.7%
Used alcohol	72.1%
Daily	4.3%
Weekly	17.6%
Monthly	15.9%
Less	34.3%
Used drugs	
Diet pills	20.6%
Daily	1.8%
Sleeping pills	9.2%
Daily or weekly	2.5%
Tranquilizers	6.6%
Daily	1.5%
Marijuana	4.3%
Amphetamines	3.4%
Daily	0.5%
Cocaine	1.6%
Daily	0.4%
Other nonprescription drugs	9.8%

Table 4. Eating behavior and food preferences

	% of Subjects (n = 3193)
No. of meals/day	
<3	31.7%
3	54.3%
4-9	14.0%
Snacks/day	
4-9	35.5%
3	30.8%
0	0.5%
Like chocolate	98.9%
Eat 5 or more chocolate bars/wk	54.7%
Eat 5 or more bananas/wk	9.3%
Eat 1-5 ice cream bars/wk	29.3%
Eat 1-5 apples/wk	76.4%
Eat 1-5 mint candies/wk	48.4%
Binge eating	48.7
Favorite binge foods:	
Chocolate	12.8%
Potato chips	9.6%
Candy	7.7%
Ice cream	6.0%
Pretzels	3.3%
Crave certain foods	55.9%
Chocolate	15.6%
Candy	6.7%
Potato chips	4.6%
Ice cream	3.8%
Pretzels	3.1%
Fast frequently to control weight	14.1%
Diet currently	16.7%
Eat more when nervous	79.4%

years for our subjects, and ranged from birth to 63 years. Slightly over half of those in the group had been in one or more of 66 different diet or obesity programs. Many subjects reported suffering various effects of overweight. Most frequently mentioned was family disharmony, with 89% of the study population naming this problem. Over half the subjects suffered from insomnia and had trouble working as a result of being overweight. Table 6 shows the history of obesity and its effects among those in our study.

Many subjects had obese parents: 45% had obese mothers, who averaged 45.4 pounds overweight; about 27% had obese fathers, who averaged 40.6 pounds overweight. Of those who were married (425 subjects), 79.2% had obese spouses, who averaged 38.6 pounds overweight (Table 6).

#### Olfactory Status

Most subjects were able to detect the three odorants in the Chicago Smell Test, namely banana, apple, and mint, and to correctly identify at least one of the three. On Amoore's odor threshold test for thiophane, 85% of our subjects had a threshold within the normal range of -25

Table 5. Psychological factors upon admission into this study

	% of Subject population (n = 3193)
Complained of impaired sex life due to overweight	89.9%
Felt bad about overeating	78.3%
Were too tired to do almost anything	76.0%
Perceived themselves as unattractive or ugly	76.0%
Hated themselves	56.1%
Became irritated more easily than usual	54.8%
Worried about physical health	53.4%
Felt dissatisfied with their lives	52.9%
Criticized or blamed themselves for everything bad that happened to them	47.7%
Lost some or all interest in sex	46.7%
Felt sad most or all of the time	34.6%
Had trouble making decisions	34.3%
Felt guilty much or most of the time	33.7%
Had lost interest in other people	31.7%
Avoided others because of eating problems	29.7%
Cried more than usual or wanted to cry but could not	24.0%
Had times of feeling a failure	22.7%
Had given up hope of losing weight	20.4%
Felt discouraged about the future	20.1%
Felt punished	15.2%
Had no pleasures other than those revolving around food	10.8%
Wished for suicide	8.0%

to +25 decismels; 15% of subjects had a threshold of 55 decismels indicating hyposmia (Table 7).

#### Use of Inhalers

Frequency of use of inhalers varied from three times a day (three sniffs in each nostril each time = 18 sniffs) to 48 times a day (288 sniffs).

Table 6. History of overweight and its effects

	No. of subjects % (n = 3193)
Had been in diet or obesity programs	51.0%
with M.D.s	23.5%
with Weight Watchers	27.6%
with Office-based centers	22.2%
Suffered effects of overweight	
Medical problems	15.7%
Previously diagnosed bulimia	0.7%
Previously diagnosed anorexia nervosa	0.3%
Family disharmony	89.0%
Insomnia	50.4%
Trouble working	54.2%
Had obese mothers	45.4%
Had obese fathers	26.7%
	No. of married subjects (n = 425)
Had obese spouses	79.2%

Table 7. Olfactory status

	% of Subjects able to	
	Detect	Identify
Chicago Smell Test*		
Banana	99.0%	15.8%
Apple	98.3%	16.9%
Mint	99.5%	76.0%
Amoore's Threshold Test**		
Thiophane		
-25 decismels	0.0%	
0 decismels	12.8%	
25 decismels	72.2%	
55 decismels	15.0%	

\* Normal subjects are able to detect all three odors and to identify at least one.

\*\* Normal range is -25 to +25 decismels.

### Weight Loss

The amount of weight the subjects lost directly correlated with the frequency of their use of the inhalers ( $p < 0.002$ ). Those who showed good olfactory ability, that is, a threshold of 0-25 decismels in Amoore's thiophane test, who correctly identified the apple odorant in the Chicago Smell Test, who ate an average of two to four meals a day and felt bad about overeating but did not feel bad about themselves, experienced an average weight reduction of 4.7 pounds, or 2.1% of body weight per month. Individuals lost up to 18 pounds per month. Other characteristics that correlated with weight loss were medium or large frame size, not avoiding others, eating fewer chocolate bars, eating more apples, and eating more mint candies. The characteristics that correlate with weight loss and their  $p$  values are shown in Table 8.

Subjects who showed poor olfactory abilities, those who tended to snack more than five times a day, and those who disliked chocolate did not lose weight.

### Conclusion

These data suggest that it may be possible for individuals with good olfaction, by inhaling certain aromas, to induce

Table 8. Characteristics that correlate with weight loss

Frequency of inhaler use	$p < 0.002$
Amoore's thiophane threshold 0-25 decismels	$p < 0.050$
Chicago Smell Test—ability to identify apple odor	$p < 0.050$
Medium or large frame size	$p < 0.020$
Not avoiding others	$p < 0.005$
Not feeling bad about oneself	$p < 0.005$
Liking chocolate	$p < 0.008$
Eating fewer chocolate bars	$p < 0.040$
Eating more apples	$p < 0.060$
Eating more mint candies	$p < 0.060$

and sustain loss of weight over a 6-month period. Theoretically, this approach may be helpful for use in connection with a program of nutrition and exercise to facilitate weight reduction.

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