

The Biology of Human Starvation: A Look at the Impact of Voluntary Food Restriction

The following information is based on Ancel Keys' classic 1950 book which reviewed his study of the physical and mental reactions of wartime conscientious objectors.

- men ate 1,570 calories/day for 6 months (comparable to ~ 1300 calories/day for women)
- lost 24% of body weight (the current ideal for women is 23% thinner than average)

Physical Changes

- decreased body size, especially in upper arm
- decreased heart volume
- slowed pulse rate
- BMR reduced by 40% (women experience greater decrease)
- subjects felt cold, complained of cold hands and feet
- voluntary movements became slower
- decreased capacity to work
- decrease in strength, endurance
- increased frequency of urination
- subjects felt older, behaved older

Personality Changes

- increase in apathy and depression
- decrease in mental alertness, comprehension and concentration
- deterioration of spontaneous activity
- loss of ambition
- narrowing of interests
- general feeling of ineffectiveness
- distraction
- frustrated by discrepancy between what they wanted to do and what they did do
- decrease in sexual interest
- increased neurotism (typically seen as a "woman's problem")
- increased hysteria (also typically seen as a "woman's problem")
- almost 20% of subjects showed severe "character neurosis"
- two subjects bordered on psychosis including violence and hysteria
- sensitivity to noise

Food Preoccupation

- increase in food interest...food talk, food interests
- collected recipes, studied cookbooks and menus, fixed food saved from mealtime
- heightened craving for food
- much meal planning
- food dislikes disappeared (they like the monotonous meals served)
- became possessive about food
- demanded food and beverages be hot
- toyed with food to make it seem like more

- dawdled over meals for hours
- extensive gum chewing
- increased drinking of coffee and tea
- increased smoking
- nail-biting became common
- began to purchase useless articles they did not need or use, others began hoarding money
- some escaped the experiment environment and binged, followed by feelings of guilt and self-reproach
- some vomited following binges

Social Activities

- initial lively, responsive, tolerant and happy, with good humor and high spirits...this gradually disappeared...subjects became sober, serious and what humor remained tended to be sarcastic
- became reluctant to make group decisions or plan activities
- reluctant to participate in group activities, "too much trouble dealing with others"
- became self-centered and egocentric
- social interaction stilted, politeness artificial
- food central topic of conversations
- not able to control emotions

During Refeeding (It took between 15 and 20 weeks to partially recover from the effects of dieting and weight loss. It appears, then, that **one can expect to feel worse** when coming off a prolonged weight loss period.)

- intake between 1,877 and 4,158 kcal
- many became more irritable and depressed
- slump in morale, subjects lost all interest in earlier humanitarian concerns
- became argumentative
- expressed feelings of being "let down"
- hunger pains "more intense than ever"
- appetites insatiable for 12 weeks, even those on highest kcal diets
- found it hard to stop eating, although "stuffed"
- still concerned with food, above all else
- table manner's continued to deteriorate
- week 13 of refeeding subjects had access to food, ate an average of 5,218 kcal, ate nearly continuously, either ate or slept
- by week 15, increase in social behavior at meals
- by week 20, all felt nearly normal with food
- by week 33, 10 of 14 were eating normal amounts, others still ate more than before
- slowly humor, enthusiasm and sociability returned

Physical Effects of Refeeding

- expected relief did not come quickly
- subjects gained fat tissue rapidly, "soft, roundness" became their dominant characteristic
- lean tissue recovered more slowly
- sleepiness and headaches increased for some

- thirst increased
- work capacity increased by week 13

Source: Health Risks of Obesity (1993) by F. Berg

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