



Co-funded by the
Erasmus+ Programme
of the European Union



Breaking WEIGHT BIAS

Promoting Health without
harming through digital
training tools

Project number:

2020-1-UK01-KA204-
079106

Module: 5. Dismantling body weight 5.1. BMI as a health measure





Table of Content

TRAINING CONTENT	3
Module: 5. Dismantling body weight	3
5.1. BMI as a health measure	3
EXTERNAL RESOURCES	7



TRAINING CONTENT

Module: 5. Dismantling body weight

Learning objectives

By reading this module, health care professionals will:

- become aware of the limitations of BMI as a tool to measure health;
- recognise the complex interrelationships between a great variety of different determinants that affect weight control;
- understand the effects of dieting on physical and mental health;
- become familiar with a more holistic approach to health that goes beyond body weight.

5.1. BMI as a health measure

Origin

Lambert Adolph Jacque Quetelet was a Flemish astronomer and statistician who tried to determine the characteristics of the “average” man. In 1835, Dr. Quetelet noticed that when the weight (kilometres) is divided by height squared (metres), the body mass relationship to height in normal young adults was least affected by height. This ratio was known as the “Quetelet Index” (Nuttall, 2015).

The “Quetelex Index” was not popular, until Ancel Keys, a nutritional epidemiologist and physician, proposed it as a proxy for determining body fat percentages in 1972. Keys et al., (1972) referred to it as Body Mass Index (BMI) and used it in population-based studies. However, they have already stated that BMI is a poor indicator of percent of body fat (Keys et al., 1972).

BMI is currently the most widely used method to measure body fat, although it has a history of approximately 190 years, and it was initially developed for a different purpose. It seems that its simplicity and readily-availability are two basic factors that have reinforced its use in research and clinical practice (Nuttall, 2015).

Limitations

Many authors have questioned the accuracy of BMI in diagnosing obesity and have emphasised its limitations (Ogden et al., 2004; Wellens, 1996).

- age,
- gender,
- race/ethnicity,
- cardiorespiratory fitness,



- body fat distribution.

As age increases, the BMI may remain stable, without detecting possible changes in body composition that may have occurred (i.e., increased body fat mass, decreased muscle mass and diminished bone density), especially above the age of 60 years (Rothman, 2008).

Body composition of women is different from men, even when they have the same BMI. Women tend to have lower BMI values compared to men, although their body fat mass is significantly higher (Nuttall, 2015). Moreover, the BMI cut-off points for obesity are not a good predictor of body fat percentage among post-menopause women who experience determinant changes in their body composition, regardless of body weight changes (Banack, 2018). At the same time, BMI seems to correlate more with body lean mass (fat-free mass) than body fat mass in men (Romero-Corral, 2008).

Many Asian races tend to have similar fat mass and metabolic risk factors at lower BMI values compared to Caucasians. Using the same BMI cut-offs points for Asians could delay a possible diagnosis and proper intervention (Humphreys, 2010).

BMI cannot estimate cardiorespiratory fitness, which seems to have a protective role against all-cause and cardiovascular mortality irrespective of the presence of obesity (Ortega, 2018).

BMI represents the sum of fat-mass index (peripheral and visceral adipose tissues) and fat-free mass index (skeletal muscle mass, bone, and organs) and cannot distinguish between body weight components (Dulloo, 2010).

Apart from this, BMI fails to provide us with any information regarding the location of body fat. This is a serious limitation if we consider the well-established role of visceral fat accumulation in metabolic disturbances, including insulin resistance and the development of the so-called “metabolic syndrome”. Consequently, body composition and body fat distribution can vary widely even among people with similar BMIs.

It is worth pointing out that the definition of obesity is characterised by the accumulation of abnormal or excess body fat (adiposity), which can be harmful to health (Lau, 2020). Thus, a diagnosis of obesity based solely on BMI can lead to misleading results.

BMI as a proxy for health

According to a study by Tomiyama et al., (2016), using BMI as a diagnostic tool for health resulted in the misclassification of an estimated 74 936 678 individuals as metabolically healthy or unhealthy. Nearly half of the individuals whose BMI was within the “overweight” category were metabolically healthy, whereas 30% of the individuals whose BMI was considered “normal” had an unhealthy metabolic profile.



Focusing only on BMI to assess health could provoke undesired effects and mistreatment of patients. More specifically, using BMI as a proxy for cardiometabolic health would urge health care professionals to prescribe “weight-loss” to people who would not benefit from that, while not paying attention to people who need treatment, merely because they are considered as “*healthy*” according to the BMI categorisation (Tomiya et al., 2016).

It has been documented that not all people with obesity have metabolic complications. When excess body fat is not accompanied by the presence of metabolic syndrome components, it can be considered as “metabolically healthy obesity”. Although there is no universal definition for “metabolically healthy obesity”, Figure 5.1.1. illustrates some of the most important factors that are suggested to be responsible for the differences observed in metabolic health between people with “metabolically healthy” and “metabolically unhealthy” obesity (Smith et al., 2019).

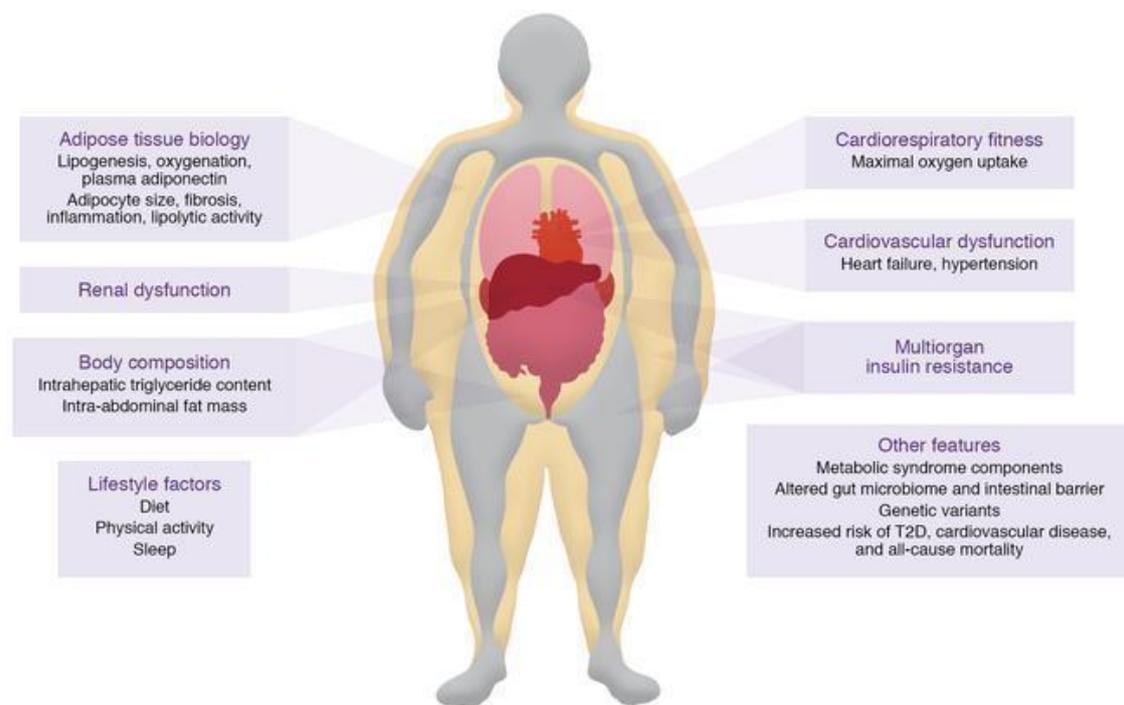


Figure 5.1.1. Suggested mechanisms that could explain the differences between individuals with “metabolically healthy” and “metabolically unhealthy” obesity. The mechanisms cannot be confirmed, due to inadequate data or inconsistency among different studies. (Source: Smith et al., 2019, <https://doi.org/10.1172/JCI129186>.)

BMI is also being used in population-based studies to investigate the association of different BMI categories with mortality risk. However, this kind of approach has limitations too. It is worth mentioning that those studies often do not take into account important factors that can affect mortality rates, including a family history of chronic diseases, familial longevity, a current history of drinking and smoking habits and the use of treatment practices for possible comorbidities (Nuttall, 2015).



It is crucial to realise that evaluating one's health solely based on BMI categorisation can be even dangerous, considering the metabolic side-effects of dieting, which is often suggested as a weight-loss method when BMI is higher than "normal" (Gaesser, 1999). (You can find more about the consequences of dieting in chapter 5.3)

Moreover, it should be noted that sudden or big weight changes should be further evaluated even if the BMI remains in the "normal" category, as well as the adoption of unhealthy practices to keep a certain weight within the "*healthy range*" (Obesity Canada, 2003). A detailed health assessment is very useful and can provide health care professionals with important information about weight history, lifestyle factors, and potential barriers to treatment (Rueda-Clausen et al., 2020).

"Obesity paradox" is a term used to describe the decreased mortality that has been observed in people with obesity that are older or have several chronic diseases (such as coronary artery disease, chronic heart failure, etc.). However, Donini et al., (2020) support that "*the actual paradox seems to be keeping defining obesity by BMI, which is not able to quantify body fat percentage and adiposity distribution, nor the degree of metabolic disturbances that it can underlie*" and this can be "*a lesson to be learned*" (Donini et al., 2020).



EXTERNAL RESOURCES

- Arnsten A.F.T., Raskind M. A., Taylor F.B., Connor D.F. (2015). The effects of stress exposure on prefrontal cortex: Translating basic research into successful treatments for post-traumatic stress disorder. *Neurobiology of Stress*, 1:89-99. ISSN 2352-2895
- Bacon L. & Aphramor L. (2014) *Body Respect*. BenBella Books, Inc
- Bacon L. & Aphramor L. (2011). Weight science: Evaluating the evidence for a paradigm shift. *Nutrition Journal*, 10(1), 1–13. <https://doi.org/10.1186/1475-2891-10-9>
- Banack H.R., Wactawski-Wende J., Hovey K.M., Stokes A. (2018). Is BMI a valid measure of obesity in postmenopausal women? *Menopause*, 25(3):307-313. <https://doi.org/10.1097/GME.0000000000000989>.
- Barry V.W, Baruth M., Beets M.W., Durstine J.L., Liu J., Blair S.N. (2014). Fitness vs. fatness on all-cause mortality: a meta-analysis. *Prog Cardiovasc Dis. Jan-Feb*;56(4):382-90.
- Beccuti G., Pannain S. (2013). Sleep and obesity. *Curr Opin Clin Nutr Metab Care. July*;14(4): 402–412. <https://doi.org/10.1097/MCO.0b013e3283479109>
- Berset M., Semmer N.K., Elfering A., Jacobshagen N., Meier L.L. (2011). Does stress at work make you gain weight? A two-year longitudinal study. *Scandinavian Journal of Work, Environment & Health*, 37(1):45-53. <https://doi.org/10.5271/sjweh.3089>.
- Blair S.N., Shaten J., Brownell K., Collins G., Lissner L. (1993). Body weight change, all-cause mortality, and cause-specific mortality in the Multiple Risk Factor Intervention Trial. *Ann Intern Med*. 119:749–757.
- Blechert J., Naumann E., Schmitz J., Herbert B.M., Tuschen-Caffier B. (2014). Startling Sweet Temptations: Hedonic Chocolate Deprivation Modulates Experience, Eating Behavior, and Eyeblink Startle. *PLoS ONE* 9(1): e85679. <https://doi.org/10.1371/journal.pone.0085679>
- Brandkvist M., Bjørngaard J.H., Ødegård R.A., Åsvold B.O., Sund E.R., Vie G.Å. (2019). Quantifying the impact of genes on body mass index during the obesity epidemic: longitudinal findings from the HUNT Study. *British Medical Journal*, 366:l4067. <https://doi.org/10.1136/bmj.l4067>
- Bryan J. & Tiggemann M. (2001). The effect of weight-loss dieting on cognitive performance and psychological well-being in overweight women. *Appetite*, 36(2),147-156, ISSN 0195-6663, <https://doi.org/10.1006/appe.2000.0389>.
- Butland B., Jebb S., Kopelman P., McPherson K., Thomas S., Mardell J., Parry, V. (2007). Tackling obesity: future choices – Project Report. 2nd Edition, *Foresight, Government Office for Science*. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/287937/07-1184x-tackling-obesity-future-choices-report.pdf Accessed [December 7, 2021]
- Chumlea W.C., Guo S.S., Kuczumarski R.J., Flegal K.M., Johnson C.L., Heymsfield S.B., Lukaski H.C., Friedl K., Hubbard V.S. (2002). Body composition estimates from NHANES III bioelectrical impedance data. *International Journal of Obesity*, 26(12):1596-1609. <https://doi.org/10.1038/sj.ijo.0802167>.
- Crowther J.H., Hobfoll S.E., Stephens M.A., Tennenbaum D.L. (1992). *The Etiology Of Bulimia Nervosa* Taylor & Francis
- de Ridder D., Adriaanse M., Evers C., Verhoeven A. (2014) Who diets? Most people and especially when they worry about food. *Appetite*, 80, 103-108,
- De Witt Huberts J.C., Evers C., De Ridder D.T.D. (2013). Double trouble. Restrained eaters do not eat less and feel worse. *Psychology & Health*, 28, 686–700.
- Domecq JP., Prutsky G., Leppin A., Sonbol M.B., Altayar O., Undavalli C., Wang Z., Elraiyah E., Brito J.P., Mauck K.F., Lababidi M.H., Prokop L.J., Asi N., Wei J., Fidahusseini S., Montori V.M., Murad M.H. (2015). Drugs Commonly Associated With Weight Change: A Systematic Review and Meta-analysis. *The Journal of Clinical Endocrinology and Metabolism*, 100(2):363-370. Donini, LM.



- Pinto, A. Giusti, AM. Lenzi, A. Poggiogalle, E. (2020). Obesity or BMI Paradox? Beneath the Tip of the Iceberg. *Frontiers in Nutrition*, 7:53. <https://doi.org/10.3389/fnut.2020.00053>
- Dulloo A., Jacquet J., Solinas G., Montani J-P., Schutz Y. (2010). Body composition phenotypes in pathways to obesity and the metabolic syndrome. *International Journal of Obesity*, 34(2): 4–17. <https://doi.org/10.1038/ijo.2010.234>.
- Dulloo A.G., Jacquet J., Montani J.P. (2012). How dieting makes some fatter: from a perspective of human body composition autoregulation. *Proceedings of the Nutrition Society*, 71(3):379-89. <https://doi.org/10.1017/S0029665112000225>
- Eggar G., Swinburn B. (2002). Preventative Strategies against Weight Gain and Obesity. *Obesity Reviews*, 3:289–301. <https://doi.org/10.1046/j.1467-789X.2002.00082.x>
- Emmer C., Bosnjak M., Mata J. (2019). The association between weight stigma and mental health: A meta-analysis. *Obes Rev*. 2020 Jan;21(1):e12935. <https://doi.org/10.1111/obr.12935>.
- Holm J.E., Holroyd K.A. (1993). The Daily Hassles Scale (Revised): Does it measure stress or symptoms? *Behavioral Assessment* 14:465–82.
- Fothergill E., Guo J., Howard L., Kerns J.C., Knuth N.D., Brychta R., Chen K.Y., Skarulis M.C., Walter M., Walter P.J., Hall K.D. (2016). Persistent metabolic adaptation 6 years after "The Biggest Loser" competition. In Tribol E. & Resch E. (2012) *Intuitive Eating*. St. Martin's Press, New York
- Gaesser G.A. (1999). Thinness and weight loss: beneficial or detrimental to longevity? *Medicine & Science in Sports & Exercise*, 31(8):1118-1128. <https://doi.org/10.1097/00005768-199908000-00007>
- Healthy People 2030. Social Determinants of Health Available from: <https://health.gov/healthypeople/objectives-and-data/social-determinants-health> Accessed [December 7, 2021].
- Heatherton T.F., Mahemedi F., Strieppe M., Field A.E., McGree S.T. (1997). A 10-year longitudinal study of bodyweight, dieting, and eating disorder symptoms. *Journal of Abnormal Psychology*, 106, 117–125.
- Herman C.P., Polivy J. (1975). Anxiety, restraint, and eating behavior. *Journal of Abnormal Psychology*. 84:666–672.
- Humphreys S. (2010). The unethical use of BMI in contemporary general practice. *The British journal of general practice: the journal of the Royal College of General Practitioners*, 60(578):696–697.
- Irwin A., Valentine N., Brown C., Loewenson R., Solar O., Brown H., Koller T., Vega J. (2006). The Commission on Social Determinants of Health: Tackling the Social Roots of Health Inequities. *PLoS Med* 3(6): e106. <https://doi.org/10.1371/journal.pmed.0030106>
- Johanssen D.L., Knuth N.D., Huizenga R., Rood J., Ravussin E., Hall K.D. (2012). Metabolic slowing with massive weight loss despite preservation of fat-free mass. *J Clin Endocrinol Metab*. 97:2489–2496.
- Jones A., Bentham G., Foster C., Hillsdon M., Pater J. (2007). Foresight Tackling Obesities: Future Choices. *Obesogenic Environments - Evidence Review*. *Foresight, Government Office for Science*. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/295681/07-735-obesogenic-environments-review.pdf Accessed [December 7, 2021]
- Kausman R. (2004). *If not dieting, then what?* Allen & Unwin
- Keeler C.L., Mattes R.D., Tan S.Y. (2015). Anticipatory and reactive responses to chocolate restriction in frequent chocolate consumers. In Tribol E. & Resch E. (2012) *Intuitive Eating*. St. Martin's Press, New York
- Keys A., Brožek J., Henschel A., Mickelsen O., Taylor H.L. (1950). *The biology of human starvation*. University of Minnesota Press.
- Keys A., Fidanza F., Karvonen M.J., Kimura N., Taylor H.L. (1972). Indices of relative weight and obesity. *Journal of Chronic Diseases*, 25(6):329-43. [https://doi.org/10.1016/0021-9681\(72\)90027-6](https://doi.org/10.1016/0021-9681(72)90027-6).



- Lau D.C.W., Wharton S. (2020). Canadian Adult Obesity Clinical Practice Guidelines: The Science of Obesity. Available from: <https://obesitycanada.ca/guidelines/science>. Accessed [December 6, 2021].
- Lee Y.S. (2009). The role of genes in the current obesity epidemic. *Annals of the Academy of Medicine of Singapore*, 38(1):45-3.
- Lissner L., Odell P.M., D'Agostino R.B. (1991). Variability of body weight and health outcomes in the Framingham population. *N. Engl. J. Med.*324:1839–1844.
- Lowe M.R., Butryn M.L. (2007). Hedonic hunger: A new dimension of appetite? *Physiology & Behavior* 91(4)432–439, <https://doi.org/10.1016/j.physbeh.2007.04.006>
- Lowe M.R., Levine A.S. (2005). Eating Motives and the Controversy over Dieting: Eating Less Than Needed versus Less Than Wanted. *Obesity Research* 13(5):797-806.
- MacLean P.S., Higgins J.A., Giles E.D., Sherk V.D., Jackman M.R. (2015). The role for adipose tissue in weight regain after weight loss. *Obesity Reviews* 16(1), 45–54
- Major B., Hunger J.M., Bunyan D.P., Miller C.T. (2014). The ironic effects of weight stigma. *Journal of Experimental Social Psychology*, 51;74-80 <https://doi.org/10.1016/j.jesp.2013.11.009>
- Mann T., Tomiyama A.J., Westling E., Lew A-M., Samuels B., Chatman J. (2007). Medicare's search for effective obesity treatments: diets are not the answer. *Am Psychol* 62(3):220–233
- Mann T. (2015) *Secrets From the Eating Lab*. New York: Harper Collins.
- Mata J., Hertwig R. (2018). Public beliefs about obesity relative to other major health risks: representative cross-sectional surveys in the USA, the UK, and Germany. *Ann Behav Med* 52:273–286 <https://doi.org/10.1093/abm/kax003>
- Milano W., Ambrosio P., Carizzone F., Biasio V., Munzio W., Foia M.G., Capasso A. (2020). Depression and Obesity: Analysis of Common Biomarkers. *Diseases*, 8(2):23. <https://doi.org/10.3390/diseases8020023>
- Moellering D.R., Smith D.L. (2012). Ambient Temperature and Obesity. *Current Obesity Reports*, 1(1):26-34. <https://doi.org/10.1007/s13679-011-0002-7>.
- Molarius A., Seidell J.C., Sans S., Tuomilehto J., Kuulasmaa K. (2000). Educational level, relative body weight, and changes in their association over 10 years: An international perspective from the WHO MONICA Project. *American Journal of Public Health*, 90:1260–1268.
- Monnier L., Schlienger J.L., Colette C., Bonnet F. (2020). The obesity treatment dilemma: Why dieting is both the answer and the problem? A mechanistic overview. *Diabetes & Metabolism*.47(3), <https://doi.org/10.1016/j.diabet.2020.09.002>
- Montani J.P., Schutz Y., Dulloo A.G. (2015). Dieting and weight cycling as risk factors for cardiometabolic diseases: who is really at risk? *Obesity reviews: an official journal of the International Association for the Study of Obesity. Suppl 1*:7-18. <https://doi.org/10.1111/obr.12251>.
- Monteleone P., Piscitelli F., Scognamiglio P., Monteleone A.M., Canestrelli B., Di Marzo V., Maj M. (2012). Hedonic Eating Is Associated with Increased Peripheral Levels of Ghrelin and the Endocannabinoid 2-Arachidonoyl-Glycerol in Healthy Humans: A Pilot Study, *The Journal of Clinical Endocrinology & Metabolism*, 97,(6)917–E924, <https://doi.org/10.1210/jc.2011-3018>
- Müller M.J., Bosy-Westphal A., Heymsfield S.B. (2010). Is there evidence for a set point that regulates human body weight? *Medicine Reports*, 2:59. <https://doi.org/10.3410/M2-59>.
- Munter C.H., Hirschmann J.R. (1989). *Overcoming Overeating*. Fawcett Books: New York.
- Neumark-Sztainer D., Wall M., Larson N.I, Eisenberg M.E., Loth K. (2011). Dieting and disordered eating behaviors from adolescence to young adulthood: Findings from a 10-year longitudinal study. *J Am Diet Assoc. July*; 111(7): 1004–1011.
- Nuttall F.Q. (2015). Body Mass Index: Obesity, BMI, and Health: A Critical Review. *Nutrition Today*. May;50(3):117-128. <https://doi.org/10.1097/NT.0000000000000092>.
- Obesity Canada (2003). Canadian Guidelines for Body Weight Classification in Adults. Available from: <https://www.canada.ca/en/health-canada/services/food-nutrition/healthy-eating/healthy->



- [weights/canadian-guidelines-body-weight-classification-adults/questions-answers-public.html](#)
Accessed [December 7, 2021].
- Ogden C.L., Fryar C.D., Carroll M.D., Flegal K.M. (2004). Mean body weight, height, and body mass index, United States 1960-2002. *Advance Data*, (347):1-17.
- Ogden J. (1995). Cognitive and motivational consequences of dieting. *European Eating Disorders Review* 3(4), 228-241 <https://doi.org/10.1002/erv.2400030405>
- Ortega F.B., Ruiz J.R., Labayen I., Javie C.J., Blair S.N. (2018). The Fat but Fit paradox: what we know and don't know about it. *British Journal of Sports Medicine*, 52:151-153.
- Polivy J. (1996). Psychological consequences of food restriction. *J Am Diet Assoc. Jun*;96(6):589-92; quiz 593-4. [https://doi.org/10.1016/S0002-8223\(96\)00161-7](https://doi.org/10.1016/S0002-8223(96)00161-7)
- Puhl R.M., Heuer C.A. (2010). Obesity stigma: Important considerations for public health. *American Journal of Public Health*, 100(6), 1019–1028. <https://doi.org/10.2105/ajph.2009.159491>
- Ravussin E., Swinburn B.A. (1992). Effect of calorie restriction and weight loss on energy expenditure. In: Van Itallie, TB (eds.). *Treatment of the Seriously Obese Patient*. Guilford Press: New York. 524.
- Romero-Corral A., Somers V.K., Sierra-Johnson J., Thomas R.J., Collazo-Clavell M.L., Korinek J., Allison T.G., Batsis J.A., Sert-Kuniyoshi F.H., Lopez-Jimenez F. (2008). Accuracy of body mass index in diagnosing obesity in the adult general population. *International journal of obesity*, 32(6):959-66. <https://doi.org/10.1038/ijo.2008.11>.
- Rothman K.J. (2008). BMI-related errors in the measurement of obesity. *International Journal of Obesity*, 32(3):56–9. <https://doi.org/10.1038/ijo.2008.87>
- Rueda-Clausen C.F. Poddar M., Lear S.A., Poirier P., Sharma A.M. (2020). Canadian Adult Obesity Clinical Practice Guidelines: Assessment of People Living with Obesity. Available from: <https://obesitycanada.ca/wp-content/uploads/2021/05/6-Obesity-Assessment-v6-with-links.pdf>
Accessed [December 7, 2021].
- Santos I., Sniehotta F.F., Marques M.M., Carraça E.V., Teixeira P.J. (2017). Prevalence of personal weight control attempts in adults: a systematic review and meta-analysis. *Obesity Reviews* 18,32–50
- Science Direct, Dietary restraint theory Available from: <https://www.sciencedirect.com/topics/medicine-and-dentistry/dietary-restraint> Accessed [February 14, 2022].
- Shetty B., Shantaram M. (2014). Heritability of body weight: an evidence for obesity? *International Journal of Pharma Medicine and Biological Sciences*, 3(1): 15-20.
- Slof-Op't Landt M.C.T., van Furth E.F., van Beijsterveldt C.E.M., Bartels M., Willemsen G., de Geus E.J., Ligthart L., Boomsma D.I. (2017). Prevalence of dieting and fear of weight gain across ages: a community sample from adolescents to the elderly. *Int J Public Health. Nov*;62(8):911-919. <https://doi.org/10.1007/s00038-017-0948-7>
- Smith G.I., Mittendorfer B., Klein S. (2019). Metabolically healthy obesity: facts and fantasies. *The Journal of Clinical Investigation*, 129(10):3978-3989. <https://doi.org/10.1172/JCI129186>
- Sørensen T.I., Holst C., Stunkard A.J. (1998). Adoption study of environmental modifications of the genetic influences on obesity. *Int J Obes Relat Metab Disord. Jan*;22(1):73-81. <https://doi.org/10.1038/sj.ijo.0800548> PMID: 9481603
- Speakman J.R., Levitsky D.A., Allison D.B., Brady M.S., Castro J.M., Clegg D.J., Clapham J.C., Dulloo A.G., Gruer L., Haw S., Hebebrand J., Hetherington M.M., Higgs S., Jebb S.A., Loos R.J.F., Luckman S., Luke A., Mohammed-Ali V., O'Rahilly S., Pereira M., Perusse L., Robinson T.N., Rolls B., Symonds M.E., Westerterp-Plantenga M.S. (2011). Set points, settling points and some alternative models: theoretical options to understand how genes and environments combine to regulate body adiposity. *Disease Models & Mechanisms*, 4(6): 733–745. <https://doi.org/10.1242/dmm.008698>.



- Stice E., Presnell K., Groesz L., Shaw H. (2005). Effects of a Weight Maintenance Diet on Bulimic Symptoms: An Experimental Test of the Dietary Restraint Theory. *Health Psychol.* July; 24(4): 402–412.
- Stice E., Yokum S. (2016). Neural vulnerability factors that increase risk for future weight gain. *Psychological Bulletin*, 142(5), 447–471.
- Stice E., Cooper J.A., Schoeller D.A., Tappe K., Lowe, M.R. (2007). Are dietary restraint scales valid measures of moderate to long-term dietary restriction? Objective biological and behavioral data suggest not. *Psychological Assessment*, 19, 339–458.
- Stroebe W. (2008). *Dieting, overweight, and obesity: Self-regulation in a food-rich environment*. American Psychological Association.
- Strohacker K., Carpenter K. C., McFarlin B.K. (2009). Consequences of Weight Cycling: An Increase in Disease Risk?. *International journal of exercise science*, 2(3), 191–201.
- Stunkard A.J., Harris J.R., Pedersen N.L., McClearn G.E. (1990). The Body-Mass Index of Twins Who Have Been Reared Apart. *The New England Journal of Medicine*, 322(21): 1483-1487.
<https://doi.org/10.1056/NEJM199005243222102>.
- Tamhane N.M. (2017). The Role of Body Image, Dieting, Self-Esteem and Binge Eating in Health Behaviors. Masters Theses. 2922.
- Taylor L.A., Tan A.X., Coyle C.E., Ndumele C., Rogan E., Canavan M., Curry L.A., Bradley E.H. (2016). Leveraging the Social Determinants of Health: What Works? *PLoS ONE* 11(8): e0160217.
<https://doi.org/10.1371/journal.pone.0160217>
- Timmerman G.M., Gregg E.K. (2003). Dieting, perceived deprivation, and preoccupation with food. *West J Nurs Res.* 25:405–418.
- Tomiyama A.J., Ahlstrom B., Mann T. (2013). Long-term Effects of Dieting: Is Weight Loss Related to Health? *Social and Personality Psychology Compass* 7(12), 861–877
- Tomiyama A.J., (2014). Weight stigma is stressful. A review of evidence for the Cyclic Obesity/Weight-Based Stigma model. *Appetite*. Nov;82:8-15. <https://doi.org/10.1016/j.appet.2014.06.108>. Epub 2014 Jul 2. PMID: 24997407
- Tomiyama A.J., Hunger, J. Nguyen-Cuu, and C. Wells. (2016). “Misclassification of Cardiometabolic Health When Using Body Mass Index Categories in NHANES 2005–2012.” *International Journal of Obesity* 40: 883–86. <https://doi.org/10.1038/ijo.2016.17>.
- Tomiyama A.J., Epel E. S., McClatchey T. M., Poelke G., Kemeny M.E., McCoy S.K., Daubenmier J. (2014). Associations of weight stigma with cortisol and oxidative stress independent of adiposity. *Health psychology: official journal of the Division of Health Psychology, American Psychological Association*, 33(8), 862–867. <https://doi.org/10.1037/hea0000107>
- Tomiyama A.J., Carr D., Granberg EM., Major B., Robinson E., Sutin A.R., Brewis A. (2018). How and why weight stigma drives the obesity ‘epidemic’ and harms health. *BMC Medicine*, 16, 123.
<https://doi.org/10.1186/s12916-018-1116-5>
- Tomiyama A.J., Mann T., Vinas D., Hunger J.M., DeJager J., Taylor S.E. (2010). Low Calorie Dieting Increases Cortisol. *Psychosom Med.* 72(4): 357–364.
<https://doi.org/10.1097/PSY.0b013e3181d9523c>.
- Tribole E. & Resch E. (2012) *Intuitive Eating*. St. Martin’s Press, New York
- Tylka T.L., Annunziato R.A., Burgard D., Daniélsdóttir S., Shuman E., Davis C., Calogero R.M. (2014). "The Weight-Inclusive versus Weight-Normative Approach to Health: Evaluating the Evidence for Prioritizing Well-Being over Weight Loss", *Journal of Obesity*, vol. 2014, Article ID 983495, 18 pages, 2014. <https://doi.org/10.1155/2014/983495>
- Urbszat D., Herman C.P., Polivy J. (2002). Eat, drink, and be merry, for tomorrow we diet: Effects of anticipated deprivation on food intake in restrained and unrestrained eaters. In Tribole E. & Resch E. (2012) *Intuitive Eating*. St. Martin’s Press, New York
- van Strien T. (2020). Dieting and Overeating. In: Meiselman H. (eds) *Handbook of Eating and Drinking*. Springer, Cham. https://doi.org/10.1007/978-3-030-14504-0_136



- Vartanian L.R., Shaprow J.G. (2008). Effects of weight stigma on exercise motivation and behavior: a preliminary investigation among college-aged females. *Journal of health psychology*, 13(1):131-8. <https://doi.org/10.1177/1359105307084318>. PMID: 18086724.
- Wellens R.I., Roche A.F., Khamis H.J., Jackson A.S., Pollock M.L., Siervogel R.M. (1996). Relationships between the body mass index and body composition. *Obesity Research*, 4(1):35Y44. <https://doi.org/10.1002/j.1550-8528.1996.tb00510.x>.
- Williamson D.F., Serdula M.K., Anda R.F., Levy A., Byers T. (1992). Weight loss attempts in adults: goals, duration, and rate of weight loss. *Am J Public Health*. 82:1251–1257.
- Woolley K., Fishbach A., Wang R.M. (2020). Food restriction and the experience of social isolation. *J Pers Soc Psychol*. Sep;119(3):657-671. <https://doi.org/10.1037/pspi0000223>
- World Obesity, (n.d.) Weight Stigma Available from: <https://www.worldobesity.org/what-we-do/our-policy-priorities/weight-stigma> Accessed [December 14, 2021].
- Zeigler Z. (2021). COVID-19 Self-quarantine and Weight Gain Risk Factors in Adults. *Current Obesity Reports*, 12:1-11. <https://doi.org/10.1007/s13679-021-00449-7>
- Żukiewicz-Sobczak W., Wróblewska P., Zwoliński J., Chmielewska-Badora J., Adamczuk P., Krasowska E., Zagórski J., Oniszczyk A., Piątek J., Silny W. (2014). Obesity and poverty paradox in developed countries. *The Annals of Agricultural and Environmental Medicine*, 21(3):590-4. <https://doi.org/10.5604/12321966.1120608>.