Management of Obesity

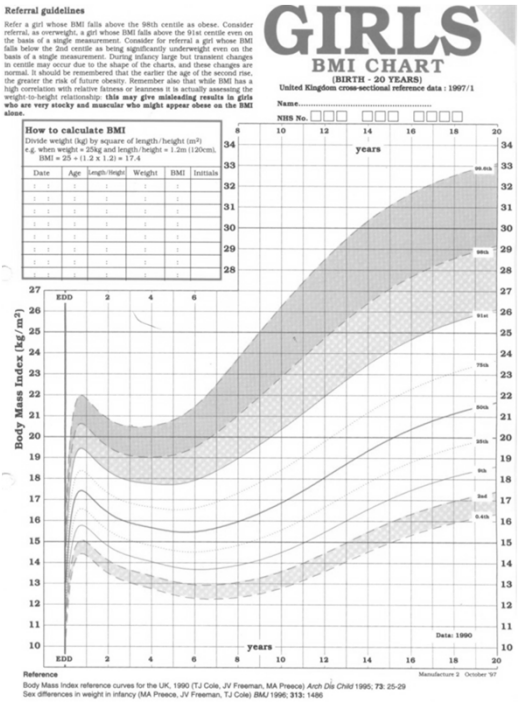
Jacobus van Dyk

Obesity cause social, psychological and health problems and is linked to obesity later in life and poor health outcomes as an adult.

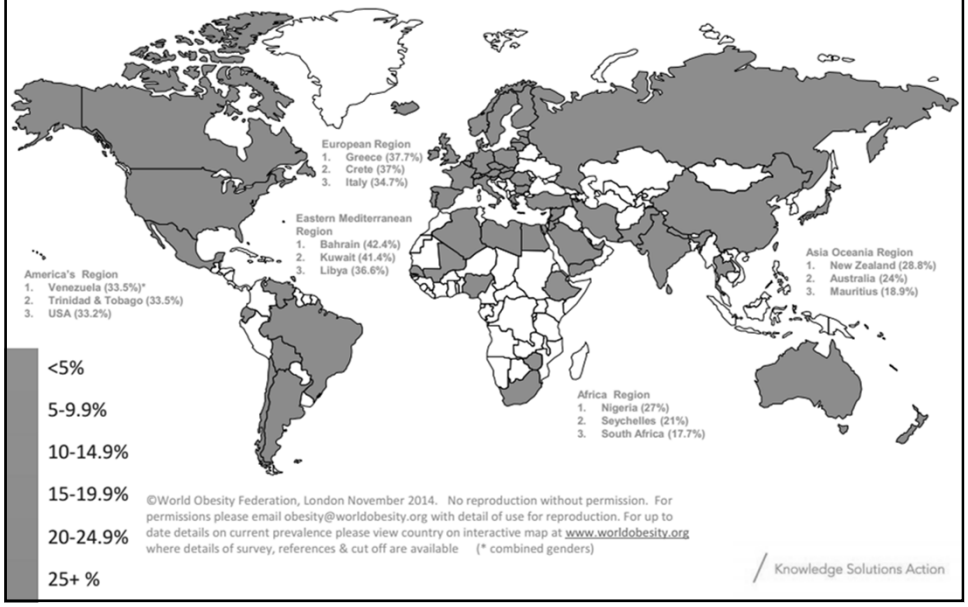
Definition

There is no standardized definition for extreme obesity in children.

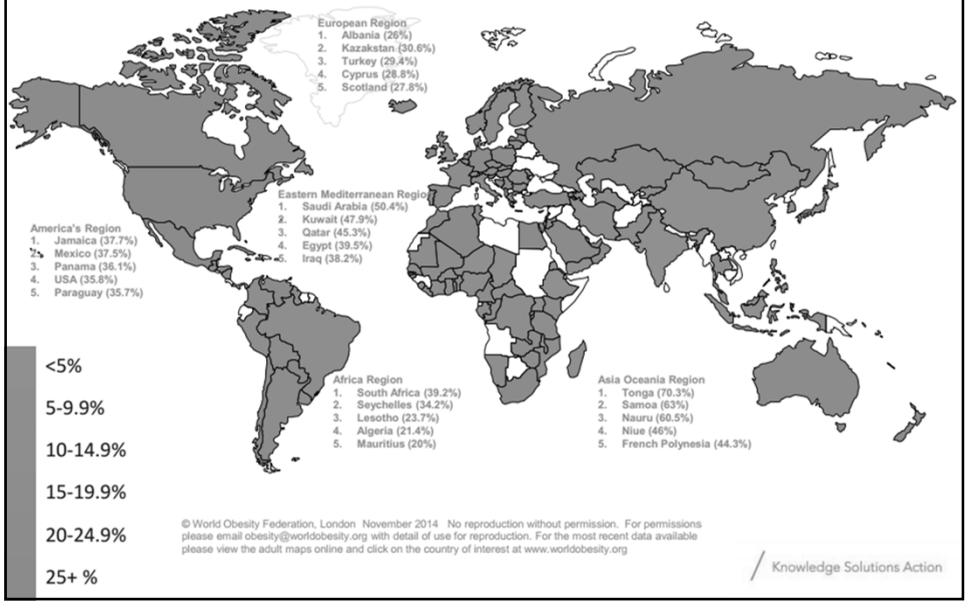
On the basis of definition for adults (BMI >40) and by extrapolation to pediatric values for weight and height, children and adolescents with BMI >99.5 percentile were described as “extremely obese”



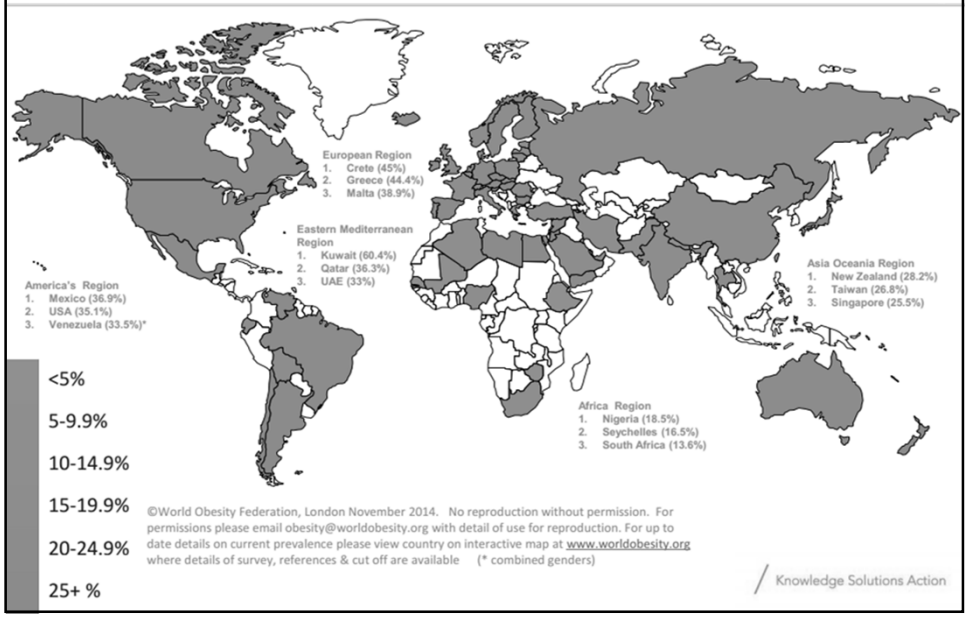
Current % Prevalence of Girls Overweight (including obesity) with Top 3 countries in each region



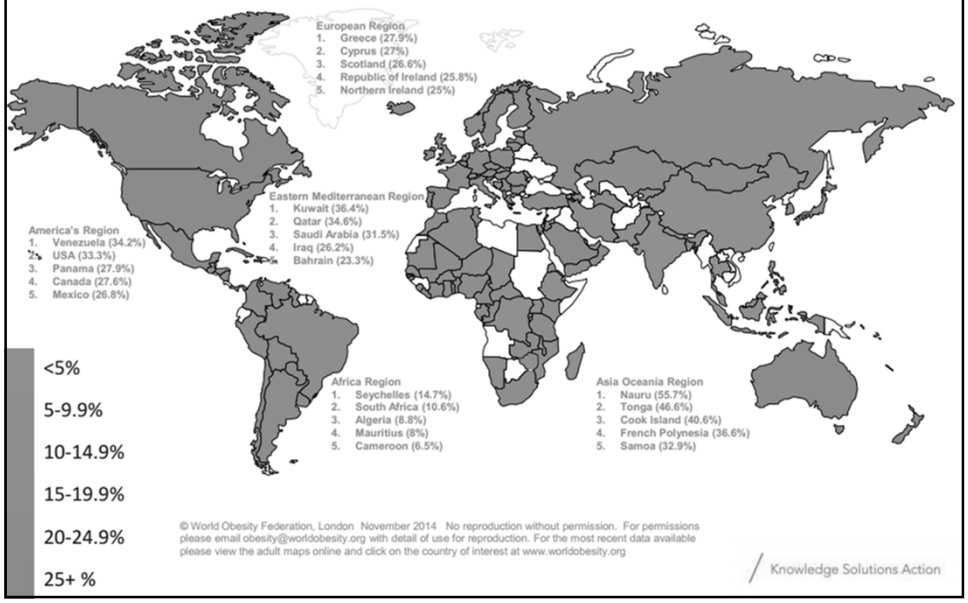
Current % Prevalence of Female Obesity (BMI ≥ 30 kg/m ²) with Top 5 countries in each Region.



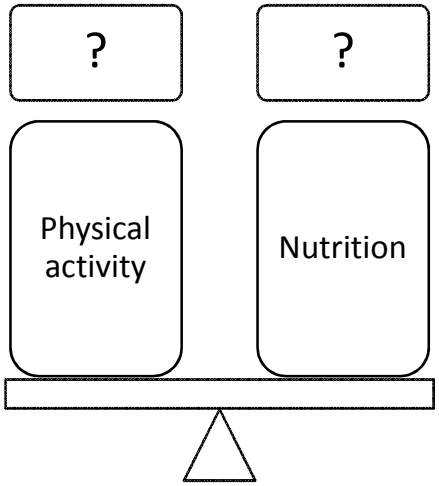
Current % Prevalence of Boys Overweight (including obesity) with Top 3 Countries in each region



Current % Prevalence of Male Obesity (BMI ≥ 30 kg/m ²) with Top 5 countries in each Region.

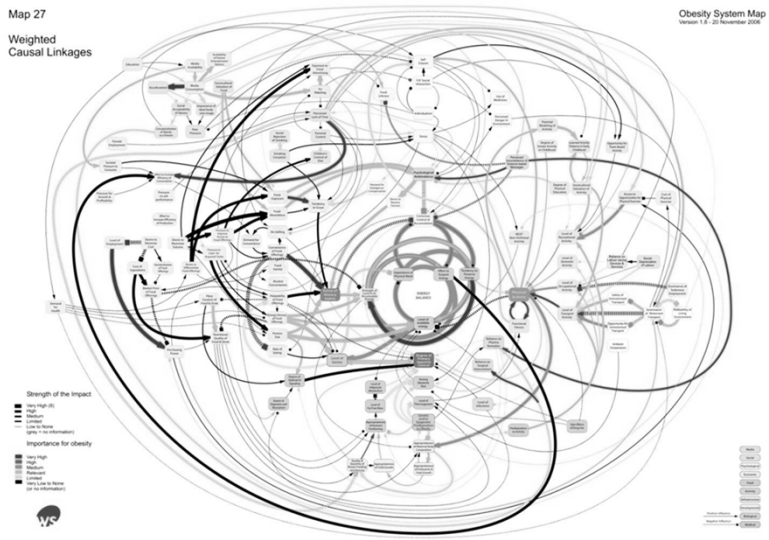


Obesity development

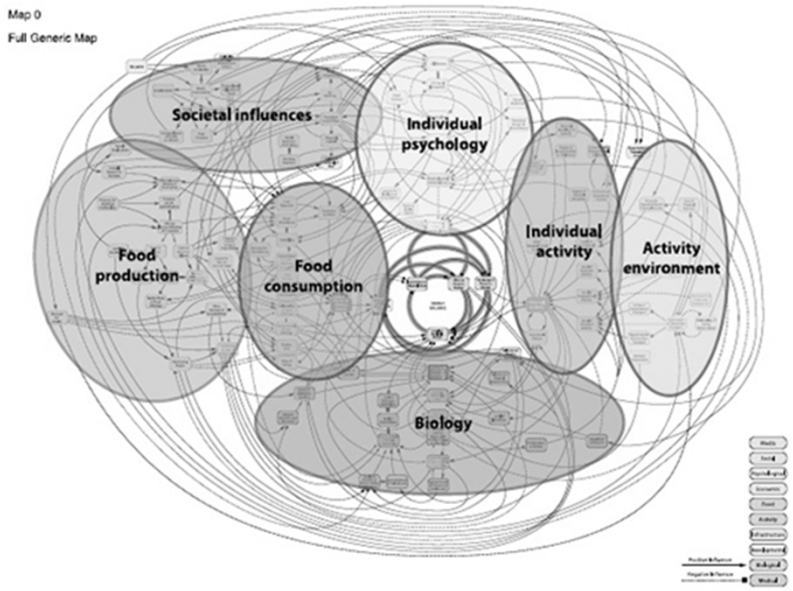


It is more complex!

Obesity develops from a sustained positive energy imbalance and a variety of genetic, behavioural, cultural, environmental and economic factors



Swinburne et al; The Lancet;378:Aug 27,2011



FOOD PRODUCTION & FOOD CONSUMPTION

Obesity seem to be driven mainly by changes in the global food system, which is producing more processed, affordable, and effectively marketed food than ever before. This passive overconsumption of energy leading to obesity is a predictable outcome of market economies predicated on consumption-based growth.

Is the market failing children?

A market fails when prices and the quantities bought and sold are no longer indicative of their costs and benefits to society.

Reason 1

1. **Market failure is when vulnerable individuals are not protected**

Children are clearly a vulnerable group that warrant societal protection, and this notion represents the strongest argument for government intervention.

They are not mature, they do not have nutritional knowledge, are unable to perceive the risks of their behaviour, and their choices are readily affected by marketing

Reason 2

When consumers do not have the information necessary to make fully informed decisions about their food selection

Reason 3

When people
prioritise immediate gratification over potential long-term negative results, which is a
hallmark of childhood.

Governments have a fundamental role in
helping to make healthy choices the easy choices.

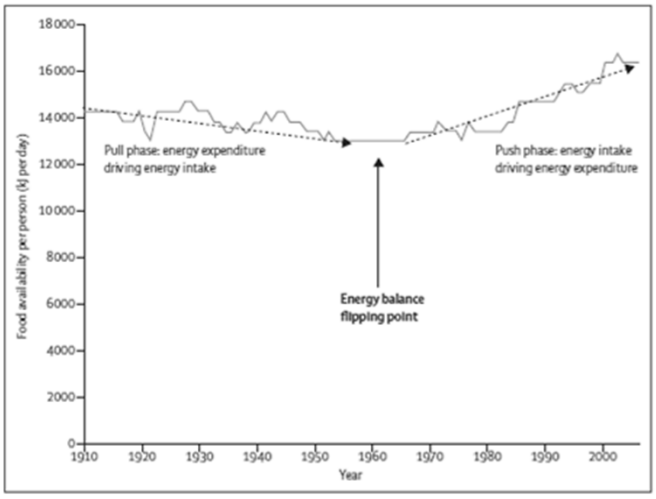


***Figure 3*: Food availability for the USA, 1910–2006[58]**
There are two distinct phases: a decrease in food energy supply (postulated to be pulled down by reduced energy expenditure requirements for daily living), followed by an increase in food energy supply (postulated to be pushed up by increasing food access). An energy balance flipping point is proposed, marking the change in how the US population generally achieved energy balance.

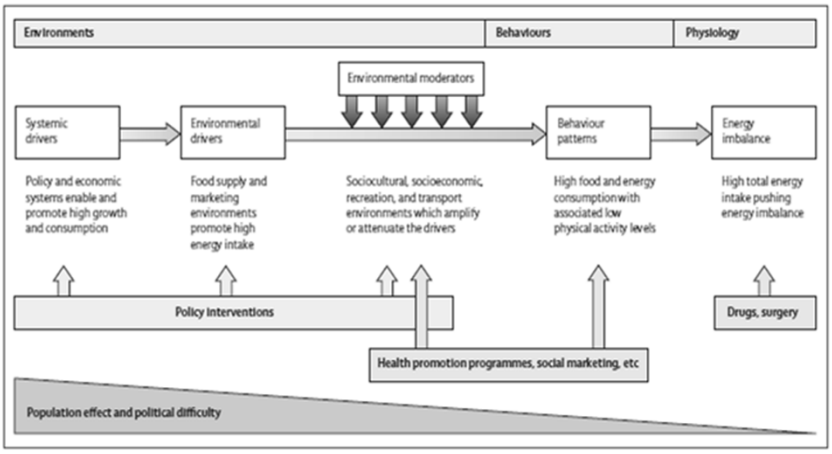


***Figure 4*: A framework to categorise obesity determinants and solutions**
The more distal drivers are to the left and the environmental moderators that have an attenuating or accentuating effect are shown, along with some examples. The usual interventions for environmental change are policy based, whereas health promotion programmes can affect environments and behaviours. Drugs and surgery operate at the physiological level. The framework shows that the more upstream interventions that target the systemic drivers might have larger effects, but their political implementation is more difficult than health promotion programmes and medical services.

As a guide to policy makers planning programmes, the following activities have been included in beneficial programmes:

Curriculum on healthy eating, physical activity and body image integrated into regular curriculum

• More sessions for physical activity and the development of fundamental movement skills throughout the school week

• Improved nutritional quality of foods made available to students

• Creating an environment and culture that support children eating nutritious foods and being active throughout each day

• Providing support for teachers and other staff to implement health promotion strategies and activities (e.g. professional development, capacity building activities)

• Engaging with parents to support activities in the home setting to encourage children to be more active, eat more nutritious foods and spend less time in screen-based activities

Cochrane Review 2013

BIOLOGY

Leptin

Monogenic causes of severe obesity within the general population remain very rare indeed.

Even pathogenic mutations in the melanocortin 4 receptor, which are the commonest mendelian cause of severe obesity, still only account for 5% of morbid early-onset obesity, and perhaps

1% of obesity (BMI > 30)

Can genetics explain the obesity epidemic?

One useful way to think about the relation of genes with obesity was expressed by

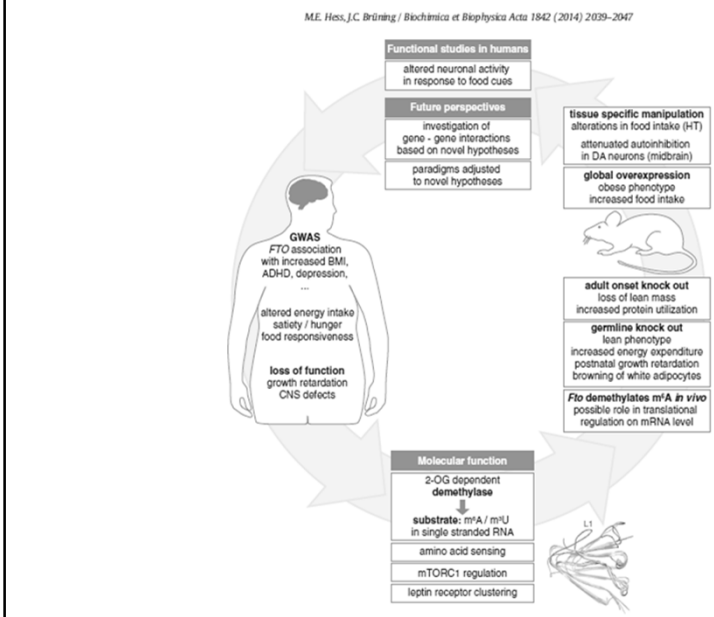
George Bray when he said, “the genetic background loads the gun, but the

environment pulls the trigger”

Thus, genetic predisposition

to obesity for the vast majority of individuals

is likely to have a polygenic basis.



Ghrelin

- The only known circulating appetite stimulant
- Increase before meals & decrease after food intake

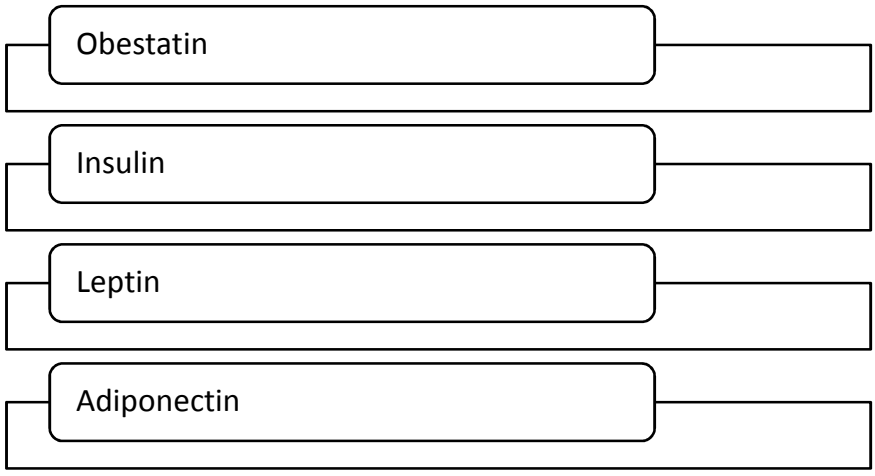
Ghrelin

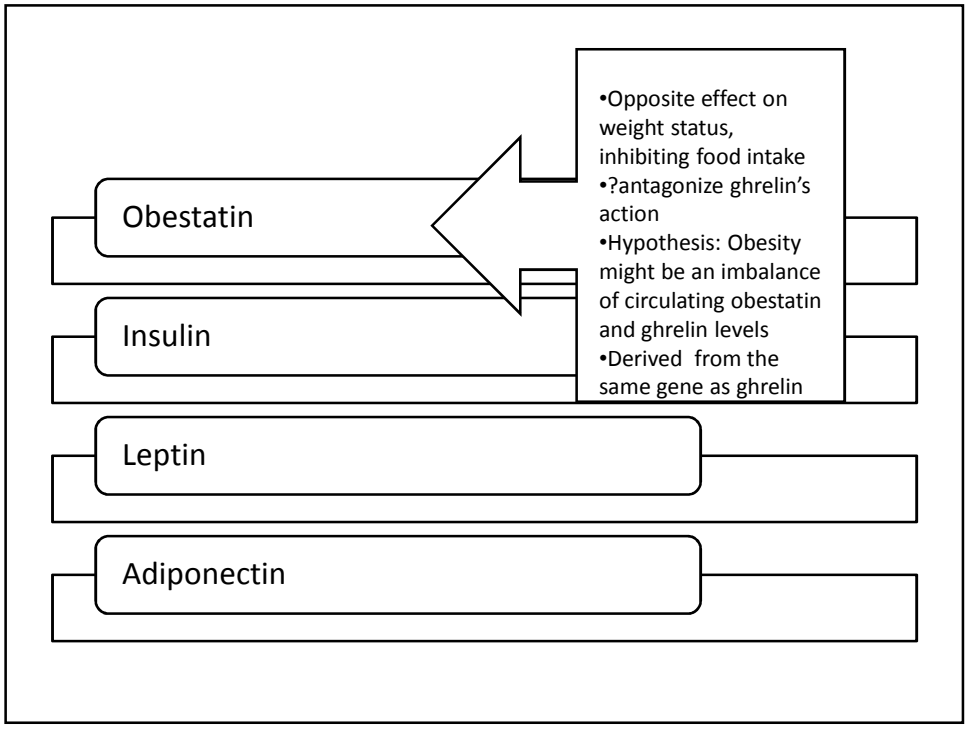
Prader-Willi: Both the hyperphagia and growth hormone deficiency due to ghrelin dysregulation , as high levels of ghrelin have been observed in this disorder

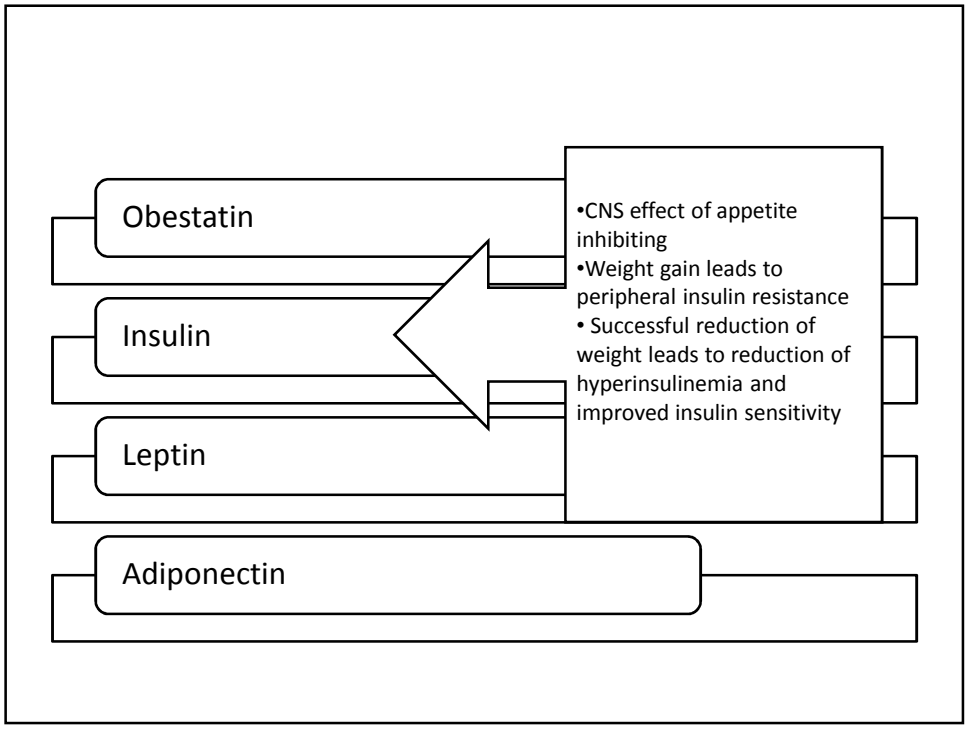
Ghrelin

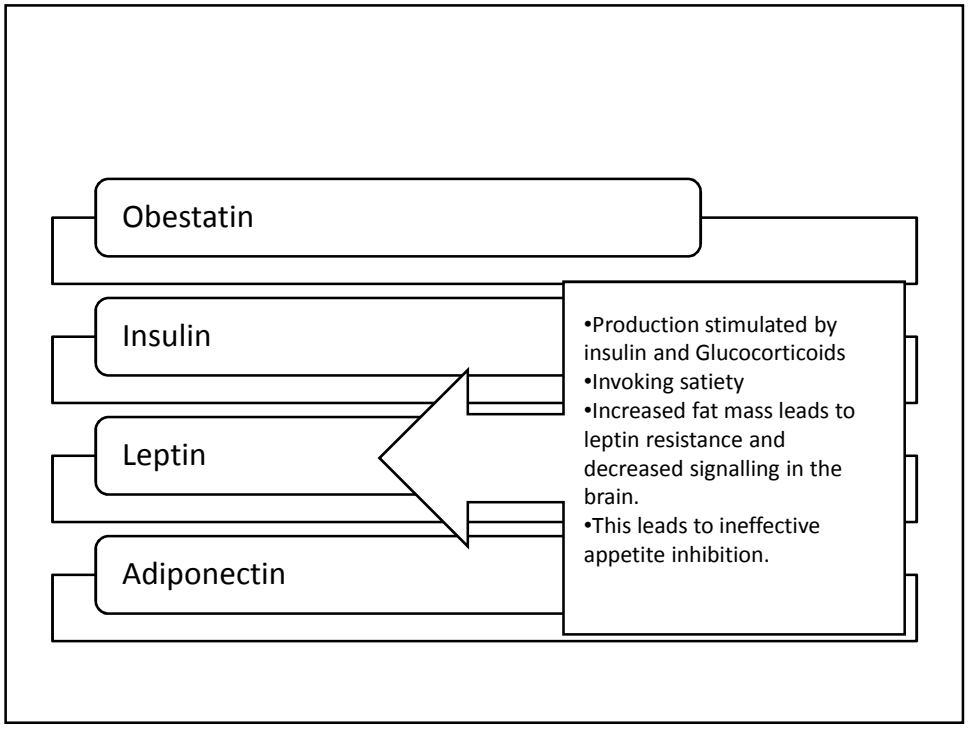
Increased ghrelin levels during weight reduction are considered to be compensatory mechanism responsible for making weight reduction unsustainable.

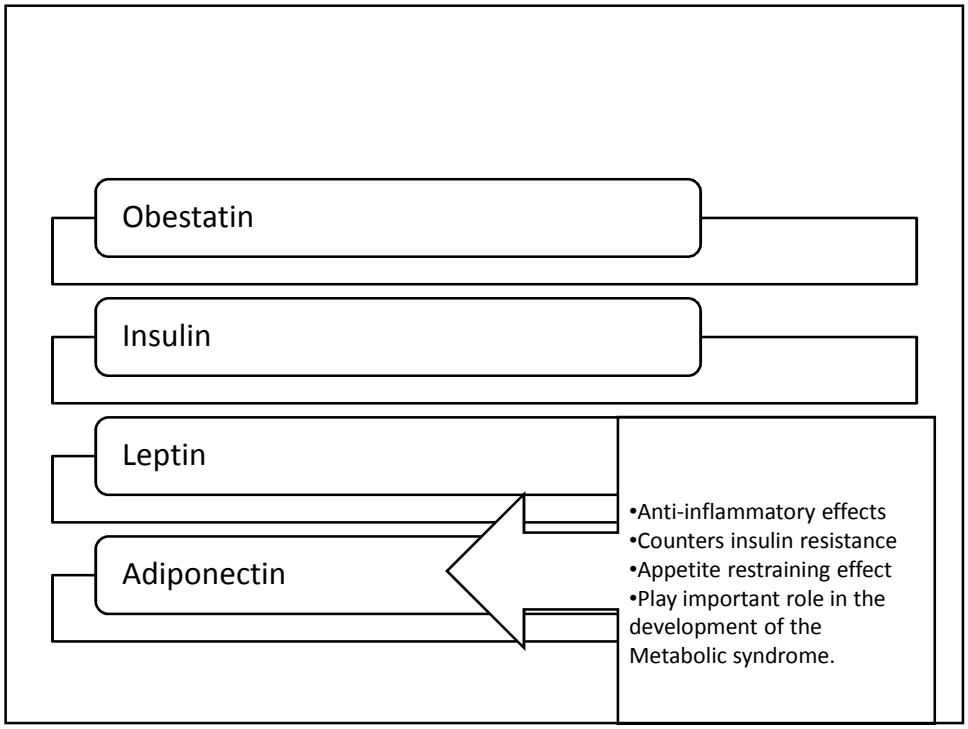
A slow reduction of weight that does not cause an immediate compensatory increase of ghrelin may help stabilize and maintain a lower body weight and prevent fast regain.




Obestatin
Insulin
Leptin
Adiponectin
•Opposite effect on weight status, inhibiting food intake
•?antagonize ghrelin's action
•Hypothesis: Obesity might be an imbalance of circulating obestatin and ghrelin levels
•Derived from the same gene as ghrelin


Obestatin
Insulin
Leptin
Adiponectin
•CNS effect of appetite inhibiting
•Weight gain leads to peripheral insulin resistance
• Successful reduction of weight leads to reduction of hyperinsulinemia and improved insulin sensitivity


Obestatin
Insulin
Leptin
Adiponectin
•Production stimulated by insulin and Glucocorticoids
•Invoking satiety
•Increased fat mass leads to leptin resistance and decreased signalling in the brain.
•This leads to ineffective appetite inhibition.

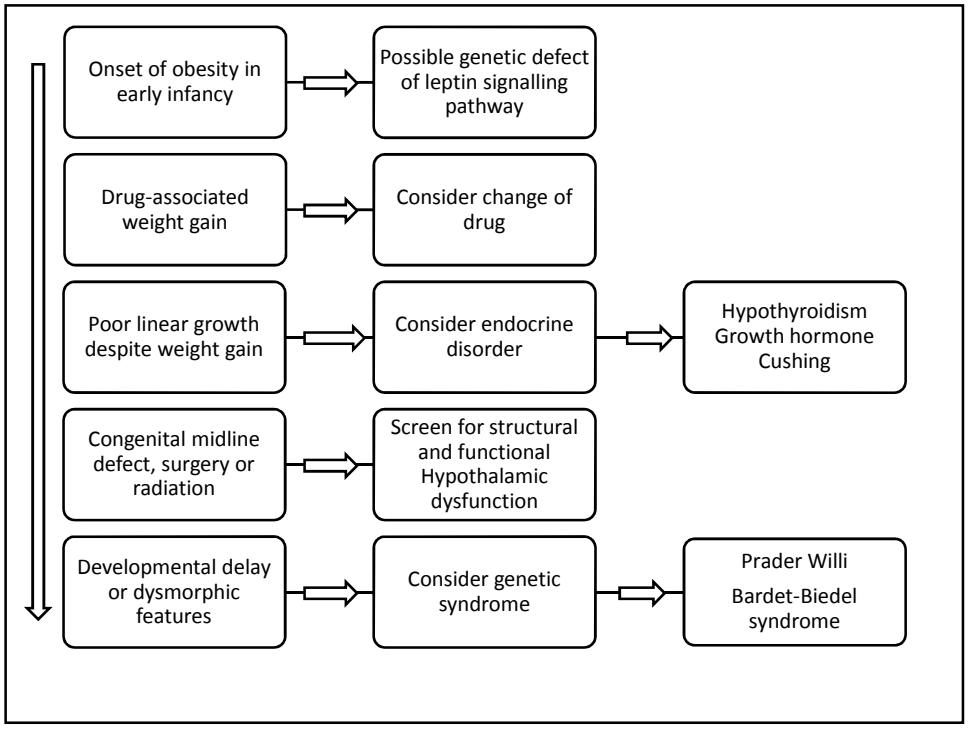

Obestatin
Insulin
Leptin
Adiponectin
•Anti-inflammatory effects
•Counters insulin resistance
•Appetite restraining effect
•Play important role in the development of the Metabolic syndrome.

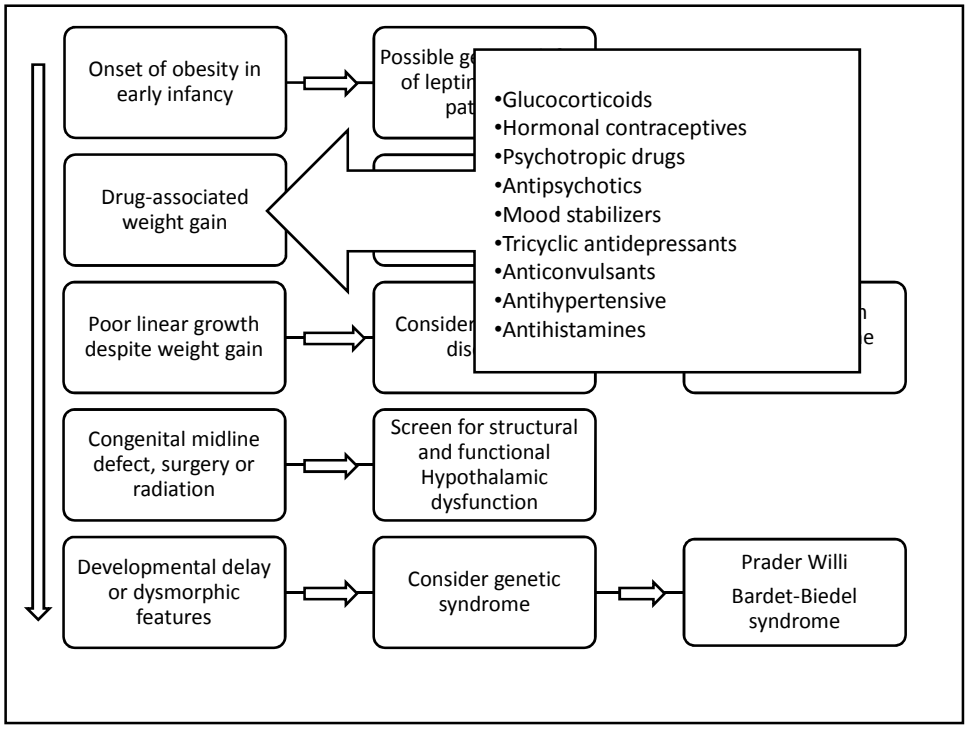
Medical and diagnostic procedures:

- Exclusion of endocrine dysfunction (hypothyroidism, hypercortisolism, hypothalamic dysfunction)
- Metabolic profile (glucose metabolism, lipid profile, liver- and kidney-function, possibly additional parameters, e.g. Pubertal hormones)

"But I do exercise, Mom ... I surf the net!"

WHAT CAN WE AS CLINICIANS DO!


Onset of obesity in early infancy
Possible genetic defect of leptin signalling pathway
Drug-associated weight gain
Consider change of drug
Poor linear growth despite weight gain
Consider endocrine disorder
Hypothyroidism
Growth hormone
Cushing
Congenital midline defect, surgery or radiation
Screen for structural and functional Hypothalamic dysfunction
Developmental delay or dysmorphic features
Consider genetic syndrome
Prader Willi
Bardet-Biedel syndrome


Onset of obesity in early infancy
Drug-associated weight gain
•Glucocorticoids
•Hormonal contraceptives
•Psychotropic drugs
•Antipsychotics
•Mood stabilizers
•Tricyclic antidepressants
•Anticonvulsants
•Antihypertensive
•Antihistamines
Poor linear growth despite weight gain
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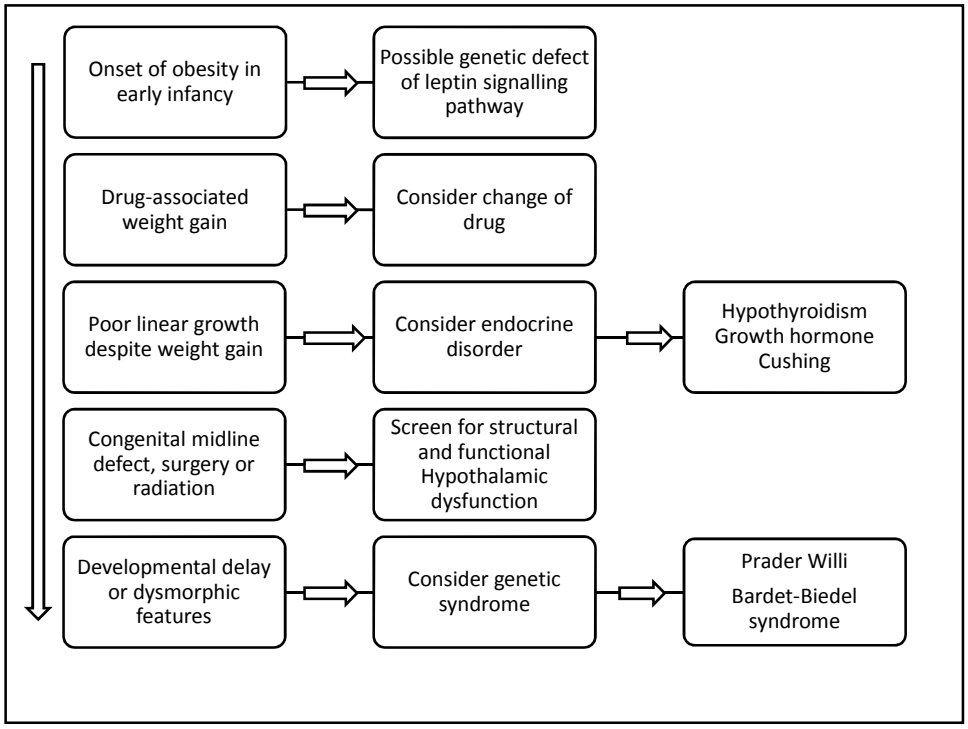
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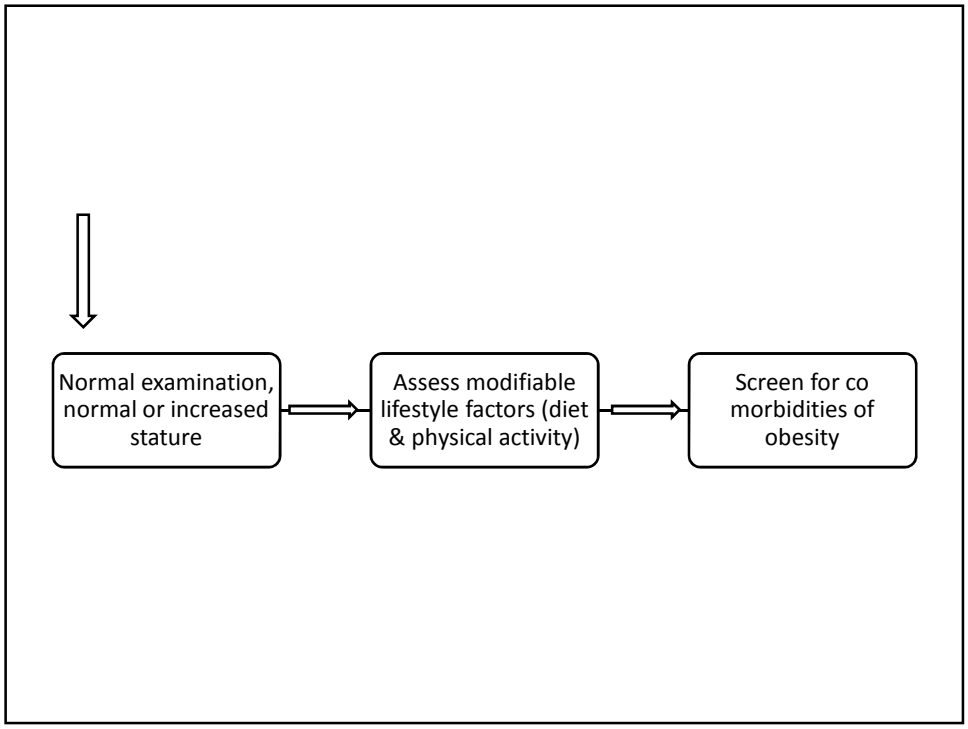

Normal examination, normal or increased stature
Assess modifiable lifestyle factors (diet & physical activity)
Screen for co morbidities of obesity

Special considerations:

1

- Weight reduction normalizes impaired glucose tolerance in patients with insulin resistance and preserved insulin secretion.
- Drug treatment (e.g. Metformin) for IR and IGT is not generally recommended.

Special considerations:

2

- **Pubertal disorders**
  - Oligo- and dysmenorrhoea are present in nearly 50% of extremely obese girls, partially in combination with hyperandrogenemia, insulin resistance and polycystic ovaries (PCOS).
  - Metformin as well as Rosiglitazone, have recently been tested as effective concerning metabolic and CV risk factors in adolescents with PCOS

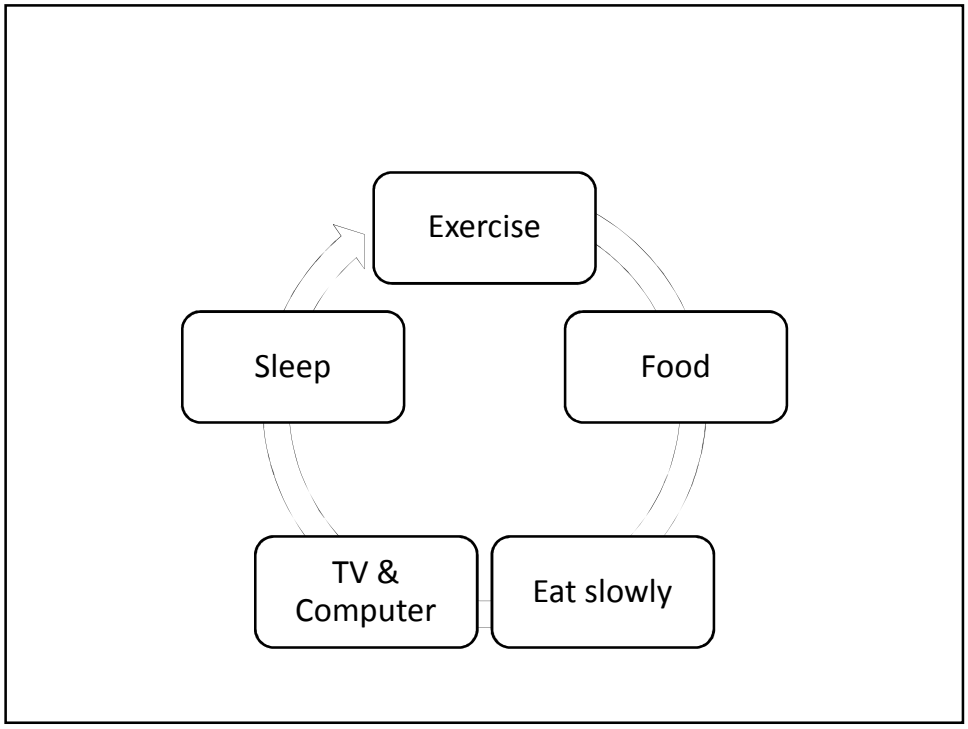
Treatment

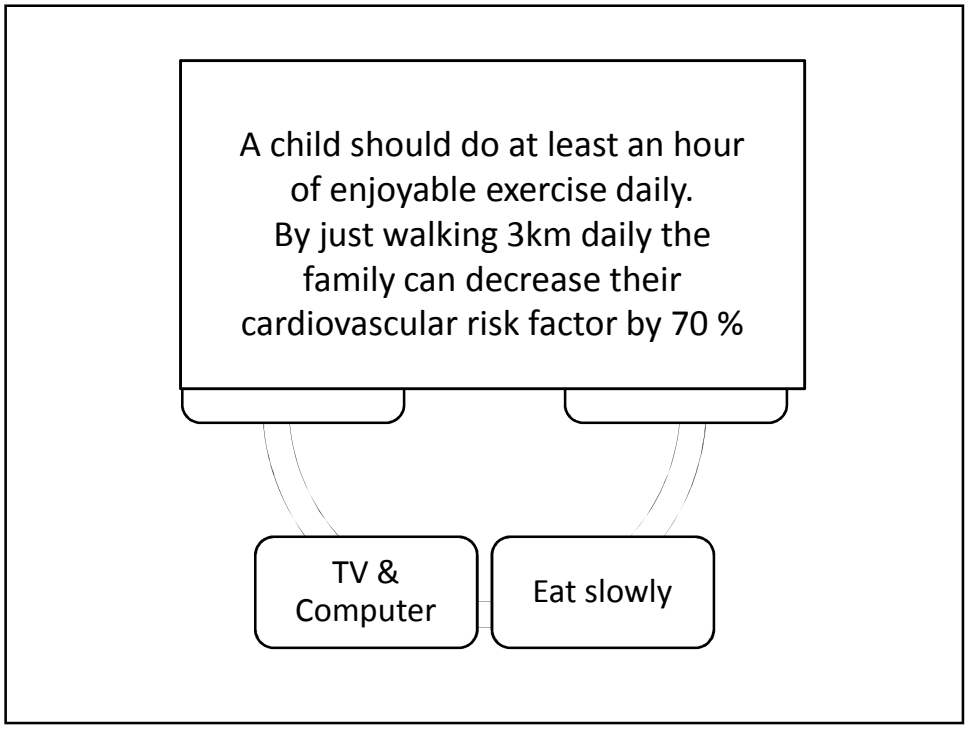
- Complex medical and psychosocial needs.
- In many patients and families self responsibility and motivation for lifestyle changes are in contrast to the degree of obesity and severity of related morbidity.
- Therefore a multiprofessional analysis of individual problems, stepwise target planning and practical recommendations are necessary

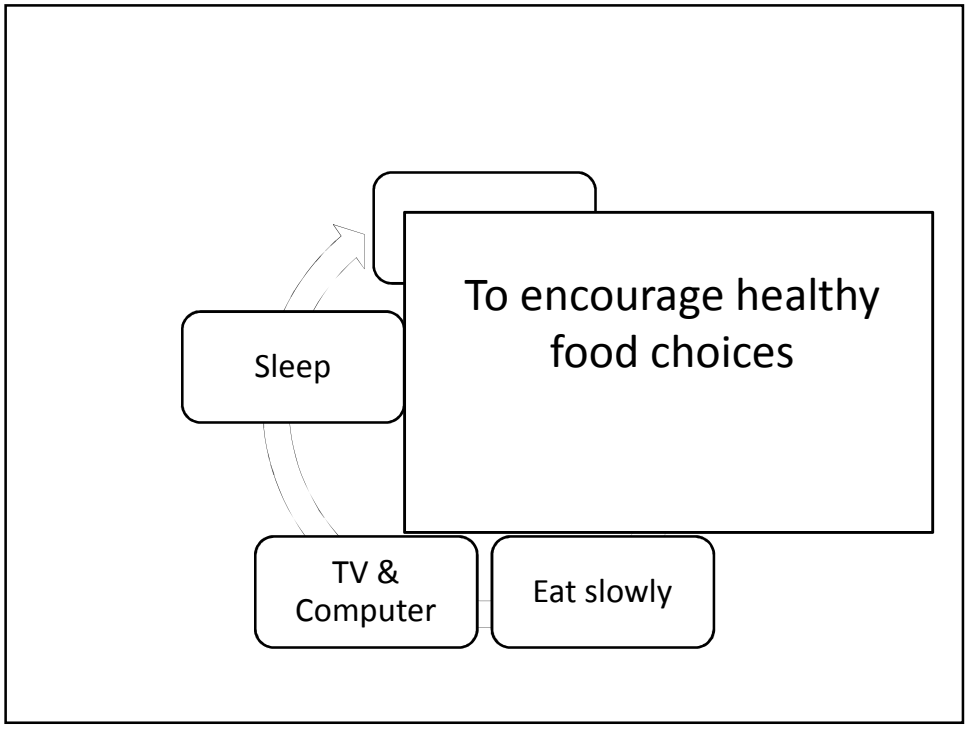
Cochrane review 2010 (64 RCT's

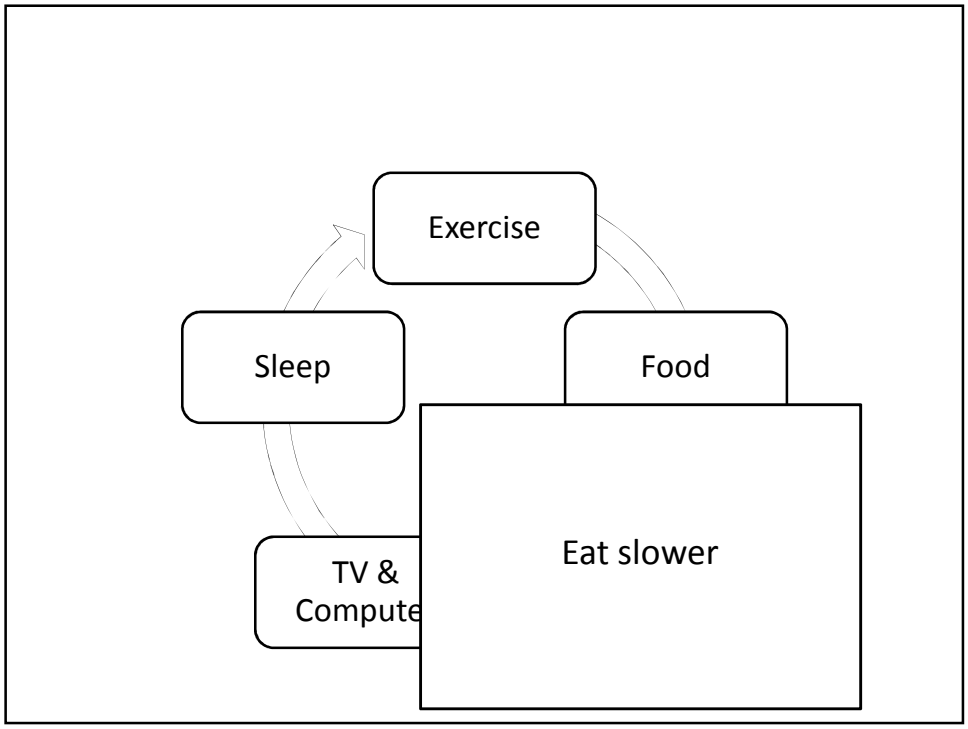
Authors' conclusions

While there is limited quality data to recommend one treatment program to be favoured over another, this review shows that combined behavioural lifestyle interventions compared to standard care or self-help can produce a significant and clinically meaningful reduction in overweight in children and adolescents


Exercise
Sleep
Food
TV &
Computer
Eat slowly


A child should do at least an hour of enjoyable exercise daily.
By just walking 3km daily the family can decrease their cardiovascular risk factor by 70 %
TV &
Computer
Eat slowly


To encourage healthy food choices
Sleep
TV & Computer
Eat slowly


Exercise
Sleep
Food
Eat slower
TV & Compute

Effects of retaining eating speed on fasting and postprandial plasma ghrelin in obese children

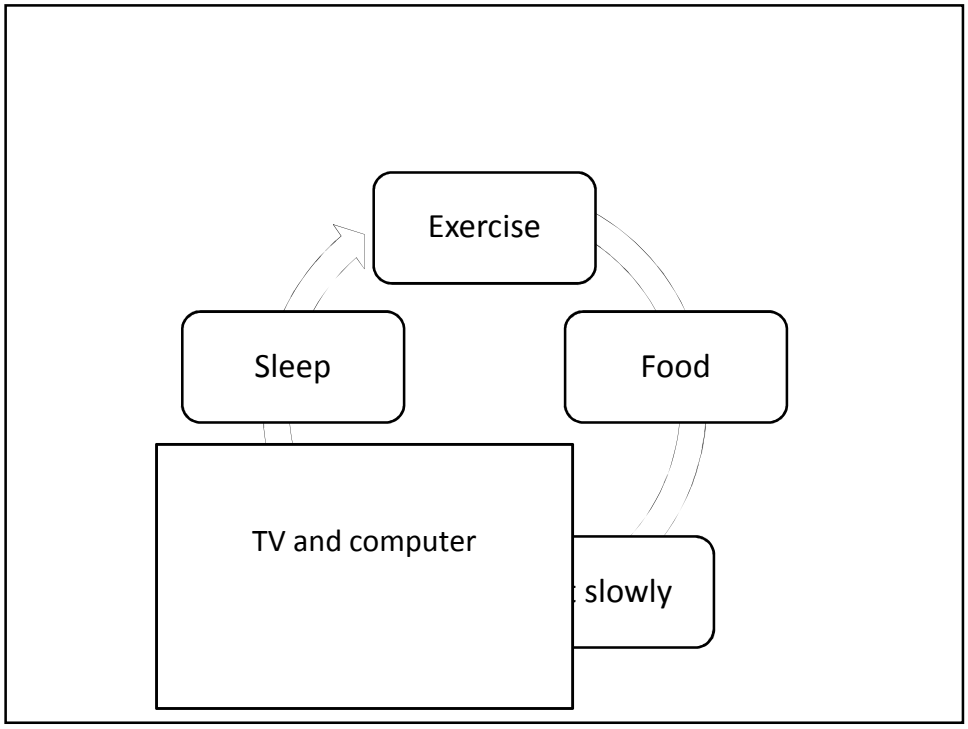
Retraining obese adolescents to eat slower had a significant impact on the gastro-intestinal hormone response to carbohydrate load.

Externally modifiable eating behaviour regulate the hormonal response to food rather than these hormones determining eating behaviour.

ESPE Award session 2011 - Julia Galhardo et al Section of applied Neuro-endocrinology, Stockholm, Sweden

- Ghrelin in both groups at baseline were similar.
- At 12 months , those in the Study arm exhibit greater absolute suppression of Ghrelin at 60 min.

ESPE Award Session 2011

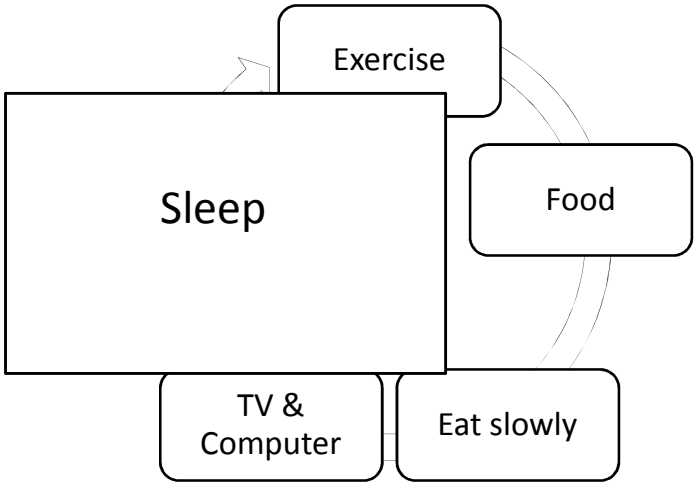


Light at night increases BMI by shifting the time of food intake

The study found that mice gained 50% more body mass over 8 weeks when they were exposed to dim light compared to mice with standard dark-light-cycle.

The authors hypothesize that people who sit in front of the TV or computer at night eat at the wrong times, thereby disrupting their whole metabolism.

Laura Fonken etal; Proc Natl Acad Sci USA 2010;107:18664-9



Sleep and obesity in children an adolescents.

- The secretion of growth hormone, prolactin, cortisol, thyrotropin and insulin are influenced by sleep.
- Studies suggest that sleep restriction leads to decreased circulating Leptin and increased Ghrelin, both of which are associated with increased hunger, appetite, motivation to eat and food intake.

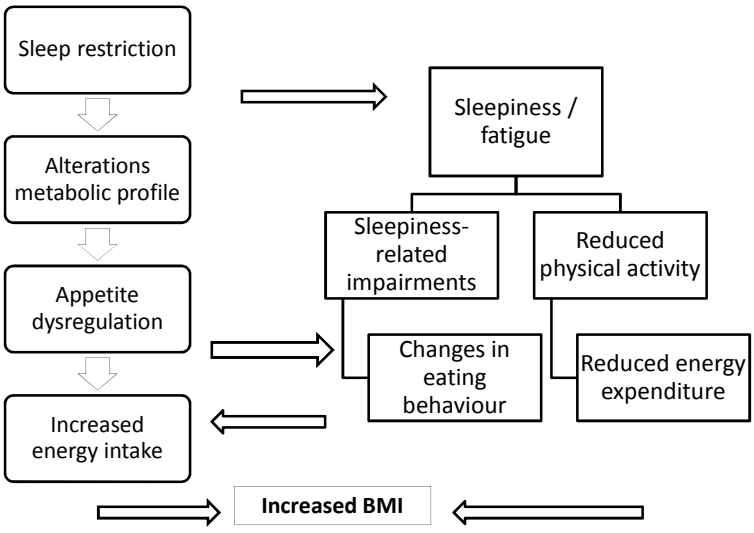
Pediatr Clin N Am 58 (2011) 715-733

Sleep and obesity in children an adolescents.

- Data from the 2004 National Sleep foundation's Sleep in America poll show that the mean sleep length for school-aged children is 9,4 hours per night.
- These data are in contrast to recommendations by sleep experts that children in this age group should obtain 10 – 11 hours per night.

Pediatr Clin N Am 58 (2011) 715-733

Hypothesized pathways through which sleep duration may increase obesity risk – Judith Owens



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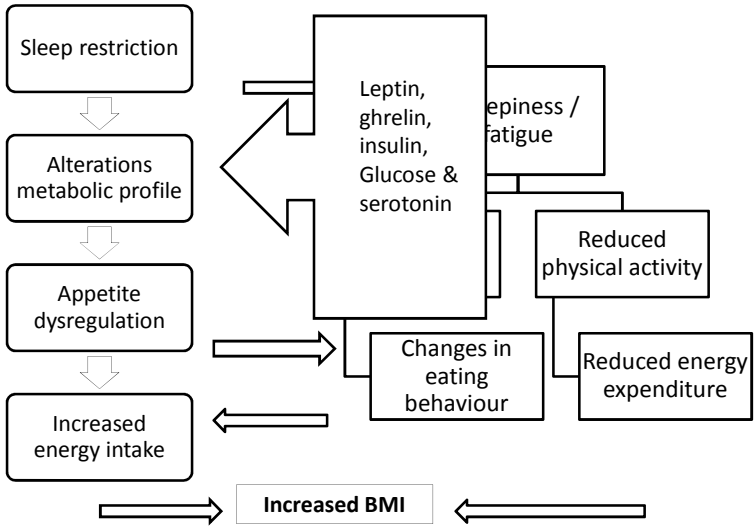

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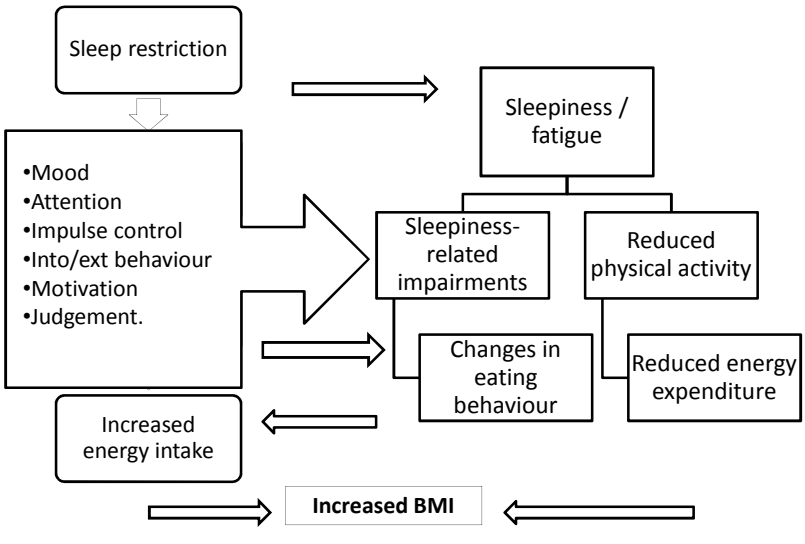

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