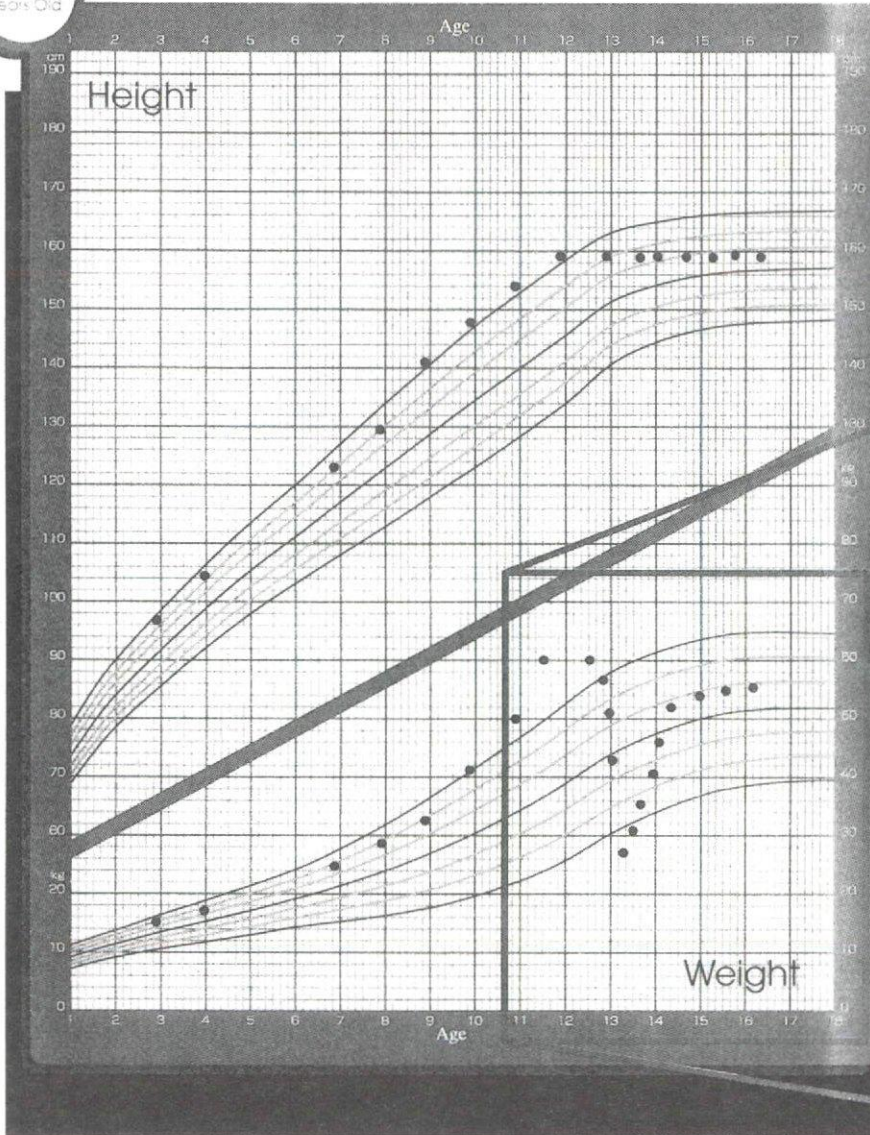


# Early Detection of Early-onset Anorexia Nervosa

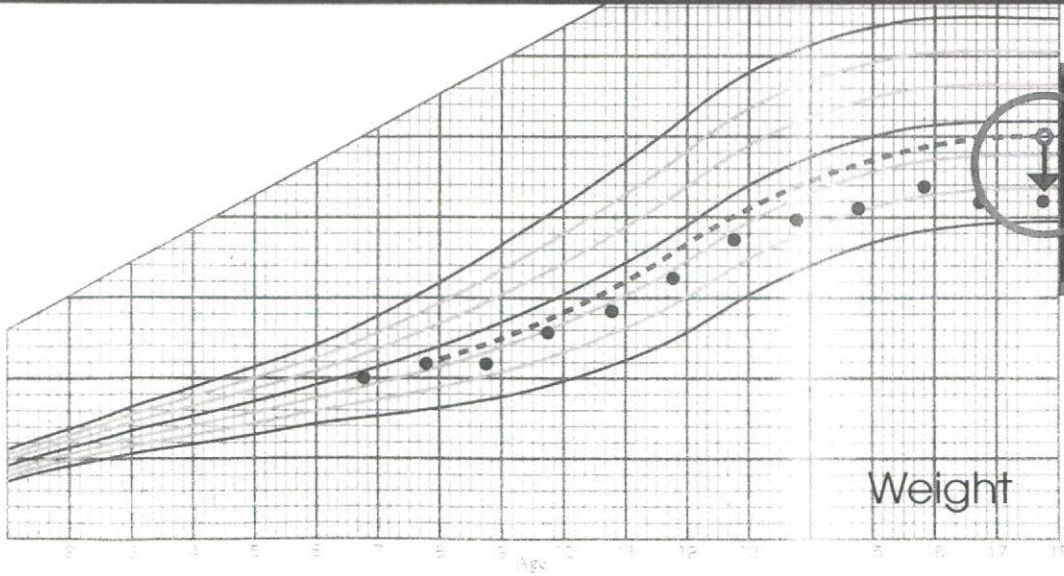
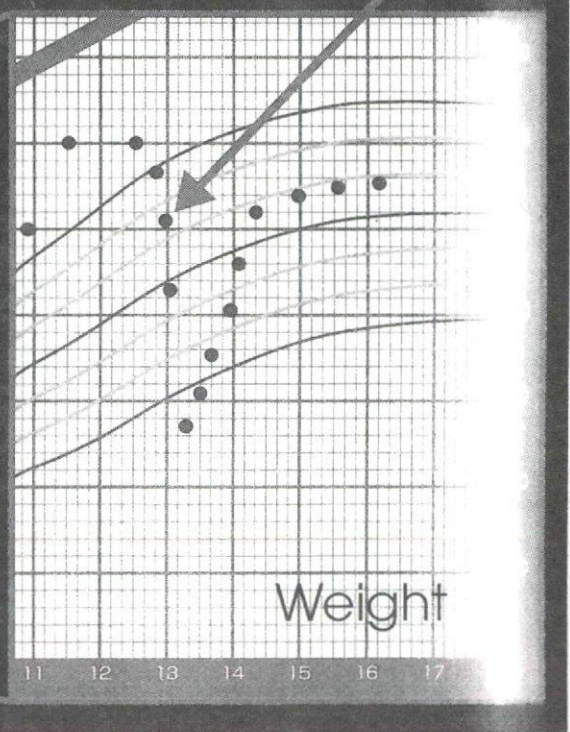
## ▼ Growth Curve of a Child with Early-onset Anorexia Nervosa

Female  
1-18  
Years Old



Why are extremely underweight youngsters left undiagnosed?  
Have they had a health-check during the process of losing weight?

Health-Check



The plotted weight shows that the figure is decreased by more than 1 channel.

# Method 1: Growth Curve

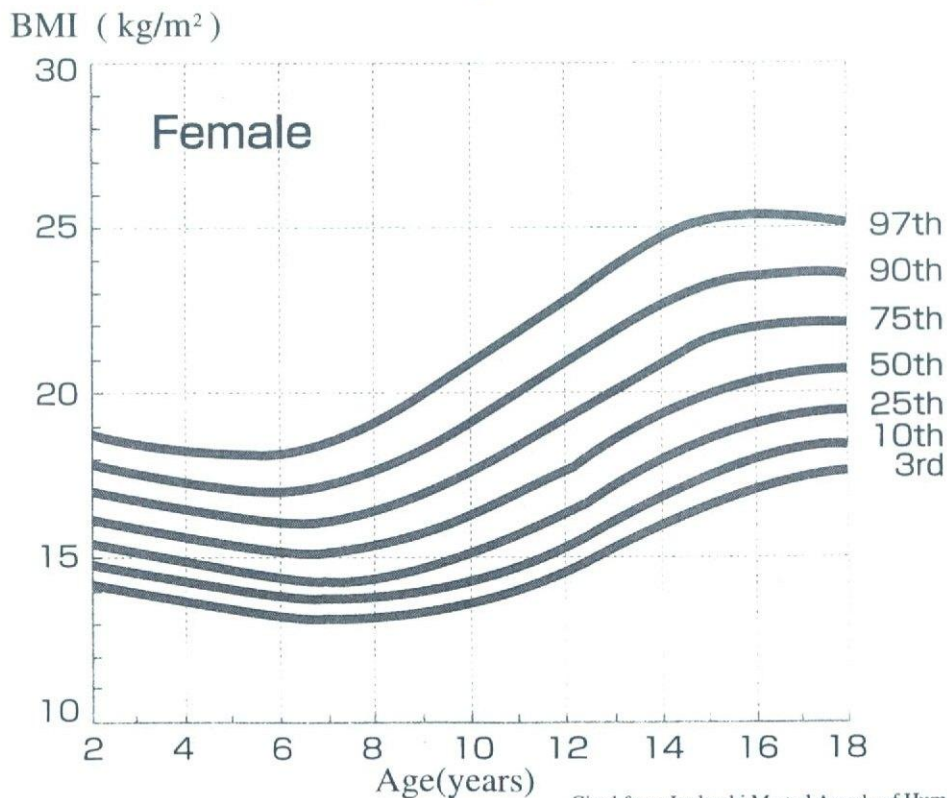
- ① Onset of anorexia nervosa is suspected when the growth curve shows the weight has decreased by more than 1 channel in addition to existing physical symptoms such as bradycardia and amenorrhoea.
- ② Onset of anorexia nervosa is suspected when the current weight is 3 kg lower than the previous weight in addition to existing physical symptoms such as bradycardia and amenorrhoea.

Upon detection of such physical changes, a healthcare visit or a health-check up must be strongly advised to the child

## ● Body Mass Index(BMI)

$$= \frac{\text{Weight}}{\text{Height} \times \text{Height}}$$

## Standardized BMI Curve for Japanese Female Children



Cited from Inokuchi, M et al Annals of Human Biology 33(4):444-453 2006

## Counting the Pulse !

Counting the pulse of the child is a way to detect early-onset anorexia

In a state of starvation, early-onset anorexia induces an autonomic nervous dysfunction (i.e., over-activated parasympathetic nervous) which leads to bradycardia (slow pulse) as a result.

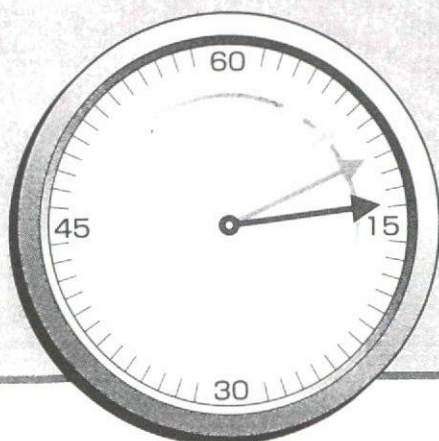
As stated above, the child may look cheerful but his or her bodily state is analogous to that of a hibernating animal.

Just like a hibernating squirrel, the young sufferer's pulse is slow and the body and mind are "frozen".

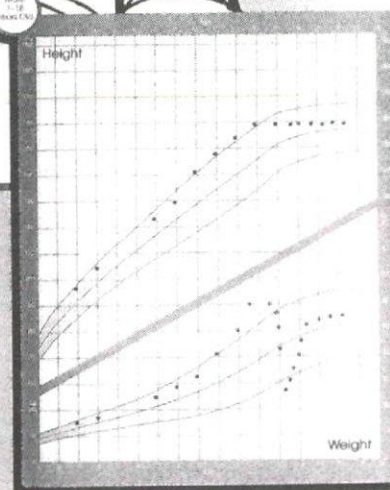


## Prevention and Intervention

- If the growth curve indicates early-onset anorexia nervosa, always check the pulse of the child.



- When counting the pulse, try to encourage enthusiasm for better health by letting them count their own pulse or the others' (e.g., health care staff's).

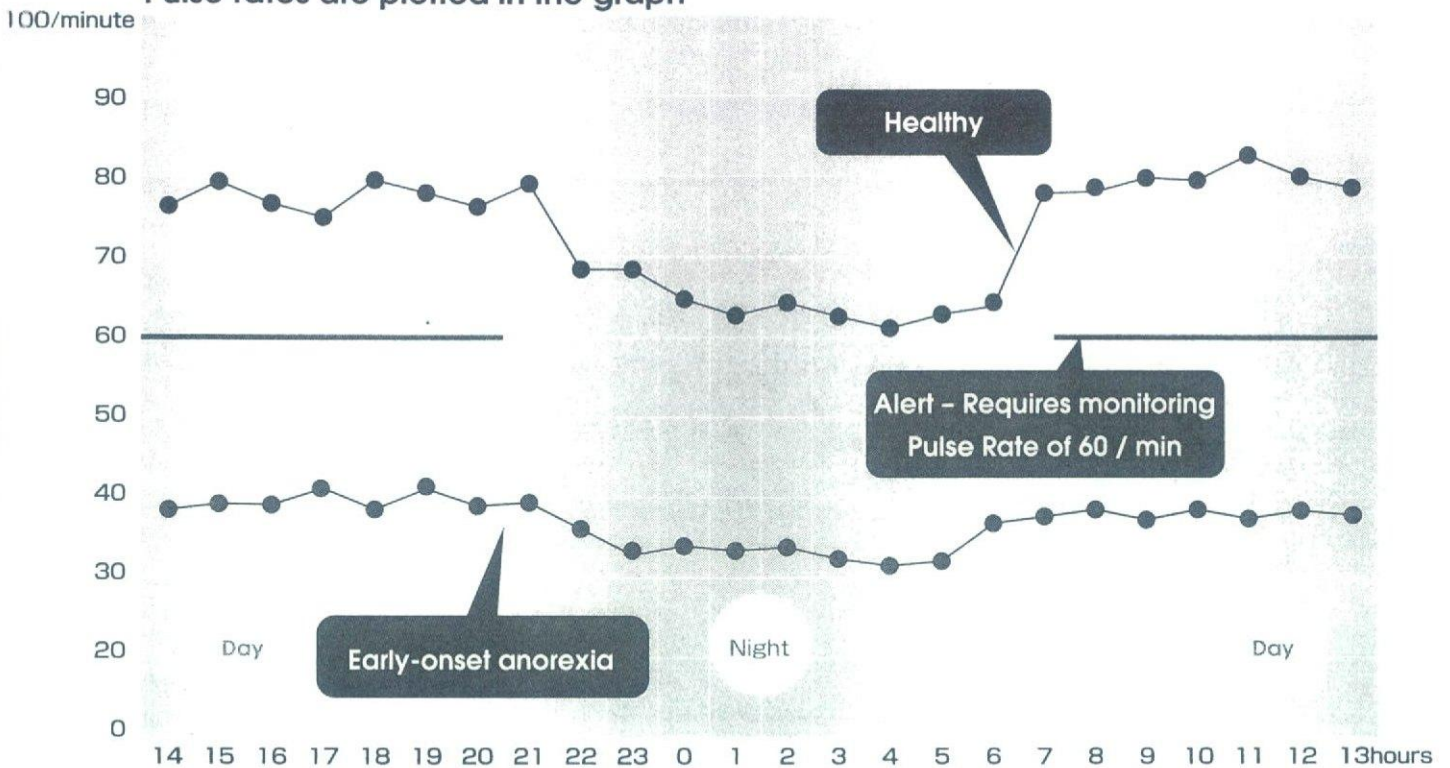


## Method 2: Pulse

### The Determination of Bradycardia

### The Pulse Rate: Below 60 Beats / minute (at rest)

Pulse rates are plotted in the graph



If the growth curve indicates a tendency for weight loss, as well as a presence of bradycardia (ie a pulse rate below 60 beats per minute) it is highly possible that the child is suffering from early-onset anorexia nervosa

He or she must consult a doctor before participating in any school activities including P.E. lessons

(Note) In some cases of early-onset anorexia, there is no clear sign of bradycardia during the daytime hours when he or she is in an alert state. However, towards the evening, the symptom of bradycardia may become more salient. A "Holter" electrocardiogram examination (24-hour holter ECG recording system) may be a useful means of detecting early-onset anorexia. Please consult the school doctor or a medical practitioner.

In the early-onset of anorexia, hormones\* are also affected. Especially, hormones responsible for 'Growth' and 'Maturity' of the body are believed to be affected to a large extent\*\*.

## 1. The Effect on Growth

When a child suffers from anorexia, hormones responsible for growth are adversely affected causing a height stagnation (see Table 1). Early detection along with successful treatment may terminate this stagnation if the child completely recovers from eating disorder. However, failure to detect the condition at an early stage may lead the child to suffer from growth disturbance such as short stature.

## 2. The Effect on Maturity

When a child suffers from anorexia, hormones responsible for maturation are adversely affected causing hormonal gland (the ovary or the testis) dysfunctions concomitant with other conditions mentioned above. In the case where the female child already has her menstrual period, she may experience menstrual irregularity (irregular ovulation cycle) as weight loss progresses and her period may eventually stop due to ovulatory dysfunction (persistent amenorrhoea). The sex maturation of the child is at great risk if she has not yet had her first menstrual period. Girls with eating disorders often experience a delayed onset of their menstrual period (primary amenorrhoea). Early detection along with successful treatment may terminate both persistent amenorrhoea and primary amenorrhoea if the child completely recovers from the eating disorder. However, failure to detect the condition at an early stage may lead the child to suffer from amenorrhoea or menstrual irregularity which then increases the risk of infertility.

\* : Hormones here refers to transmitter substances produced in the body for information processing. These are normally secreted from the pituitary gland, thyroid gland, paranephron, pancreas, ovary, testis and transmitted to various parts of the body in the blood stream. They then are bound with receptors (i.e., protein) which are responsible for adjustment of organ functions.

\*\* : Hormonal imbalance caused by early-onset anorexia nervosa varies between individuals and between phases of the disorder. The hormonal mechanism in the face of pathology has not yet been empirically determined.

Early-onset anorexia causes acute hormonal dysfunction during development. Early detection along with successful treatment are the only way to alleviate the hormonal abnormalities. In order to prevent irreversible consequences, early treatment is extremely vital.

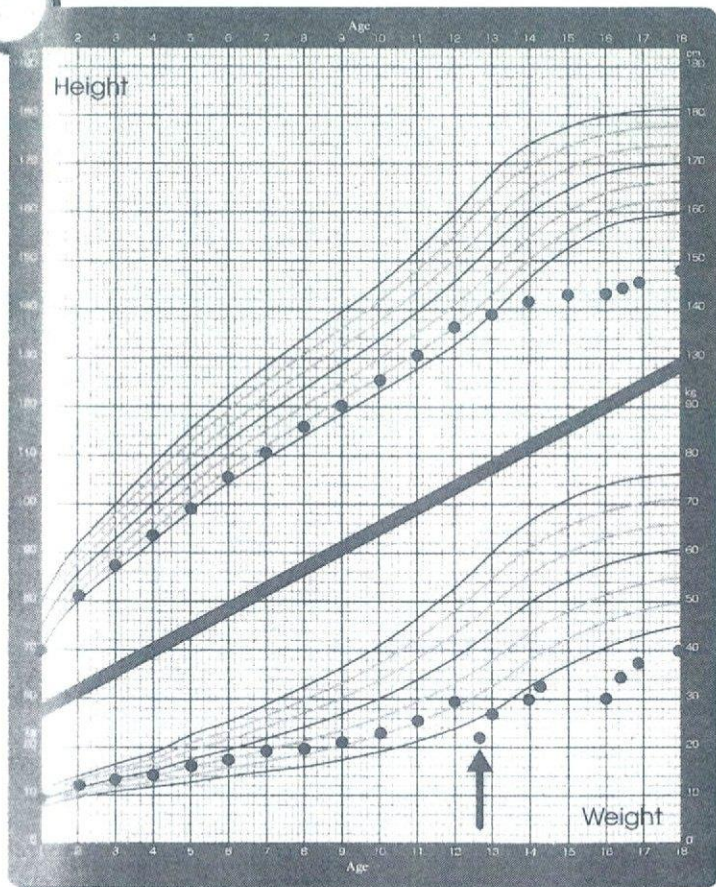
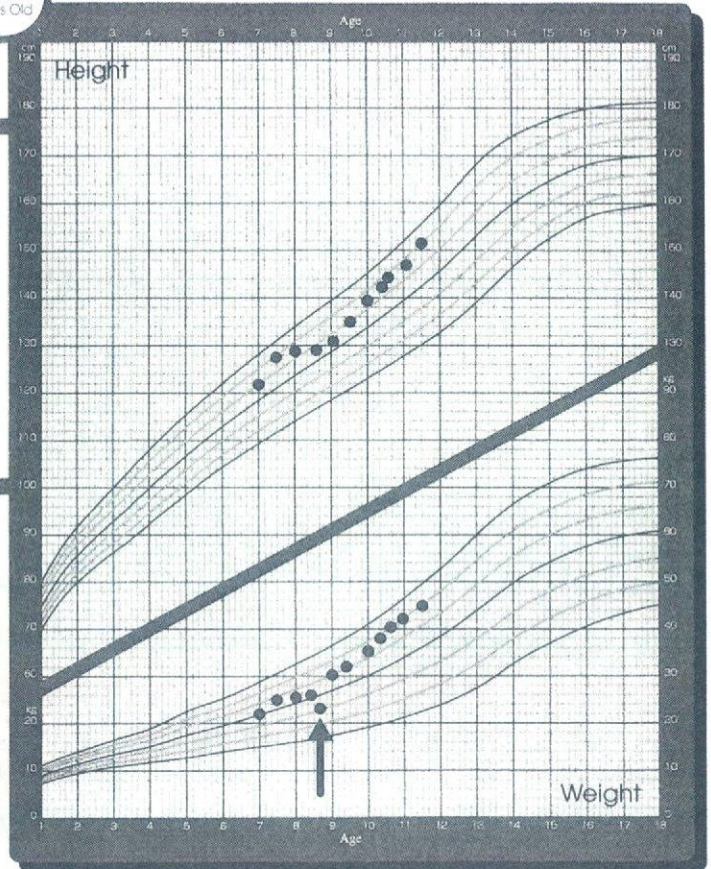
## [ Figures 1 & 2 ] Sample Growth Curves (Two Cases of Male Patients)

Each graph is divided by the diagonal line with the upper part presenting the height growth and with the lower part presenting the weight growth of the child with an arrow indicating the onset of early-onset anorexia nervosa.

### [ Figure 1 ]

The age of onset is 7 years. The growth curves indicate simultaneous weight and height stagnations. He was admitted to hospital at the age of 8. Weight gain is evident followed by the clear height increase.

Male  
1-18  
Years Old



### [ Figure 2 ]

The age of onset is 12 years. The growth curves show weight loss coinciding with height stagnation. Although an increase in weight was evident at age 16, his height remained stagnated. At his first healthcare visit, he was suffering from testicular deficiencies.

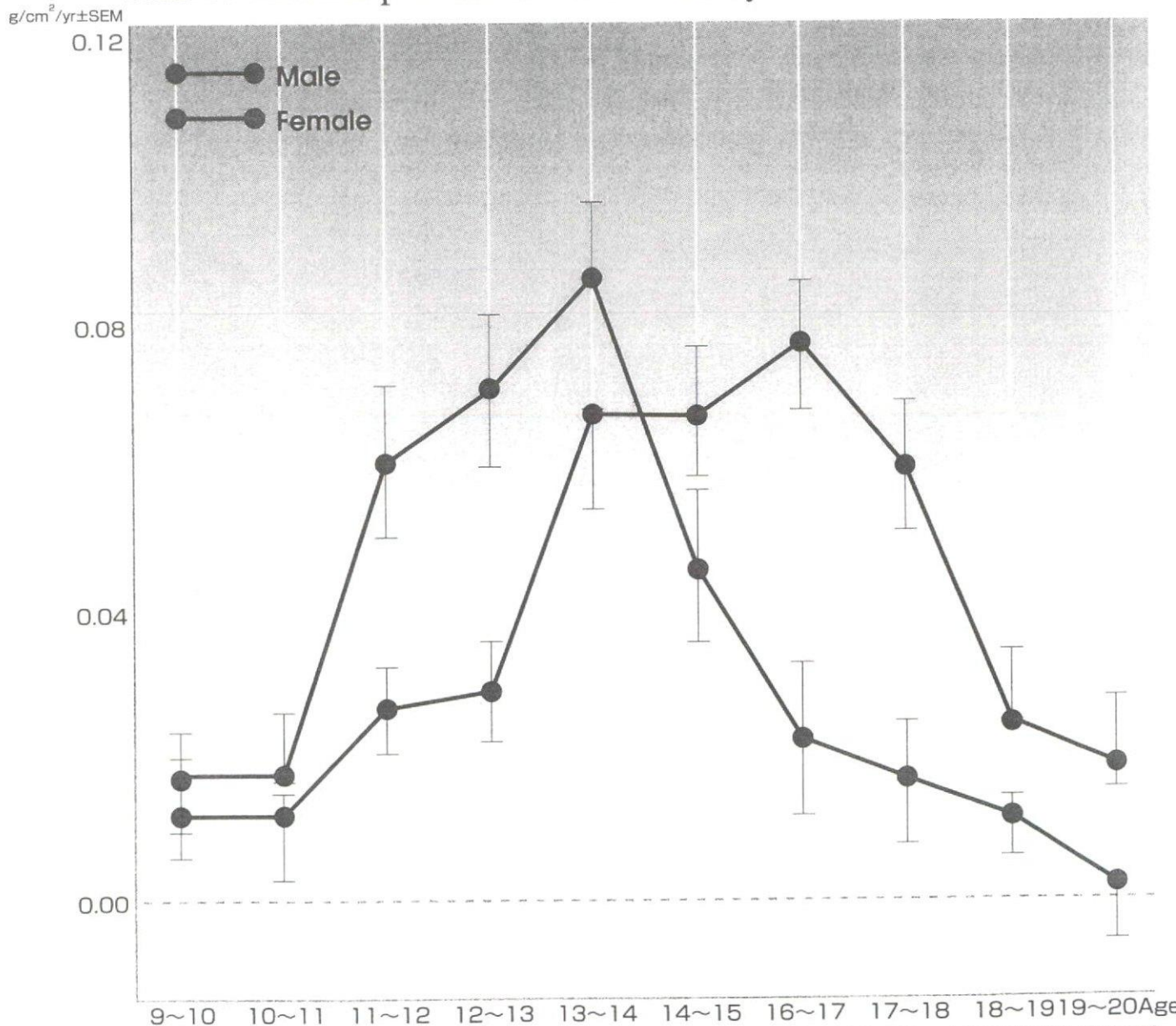
# Adverse Effects on the Body 2: Bone Density

## Bone Development

The bone mass of an average female reaches its maximum density when the person is around 20 years of age. Recent findings show that after that the bone mass of a female starts to decrease. The rate of acquisition of lumbar bone density per year of an average female maximizes at around the age of 13 to 14, after which it dramatically declines. After age 20 the bone density will never rise in response to calcium intake. (see Figure 1). By dint of growth factors and ovarian functions the bone formation is completed within a short period puberty providing the ground for lifelong health. It should be kept in mind that, bone development is a phenomenon that only occurs during puberty and no compensation will take place after that particular period in one's life. When a dramatic weight loss occurs during puberty, bone development is severely disturbed and genetically determined bone growth cannot be achieved.

[ Figure 1 ]

Rate of Increase per Year of Bone Density



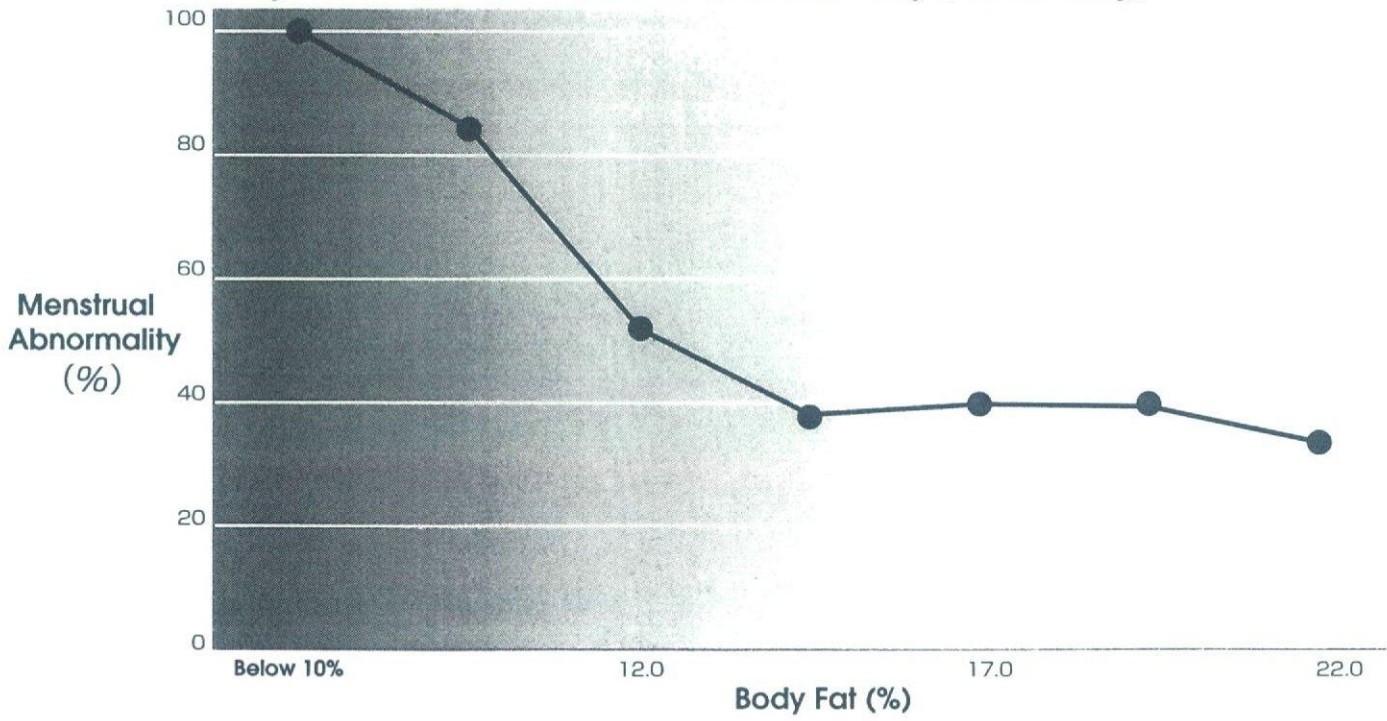
Extracted from Theintz, G. et al. JCEM 75:1060-1065, 1992

# The Relationship between Weight and Body Fat

Factors for growth of the body and bones are correlated with weight. A massive weight loss usually results from loss of body fat. Since body fat produces substances vital for maintaining physiological functions, its loss paves way to eventual organ failures. Ovarian function and body fat mass are highly correlated in female during puberty (see Figure 2). 15% as a body composition of fat is considered to be a crucial cut-off point. A female with body fat composition of less than 15% is at a high risk of ovarian dysfunction. 100% of females with body fat composition less than 10% is reported to suffer from stark ovarian dysfunction such as infertility. At the beginning of weight loss, the young female experiences irregular menstrual period followed by amenorrhoea. There are 2 stages of amenorrhoea with Stage 2 being more severe than Stage 1. Ovarian function is completely suppressed and severe estrogen deficiency is induced in Stage 2. Consequences of suppressed development during puberty may be irreversible.

[ Figure 2 ]

Body Fat and Menstrual Period Abnormality (Probability)



Extracted from Mezaki, N. *et al.* *Obstet. Gynecol. (Tokyo)* 66:527-533, 1999

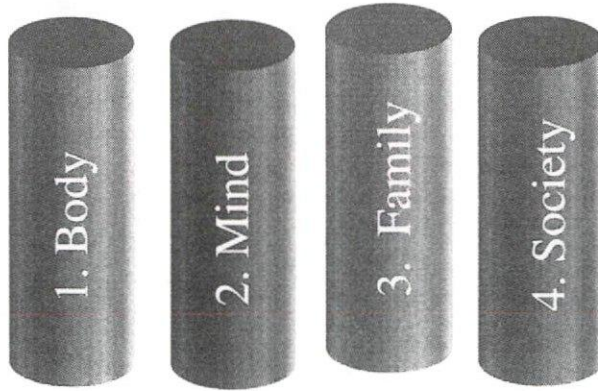
# Effects of Weight Loss and Amenorrhoea on Bone Development

The rapid development of bones during puberty is found to be strongly related to one's weight. Bone development is dependent upon the weight of the young person. Weight is, in fact, more important than menstrual period for bone development. Nevertheless, amenorrhoea is often a byproduct of a dramatic weight loss and directly jeopardizes bone development. Supposing that an average female life span is 85 years, a 15-year-old who suffers from eating disorder is at risk of osteoporosis for ensuing 70 years of life. Osteoporosis can be prevented by avoiding weight loss during puberty. If a girl loses weight or shows menstrual abnormality, examining bone density is highly recommended.



# Four Pillars of Treatment

For Recovery . . .



- 1 Physical Function: Healthy diurnal rhythm of autonomic nerves, regular and ovulating menstruation, regular healthy meals and eating behaviour
- 2 Psychological Function: Acquisition of self-esteem and capacity for open honest expression of feelings including saying 'no'.
- 3. Family: Parental coalition, generation boundary and sexual boundary
- 4 Social Function: Capacity to be herself in her own right

are crucial.

## Assessment and Management of Daily Life

Severity	Mild	Moderate	Critical
Pulse Rate (Beats/Min)	Day 55-60 Night 50-55	Day 45-55 Night 40-50	Day Below 45 Night Below 40
Temperature / Blood Pressure	Normal Range- Moderately Low	Moderately Low	Low
Weight	- 15 %	-15 % to -20%	Below -20%
Menstrual Period (Past 3 months)	3 times (Irregular)	1 to 2 times	None
Organ Failure (e.g brain atrophy, osteoporosis)	Mild	Moderate	Severe
Life Management	Attending School Under Supervision No P.E. Lessons	Staying at Home Limited Schooling	Hospitalization
Life Management Supervisory Classification*	C - D	B - A	A

\* Life Management Supervisory Classification

Class A: Requires hospitalization or home visit of a medical practitioner.

Class B: Schooling permitted but no exercise allowed.

Class C: No vigorous sporting activities. Only mild sporting activities suited to the age of the child are permitted.

(Note) The above table is created in reference to Morgan -Russell Outcome Assessment. Please note that the figures in the table are guidelines only. It is not unusual for a person with early-onset anorexia nervosa to have pulse beats over 60 during daytime.

# Goals and Risks of Three Phases of Treatment

The three phases of treatment are :Acute Phase, Recovery Phase and Social Rehabilitation Phase. Each phase has goals and risks.

## 1. Acute Phase

The child denies that he or she has any physical or psychological problems and is reluctant to receive treatment. Clarifying and showing signs of starvation to the child may motivate him or her entering into a treatment

- Chilly hands and feet: Your body is too weak to make them warm.
- Constipation: Your stomach and guts no longer move briskly with less food intake.
- Dry skin and hair: Without enough fat and fluid your hair cannot stay glossy
- Thick lanugo: Your body is desperate to minimize heat loss for survival.
- Bradycardia: A warning sign from the heart to stop burning energy without caloric intake. Though easily masked during daytime, bradycardia reveals itself at night.
- Amenorrhoea: A sign of dysfunction of endocrine system and the body attempts to minimize loss of energy ( eg . blood ) for survival.

By providing a firm holding environment with bed rest and regular caloric intake we aim to reestablish a normal vital rhythm such as sleep-wake cycle and hunger and satiation of eating. The child may suffer from unvoiced stress having lived in tension and anxiety probably since very early life. The child in acute phase of anorexia nervosa can best be treated as a psychological baby with daily consistent warm, meticulous and delicate care,( similar to a paediatrician's neonatal intensive care, thus we name this care Anorexia Nervosa Intensive Care.) Until the minimum pulse recovers to above 60 per minute at night, we advise the child to refrain from school and rest at home. The goals of treatment of acute phase are recovery of vital signs, body sensations and a warm relaxed interaction with her mother at home or with attending staff in the ward.

## 2. Recovery Phase

Recovery from state of hunger will manifest in affective and behavioural change.

Reduction of endorphin secretion may lead to depressed, irritated, anxious mood similar to that in opiate withdrawal syndrome. Violent outbursts and stealing may occur. A persistent practice of steady regular eating habit will prevent bingeing and purging. Parents and therapeutic team unite to understand and contain the fearful world of the recovering child with compassion. The child will steadily acquire a sense of trust in self and others through tangible experience of being firmly and warmly contained without threat of abandonment.

## 3. Social Rehabilitation Phase

Anxiety will be heightened as the body recovers. A premature return to school life and exposure to stimuli of interpersonal relationship before the child is physically fit enough will exhaust her. A careful reflection on the child's own perception of her mind and body is thoroughly required. Ample time and small steps are required to return safely to a full school life. Otherwise she will feel overwhelmed and will succumb to anorexic withdrawal only to relapse.

# A Long-Term Perspective and Treatment Goal

We follow up the child at least for the subsequent 3 years after the above treatment with an aim for her to maintain and establish her weight, healthy eating habit, ovulating menstruation, a trustful relationship with an attachment figure and an honest open expression of her feelings. College examination, love affairs, leaving home can pose risk of relapse.

Early-onset Anorexia Nervosa:  
Prevention and Early Detection

**The Health, Labour, and Welfare Ministry of Japan**  
**Department of Children and Family Research**  
**A Project for Early-onset Anorexia Nervosa – Investigation and Treatment**

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Motoki Akamatsu \*2, Natsuko Tokita \*1, Myong Sung Che \*1, Naoki Hori \*1, Akihiro Sato \*1

Mikako Inokuchi (secretary) \*1

# Méthodes de dépistage précoce de la maigreur de la puberté



## Qu'est ce que la maigreur de la puberté ?

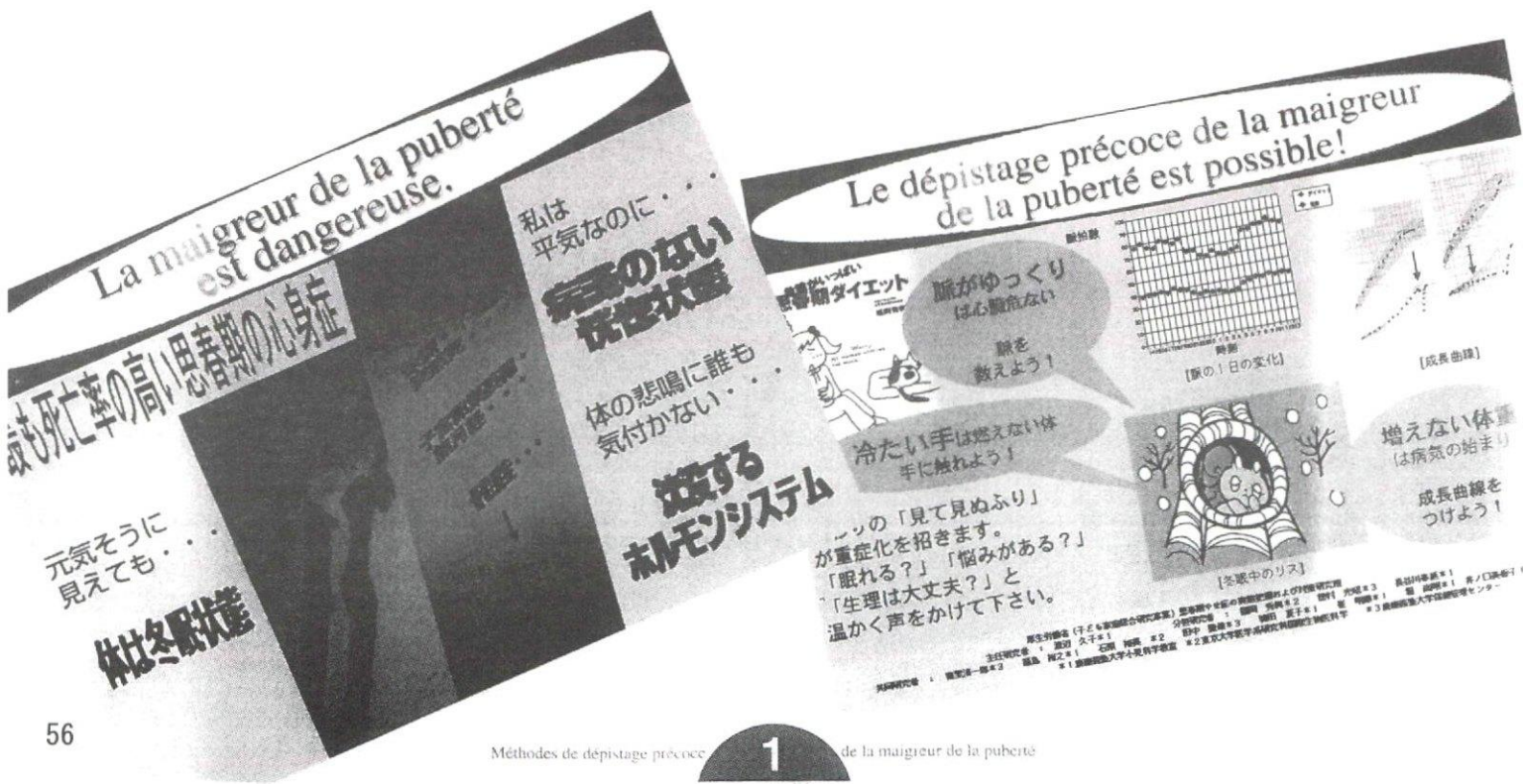
Ces temps derniers, de plus en plus d'écoliers et de collégiens sont atteints par le symptôme de maigreur de la puberté.

La maigreur de la puberté (inappétence d'origine nerveuse de l'enfance) est un trouble du comportement alimentaire. Au lieu d'assumer le stress psychique, les malades se libèrent à travers des manies alimentaires du type : « je mange », « je ne mange pas ».

Parmi les autres troubles du comportement alimentaire, on peut citer la boulimie et les vomissements auto-provoqués qui vont de pair.

Le symptôme de maigreur entrave le développement non seulement physique mais aussi psychique ; il constitue un facteur d'isolement.

La prévention et le dépistage précoce sont essentiels.



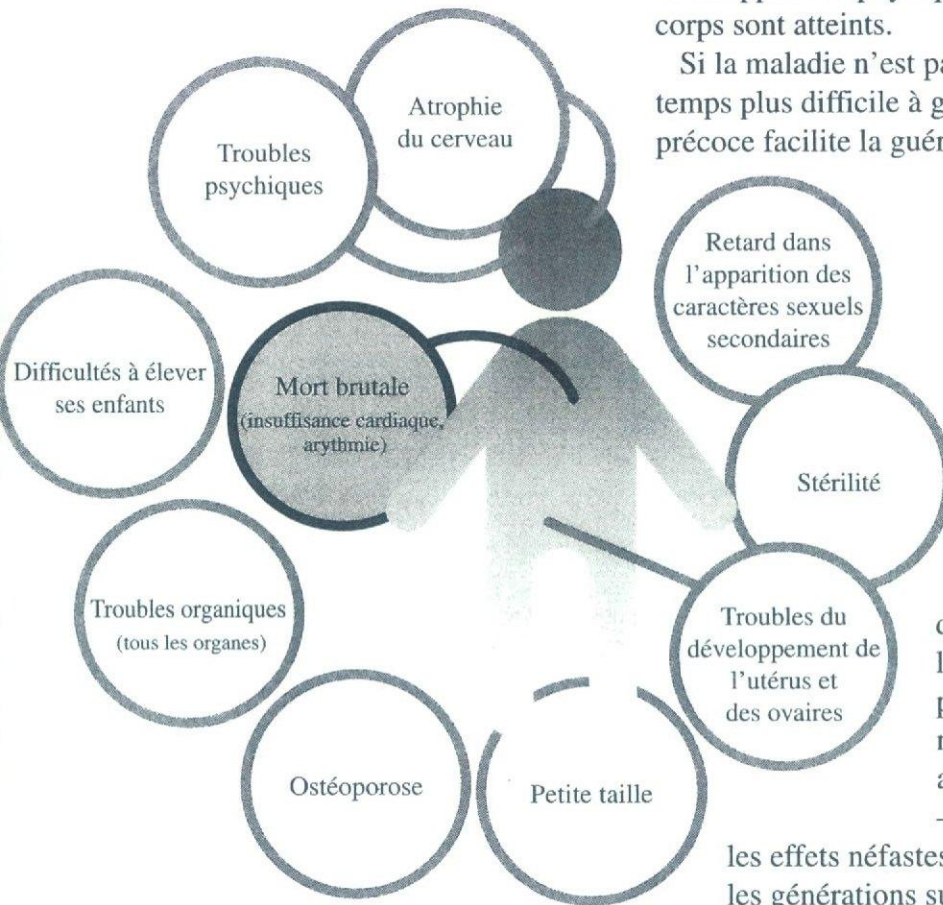
# Les facteurs de déclenchement de l'anorexie

De nombreuses formes de stress et de traumatisme servent de facteurs de déclenchement : moqueries ou critiques adressées à l'enfant qui est traité de gros, blessures dans les relations avec les camarades ou la famille, examen d'entrée au collège ou au lycée, divorce des parents, maladie ou mort, déménagement, abus sexuels dans l'enfance.

## Troubles organiques dus à l'inanition

L'inanition durant la période de croissance entrave le développement physique et psychique, tous les organes du corps sont atteints.

Si la maladie n'est pas identifiée, elle devient avec le temps plus difficile à guérir. En revanche, un dépistage précoce facilite la guérison.



Le symptôme de maigreur de la puberté peut être comparé à un éboulement psychique et physique. Si la maigreur ou l'aménorrhée perdurent, les troubles organiques s'aggravent, et le risque pour la vie du patient augmente. En outre, même s'il y a rétablissement physique, tant que le patient n'arrive pas à s'accepter lui-même, à dire ce qu'il pense à ses parents ou ses amis, l'exposition à de nouveaux stress – grossesse, accouchement, éducation des enfants – l'empêchera d'aimer ses enfants et les effets néfastes de la maladie se répercuteront sur les générations suivantes.

## Le cercle vicieux de l'anorexie

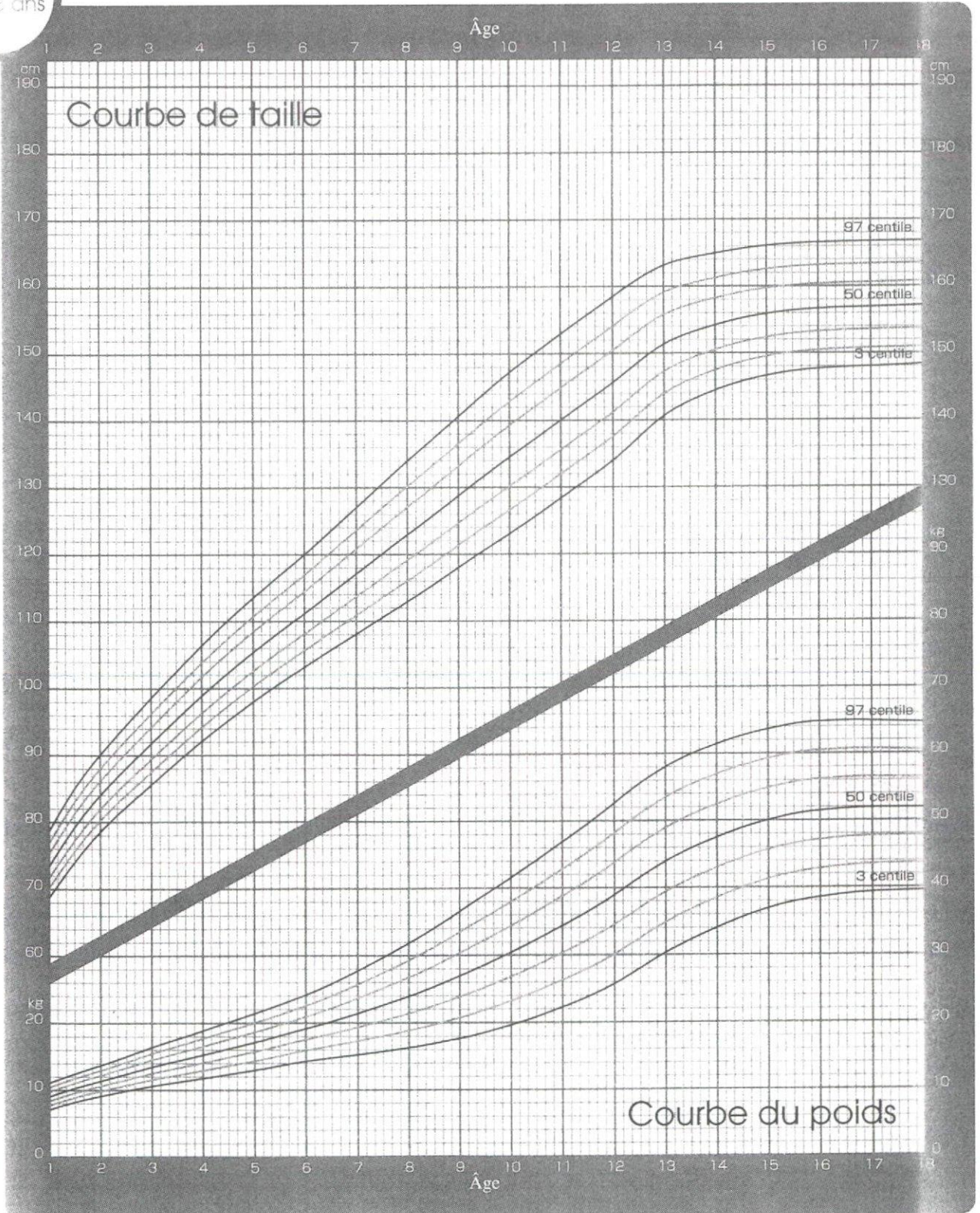
Les enfants sensibles qui, dès la petite enfance, se soucient d'autrui semblent plus exposés que les autres. Quand ils se mettent à maigrir, au lieu de s'en inquiéter, l'entourage les complimente : « Tu t'es affiné », leur dira-t-on, ce qui les conduit à se priver encore plus et à sombrer dans un état d'inanition. Il y a alors sécrétion d'endomorphine dans le cerveau, ce qui réduit la souffrance de l'inanition. Le patient connaît une sorte d'extase (thiness high) et peut s'abstenir de manger sans souffrir. Il affecte la gaieté, ses notes en classe s'améliorent, il est actif sans dormir, il ne peut plus s'arrêter. Son estomac s'atrophie, il n'éprouve plus de sensation de faim, et son estomac en vient à ne plus accepter la nourriture. Le cerveau s'atrophie aussi, les capacités de jugement sont atteintes et le patient n'est plus à même de se rétablir tout seul. L'affaiblissement cardiaque met ses jours en danger (arythmie), le taux de mortalité atteint alors 10%. Au bout de vingt ans de maladie, on considère que le taux de mortalité s'élève à 20%.

# Le dépistage précoce et le diagnostic de la maigreur de l'adolescence

## ● Etablir sa propre courbe de croissance

Noter le poids et la taille depuis l'enfance sur ce graphique pour établir soi-même sa propre courbe de croissance.

Filles de 1 à 18 ans



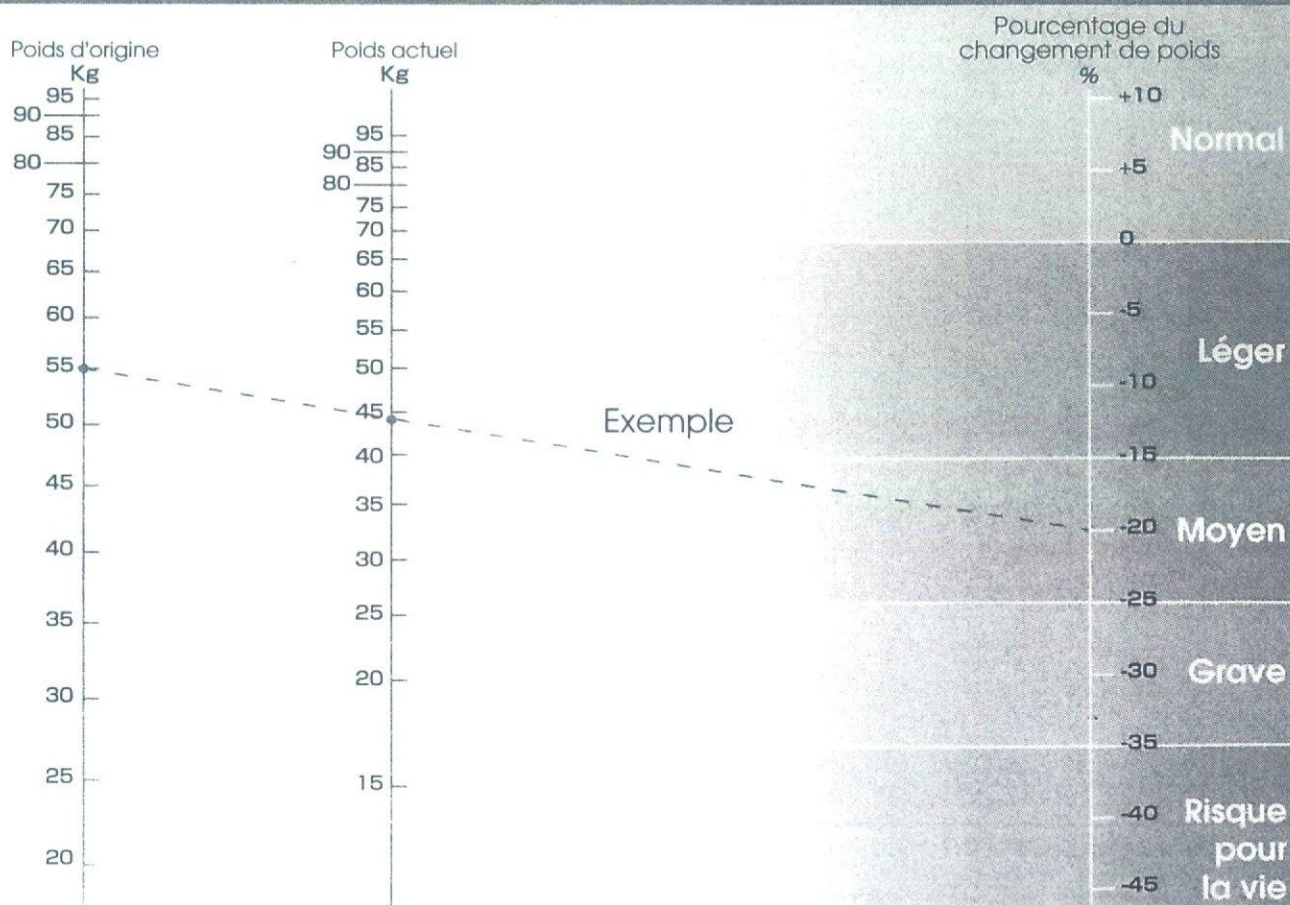
# Critères de diagnostic

## Critères de diagnostic pour l'enfance

● Si un écolier ou un collégien remplit au moins deux des critères ci-dessous, il est diagnostiqué comme souffrant du symptôme de maigreur de la puberté (inappétence d'origine nerveuse de l'enfance).

1. Anorexie et privations alimentaires opiniâtres
2. Mauvaise progression ou diminution du poids en l'absence de maladies somatiques nettes
3. Le patient présente au moins deux des symptômes ci-dessous.  
Obsession du poids, obsession des calories, obsession de la silhouette, peur de grossir, auto-vomissements, exercice physique trop intense, utilisation de laxatifs

● En cas de perte pondérale, reliez par des pointillés le poids de départ au poids actuel, comme indiqué ci-dessous.

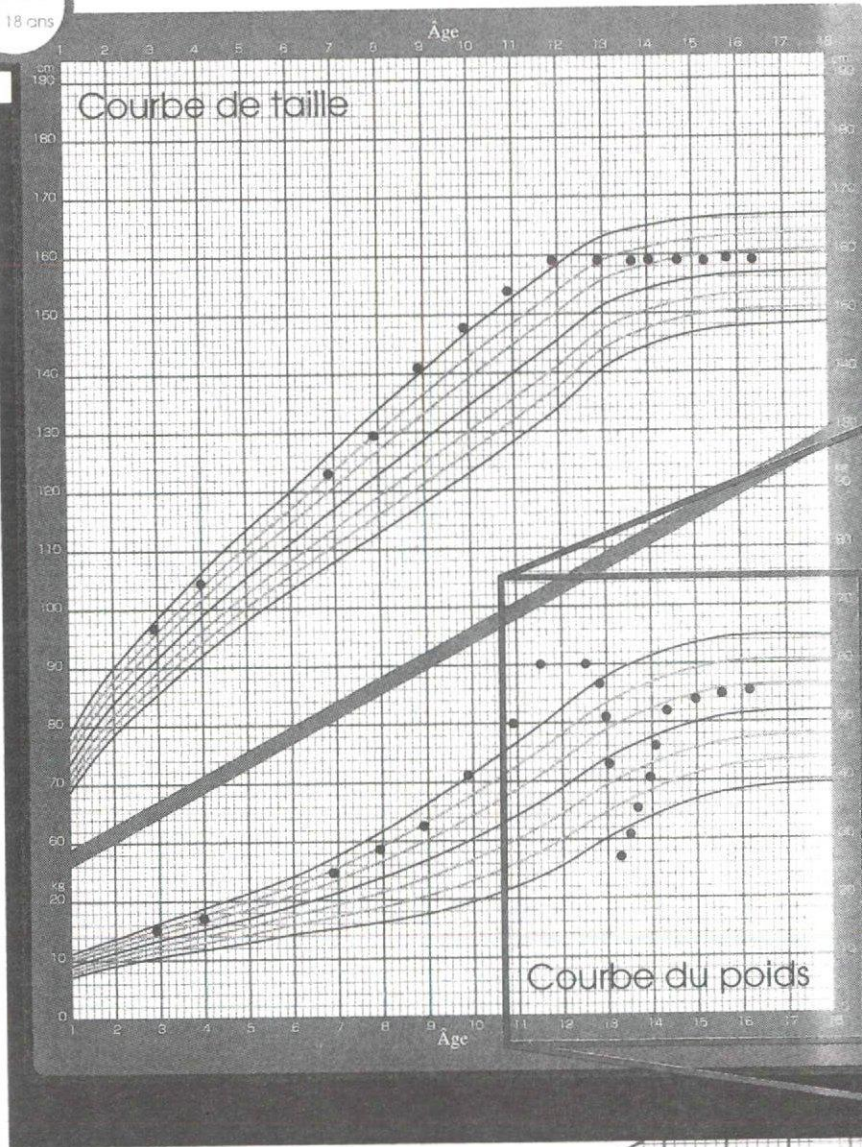




# Méthodes de dépistage précoce de la maigreur de la

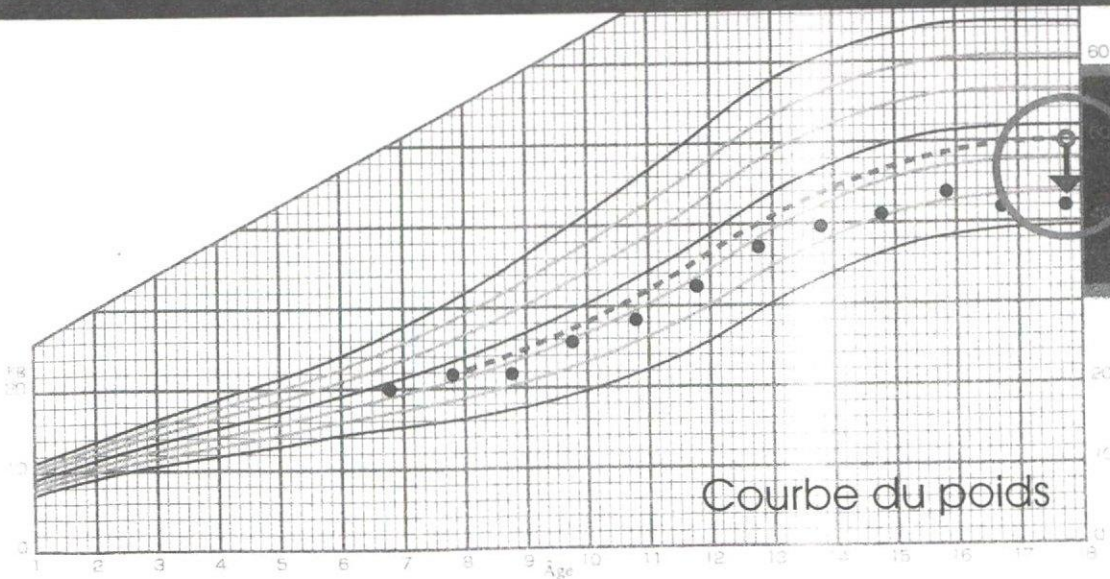
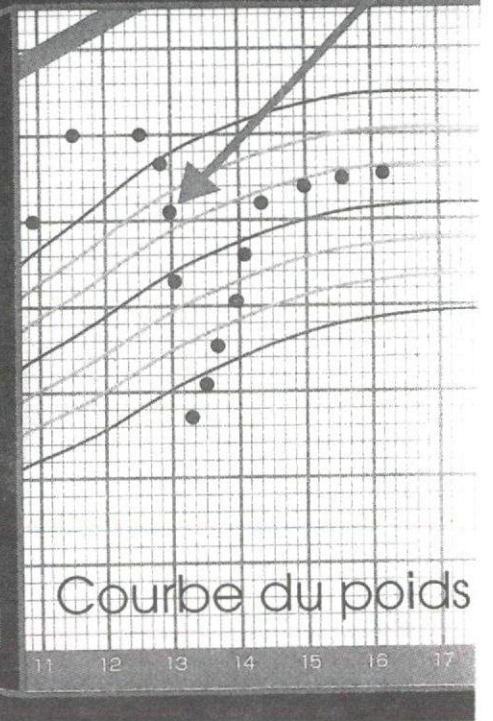
▼ Exemple de courbe de croissance du symptôme de maigreur de la puberté

Filles de  
1 à 18 ans



Pourquoi ne fait-on rien pour les patientes avant le stade extrême de la maigreur ? Il faut passer une visite médicale quand le processus d'amaigrissement est amorcé.

Visite médicale



Le poids bas d'au moins une bande.

# Partie 1 Courbe de croissance

- ① Le poids a baissé d'au moins une bande sur la courbe de croissance.  
L'indice d'obésité est inférieur à -15%
- ② Le poids diminue d'au moins 3 kg, il y a des symptômes physiques  
(ralentissement du pouls, aménorrhée)



Dans ce cas, conseiller une consultation médicale et des examens.

## ● Indice d'obésité

$$= \frac{\text{Poids réel} - \text{Poids standard}}{\text{Poids standard}} \times 100\%$$

## ● Poids standard

Formule de calcul  
depuis la taille (X)

$$= ax - b$$

a et b sont classés  
selon l'âge et le sexe

Tableau  
1

Garçon	a	b	Fille	a	b
5ans	0.381	23.099	5ans	0.379	22.923
6	0.440	30.134	6	0.433	29.331
7	0.489	36.294	7	0.484	35.640
8	0.576	47.007	8	0.538	42.371
9	0.634	54.615	9	0.620	53.008
10	0.708	64.866	10	0.700	64.186
11	0.763	72.848	11	0.784	76.406
12	0.784	76.118	12	0.806	78.855
13	0.816	81.589	13	0.682	58.704
14	0.822	82.034	14	0.614	46.482
15	0.774	72.009	15	0.562	36.913
16	0.708	60.404	16	0.588	40.622
17	0.675	54.084	17	0.583	39.935

Par exemple, lorsque la taille est de 152cm pour une fille âgée de 12 ans, son poids standard est,  
 $y = 0.806 \times 152 - 78.885 = 43.7\text{kg}$

Extrait et modification d'une partie de la revue Pediatrics International 98:96-102 1994 faite par Kimie Yamazaki et autres.

## Prenons le pouls des enfants !

La découverte d'un ralentissement du pouls contribue au dépistage précoce de la maigreur de l'adolescence.

Dans le symptôme de maigreur de la puberté (inappétence d'origine nerveuse de l'enfance), le patient est en état d'inanition, ce qui provoque un dysfonctionnement du système neurovégétatif (prédominance de l'activité du nerf parasympathique). Apparaît ainsi un ralentissement du pouls.

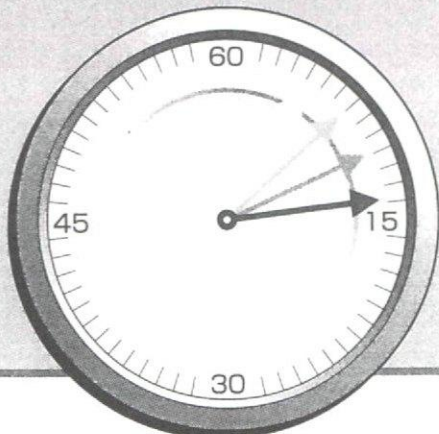
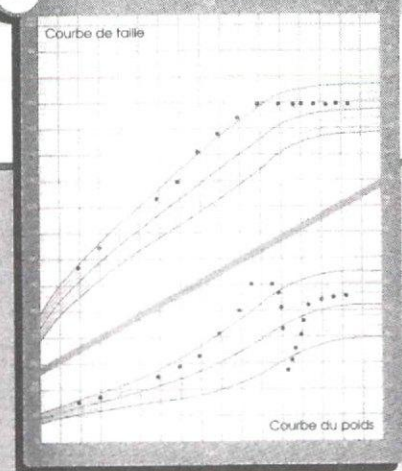
L'état de l'enfant est en tous points pareil à l'hibernation des animaux. Il apparaît à première vue vif, mais son corps hiberne.

Un pouls lent comme le rythme de l'hibernation, l'esprit et le corps parcourus de tremblements



### Prévenir et réagir

• Si la courbe de croissance fait apparaître le moindre doute de maigreur de la puberté, prenons le pouls de l'enfant ! Prendre le pouls peut se faire facilement à l'école ou dans la famille.

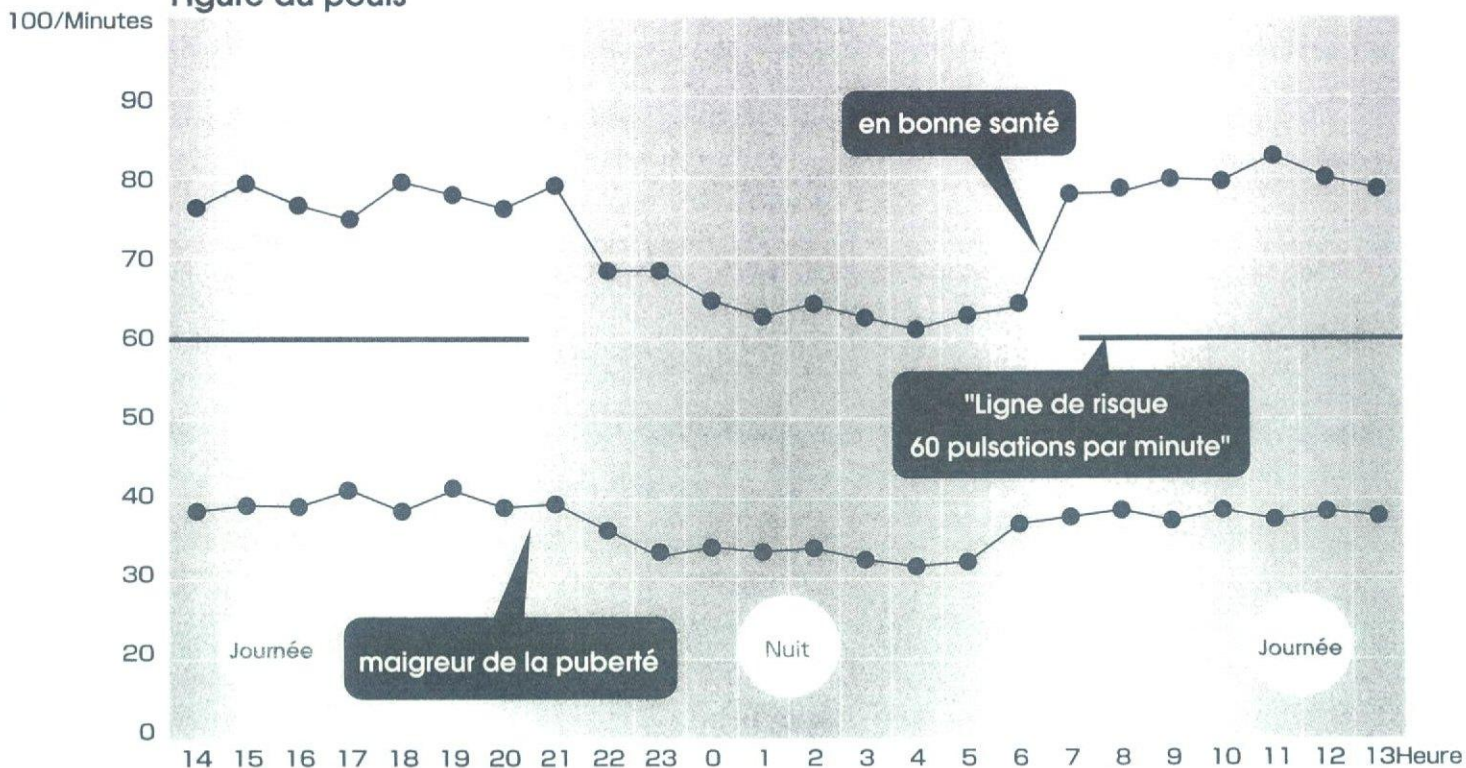


• Lorsqu'on prend le pouls de l'enfant, il est conseillé de lui faire prendre son propre pouls, de lui faire prendre le pouls d'autrui (par exemple de l'infirmière de l'établissement), afin de l'intéresser à l'état de son propre corps.

# rté 1 Le pouls

On considère qu'il y a ralentissement du pouls au-dessous de 60 pulsations par minute (repos en état d'éveil)

Figure du pouls



Si les signes d'amaigrissement dans la courbe de croissance coïncident avec un ralentissement du pouls au-dessous de 60 pulsations par minute, il y a possibilité d'un symptôme de maigreur de la puberté.

Faites en sorte que l'enfant ne se surmène pas à l'école, notamment durant la gymnastique, et conseillez de consulter un pédiatre.

(Note : Dans le symptôme de maigreur de la puberté, il arrive qu'il y ait un net ralentissement du pouls la nuit, sans ralentissement notable du pouls dans la journée, durant l'éveil. Le recours à un électrocardiogramme holter (enregistrement continu sur 24 heures du rythme cardiaque) permet d'évaluer le pouls durant le sommeil, ce qui peut contribuer à détecter la maigreur de la puberté. Parlez-en au médecin scolaire ou à un médecin de votre quartier.