

Child age distribution

Pediatrics deals with the health and illness of a human individual from birth to adulthood - in the Czech Republic up to the 19th birthday (up to the age of 18 years and 364 days). Pediatrics is the science of the development of the human individual. ^[1]

Periodization of childhood

- prenatal period (intrauterine, intrauterine) – 40 weeks (= 280 days):
 - embryo (embryo) – first 8 weeks;
 - fetus (fetus) – from the 9th week to birth;
- postnatal period:
 - newborn – from birth to the 28th day of life (lasts 28 days);
 - infant – from day 29 to day of first birthday (lasts 11 months);
 - toddler – 2nd to 3rd year of life (lasts 2 years);
 - preschooler – 4th to 6th year of life (lasts 3 years);
 - schoolboy – from the age of 7;
 - adolescent – the period between early adolescence and adulthood. ^[1]

Psychomotor development of the child

 For more information see *Child's psychomotor development*, *Child's neuromotor development*, *Child's psychosocial development*.

Psychosocial human development ^[2]

Age	According to Freud	According to Erikson	According to Piaget
0-18 months	oral	primary trust vs. mistrust	sensorimotor
1.5-3 years	anal	autonomy vs. shame, doubt	symbolic (preoperative)
3-6 years	Oedipal	initiative vs. guilt	intuitive (preoperative)
6-11 years	latency	diligence vs. subordination	specifically operative
12-17 years	adolescence	identity vs. role confusion	formally operative
17-30 years	young adulthood	intimate relationships vs. isolation	
30-60 years	maturity	creativity vs. stagnation	
over 60 years	old age	self-integration vs. decomposition	

Periodization of child growth

 For more information see *Child Growth and Development*.

- human growth pattern is referred to as "**sandwich**" because between the period of rapid postnatal growth and the pubertal spurt there is a period of quiet growth (childhood; 2 to 11 years of life), unlike other biological species.
- **ICP growth model according to Karlberg:**
 - component I (infancy), infantile growth component - from the 2nd half of intrauterine development to the 3rd to 4th year of life; mainly IGF-I is applied;
 - component C (childhood), children's growth component - starts before the end of the 1st year of life and lasts until the end of physical growth; dominant influence of growth hormone and persistent action of IGF-I;
 - component P (puberty), pubertal component of growth – phase of additional growth induced by puberty; it accelerates until the age of the highest growth rate, it slows down until the end of growth; influence of sex hormones. ^[3]

Prenatal period

The prenatal period is the most dynamic developmental period of the entire life. ^[1]

Embryonic period

 For more information see *Embryo*.

- first 8 weeks of intrauterine development;
- individual parts of the body differentiate, the foundations of organs and body systems are formed.

Development of the embryo

- 1. week - fertilization and nesting of the egg;
- 2. week - the embryo has 2 layers of cells;
- 3. week - the first missed period in the mother, the embryo has 3 layers of cells;
- 4. week - the embryo already has a human form, the neural tube closes, the bases of the limbs are formed, the embryo measures 4-5 mm;
- 5. week - the initial mouth and the bases of the fingers are formed;
- 6. week - primary nose and palate are formed, embryo measures 21-23 mm;
- 7. week - the foundation of the eyelids is formed;
- 8. week - distinct gonads appear (testes or ovaries); ^[1]
- at the end of the embryonic period, small twitches or subtle muscle contractions appear, although the muscles are not yet connected to the nervous system. ^[4]

Fetal period (period of fetal development)

 For more information see *Fetus*.

- from 9 weeks to birth;
- organs and body systems differentiate structurally and functionally and begin to function.

Fetal development

- 9. week - the fetus weighs 8 g and is 5 cm long;
- 10. week - the external genitalia are clearly developing;
- 20. week - the fetus weighs 460 g and is 19 cm long;
- 25. week - the third trimester begins; the fetus weighs 900 g and is 25 cm long;
- 28. week - the fetus has open eyes, bends its head down;
- 38-41 week - usual delivery date; ^[1]
- reflex movements of the fetus begin as early as the 9th week of pregnancy;
- most newborn reflexes develop between the 20th and 38th week of pregnancy (the sucking reflex was detected as early as the 14th week, the search reflex, Moro's and palmar grasp at the 28th week, the Babinski reflex appears just before the due date). ^[3]

Notes on fetal development

- at the beginning of the 3rd month, the fetus spontaneously moves its upper and lower limbs, turns its head, furrows its forehead, opens and closes its mouth;
- subsequently, signs of grasping appear;
- an 8.5-week-old fetus has a developed sense of touch - it reacts to irritation with a hair, in the case of irritation in the mouth area, an indication of the search reflex appears;
- at 9 weeks the bioelectrical activity of the brain can be registered on the EEG, from the 5th month on the EEG of the fetus can differentiate between sleep and wakefulness;
- from the 20th week, the pain sensory pathways work;
- reacts to sound stimuli, subsequently begins to distinguish the sounds of human speech from other sounds, and towards the end of pregnancy, it is very likely that he already distinguishes his mother's voice with its different emotional shades;
- has the ability to remember in the short term - is capable of habituation (reduction of response to the repetition of the same stimulus, not to a different stimulus);
- the ability to habituate to sound and vibrations is proven from the 22nd week and gradually increases with age;
- reacts to visual stimuli;
- is active - it is able to influence its surroundings (e.g. initiate changes in the mother's position), thereby acquiring the prerequisites for a future independent life outside the mother's body;
- in the 30th week, the fetus has the ability of social interaction - it reacts to changes in the mother's emotional state by changing its heart rate and spontaneous movements;
- in the last third of pregnancy, the fetus swallows amniotic fluid, and at this time it apparently already has a developed sense of taste - after birth, the child better tolerates the tastes that it encountered at the end of prenatal development (i.e. foods that the mother consumed more often);
- in the last 2 months, the fetus is capable of the simplest forms of learning, it is able to benefit from experience. ^{[4] [5]}

Fetal growth

- controlled by IGF-I and IGF-II - they regulate the frequency of cell divisions (the frequency of cell mitotic cycles); their levels are affected by the mother's nutrition, chronic maternal diseases, embryonic/fetal infections, exposure to toxic substances, placenta function;



7-week human embryo during ectopic pregnancy.



9-week human embryo from ectopic pregnancy.

- endogenous factors interact – chromosomal aberrations and other genetic disorders affect growth potential;
- at the end of the fetal period, gonadotropins and sex hormones are used;
- male fetuses grow faster than female fetuses (boys have a higher birth weight and length); in 1991, the average birth weight and length of boys was 3390 (\pm 464) g and 50.4 (\pm 2.9) cm and of girls 3244 (\pm 460) g and 49.7 (\pm 2.9) cm;. [3]

Newborn period

 For more information see *Newborn*.

- from birth to the completed 28th day;
- the period of adaptation of individual body systems to extrauterine conditions;
- the highest mortality rate of all childhood;
- the period is quite specific, which is why the medical field of **neonatology** was gradually separated. [1]

Characteristics of the newborn period:

- behavioral states according to Brazelton: deep sleep, light sleep (REM sleep phase), doze (transitional state between sleep and wakefulness), calm wakefulness, active wakefulness, crying;
- sleep is still poorly consolidated (it is fragmented into a larger number of time periods), it lasts around 20 hours a day;
- newborn (unconditioned) reflexes present: searching and sucking reflex enabling food intake, excretory, defensive, orientation, grasping, positioning, etc.;
- developed sensory functions:
 - hearing – well developed, prefers speech sounds, prefers female voice with higher frequencies; a newborn child probably recognizes and prefers his mother's voice to that of a strange woman, he recognizes his father's voice only a little later;
 - smell – enables orientation in the environment; turns away from unpleasant odors and reacts positively to pleasant smells; at one week of age, a breastfed baby can distinguish the smell of its mother's nipple;
 - taste – prefers sweet taste, avoids bitter or otherwise unpleasant taste; has more taste buds than adults;
 - sight – the retina is well developed, but lens mobility and visual acuity are impaired; visual acuity is low at birth (approx. 20/400), adult vision acuity is reached around 1 year of age; fixation and tracking in the visual field appear by 2 months of age; the optimal distance for eye accommodation is 20-25 cm; prefers the human face (and all shapes that resemble it) to geometric shapes, prefers moving objects, bright colors and color contrasts; strabismus is common, which usually disappears by 3 months of age (if it persists, an ophthalmological examination is recommended);
 - touch – responds positively to warmth and tactile soothing; finger sucking is observed as early as the 24th week of pregnancy;
- in the awake state, the limbs usually take an asymmetric position due to the predominance of the subcortical areas over the immature cerebral cortex (tonic neck reflex or fencing reflex, i.e. the head is turned to the side and the limbs in the direction of view are in extension, while on the opposite side they are in semiflexion);
- his fists are mostly clenched, not ready for an active grip;
- capable of learning, capable of simple thought processes, but has a short and fleeting state of wakefulness with the need for regular and frequent repetition of learning situations and social experience;
- screaming is differentiated – analysis of the sound spectrum showed differences, for example, between screaming immediately after birth, screaming from hunger and screaming from pain;
- able to imitate simple facial expressions (opening and closing the eyes and mouth, sticking out the tongue, but also simple vocalization);
- able to recognize the native language from a foreign one (unlike adults, it distinguishes subtle differences in the time relationships of the sounds contained in human languages) - a newborn (at the age of 2 weeks) is disturbed if he is spoken to in a different language than the one he has heard so far. [6] [3]

The most common problems in the newborn period:

- severe congenital developmental defects – congenital heart defects and lungs, disorders of body tube closure and GIT patency ;
- consequences of perinatal pathology – asphyxia and infection from the birth canal;
- continuation of intrauterine pathological conditions – embryonic and fetal infections etc.;
- due to the immaturity of the immune system, infections tend to generalize - more serious infections take the form of sepsis. [1]

Infancy

 For more information see *Infant*.

- starts on the 29th day and ends on the child's first birthday (lasts 11 months);
- a period of dramatic somatic, neuropsychic and motor development;
- symbolically, the period culminates with the first step and the first word around one year of age;
- in terms of morbidity and mortality it is the second most significant period (right after the previous); [1]

The most common problems during infancy:

- congenital developmental defects;
- late manifestations of the consequences of perinatal pathologies (e.g. development of cerebral palsy due to

- perinatal asphyxia);
- inherited metabolic disorders;
- molecular endocrinological, immunological, hematological diseases, etc.;
- acquired diseases (especially infectious). ^[1]

Development of motor skills

- the development of fine motor skills is characterized by the development of grip:
 - at 3-4 months – grip with the whole palm, especially the ulnar part;
 - before the 5th month – grasping with the thumb as well (e.g. when grasping a cube);
 - before the 7th month – opposition of the thumb (when grasping small objects);
 - at 9 months – tweezers (pincer) grip;
 - at 9-10 months begins to intentionally drop things;
- the development of gross motor skills allows you to explore your surroundings
 - at 6 months – independent sitting;
 - at 12 (9-17) months – the beginnings of walking. ^{[3] [7]}
- laws of development according to Arnold Gesell:
 - principle of the direction of development - *cephalocaudal* procedure (first actively controls the head, then in a passive sitting position first aligns the cervical spine and then the lumbar spine, then climbs on the knees and stands on the feet), *proximodistal* procedure (movements of the limbs they start in the shoulder and hip joints, pass through the wrist to the fingers, or through the knees to the feet) and the *ulnaradial* procedure (shift from the little finger side to the thumb side during an active grip);
 - principle of alternating "interweaving" of antagonistic neuromotor functions (development along a spiral) - alternating dominance of flexors and extensors of limbs;
 - principle of functional asymmetry – alternation of functional symmetry and asymmetry at an increasingly higher developmental level (symmetrical position of the limbs of a premature newborn, tonic cervical reflex of a full-term newborn, symmetrical position of the limbs after 3 months of age, grasping objects with one hand after 6 months of age);
 - principle of individualization – general principles of development apply, but with inter-individual differences;
 - principle of self-regulation – development controlled by the child himself is not smooth, but with fluctuations. ^[7]
- at 8 months he can hold a bottle by himself while drinking and with help he drinks from a cup, holds and bites a roll or biscuit;
- in the first months of life, the visual attention of the infant is primarily drawn to distinctive and colorful objects, while after the 9th month of age, on the contrary, details and small objects (a crumb, a pill, a chain, etc.);
- at 9 months he begins to understand simple calls - "do papa", "paci-paci";
- at the age of 1, he differentiates objects according to their properties – squeezes a squeaky toy, pushes a toy car, puts a comb to his head; ^[7]

Speech development

- up to 2 months – non-verbal phase;
- from 2 months – vocal play (between mother and child);
- 3 months – babbling; vowels a, u, e;
- 7 months – imitating speech sounds;
- 8 months – syllables da, ba, ka;
- 10 months - "Dad" or "Mum" unaddressed;
- 10. up to 11 months - short "strings" that do not have a specific meaning, but have a clear form of message, question or order (by the rhythm and melody of speech); around 1 year, this jargon has the character of long "speech", during which it is only rarely possible to catch a clear word;
- 12 months - own speech (jargon) that only parents understand - imitates physical sounds, animal voices or human screams; clearly articulates one other word besides "mom" and "dad";
- speech comprehension (passive vocabulary) develops faster than expressive ability (active vocabulary) – first words are understood at 9 months; ^{[3] [8]}

Psychosocial development in the 1st year of life

- crying is the main means of communication in the first weeks of life;
- time spent crying in the first 2-3 months of life increases as the total daily sleep time decreases;
- after 12 weeks of age, crying decreases, because the child learns to react differently - by smiling, touching, musing;
- average sleep time in the first year of life (1 week...1 month...1 year of age): 16...15...14 hours, of which 8...7...3 hours during the day;
- the infant perceives reality as the equivalent of its immediate surroundings;
- the infant can follow the path of an object in the field of vision, but in the first six months the object ceases to exist for him as soon as it leaves the field of vision; only between 9.-12. by the month he begins to understand the permanence of objects;
- for 3.-6. a month are typical simple games where the child and parent alternate moments of visual contact with moments of turning the face away - they represent an early stage of imitation;
- more complicated games (e.g. hide and seek) appear around the 9th month; the expression of joy at a face that has disappeared and reappeared expresses an understanding of the object's permanence;
- between 8 and 9 months comes the fear of separation and fear of unknown people, the so-called **separation**

anxiety - the child reacts to strangers by crying, it is an expression of recognizing the difference between the mother's presence and absence (the child can evoke an image her presence, he becomes aware of the difference, becomes insecure and begins to fear); these manifestations peak at 15 months and disappear around 2 years of age. ^[3]

- **Jean Piaget** (1966) describes the first 2 years of life as the **sensorimotor period** - the child learns to associate a stimulus from the environment with a motor response; it is based on simple reflective stereotypes (schemas) and supplements them with own experiences;
- **Sigmund Freud** calls the first year of life the **oral stage** - the child satisfies its needs through the mouth;
- **Erik Homburger Erikson** calls this a period of **primary trust or distrust**; ^[3]
- **Margaret Mahler** (1975) described the following stages:
 - 1. a month of life - the **period of normal (primary) autism** - the child mostly sleeps, satisfies his needs, does not distinguish himself or his mother from the environment;
 - 2. up to the 4th month - **stage of symbiosis with the mother** - the mother satisfies all the child's needs; permanent mutual bonds are formed; parents learn to perceive and recognize their child's expressions; mutual emotional interaction develops; the child does not distinguish itself from its mother, but begins to distinguish its surroundings;
 - 4. month to 3 years - **period of separation - individuation**:
 - 4. up to the 10th month - the differentiation subphase - the child differentiates its mother from other people; explores surroundings, own body and mother's body; at the end of this period, separation anxiety is manifested;
 - 10. up to the 16th month - subphase of practice - the child begins to actively move away from the mother, but always returns to her again to gain security and emotional comfort, thereby strengthening his relationship with the mother; forced separation during this period can cause stagnation or even regression in the child's development;
 - 16. to the 25th month - the subphase of rapprochement, or the phase of establishing social relations;
 - 25. to the 36th month - subphase of individuation or object permanence; ^[7]

Development of the central nervous system

- the ratio between head size and body length/height decreases - from 1/4 in a newborn to 1/8 in an adult;
- at birth, the circumference of the brain part of the head is 65% of the circumference of an adult;
- half of the postnatal brain growth is completed already at 1 year of age; after 2 years of age, head circumference increases by only 2 cm/year; by age 10, brain growth is almost complete;
- the human brain contains approximately 100 billion neurons;
- neuron replication takes place mainly during the first 3 months of pregnancy and is completed before birth;
- brain cell organization continues to develop long after birth;
- cerebral white matter increases and synaptic connections proliferate;
- the gray matter of the cerebellum develops relatively late (from the 30th week of pregnancy to 1 year of age);
- the spinal cord gradually grows through the neural canal until the 3rd month of pregnancy, after which the body of the fetus grows faster than the spinal cord, so the lower pole of the spinal cord gradually rises; reaches the 3rd lumbar vertebra at birth;
- myelination begins in the spinal cord in the 4th month of pregnancy and in the brain in the last trimester; at birth, the maturation and myelination of the autonomic nervous system is completed, the cranial nerves are myelinated except for the optic and olfactory nerves; myelination of the cerebral cortex and its connections to the thalamus and basal ganglia ends around 2 years of age;
- Moreau's reflex and palmar grip develop in the 28th week of pregnancy and gradually disappear in the 3rd and 4 months of age;
- The Babinski reflex appears just before the birth date and usually disappears after 12 to 16 months of age due to myelination. ^[3]

Infantile growth period

- the infantile growth period is a direct postnatal continuation of intrauterine growth;
- growth in this period is not directly affected by the parents' height;
- at the beginning of postnatal life, the action of gonadotropins and sex hormones from the end of the fetal period persists (the period after birth resembles the beginning of puberty);
- the effect of growth hormone on growth rate is just beginning to develop;
- only during the 2nd year of life does body growth begin to be influenced by growth hormone;
- in the first years of life, the need for energy decreases significantly: from 110 kcal/kg/day in early infancy to 90 kcal/kg/day at 2 years of age and then 60 kcal/kg/day (basal metabolism + body movement + growth); it is caused by a reduction in the relative mass of energy-demanding organs (especially the brain and liver) from 17% of an infant's body weight to 5% of an adult's body weight;
- the percentage of energy used for growth also decreases: from 40% in early infancy to 3% at 2 years of age. ^[3]
- weight gain is most intense in the first months of life
 - in the first year it will grow by 25 cm → at the end it should be 75 cm long
 - birth weight doubles in the 4th month (roughly 7 kg), triples around the year (approx. 10 kg) ^[9]

ICP model according to Karlberg

- the first 3 years of life are a combination of the decelerating infantile growth component (I) and the emerging child growth component (C), which operates from the second half of the 1st year of life;
- the levels of gonadotropins and sex hormones activated in the late fetal period decrease;
- the influence of component I gradually disappears and then only component C participates in growth. [3]

Toddler Age

 For more information see *Toddler*.

- from the child's 1st to 3rd birthday (lasts 2 years);
- the period of gradual independence of the child;
- thanks to independent movement, he gets to know the world around him, thanks to the development of speech, he improves communication with other people. [1]

Development of motor skills

- development of gross motor skills:
 - at 1 year – first imperfect independent steps;
 - at 13-15 months – independent walking (starts from a free stance, takes a few steps, stops without holding on to something);
 - after 15 months – more confident walking, rarely falls, can run, but with a wide base;
 - at 2 years – runs well, manages uneven terrain (crosses thresholds etc. without difficulty);
 - stair walking: initially climbs stairs; around 1.5 years climbs stairs when led by the hand; at 2 years, climbs stairs without holding, but usually with feet on each step; at 2.5 years old, he climbs stairs with alternating legs; does not go down the stairs until around 3 years old;
 - around 2 years old, he can jump on the spot and likes to jump from a small height (from the last step, etc.); can jump over a certain distance up to around 3 years;
 - before the age of 3, he can usually ride a tricycle;
- development of fine motor skills:
 - at the end of the infant period, he has a good grasp of even very small objects, but it is difficult to drop an object deliberately and accurately - letting go is more like throwing or throwing
 - after the 1st year, he is able to release objects better (softer, timed) - for example, he is able to stack 2 cubes
 - in 1.5 years he can build a tower of cubes; at 2 years old he can arrange blocks vertically and horizontally; at 3 years old he imitates a "bridge" of 3 cubes;
 - around 2 years matches basic geometric shapes to corresponding holes;
 - at 3 years old he can string beads on a string;
 - development of scribbling: initially treats the pencil like other objects (waves and beats it on the table); then he begins to scribble on paper, but the strokes are haphazard, rough, often exceeding the surface of the paper; around 1.5 years, they try to imitate a line drawn by an adult, but so far regardless of the direction; at the age of 2 he imitates more faithfully (he tries to keep the direction or imitate circular movements); around 3 years old imitates a circle or a cross only according to the model;
- dressing: around the age of 1, he begins to actively help with dressing (e.g. puts his hand through the set sleeve, holds his feet when putting on shoes); during the 3rd year he pulls on his boots and unbuttons (later also fastens) buttons; at the age of 3, he gets dressed with only a little help, he can wash his hands;
- eating: at 15 months she eats with a spoon by herself (although she still turns it over); at 1.5 years old, he handles the cup well and doesn't swell too much when drinking;
- maintaining cleanliness: after the 1st year, he cooperates when he is put on the potty at an appropriate time (e.g. after waking up), but does not report his need yet; only towards the end of the 2nd year does it self-report, but sometimes it has to be remembered. [8]

Speech development

- there are big differences between individual children;
- speech comprehension (passive vocabulary) develops faster than expressive ability (active vocabulary) - at 13 months he can understand 20-100 words, but says only a few words;
- speech development is slowed down by a low-stimulating environment, but also by frequent otitis media with conductive hearing loss;
- at 12 months, the babbling phase peaks, then begins to use specific words to refer to objects and activities; points to objects first;
- at 16 months he says 6 words, consonants t, d, v, n, h;
- at 18 months uses an average of 20-50 words;
- after 18 months, there is rapid development of both passive and active vocabulary; the child begins to understand the symbolic meaning of words;
- at the end of the 2nd year (at 18-24 months) he starts using verbs and says comprehensible sentences of 2 words, describes his activity ("I go out"); uses prepositions; begins to ask "why?"; begins to realize the factor of time;
- uses vowels correctly at 2 years old; approximately 270 words; uses pronouns;
- at 24-30 months says comprehensible sentences of 3 words;
- uses approximately 900 words at age 3; understandable sentences of 4 words;
- up to about 2 years old, the child usually talks about himself in the 3rd person (he calls himself by his name) and only from the beginning of the 3rd year he starts talking in the 1st person ("I"). [3] [8]

Psychosocial Development

- walking will allow the child to leave the mother and explore the surroundings, and this is the **beginning of independence and independence**; the older the toddler actively moves away from the mother; but if it is taken away from the mother by a stranger and taken away by force (e.g. in the hospital), it arouses anxiety and helplessness in him (he is a passive victim of the situation, unable to control it); if the separation lasts longer, there is a risk of delayed psychomotor development and disruption of the foundations of personality; he tolerates separation from his mother better if he remains in the familiar environment of the home with the people he has become accustomed to, than if he is without his mother and in a foreign environment;
- thanks to independent walking, the child **begins to be aware of himself**;
- self-recognition in the mirror (visual self-recognition): around 3 months he smiles and vocalizes at himself, then reaches for his image; around the age of 1, he looks questioningly behind the mirror as if he were looking for a real child, he tries to give a toy to his image; only around 2 years of age does he start to recognize himself (e.g. he notices in the mirror that he has a mark painted on his face and starts reaching for it on his face); at 2.5-3 years, he names his picture with his name or "I"; they can recognize themselves in a photo or video only in the 3rd year of life;
- between 1 and 3 years gained independence and begins to realize that he can grab or throw things, hit them or pull back, give or take something from someone, come to or run away from someone, invite someone to him or to reject him and that his desire for movement or possession may be thwarted by a parent, which sometimes leads to violent enforcement ("I want") or rejection ("I myself") - this whole period is therefore referred to as the **phase of defiance** or **phase of negativism** ("no") - the larger the child's vocabulary and the better he is able to communicate verbally, the more this defiance is expressed in words; children with slower speech development protest more directly (more aggressively); this period requires a calm, understanding and tolerant but consistent educational approach; it is appropriate to divert attention elsewhere, attract something interesting, emphasize his good qualities, ask for his help and cooperation, etc.; it is important to leave sufficient space for its autonomy and self-reliance within fixed boundaries;
- educational problems are typical for the 2nd year of life - the child forms an idea of what he can conquer from his environment - parents should not prevent him, but should define boundaries and protect against risks;
- although between the ages of 1 and 3 it is still largely dependent on its mother, it gradually expands its range of social relationships, especially within the extended family; he tolerates the mother's short departures better if other family members are present;
- around the age of 2 he begins to establish relationships with other children of the same age - so far it is only a matter of short exchanges of attention, tussles over various things, handing over a toy or artificial attempts to quiet another child; **parallel play** appears and only in the 3rd year does the game begin to have the character of cooperation or competition;
- **begins to perceive the feelings of others** (the basis of empathy) - wants to please someone who is sad; he begins to understand the feelings of another child who has hit himself, thanks to this he begins to control his own aggression;
- the toddler period is crucial for the acquisition of prosocial (altruistic) behavior - being able to help, comfort, make happy;
- begins to understand right and wrong, perceives parents' expectations; awareness of a wrongdoing can lead to an anxious response;
- he gets jealous when a younger sibling is born - between 12-18 months he can't stand the mother going to the maternity hospital; after her return, she requires the same care and attention as before the birth of a sibling; a two-year-old child consciously experiences "dethronement" if he receives less attention after the birth of a sibling; explaining the arrival of a baby into the world is incomprehensible to him; it is appropriate if the toddler helps in caring for the newborn (brings, hands,...); only at the age of 3-4 is he mentally better prepared for the arrival of a sibling;
- according to **Sigmund Freud** it is the **anal stage** - the main task is the control of defecation; Freud judges that control of defecation leads to care, reliability and conscientiousness;
- according to **Jean Piaget**, the development of sensorimotor intelligence ends at 1.5-2 years and the **stage of symbolic and preconceptual thinking** begins (lasts from about 2 to 4 years) - the child uses words so far only as "preconceptions" rather than actual concepts; "preconceptions" are based on secondary, non-essential properties. [8] [3]

Development of the central nervous system

- myelination ends;
- all layers of the cerebral cortex reach a synchronous state of maturation between 15-24 months of age - this is a prerequisite for training to maintain cleanliness after 18 months of age;
- toddlers can sense a full rectum and bladder and are physically able to control the rectal sphincter - positive motivation and a sensitive approach are important during training. [3]

Child Growth Period

- a period of stable growth between the dynamic periods of infantile and pubertal growth;
- after the 1st year of life, the genetic growth potential and the action of the growth hormone, which controls the secretion of IGF-I, begin to apply;
- up to 2 years of age, a healthy child reaches the percentile with its height, which is determined by its growth potential inherited from its parents, and then grows along this percentile throughout childhood - slow growth is called "lag-down growth" (e.g. a large newborn of small parents), rapid growth is called "catch-up growth" (eg, a tiny newborn of tall parents);
- during the first two years of life, the child grows quickly and then the growth rate decreases slightly - in the

- 1st year it grows by 25-30 cm, in the 2nd year by around 12 cm, then at least 5 cm per year;
- girls reach half of their future adult height in 1.5 years and boys in 2 years;
- children with intrauterine growth retardation (IUGR) can have physiological catch-up growth already in the first 3 months of life; if IUGR started before the 26th week of pregnancy, catch-up growth in body height and brain usually does not occur. [3]
- at 12.-18. the large fontanelle closes
- ends teething. [9]

Preschool period

 For more information see *Preschooler*.

- from 3 to 6 years of age (lasts 3 years);
- at the end of this period, most children are able to start school. [1]

Development of motor skills

- there is further refinement, improvement of movement coordination, greater agility and elegance of movement;
- a four-year-old child runs well, runs nimbly down stairs, jumps, hops, climbs a ladder, jumps off a low bench, stands longer on 1 leg, can throw a ball;
- he eats independently, undresses and dresses himself, puts on his shoes and tries to tie his laces; needs only a little help when toileting; he can wash his hands well and can bathe himself under supervision; likes to "help" with simpler household chores and complete small assigned tasks;
- drawing: a three-year-old child can imitate the different direction of the line (vertical, horizontal, circular) according to the template, draws a cross; a five-year-old imitates a square, a six-year-old a triangle;
- drawing of a person: first roughly depicts the head, legs and main parts of the face (mouth, eyes) - a "cephalopod", a five-year-old child also draws the torso with limbs, but the body proportions are still random. [10]

Speech development

- speech, vocabulary and sentence structure are improved;
- at the age of 4 uses approximately 1500 words and comprehensible sentences of 5 words;
- at age 6 uses about 2500 words and comprehensible sentences of 6-7 words; [3]
- first uses coordinating conjunctions and subordinate clauses before the end of the 3rd year;
- interest in spoken language is growing - three- and four-year-old children can already listen to short stories for a longer period of time;
- a three-year-old usually knows some nursery rhymes;
- speech development enables the development of knowledge about oneself and the surrounding world - a three-year-old child usually knows his or her full name, when asked, gives his or her gender, correctly identifies the main colors, and around the age of 5 gives a simple definition of known things (mostly purpose, material and shape);
- can recite (albeit sometimes with skipping) a number line up to about ten and matches the names of the numbers to the counted objects; before the age of 5 understands what number means (ie knows that number is determined by the last number that occurred during counting); at the age of 6, he correctly determines the number of subjects (up to approx. 10), if he has illustrative material. [10]

Psychosocial Development

- around the age of 4, the development of intelligence shifts from pre-conceptual (symbolic) to conceptual (intuitive) thinking, he thinks in holistic terms;
- can already draw conclusions (e.g. assess what is less and what is more), but these judgments are completely dependent on opinion, usually on visual form; thinking does not yet proceed according to logical operations - it is pre-logical, pre-operational (e.g. there are the same number of beads in 2 identical glasses, after pouring all the beads from 1 glass into a glass of a different shape, the child shows that there are "more beads in the glass with a narrower bottom because it is the higher");
- **Jean Piaget** calls the period between 2 and 6 years **preoperational**;
- **Sigmund Freud** calls the period between 3 and 6 years the **Oedipal phase**, because the bond with the parents of the opposite sex dominates, then, on the contrary, the bond with the parents of the same sex is strengthened;
- **thinking** is still tied to the child's own activity - it is **egocentric** (e.g. the child covers his eyes so that others cannot see him), **anthropomorphic** (he humanizes everything - "Mugs are angry!", attributes human feelings to inanimate objects), **magical** (allows to change facts at will) and **artificial** (everything is "done"); they think that humans control all natural events;
- perceives the world egocentrically, does not understand the relationship between cause and effect and often interprets it erroneously egocentrically ("Daddy left us because I was naughty") - therefore everything needs to be thoroughly explained to the child so that he does not suffer from unjustified feelings of guilt;
- the preschooler is learning to manipulate the symbolic world - he cannot yet separate reality from fantasy very well; it is a **period of night terrors and fear of ghosts**;
- unrealistic thinking peaks between 3-5 years;
- already at the age of 4 he partially understands death (of people, animals and plants), around the age of 6 he

- fully understands death with its universality, irreversibility, finitude and causality;
- preschool age is a **period of play**: first, **joint - associative play** prevails, then comes **cooperative play** - organized in cooperation and with the division of roles; often based on fantasy;
- around the age of 3-4, **competition** between children becomes apparent. ^{[10] [3]}

Child Growth Period

- a period of stable growth between the dynamic periods of infantile and pubertal growth;
- between 2 and 11 years of life, the growth curve is almost linear and does not differ significantly between boys and girls;
- the effect of growth hormone is applied;
- the child grows along the percentile, which is determined by the growth potential of the parents, at least 5 cm per year. ^[3]
- gains 1.5 kg per year. ^[9]

School Term

 For more information see *Schoolboy*.

- from the age of 7 (ie starts after the child's 6th birthday), when most children start compulsory schooling;
- the end of the period cannot be clearly defined, we usually associate the end with the beginning of adolescence (and this is individual);
- the period therefore lasts for different periods of time, it cannot be equated with the period of school attendance. ^[1]

Starting school

- school knowledge and skills are in the forefront of the child's interest - recognition of numbers, letters and words, counting and writing;
- **Jean Piaget** calls the age from 6 years as the **period of concrete operations**, because the child is able to perform thought operations that include more than one variable when solving a concrete problem; is able to sort specific objects from a familiar environment, label them with numbers and assess their properties;
- fantasy thinking is receding, but fantasy and imagination are still embedded in children's games;
- begins to better understand the relationship of cause and effect;
- a child can estimate length at 5.5 years, estimate weight at 6.5 years and estimate volume at 8 years; ^[11]

Younger school years

- **Sigmund Freud** refers to the period between 7 and 11 years as a **latency period** - children do not have significant aggressive or sexual tendencies (however, this opinion has already been overcome), they devote most of their energy to school and friendships with same-sex peers;
- sexual tendencies begin to appear and are manifested by increasing aggression during play and the first contacts with the opposite sex;
- fantasy plays a big role in preadolescent sexuality and is often focused on media idols;
- sport and hobby activities make it possible to transform aggressiveness and sexual interests in a socially acceptable form;
- for a seven-year-old child, the most important thing is to succeed in school and gain status in the peer group;
- with the increasing demands of school duties, school problems develop, especially in children with attention disorders or reduced learning ability; subsequent loss of self-confidence can manifest itself in educational problems; ^[11]

Speech development

- at 7-8 years - adult speech. ^[3]

Development of the central nervous system

- brain has reached 90% of its adult weight;
- around 6 years of age, the cerebral cortex undergoes remodeling, which becomes thinner, but the density of neurons increases in the individual layers;
- sensorimotor coordination important for working with pencil and paper and for sports matures. ^[11]

Adolescence

 For more information see *Adolescence*.

- starts with the beginning of pubertal development and ends with the achievement of full sexual maturity and the end of physical growth;
- **adolescence** is a process of psychosocial maturation, a developmental transition between childhood and adulthood; usually begins at the beginning of the 2nd decade of life with physical maturation - puberty;
- **puberty** is a hormonally conditioned process of physical maturation and growth spurt; it is terminated at the

moment when the young adult individual is capable of reproduction (in girls with the first ovulation and in boys with the start of spermatogenesis);

- for girls, it starts at the age of 10 on average, the variability is ± 2 years;
 - in boys, it starts at an average age of 12.5 years (ie, on average 2.5 years later), the variability is ± 2 years;
 - achievement of full sexual maturity (menarche, first ejaculation) usually follows in 2–3 years, the definitive termination of physical growth in 4–5 years, then physical maturation continues with the accumulation of peak bone mass, the completion of musculature and width skeleton dimensions. [1] [11]
- according to WHO: 10-19 years;
 - **youth** 14-19 years. [9]

Development of the hypothalamic-pituitary-gonadal axis

- in the 10th gestational week, the development of the sexual fetus begins and is independent of hormonal influences; placental hCG promotes germ cell migration and Leydig cell differentiation;
- in the 21st week of gestation, the hypothalamus already produces GnRH and the anterior lobe of the pituitary gland secretes gonadotropins (FSH and LH) into the blood;
- in the 23rd to 24th gestational week, FSH and LH levels peak, germ cells (oocytes) mature in the ovaries and primordial follicles develop;
- in newborns, GnRH is secreted in a pulsatile manner and thus causes episodic increases in FSH and LH levels – FSH predominates in girls and LH in boys; these gonadotropins stimulate the rise of testosterone and estrogen levels in the first months of life;
- after that, the activity of the hypothalamus-pituitary-gonadal axis gradually dies out and a rest period follows, when the levels of gonadotropins are practically zero; this lasts throughout childhood; [11]

Pubertal Development

- **major physical changes** associated with puberty:
 - development of adult secondary sexual characteristics;
 - complete maturation and gradual induction of adult function of the adrenal glands, ovaries and testes;
 - achieving the adult state of development of the skeleton, muscles and fat tissue – termination of the growth of other body organs and tissues;
- **hormonal regulation** of pubertal development and growth spurt:
 - hypothalamic-growth hormone-IGF-I axis – during puberty, the secretion of growth hormone and IGF-I is the highest throughout life, and after puberty it decreases by about 10% every 10 years;
 - hypothalamus-pituitary-gonadal axis;
- **adrenarche** (adrenal activation):
 - occurs already during the childhood growth period (i.e. before gonadarchy);
 - the *zona reticularis* of the adrenal glands grows, its enzyme systems are activated and the production of adrenal androgens (especially dihydroepiandrosterone sulfate and 17-oxosteroids) begins;
 - affects body odor, the development of pubic and axillary hair and stimulates body growth;
- **gonadarchy** (activation of the pituitary-gonadal axis):
 - the hypothalamus begins to pulsatilely secrete GnRH, which stimulates the pituitary gland to produce gonadotropins (FSH and LH);
 - initially, gonadotropins are secreted in pulses only during sleep, the intensity of pulses and the biological effectiveness of gonadotropins gradually increase;
 - the production of gonadal hormones - testosterone in boys and estrogen in girls - gradually increases. [11]

Personality development in adolescence

- difficult developmental period for the adolescent and his parents;
- according to **Jean Piaget**, *the ability of so-called 'formal operations'* begins at the age of 12 - the adolescent begins to think primarily abstractly when solving problems; fully understands the cause and effect relationship; he gradually imagines the relationship between his momentary actions and their long-term consequences; however, very few adolescents mature to the stage of formal operations in early adolescence;
- adolescent thinking is often rigid and egocentric and focuses excessively on concrete and physical aspects of social relationships; they often cannot understand the future consequences of their current actions and are not capable of conceptual thinking; they answer in one word; they cannot discuss the problem any longer; they need to be asked very specific questions;
- adolescent perceives another person's point of view not only with feeling, but also with reason;
- at the peak of adolescence, most adolescents begin to think abstractly;
- development of abstract thinking:
 - introspection – another variant of egocentrism; they reflect on and take pride in their own thinking and actions; they develop the ability to criticize the thought processes of others and tend to look down on others (especially adults);
 - thinking about morality – the moral laws of the family and society have a greater influence on his actions than the fear of punishment; if he has problems succeeding in school, he looks for another environment where he can be recognized and successful;
 - in late adolescence, adult norms of behavior are usually established; the young adult creates his own moral principles and they are more valuable to him than the rules of the group; egocentrism recedes and empathy develops in relation to others; rigidity of thinking is replaced by flexibility and the ability to accept different; [11]

Links

Related Articles

- Psychomotor development of the child • Neuromotor development of the child • Psychosocial development of the child: Psychological development according to E. H. Erikson
- Child growth and development • Child nutrition

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