

Crossed movement patterns in movement development

The ontogenetic development of the motor skills of a human individual is determined by genetic equipment and takes place automatically. The main reason for motor ontogeny is the child's motivation to achieve something, the so-called **ideomotors**. When assessing the degree of physiological motor development, knowledge of different postural activities in given periods is essential, while it is necessary to deal with both the monitoring of possible deviations from physiological development and the monitoring of the quality of certain movements.^[1]

When monitoring a child's motor development, it is necessary to take into account basic movement patterns. These include the so-called homolateral pattern or crossed pattern. In motor development, we can observe a crossed movement pattern, e.g. when grasping across the midline of the body, when turning the child on its side and on its stomach, when sitting at an angle or when climbing on all fours. During locomotion, the activity of individual muscle groups is carried out in a crossed pattern and thus ensures forward movement.^[2]

Prone Position

One of the crossed patterns appears in the child in the **half of the second trimester**, when **the child is able to grasp an object in the prone position**. In doing so, it is necessary to keep the head, upper limb and shoulder against the force of gravity. The support is now triangular in shape and is formed by the medial epicondyle humerus, homolateral spina iliaca anterior superior and contralateral epicondyle femur, while the lower limb, whose epicondyle contributes to the formation of support, is stepped on. The child can thus reach for the toy with the free upper limb. The relief of this upper limb is given by the pull of the muscles of the contralateral upper limb in the direction distal to the fulcrum. The upper limbs help to stabilize this position by supporting the roots of the hands. In the sixth month, the angle α changes hip joint and flexion increases to 110° – 120° , which is necessary for future standing on all fours. At this time, the entire palm, the distal part of the homolateral thigh and the contralateral knee already participate in the support.^[1]

Position on the back

In the supine position, the crossed movement pattern appears for the first time when **the child reaches for the toy across the middle plane of the body**. This movement occurs in the **five month** old infant, and grasping across the midline of the body helps to turn the infant onto its side, stepping on the lower limb that is homolateral to the grasping upper limb. The supporting and reaching upper and lower limbs are positioned ipsilaterally during turning, while the child achieves a complete turn from back to tummy in the sixth month.^{[1][2] [3]}

Reciprocal pattern

In this phase, one of the lower and upper limbs has a support function and the other a stepping function. Thanks to this, the so-called **reciprocal step and support pattern** appears, which is used both from the position on the stomach and from the position on the back. This reciprocal pattern means that muscle pull in the supporting limbs is directed distally, where the punctum fixum is distal to the punctum mobile. The movement of the supporting limbs occurs in the proximal segment relative to the distal segment. Pronation takes place on the upper supporting limb and internal rotation, adduction and extension occur on the lower limb in hip joint and to the extension in knee joint. Supination occurs in the forward upper extremity and external rotation, abduction and flexion in the hip joint and flexion in the knee joint occur in the lower extremity and movement occurs in the distal segment relative to the proximal one and the punctum fixum is proximal to the punctum mobile.^[1]

They are activated when turning from back to stomach two oblique abdominal muscles. The first oblique abdominal chain ensures the rotation of the pelvis in the direction of the supporting upper limb and during this contraction the obliquus abdominis internus muscle of the jaw side occurs, m. transversus abdominis and m. obliquus abdominis externus header side. The second oblique abdominal chain is associated with activation m. pectoralis major and m. pectoralis minor and allows upper torso rotation and shoulder upright.^[1]

Slanted Seat

Other positions that use the so-called crossed movement pattern include the oblique sit, which develops from a supine position. When sitting at an angle, the child leans on the area of the medial glute. In the seventh month, he stabilizes this position with the support of his elbow, while in the eighth and ninth months, the child is supported only by the palm. This position is necessary both for grasping objects and also as a position needed for transitioning to a position on all fours or to an upright sitting position.^{[1][2] [4]}

Position on all fours

The crossed movement pattern also appears in the four-legged position in the development of an individual's motor skills. The baby gets into it from a prone position. It uses two basic mechanisms on the limbs, namely '*upright and step-up*', where the erecting limbs are contralateral to the step-up limbs. Muscle the lower limb girdle, back muscles and intra-abdominal pressure ensure the correct position of the pelvis and trunk. At the eighth month, the child is able to grasp the toy in this position.^{[1][3]}

9. month-2. year

At nine months, the baby learns to crawl on all fours, in which the limbs are placed on the mat in a crossed movement pattern. The child rests on the knee and hand, while the movement of the arms and thighs takes place in the sagittal plane. At the beginning, the child performs a dorsiflexion in the forward stepankle joint, however, this shift disappears in the tenth month. The quality of future independent walking also depends on the quality of climbing.^{[1] [5]}

Crossed movement patterns can also be noticed in the locomotion of an individual, whereby a child is capable of independent **bipedal locomotion** between twelve and fourteen months and is preceded by walking in the frontal plane, which we call the **ipsilateral locomotion** model and which appears in the fourth trimenon. ^[1]

Walk becomes gradually more secure and stable from the second year of life, when the child begins to step on the heels and the knee flexes. The movement of the upper limbs is wobbly and the child still expends a relatively large amount of energy when walking, which persists until the age of twelve, when the quality of the child's gait reaches the level of an adult's gait.^{[4] [6]}

Conclusion

The individual phases of a child's motor development, which develop from newborn age until reaching the level of an adult's motor abilities, have a direct parallel to the motor abilities of an adult. The stages of a child's motor development are determined by the gradual maturation of the central nervous system, and each developmental stage is contained in a higher developmental stage. Crossed movement patterns are involved in different stages of development and are a prerequisite for proper motor development of an individual. They play an important role in various motor activities, whether we are talking about rolling over from the back onto the stomach or independent bipedal walking.^{[2][3]}

Links

References

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