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Review paper

Basics of physiological carrying babies

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Abstract

Introduction: In the first year of life, the spine is very susceptible to various types of overload. During this period, it is extremely important to ensure optimal conditions for the physiological formation of curvature of the spine.

Aim: The aim of the work is to present optimal ways of carrying infants, recommended by the authors.

Material and methods: Using the keywords: 'carrying children,' 'stacking babies,' 'moving babies,' 'carrying an infant,' 'stacking infants,' 'moving infants' the following databases were searched: ScienceDirect, Web of Science, PubMed, Scopus and ClinicalKey. Works published after 1990 were searched. The presented text describes the authors' own experience gained throughout over 30 years of clinical work.

Results and discussion: In the first year of life, manner of carrying a child should be adapted to the stage of its psychomotor development. During the first 4 months of life, the baby's spine needs full support. Between 4 and 8 months of age, it is acceptable to carry the child vertically with relief from the spine. In the period when the child acquires ability to independently assume a sitting position and is able to control positioning of the torso in space, his body weight may rest on the tubers ischiale.

Conclusions: (1) Proper way of carrying babies is important in the prevention of developmental coordination disorder in infants in the first year of life. (2) Periodical check-up of carrying position proper for a given stage of a child's development is recommended.

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1. INTRODUCTION

A child's development in the first year of life is very dynamic. Its characteristic feature is flexibility as far as cooperation between all body systems and organs.[1] Harmonious motor development at an early stage of life is condition for proper development in intellectual, emotional and social aspects.[2] Toning muscles plays a key role in motor development. It is a process of improving the ability of habitual application of the size and type of muscle tone. This process also improves the ability of many muscle groups to interact adequately to the motor task.[3]

Spine is a basic supporting and stabilizing element for the entire human locomotor system. In the first months of an infant's life it is not prepared to adopt the function of keeping vertical position and controlling the position of body axis during locomotion.[4] The fetal and neonatal periods are the only ones in human life when the flexion position of the body is treated as natural and correct.[5] A gradual change in the curves of the spine is an adaptive mechanism to changing conditions and motor needs that accompany a child during his growth. This is associated with a desire and a need to explore the environment.[6] It seems that this process can be influenced by the manner in which the child is carried and positioned.[7]

2. AIM

The purpose of the work is to present optimal ways of carrying infants, recommended by the authors.

3. MATERIAL AND METHODS

The authors reviewed literature to check whether the recommendations how to carry a child in the first year of life had been analyzed. Using the keywords: 'carrying children,' 'stacking babies,' 'moving babies,' 'carrying an infant,' 'stacking infants,' 'moving infants,' the following databases were searched: ScienceDirect, Web of Science, PubMed, Scopus and ClinicalKey. Works published after 1990 were searched. No publication has been found describing how to carry children, and what complications arise from improper carrying them.

The presented text describes the authors' own experience gained throughout over 30 years of clinical work. The authors' observations involved about 7500 children from the Provincial Specialist Children's Hospital and the Świętokrzyskie Pediatrics Center in Kielce, Poland and the Clinic of Rehabilitation in Olsztyn, Poland.

4. RESULTS

Depending on the stage of functional development, the authors recommend 4 ways of carrying children.

4.1. Carrying a pre-term baby to original due date

In children born prematurely, it is acceptable to use positions supporting kyphotic positioning of the spine, i.e. kangaroo position. This is the only period in a child's life when, with the above-mentioned precautions, the authors recommend carrying the baby facing the carer (Figure 1a). It is important to ensure changeable orientation of the baby's face and a symmetrical position of upper limbs (Figure 1b).[7]

4.2. The method of carrying babies from 0 to learning to roll over (approx. 4.5 months of age)

In the first 4 months of life, the baby's spine requires full support. Specific position of the carer's arms (Figure 2) allows providing support for the baby's spine on the carer's forearm (a), supporting the baby's head on the carer's arm (b) and ensuring the correct angle of the lower limbs in the hip joints (c and d).[5] This method of carrying guarantees that the baby is held safely, without limiting movements of the head and arms which remain positioned in front of him. This positioning supports the development of the task function of the hands. This also ensures the possibility of contact with the environment and a sense of closeness with the parent, which is important in the first weeks of life.[9]

In this period it is important to grip the baby firmly while lifting in order to protect them from a fall (Figure 3a) and to

Figure 1. Carrying pre-term babies to original due date, so-called 'kangaroo care' (the authors' own sources).

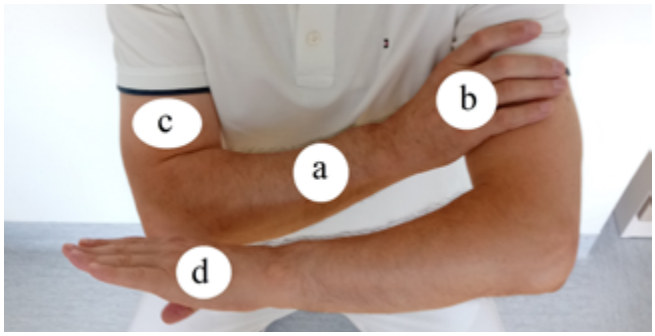

Figure 2. Arms position diagram for proper carrying an infant from 0 to learning to roll over 4.5 months old (the author's own sources): forearm supporting an infant's spine (a), arm on which rests an infant's head (b), arm separating an infant's thighs (c), hand additionally increasing abduction in the hip joints (d).

protect the head against sudden bending backward while lifting (Figure 3b).

It is recommended to perform this operation in three stages:

(1) placing the baby's head on the carer's shoulder (Figure 4a),
(2) supporting the baby's spine on the carer's forearm (Figure 4b),
(3) positioning lower limbs in abduction at the hip joints (Figure 4c).

The desired positioning of the body axis is shown in the Figures 5a and 5b (in sagittal and frontal planes, respectively).

4.3. The way of carrying babies in the age range from baby about 4.5 learning to roll over to about 8 months baby learning to sitting independently

Vertical carrying the baby in this period activates antigravity muscles of the head, shoulder girdle and pelvic girdle, preparing the child to assume more upright postures. However, special attention should be drawn to keeping physiological position of the spine in sagittal, frontal and transverse planes. The period of about 5 months of age is the time when the infant begins to control the positioning of the body in space, but his spine should not yet take over full weight of the body. Therefore, it is recommended to support the child's torso with a grip below costal arch instead of seating him on the forearm. This position also allows the carer to keep ergonomic principles. At the same time, this position secures the need for physical closeness with the carer and the development of social relations of the infant.

Grip below costal arch allows for reduction of axial load on the baby's spine (Figure 6a), control of his body in all planes, and a slight forward bend of the baby's body stimulates spinal extension by provoking vestibular, equivalent reactions and activating postural muscles.[10,11] The above position can be achieved in three stages:

(1) gripping the baby under the ribs and supination of the carer's hand doing this (Figure 6b),
(2) grip of the pelvis and pronation of the carer's hand doing this (Figure 6c),
(3) abduction of lower extremities in the hip joints (to approximately 400) (Figure 6d).

After doing the above, the baby's torso should be slightly leaned forward.

The desired positioning of the body axis is shown in the figures; in sagittal (Figure 5a) and frontal (Figure 5b) planes.

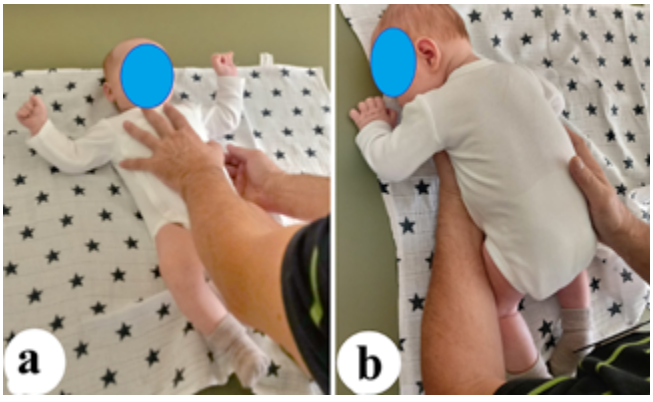

Figure 3. Lifting a child for carrying from 0 to learning to roll over approx. 4.5 months old (the authors' own source).

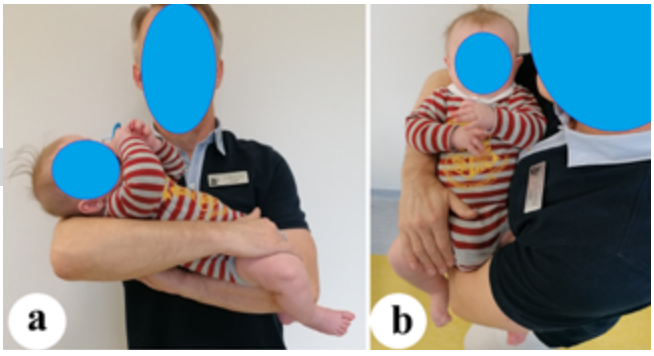

Figure 5. Proper carrying a baby from 0 to approx. 4.5 months old learning to roll over (the author's own source).

Figure 4. Stages of positioning the baby for carrying from 0 to learning to roll over approx. 4.5 months of age (the authors' own source).

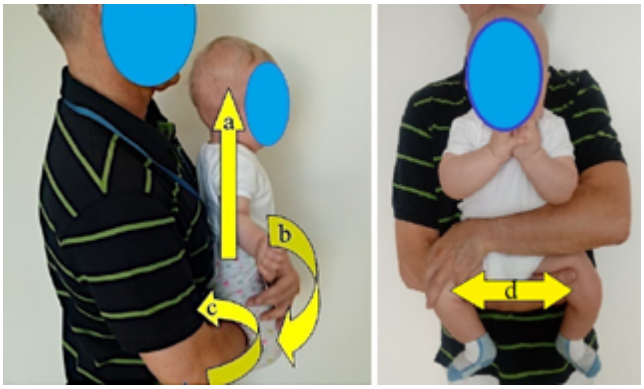

Figure 6. Schematic position of the arms for carrying a baby from learning to roll over about 4.5 to baby sitting independently: direction of spine relief (a), direction of movement of the hand placed on the baby's stomach (b), direction of movement of the hand protecting the child's (c), direction of movement of the fingers abducting the child's thighs (d).

4.4. The method of carrying a baby after learning to sit independently 8th month of life

During the period when the infant acquires ability to sit down independently and is able to control position of the torso in space, the grip is modified. It is believed that the infant achieves ability to assume a sitting position independently when, lying on his stomach and leaning on one arm he is able to lift the other arm above the head while keeping physiological position of the spine.[8] At this stage of the child's development, the spine may be axially loaded (Figure 8a) and the body weight may rest on ischial tuberosities (Figure 8b). Therefore, the arm of the carer supporting the torso under the costal arches can be shifted downwards and perform only a stabilizing function for pelvis and lower limbs. This is the stage of the next modification of carrying the child, which allows controlling the position of the spine, securing the correct position in the hip joints, pressing the child's body against the carer's torso and a slight anterior bent of the child's body provoking his extension reactions (similar to carrying in the range of 4.5–8 months).[10]

It is recommended to perform this activity in three stages:
(1) gentle grip of the child under costal arches,
(2) pelvis grip around the hip and bringing it closer to the carer's torso,
(3) slight slope of the child's body and abduction of lower limbs in the hip joints (Figure 8c).

It is recommended to check the position of the child in the carer's arms in front of the mirror, with special emphasis on alignment of body axis in sagittal (Figure 9a) and frontal planes (Figure 9b). Checking the position of the child's body in front of the mirror is important for each of presented ways of carrying.

5. DISCUSSION

It has been shown that proper positioning of infants can have a positive effect on neuromuscular development[12] and better motor organization.[13, 14] De Graaf-Peters reports that supporting the positioning of the spine has a positive effect on mobility skills of the babies.[15] Children who are carried in the first period of life in such a way that proper body positions are kept, at a later time show a wider range of active motions and dynamics of limb movements.[13] This is of special importance for the development of support functions of upper limbs that are the basis for the development of further motor skills such as standing and walking. The important role of the infant's position is also confirmed by Van Balen et al., who emphasize great variability of body posture control between 4 and 18 months of age. From the fourth month, babies are already able to choose muscle recruitment strategies that are optimal for the performed task.[16] For this reason, from the moment the infant begins to control the positioning of the body in space, moving to a higher level is recommended where the infant is turned with his back to the carer.

It should be emphasized that it is not always possible to realise the proposed models of carrying the infant correctly. However, bearing in mind multitude and importance of possible complications of the infant's extended period of remaining in improper positions, it is advisable to strive to achieve optimal correction of the spine positioning while carrying. Positions recommended by the authors are performed with safety conditions for the infant and comfort of the carer. In order to achieve optimal prevention effect it is required to check frequently the way of carrying in front of the mirror and to check the infant's body positioning in all planes to ensure proper position of the head, spine and limbs.[5]

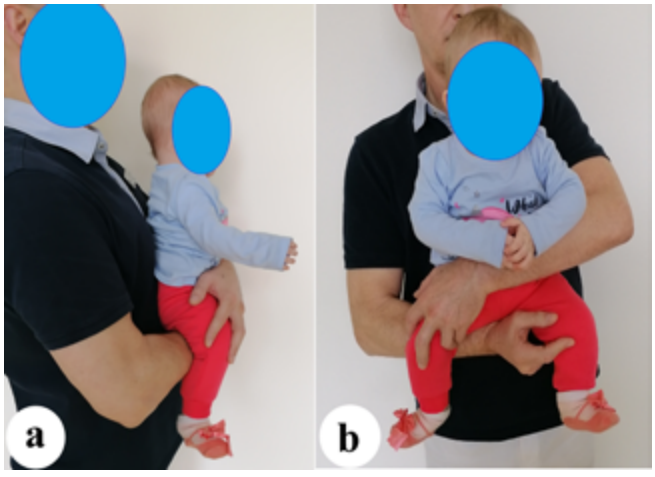

Figure 7. Proper carrying a baby from roll over about 4.5 to baby sitting independently about 8 months of age (the authors' own source).

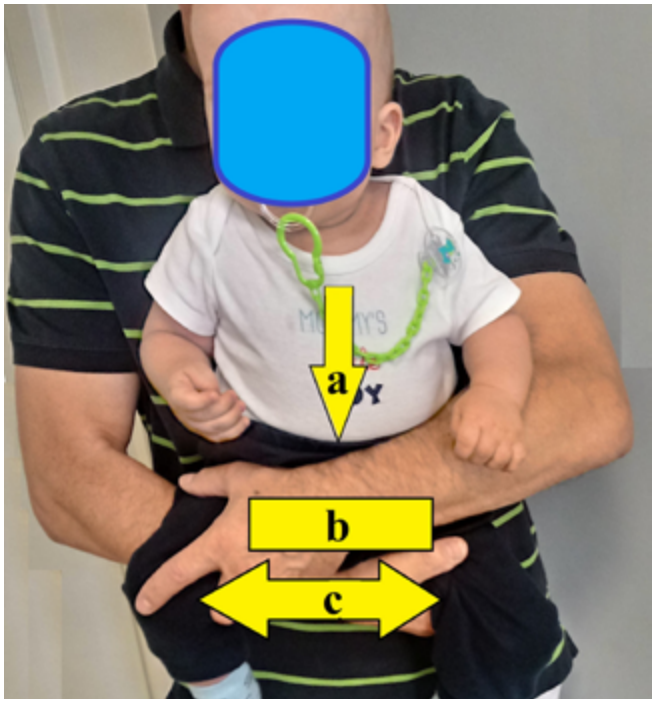

Figure 8. Schematic position of the arms for carrying a baby after baby learns sitting independently 8th month of life (the authors' own sources): direction of load on the spine (a), weight of the child's body resting on ischial (b), direction of movement of the carer's fingers abducting child's thighs (c).

The authors' own observations show that searching for the right ways of carrying babies and proposing right solutions are especially important for the children who present DCD and the children who are often and for a long time carried during the day. Recommended ways of carrying an infant presented in this work are based on the authors' many years of clinical experience and have been supported by the analysis of literature on the relationship between irregularities in positions adopted by the child in the first year of life and disorders of motor and cognitive development.

6. CONCLUSIONS

1. The correct way to carrying babes is important in the prevention of DCD in infants in the first year of life.
2. Control check-up Periodical check-up of carrying position typical of a given stage of a child's development is recommended.

Conflict of interest

None declared.

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Ethics

The author has obtained the informed, written consent of the children's guardians to use their photos in this publication.

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