NEURO-MUSCULAR EDUCATION OR DEVELOPMENT.

It was while serving the Children's Aid Society of Chicago in the capacity of superintendent and caring for little waifs that my attention was called to the necessity of some kind of physical development for backward babies and children, and while working out a system of mild exercise for these defective children I conceived the idea of neuro-muscular education or development.

Commencing with a baby, say, six months old, and continuing through all those years when the child plays around the house, before it is old enough to go to school and before the brain is taxed by any mental effort, a mild but effective course of exercise can be given to a child that will develop its nervous and muscular systems, and give it mental strength and endurance.

In neuro-muscular education or development there are certain principles involved :

1. *The principle of sequence.*—Neuro-muscular education is a developmental process of infancy and childhood merging into the physical training of youth and young manhood. While the activities of childhood lead to the actual growth and development of the body and brain, the activities of the adult serve only to maintain the brain and muscles in a healthy condition. It thus becomes evident that the problem of the order of certain exercises or the sequence of activities is a matter of fundamental importance to the welfare of the individual.

2. *The principle of reciprocity.*—There exists between the nervous and muscular development a reciprocal relation; that is, there can be no muscular development without a corresponding development of the nervous system, nor can there be a well-balanced development of the nervous system without a development of the muscular system. The natural activity of the infant or child involves the exercise of both muscles and brain. The muscles develop in size and strength because of this exercise, and

the brain cells develop in size and precision of action while guiding the muscles. Thus the brain and the muscles of the child develop together, each helping the other. The muscular and nervous system are interdependent. Muscular activity is always accompanied by activity in the nerve centers of the brain and spinal cord. Through this reciprocal influence of muscular activity, large areas of the gray matter of the brain are developed in infancy and early childhood. Unless developed through muscular activity, they remain undeveloped; and unless developed in childhood, their growth is difficult and imperfect. Hence the necessity of allowing to little children that exercise which nature has provided for them in the early instincts of activity.

These natural instincts are a safe guide in directing and providing for this exercise—as to when to take exercise, and also as to when to refrain from exercise, thus avoiding overtraining. Nature has given to all children the instincts of activity; and after many experiments I have come to the conclusion that the only practical way of giving neuro-muscular education to an infant is by utilizing its instincts of activity. To do this I provide suitable environment and attractive apparatus, and allow the child to be wholly governed by its natural instincts and inclinations in the taking of exercise and in refraining from exercise. By this plan I have found that overtraining can be avoided and effective exercise given with perfect safety, and satisfactory growth and development may be secured for all little children. My plans are not for a select few of the stronger children to be crowded forward into phenomenal development of doubtful value, but neuro-muscular education should help all of the weak ones, as well as the strong ones, and bring them all up to a common standard of excellence in mental and physical development.

Imitation is one of the strongest instincts in a year-old baby, and it may be utilized as an incentive to stimulate the initiative instincts of activity in a backward baby. If your baby is backward about creeping or talking, it can easily be cured by bringing in your neighbor's baby of the same age or a little younger (not older, for children learn more readily from those younger than from those older), and let them play together on the floor or in

the cradle. Repeat the visit often, if necessary. After the little visitor has gone away, your baby will remember and try to imitate all of the visiting baby's activities. Companionship of equals is sometimes essential to awaken a backward baby, and companionship is of itself a good brain-developer for a baby, and a series of baby parties is the simplest and most natural means of development.

ORDER OF PHYSICAL GROWTH IN CHILDREN.

A six-months' baby carries to its mouth everything it gets in its hands, not to eat it, but to test it, and these early voluntary movements of a baby's hands should be cultivated by giving it something to hold in its hands and play with. To develop its hand- and finger-grip, it can be taught to reach out its hands for what it sees by suspending bright-colored toys over it in its crib.

A six months' baby should be dressed in short clothes to allow it to flex the hips and kick freely. Flexing of the shoulders and hips is quite necessary to a baby's health and growth. Kicking can be cultivated by stretching a newspaper across the top of the crib within reach of the baby's feet. It will soon learn to kick this paper to hear it rattle. Pulling off its stockings involves the combined exercise of its hands and legs, and it develops the muscles of shoulders, back, and hips. To encourage it, sew a bright-colored button to the toe of each stocking for the baby to play with, having pinned these garments securely to the clothing.

To arouse a sluggish baby, sew a small sleigh bell to the toe of each stocking, and place under the heels a pad to prevent bruising when it kicks the floor. Take care not to leave the bells on too long — not longer than half an hour at the most — for the pliable muscles of a growing child are peculiarly liable to over-training. If you find that the baby favors one foot more than the other, take off the bell on that side and leave the other one on for a longer time, to keep the development balanced. This exercise is simply to stimulate the child's instinctive activity. This is the basis of all early fundamental development both of brains and of muscle.

After wearing the bells for a few times, the baby will get

strong enough to roll. *Rolling* on the floor is a baby's first effort in locomotion, and it is very important as a preparation for creeping. Lying on its stomach will strengthen its stomach muscles, and pressing on the floor with its hands will expand the chest and strengthen the breathing muscles. It will correct any posterior spinal curvature which the baby may have contracted while being carried in the nurse's arms, by giving the spine a counter-anterior bend. The rapidity with which a rolling baby develops the extensor muscles is almost beyond belief, for it takes only a few hours to bring them out.

The next step to be gained in a baby's development is the *sitting* position, and an active roller will soon be able to sit up on the floor. Do not prop the baby up with pillows, but leave it free to lie down when its back gets tired. Do not help it to rise to a sitting position, no matter how sweetly it may ask for assistance; you only retard its motor ability by helping it; but place it on a rug not too soft, and let it roll. It has muscles enough, and it will find a way to get up as soon as it makes the mental effort to control the muscles.

A sitting baby soon learns to creep. *Creeping* on the floor is nature's own contrivance to give neuro-muscular development to a baby. Every baby should be dressed in a creeping-apron, and be given a suitable place in which to creep, bright sunny rooms, well heated, and free from cold drafts over the floor.

The creeping age is the first great crisis in a baby's life. It is the time when three important physiological changes are affecting its health: it is being weaned, it is cutting its teeth, and its head is closing. Nature has provided the exercise of creeping to counteract the weakening influence of this trying period. Creeping brings into play all the muscles of the body except those of the feet. It aids digestion and gives physical endurance. It also conduces to sound, healthful sleep, and has thereby a tonic effect upon the brain. A baby should not be weaned until it has learned to creep; and if it does not of itself learn to creep, it can be taught to creep by seeing another baby creep.

Hitching babies are backward babies, and a large percentage of them become feeble-minded. Hitching is a danger signal

thrown out by nature that should not be disregarded. If it is caused by the child's being carried too much in the nurse's arms, it is not serious, and it may be cured by teaching the baby to creep before the brain closes. But if it is caused by retarded brain-development, and the brain closes early, the case is doubtful.

Stair-climbing is good exercise for a baby, if it is not overdone. It is especially good for a heavy-weight baby that is slow about learning to walk. All babies will climb the stairs, if given an opportunity to do so, as soon as they are able to stand upon their feet, and they will often give a scream of delight as they approach the stairs on all fours; but it is severe exercise, and they should not be urged beyond their own inclination.

The summer baby goes through his gymnastics well enough on the floor, which is the appropriate place for him to roll, creep, stand, and walk. In winter, however, babies are liable to take hard colds when allowed to play upon the floor. I have often lain down upon the floor with my baby just to test the cold draft of air that comes in every time an outside door is opened and follows along the floor, and I know that the cold floor is a dangerous place for a baby in the winter season. As a consequence, the winter babies are held in the arms of their elders altogether too much. To carry a baby about continually, or to confine its hands and feet in heavy wraps, is very undesirable; and to keep it sitting in a high chair for a long stretch of time is highly injurious. When thus deprived of the freedom of movements necessary to its growth, it loses perceptibly power of initiation action. As a result of these conditions, the development of winter babies is often seriously retarded.

Especially to meet the wants of the winter babies, I designed and built the "cradle car." It is a crib on wheels—a bed by night and a car by day. It is a miniature portable playroom especially suited for cradle athletics. It gives the baby a suitable place in cold weather for rolling, creeping, clinging by the hands, and climbing up to a standing position. A lively creeping baby will soon be able to pull itself up to its knees and then to a standing position.

Clinging by the hands is another of nature's contrivances to

give neuro-muscular education to a baby. The hand-grip of a baby is the best index of the normal condition of its brain, and any exercise that will develop the hand- and finger-grip will also develop the sensorial faculties of the brain, such as susceptibility to receive and retain impressions. Therefore, the more the baby clings to the sides of the car without fatigue, the better; and it should not be assisted, but be allowed to climb up of its own initiative. The muscles will do their part as soon as the brain is ready to guide and direct them.

Next in the order of physical growth is *climbing*. The baby whose hands have been developed by clinging will soon begin to climb upon the chairs and other articles of furniture about the house, and it needs a chair it can climb into and out of in safety. When my baby was fifteen months old, I fixed her high chair so she could climb into it at meal times. She took as naturally to it as to creeping and clinging, and used it at every meal, climbing into it and out of it without assistance. It developed the flexor and gripping muscles of the forearm, and the lifting and pushing muscles of the shoulder and back in such a way as to give her an erect carriage. It developed the muscles of the chest, rounded out her ribs all the way from her breastbone to her backbone, and increased her lungs in size and strength. Finally, it developed the muscles of the back, hips, thighs, and legs. High-chair climbing increases the digestive powers of the child, so it can assimilate a larger percentage of the food it eats. It also stimulates respiration and circulation. By this means the brain is nourished by more abundant and richer blood, and it is developed and strengthened so that it is better prepared to receive the impressions and sensations that come to it through the senses; and a more vigorous mind is the result. The brightening of the child's intellect is quite noticeable after using the chair for a few months.

To make the high-chair climbing more effective, I made a chair toboggan slide of it for use in rainy weather, when children are confined to the house and miss their out-of-door exercises and the exhilarating effects of the sunshine. I attached an ironing-board to the front of the chair and waxed the upper side with

floor wax, and the children climb up and through the chair and slide down. The pleasure of sliding down induces them to climb up many times, and the continuous climbing gives them the needed exercise. The toboggan is set up in the living-room, where the child can have the company of its mother when it takes the exercise; and, when not in use, the slide-board may be hung up in the closet and the high chair returned to the dining-room.

Next in order of physical growth I have found that *swinging* offers many opportunities for juvenile gymnastics. With that end in view, I made a single-pole swing to hang in a doorway. Such a swing is adapted to the use of a five-year-old child to exercise upon when it cannot play out-of-doors. The inconvenience of having it in the doorway is only temporary, for it is easily disconnected and removed when not in use. Standing on the footboard, one or two children can use it and find both exercise and amusement. It proved to be a good all-around developer. It gives the little boys an elastic step and manly tread. It is good for girls also. It gives them a good poise upon their feet and a graceful gait in walking. And, best of all, it continues to develop the hand-grip of the children, with a corresponding development of the brain and central nervous system.

My own daughter was undersized at one year of age, and quite frail and delicate. After six years of neuro-muscular education she is a little amazon, and she leads in her class in school.

Fundamental physical culture or neuro-muscular education is good for all children, the strong ones as well as the weak ones. The culture of a child's body and brain is most important, for it is the foundation upon which all growth and development is built in after-years, and nature has provided for this in the early instincts of activity in the child. It gives health to the invalid child, bodily strength to the delicate child, acuteness to the dull child, a forward impulse to the backward child, and keenness and power of initiative to the indifferent child.

P. F. CHASE.

BERWYN, ILL.