Relação entre desenvolvimento motor corporal e aquisição de habilidades orais***

Relationship between the motor development of the body and the acquisition of oral skills

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Abstract

Background: the literature points to the influence of body posture on the oral skills of children which sensorimotor deficits. Only a few studies with normal children exist on this subject. Aim: to study the relationship between motor skills and oral motor skills in children, from the first day of life to 24 months of age. Method: 42 children were video recorded at the first day of life, and at 1, 2, 3, 4, 5, 6, 9, 12 and 24 months of age. Recordings were made in the following postures: supine, prone, seated, standing and during breast and bottle feeding (until 5 months), using spoon (purée: 3 - 12 months); cup (water or juice: 6 - 24months) and eating solid food (6 -24 months). Quantitative scores for body motor development and oral skills were established; and for the statistical analysis the Pearson Correlation Coefficient Test was used with a significance level of 5%. Results: the results of motor development point to similar data between supine, prone, seated and standing positions; for the oral motor skills (during feeding/ breastfeeding, using spoon, cup and chewing). A similarity was observed in the acquisition of motor abilities related to the lips, tongue and jaw in each of the feeding situations. There was an association between the motor and the oral motor skills; the results indicate that the motor development (motor skills) occurred prior to the development of the oral skills from the 5th to 24 months and that the skills related to the jaw when using a cup and spoon occurred prior to the development of the skills related to the lips and tongue. Conclusion: there was a growing increase in the acquisition of motor and oral skills along the ages, as well as a variability of skills in the ages between the 3rd and 24 months and a significant association between the motor and oral skills.

Key Words: Stomatognathic System; Children; Feeding; Oral Motor Development.

Resumo

Tema: a literatura aponta para a influência da postura corporal sobre as habilidades orais em crianças com desenvolvimento sensório-motor alterado. Em crianças normais existem poucos estudos sobre essa relação. Objetivo: estudar em crianças a termo a relação entre habilidades motoras e habilidades motoras orais, desde 1 dia de vida até 24 meses de idade. Método: 42 crianças foram filmadas com 1 dia, 1 mês, 2, 3, 4, 5, 6, 9,12 e 24 meses nas posições supino, prono, sentado e em pé e durante alimentação com amamentação / mamadeira (até 5 meses), uso de colher para alimentação pastosa (3 aos 12 meses), uso de copo para água ou suco (6 aos 24 meses) e alimento sólido (6 aos 24 meses). Estabeleceram-se escores de quantificação para o desenvolvimento corporal e habilidades orais e utilizou-se o coeficiente de correlação de Pearson para o estudo estatístico, adotando-se nível de significância de 5%. Resultados: os resultados do desenvolvimento motor apontaram para semelhança de dados entre supino e prono e sentado e em pé; para as habilidades orais (durante a alimentação com mamadeira/amamentação, colher, copo, mastigação) constatou-se em cada modalidade de alimentação, homogeneidade de aquisição de habilidades para lábios, língua e mandíbula. Houve associação entre habilidades motoras e orais; resultados apontam que o desenvolvimento motor (habilidades motoras) se deu antes das orais desde o 5° ao 24° mês e que as habilidades de mandíbula em copo e colher ocorreram antes das habilidades de lábios e língua. Conclusão: houve crescente aquisição de habilidades motoras e orais, variabilidade de habilidades em idades entre 3 e 24 meses e associação entre habilidades motoras e orais.

Palavras-Chave: Sistema Estomatognático; Criança; Alimentação; Desenvolvimento Motor Oral.

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Introduction

The maturation of motor and feeding abilities are reached concomitantly to the development of the central nervous system (CNS) associated to learning experience (1-2). On the first year of age, there is a narrow relation between the evolution of the CNS and functions that appear or disappear, reflex functions evolve to complex and volunteers functions; some activities presented at birth are "inhibited" during the first year, resurging as voluntary and complex activities automated on a superior level of the nervous system (3).

The motor development evolves on an organized way, being each stage a consequence of the precedent one and necessary to the posterior stage (4). On the first two years, gradual standards of global and fine motor development and oral motor are prerequisite for abilities of auto feeding favoring the nutritional state and the growth of infants(5).

After four or five months of age the reflex condition is substituted by voluntary oral movement for feeding and speech (6-8) becoming more effective with head stability, improving the jaw control, that is influenced by the body alignment which depends on the stability of the pelvic area (9-10).

Since 1990 authors suggest scales for longitudinal accompaniment of children whic consist on observation and classification of spontaneous movements considering frequency, amplitude and strength of the movement, therefore its complexity and variability. The Alberta Infant Motor Scale (11) evaluates children on the prone, supine, seating and standing positions and weight discharge. Similarly Green e Pountney (12) developed measurements of the Chailey Levels of Abilities. This way the evaluations of motor behavior must allow to quantify and to characterize small ability changes on the first months of age showing the posture control evolution and the sequence of acquisitions during an evolutive study (11).

Studies had demonstrated the existence of an association between postural control and stomatognathic system, and reciprocal influence of corporal position on oral structures(13-15); children with motor sensory disorders need adequate control for success in feeding (11,16-17).

Studies on oral function during feeding in normal children (8, 18-22) have brought important advances; but few studies approaching relations between global motor system and oral motor abilities in normal children have been conducted.

The present study is proposed to describe the relationship between corporal motor development and acquisition of oral abilities in normal children from 1 day to 24 months of age.

Methods

Observational research - longitudinal; 42 children, 26 boys and 16 girls participated in the research. The study was approved by the Committee of Ethics in Research of the Medical School of Botucatu - UNESP (OF. 179/2002 - CEP MJBV/asc), and the parents of the subjects signed a consent form.

The inclusion criteria for the participants was to present expected weight for gestational age (23), Apgar 9 and 10 at the fifth minute of life, full term birth, absence of malformations and anatomic orofacial alterations, oral alimentation and the only offspring at birth.

The subjects were evaluated and filmed on an average of 15 minutes on the first day of life, and with 1, 2, 3, 4, 5, 6, 9, 12 and 24 months of age. A second examiner examined recordings of 10 children (25% of the sample) for determination of evaluation reliability.

The studied variables were motor and oral abilities, being defined as motor ability the corporal response for the positions: supine, prone, seating, and standing. Each child was placed on a tempered glass table, inspired on the model of the Center of Chailey Heritage in England (12), warmed at 29oCelsius, with mirror inclined at 45° for visualization of the support points positioned in: supine, prone, seating, and standing with subjects with up to 4 months of age; seated without support for the 6, 9, 12 months old and deambulation on the table and ground for the 9, 12 and 24 months old.

The oral abilities were defined as the oral motor response during breastfeeding/bottle, offer of puree food on a metal spoon, solid and liquid food on a 120ml cup.

The feeding was offered on the following sequence:

. up to 2 months, breast-feeding or bottle; finger with glove introduced on oral structure for verification of tongue movements before aliment offer;
. from 3 to 5 months of age fruit puree was introduced on a standardized amount (3ml);
. at 6 months fruit puree (5ml), soft cookie on the hand of the child and after swallow, and cookie introduced on the oral vestibule area to observe

tongue lateralization and juice or water on a glass;
. at 9 months hard cookie on the hand of the child was added;
. at 12 and 24 months gelatin candy.

The six levels of abilities in the supine and prone position and seven in the seating position described by Green et al (12) was adopted for evaluation of the motor abilities from newborns to 11 months olds. For the standing position up to twelve months the description by Bly (24) was adopted; and for the twenty-four months old the description of Nardi & Porto (25) was adopted, seven based levels were elaborated for this position.

The levels were established for observation of spontaneous activities such as, head movements, waist, body, pelvis, superior and inferior members, weight discharge and ability to move out of the positions which the child was initially placed on.

From the descriptions of Morris & Klein (26) abilities levels of the oral motor system were elaborated, considering three levels for breast or bottle feeding, four levels for spoon and glass use and five for mastication. In each level and modality the position and peculiar movements of tongue, lips and jaw were evaluated.

Each level was considered by the presence of 70% of the characteristics.

The data collected were classified through descriptive, quantitative and qualitative analysis (xx) and descriptive statistics for the study of motor and oral variables. Person correlation was used for the study of the association among the variables and calculation of level percentages. Wilcoxon test (xx) was used for reliability analysis; the level of significance of 5% was considered.

Results

The reliability level between the examiners was of 86,7%.

Homogeneity of the median and means in supine, prone and seated and standing, and tongue, lips and jaw in breast-feeding/bottle, use of spoon, glass and during chewing obtained by the levels punctuation sum was observed in the motor and oral abilities.

There were significant associations between the oral and motor abilities (Table 1).

Results obtained from the highest percentages in each oral and motor variable were initially presented on similar levels, levels of the motor variables were increased before the oral ones from the fifth until the twenty-fourth month of age. The prone and supine ability levels were increased before the seating ability and this one before the standing ability.

Level 1 of tongue, lips and jaw at three months of age with spoon, was presented concomitantly to levels 2 and 3 at three and four months of motor ability. There was a correlation between level 3 of tongue, lips and jaw in breast-feeding/bottle with level 3 in the motor abilities (supine, prone and seating) at 4 months of age.

With 5 months, the oral structures with spoon passed to level 2 and simultaneously supine and prone passed to level 4.

From 4 to 9 months there was greater distribution of the percentages on the levels of oral and motor abilities.

The jaw level at 6 and 9 months increased more than tongue and lips with spoon, and the same occurred to glass at 9 and 12 months, the supine level at 6 months increased concomitantly. At 9 months the highest percentage of the children were on the highest levels on supine, prone and seating positions. A similar percentage of the jaw with spoon and glass and seating ability is noticed at this age.

The levels of tongue, lips and jaw ability with spoon were equaled to the 12 months at level 4, while with glass only the jaw reaches this concomitant level to higher levels of supine and prone, level 6; seated and standing, level 7 (Table 2).

At 24 months of age the oral levels with glass were equaled in level 4 and on the mastication they reached level 5, being the majority of the children on the highest levels of oral and global motor abilities (Table 3).

TABLE 1. Measurement of Association between Motor and Oral Variables.

	Oral Variables	*Motor Variables*	*r Value*	*p Value*
Bottle Feeding	***Tongue***	***supine***	***0,4244***	***0,0050***
	Tongue	***prone***	***0,4732***	***0,0016***
	Tongue	***seating***	***0,4183***	***0,0058***
	Tongue	***standing***	***0,4530***	***0,0013***
	Lips	***seating***	***0,4058***	***0,0076***
	Jaw	***supine***	***0,4558***	***0,0024***
	Jaw	***prone***	***0,4496***	***0,0028***
	Jaw	***seating***	***0,3071***	***0,0480***
	Jaw	***standing***	***0,4444***	***0,0032***
Spoon	***Tongue***	***supine***	***0,4097***	***0,0070***
	Tongue	***prone***	***0,3211***	***0,0382***
	Tongue	***seating***	***0,3535***	***0,0216***
	Lips	***supine***	***0,3079***	***0,0472***
	Lips	***standing supine***	***0,3222***	***0,0374***
	Jaw	***prone***	***0,4679***	***0,0018***
	Jaw		***0,3202***	***0,0386***
Glass	***Tongue***	***supine***	***0,3678***	***0,0166***
	Tongue	***standing***	***0,4609***	***0,0011***
				0,0366
	Lips	***supine***	***0,3236***	***0,0206***
	Lips	***standing***	***0,3565***	***0,0480***
	Jaw	***standing***	***0,2940***	
Chewing	***Tongue***	***supine***	***0,4018***	***0,0020***
	Lips	***supine***	***0,4480***	***0,0030***
	Lips	***standing***	***0,4214***	***0,0054***
	Jaw	***supine***	***0,5858***	***0,0001***
	Jaw	***prone***	***0,3716***	***0,0154***
	Jaw	***seating***	***0,4740***	***0,0016***
	Jaw	***standing***	***0,3789***	***0,0134***

TABLE 2. Relationship between oral and motor ability (spoon, mastication, glass) and global motor abilities from 5 to 12 months of age.

Age	Spoon	Mastication	Glass	Motor
5 Months	tongue 69% - 2 lips 60% - 2 jaw 76% - 2	- - -	- - -	supine 62% - 4 prone 38% - 4 seating 90% - 3 standing 52% - 3
6 Months	tongue 55% - 2 lips 62% - 2 jaw 53% - 3	tongue 94% - 2 lips 69% - 2 jaw 76% - 2	tongue 95% - 1 lips 97% - 1 jaw 90% - 1	supine 52% - 5 prone 40% - 6 seating 57% - 4 standing 88% - 3
9 Months	tongue 61% - 3 lips 62% - 3 jaw 50% - 4	tongue 85% - 3 lips 74% - 3 jaw 86% - 3	tongue 74% - 2 lips 69% - 2 jaw 53% - 3	supine 90% - 6 prone 79% - 6 seating. 48% - 7 standing 62% - 4
12 Months	tongue 86% - 4 lips 81% - 4 jaw 100% - 4	tongue 86% - 4 lips 81% - 4 jaw 95% - 4	tongue 72% - 3 lips 69% - 3 jaw 53% - 4	supine 100% - 6 prone 100% - 6 seating 100% - 7 standing 69% - 7

TABLE 3. Relationship between oral motor ability (spoon, mastication, glass) and global motor from 12 to 24 months of age.

Age	Mastication	Glass	Motor
24 Months	tongue 100% - 5 lips 100% - 5 jaw 100% - 5	tongue 96% -4 lips 95% - 4 jaw 100%- 4	supine 100% - 6 prone 100% - 6 seating 100% - 7 standing 100% - 7

Discussion

Observational study, registering simultaneous changes that occur with global and oral motor abilities in the two first years of life. Association between these abilities in the majority of the evaluated ages was observed. At intermediate ages (4 and 9 months) there was a mixture of presented levels characterizing variability of motor development acquisition, described in normal children during the first and second year (27-28).

At 3 and 4 months of age the abilities for breast-feeding/ bottle were presented in the highest level while the same age demonstrated oral ability with spoon in level 1, noticing presence of oral profiles similar to the ones of bottle suction characterizing oral performance in the initial phase of this ability which mix suction with suckling (26-27, 29). At this age similar level percentages was observed, in supine prone and seating positions with increase in the seating ability to level 3 from 62% on the third month to 96% on the fourth month. This demonstrates evolution on the acquisition of motor components that will qualify the child to support the head and the body. In normal development the head control and body stability supplies the motor base to fine motor function of hands and mouth and the oral motor movements for feeding occur after the head and the body have acquired stability, symmetry and alignment (2, 9, 24, 29) .

At five moths of age the relationship between global and oral motor ability is maintained. The levels of oral structures with spoon were raised concomitantly to the increase on the levels of motor abilities, confirming some studies (5-6)..

At six months of age only the jaw level 3, remaining steadily for the aliment entrance in the mouth, and levels in supine, prone and seating were parallelly increased. The movement of the superior lip to clean the spoon during the feeding is initiated at 6 months of age and it depends on jaw and body stability(2, 26). At this age oral structures in mastication and glass were at inferior levels, indicating the oral motor immaturity.

At 9 months the levels with spoon of the oral structures increased again, however the jaw presented more elaborated motor characteristics than tongue and lips, demonstrating its importance on the oral performance, due to the fact of being the closest oral structure to waist and body (24, 26), offering stability to the work of oral structures(24). At this age, it was demonstrated that the levels of global the motor abilities were increased, and the highest percentage of children presented domain on the supine and prone positions, increasing the level in the seating ability.

At 12 months of age with spoon, tongue, lips and jaw reached the higher levels and simultaneously the motor abilities presented higher levels in supine, prone, seating and standing positions.

At 9 and 12 months similar oral behaviors with glass to the ones presented with spoon were observed. The jaw presented superior level when compared to other structures, signaling the beginning of gradual maturation for accomplishment of the function, however the presence of suction, choking(2), exaggerated mouth opening, bitten on the edge of the cup had, among others, elapsed from the small jaw stability, even being the sustentation of the head presented (2, 26, 29). Lips and tongue reached the same level of jaw at 24 months, probably because of the interdependence between the acquisition of jaw stability and highest ability of lips and tongue pointed by literature (26).

The three structures increased levels simultaneously. At 6 months of age movements without dissociation among the structures were observed. The dissociation was observed at 9 months of age when the levels of oral structures were increased whereas the supine, prone and seating positions presented the highest levels(6).

The diagonal movements of the jaw during mastication occurred at 12 months. At 24 months, rotatory and controlled movements and lateralization of the tongue were observed(2, 26).

A sequence on the development of the postural control in supine and prone was observed in the development of the motor abilities, with similar results to the ones described by Green et al (12) and on study with children up to 3 months of age by Gaetan et al(30). The domain of the seating ability was prerequisite for the adequate development of the oral control and for oral motor acquisitions (5-6, 9-10, 24).

This study emphasizes the influence between corporal position on oral structure and vice versa in the feeding on sensory motor disorders (10, 13, 15) being a detailed longitudinal observation in normal children.

Conclusion

We can affirm in this conclusion that children presented oral motor abilities inside normal limits and that these abilities developed concomitantly to the global motor abilities, presenting an association between both.

The limitation of the study is the fact of being an observational study, and the positive point was the increased degree of reliability among the examiners.

Future research with time measures since the entrance of the aliment in the mouth until its swallowing will be able to supply quantitative and normative data at different ages in normal children

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