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Evaluation of the effects of using a baby walker on trunk control and motor development

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What is already known on this topic?

- *Trunk control is critical in improving motor development such as sitting, standing, and walking.*
- *Using a baby walker causes retardation in motor development.*

What this study adds on this topic?

- *In the literature, there are limited studies investigating the effects of the use of baby walkers on trunk control and motor development in typically developing children.*
- *Using a baby walker delays motor development by adversely affecting trunk balance.*

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ABSTRACT

Objective: This study aimed to evaluate the effects of the use of baby walkers on trunk control and motor development in typically developing children.

Material and methods: Demonstrating standard developmental steps, 29 children (14 females, 15 males; mean age 10±1 month) who used a baby walker and 19 children (10 females, 9 males; mean age 10±1 month) who did not use a baby walker were included. Motor skills were assessed using the Alberta Infant Motor Scale and trunk control using Segmental Assessment of Trunk Control.

Results: The motor development scores and trunk balance scores were found significantly lower in infants who used a baby walker compared with those not using a baby walker.

Conclusion: It was concluded that the use of baby walkers might adversely affect the motor development of infants and this may be due to impaired trunk control.

Keywords: Alberta Infant Motor Scale, baby walker, infant, postural control

Introduction

Child development is a complex process, which is completed with the maturation of the nervous system in a certain period. Many factors such as genetics, ethnicity, nutrition, social environment, and economic situation affect this process (1). Trunk control is critical in improving motor development such as sitting, standing, and walking. In the ensuring of balance, the sacral, lumbar, abdominal, thoracic, and cervical muscles should work in coordination (2, 3). Postural control becomes functionally active, especially from the sixth month after birth, and infants begin to develop the ability to adapt postural activity according to the characteristics of daily activities. First, this adaptation occurs naturally, but as from the ninth and tenth months, postural activity is set more finely with the coordinated contraction and involvement of more muscles. During the motor development process, allowing the infant to discover new movements and reaching activities while playing is essential in the development of postural control and trunk balance (4). One of the factors effective in gaining such motor skills is the use of a baby walker in the early period. Studies reported that 47-83% of 5-15–month-old infants used a baby walker (5-9).

Such a high rate of use of baby walkers, despite the possibility of delayed motor development and families not knowing much about this issue, constituted the basis for planning this study. In the literature, no study has investigated the effects of the use of baby walkers on

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trunk control and motor development in typically developing children. Accordingly, this study was planned to investigate this issue and provide data for the literature.

Material and Methods

This case-control study was conducted in the Pediatric Department of Gazi University Faculty of Medicine and Department of Physiotherapy and Rehabilitation in the Faculty of Health Sciences at Gazi University between July 2016 and March 2017. The study population was from the medium-high socioeconomic status in Ankara. After recording all the relevant information about prenatal, natal and family history, infants who were born at this hospital were monitored regularly at birth, in the 1st, 2nd, 4th, 6th, 9th, 12th, 15th, and 18th months and then in the 2nd, 3rd, 4th, and 5th years. During these visits, their feeding histories, immunization schedule, growth (weight and height) and developmental steps were noted.

The study was performed with individuals who presented to those departments for follow-up during the 8-month period of the study, who agreed to participate in the study, among typically developing full-term infants and their families. Premature infants, with a known neurologic or developmental delay and chronic disease were not included in the study.

Information on the infants' age and sex, sociodemographic characteristics, and on the use of baby walkers were recorded. The infants who used a baby walker for a certain period were included in the study group, and infants who did not use a baby walker were included in the control group. This study complied with the ethical standards of the Declaration of Helsinki, and all subjects and parents received explanations regarding the purpose and procedure of the study before voluntarily agreeing to take part. All parents signed an informed consent statement before the start of the measurements. Ethics committee approval required for the study was granted by the Clinical Research Ethics Committee of Gazi University (Approval No.: 77082166-604.01.02; Date: June 1st, 2016).

The motor development of the children was evaluated using the Alberta Infant Motor Scale (AIMS). AIMS is a norm-referenced and reliable assessment tool that is used to assess motor skills in infants from the neonatal period up to 18 months (10, 11). It enables to make an evaluation of a total of 58 positions that emerge with facedown, supine, sitting, and standing skills (12). By observing spontaneous motor movements of infants, it is determined that they can provide postural balance, weight transfer, and antigravity control in different positions. With this method, the total score of the infant is calculated and converted to a percentage score indicating the status of the infant according to the age (13). The infant's motor performance is categorized by percentiles: 0-10% is classified as atypical development, 11-25% as suspicious developmental performance, 26-75% as normal developmental performance, and 76-100% is classified as very good development (14).

Trunk control was evaluated using the Segmental Assessment of Trunk Control (SATCo). The SATCo is a clinical measurement method that assesses trunk balance control (11). At the beginning of the assessment, the infant is fixed to the seat in the position in which the pelvis is neutral by using an adjustable belt. The person who performs the assessment supports the trunk from different points with their hand by following the order from top to bottom. Support is provided parallel to the ground from the shoulder girdle to assess cervical control, from the axilla to assess the upper thoracic control, from the lower edge of the scapula to assess the middle thoracic control, from the bottom of the costa level to assess the lower thoracic control, from the bottom of the costa for upper lumbar control, and from the pelvis for lower lumbar control. Finally, the whole trunk control is evaluated without any support. The test was prepared to assess static (in a neutral position), active (when turning the head to a side or reaching out), and reactive (against a rhythmic push) trunk control at all levels. The scores are recorded as 'present' and 'absent' according to the response formed in the trunk. The recorded score reflects the region in which the infant has lost postural control as follows: 1: loss of control at the head level, 2: loss of control in the upper thoracic region, 3: in the middle thoracic region, 4: in the lower thoracic region, 5: in the upper lumbar region, 6: in the lower lumbar region, 7: in the pelvis, 8: loss of control in the trunk. In other words, although there is a postural control response above the specified level, there is no postural control response at that level and below (15).

Statistical analysis

Data were analyzed using the IBM Statistical Package for the Social Sciences version 24.0 (IBM SPSS Corp.; Armonk, NY, USA) package program. Continuous variables are presented as mean ± standard deviation and median (minimum-maximum values), and categorical variables are presented as number and percentage. The conformity of data to a normal distribution was examined using the Shapiro-Wilk test. When parametric test assumptions were not provided, the Mann-Whitney U test was used to compare the independent group differences. Chi-square analysis and Fisher's exact tests were used to examine differences between the categorical variables. $P<0.05$ was considered statistically significant in all analyses.

Results

A total of 48 typically developing children were included in the study. Twenty-nine infants using a baby walker were included in the study group, and 19 infants who were not using a baby walker were included in the control group. The mean age of the infants using a baby walker was 10.55±1.82 (min: 8, max: 15, median: 9.5) months, and the mean age of those not using a baby walker was 10.55±1.82 (min: 8, max: 12.5, median: 10) months. Of the infants using a baby walker, 14 were female (48.3%) and 15 were male (51.7%), and of the infants not using a baby walker, 10 were female (52.6%) and nine were male (47.4%). There was no statistical difference between the groups in terms of age and sex ($p>0.05$) (Table 1).

All (100%) of the fathers in both groups were employed. The maximum number of children in the family in both groups was three. Upon examining the responses of the families to the question ''What do you think about the harm or benefit of using baby walkers?', 72.4% of the families in the baby walker-using group stated that it was beneficial, and 24.1% of the families stated that it was harmful; 3.5% answered that they had no idea. The responses of the families of the infants not using a baby walker were as follows: 5.3% thought it was beneficial, 89.4% thought it was harmful, and 5.3% had no idea.

Table 1. Demographic characteristics of groups			
Demographic characteristics	**Using a baby walker (n=29)**	**Not using a baby walker (n=19)**	**p**
Age (Months) (mean±SD)	10.55±1.82	10.52±1.39	0.74§
Median/min-max	9.5/8-15	10/8-12.5	
Sex (F/M) n (%)	14/15 (48.3%/51.7%)	10/9 (52.6%/47.4%)	0.77¤
Maternal employment status			
Housewife	20 (69%)	11 (57.9%)	0.433¤
Employed	9 (31%)	8 (42.1%)	
Number of children in the family			
Single child	20 (69%)	11 (57.9%)	0.433¤
Two and more children	9 (31%)	8 (42.1%)	
Opinion about the use of a bay walker			
Beneficial	21 (72.4%)	1 (5.2%)	<0.001*β
Detrimental	7 (24.1%)	17 (89.4%)	
No idea	1 (3.5%)	1 (5.3%)	
Maternal education status			
Primary education	5 (17.2%)	4 (21.1%)	0.104¤
High school	13 (44.8%)	3 (15.8%)	
Undergraduate education	11 (37.9%)	12 (63.2%)	
Paternal education status			
Primary education	5 (17.2%)	3 (15.8%)	0.585β
High school	12 (41.4%)	5 (26.3%)	
Undergraduate education	11 (37.9%)	11 (57.9%)	
Postgraduate education	1 (3.4%)	-	

F, female; M, male; §Mann-Whitney U test, ¤Chi-square analysis, βFisher's exact *p<0.05

Table 2. Comparison of AIMS percentage scores of groups					
AIMS percentage score	**Use of a baby walker**				**p**
	Yes		**No**		
	n	**%**	**n**	**%**	
0-10	5	17.2	0	0	0.014*β
11-25	3	10.3	2	10.5	
26-75	16	55.2	6	31.6	
76-100	5	17.2	11	57.9	

AIMS, Alberta Infant Motor Scale, βFisher Exact, *p<0.05

Table 3. Comparison of SATco scores of groups			
	Use of a baby walker		**p**
	Yes (n=29)	**No (n=19)**	
SATCo Reactive score	5.45±0.78	5.89±0.32	0.029*§
SATCo Total score	19.31±1.07	19.89±0.32	0.028*§

SATco: Segmental Assessment of Trunk Control, §Mann-Whitney U test, *p<0.05

The mean duration of using a baby walker in the baby walker-using group was 2.39±1.68 (min: 0.50 months, max: 7, median: 2.5) months. Upon examining the motor development of the infants using and not using a baby walker, a statistically significant difference was observed between the two groups in favor of the group not using a baby walker (p<0.05) (Table 2).

The trunk balance (SATCo reactive score) according to the reaction of the infants using a baby walker against a rhythmic push was found to be statistically significantly weaker compared with the infants not using a baby walker (p<0.05). The total trunk balance scores of the infants using a baby walker were significantly lower than those of the infants not using a baby walker (p<0.05) (Table 3).

Discussion

In this study, it was concluded that the use of baby walkers adversely affected the motor development of infants and this might be due to impaired trunk balance. The results of the present study draw attention to facts that the majority of the mothers in the group using a baby walker were unemployed and the infants in this group were mostly from single-child families.

Doğan et al. (16) reported that one of the reasons why mothers tended to use a baby walker was to amuse the child and creating an opportunity for the mother to do household chores and other work in the meantime. The discussed information supports our findings. Although the mothers did not work outside the home and did not have other children to take care of, they preferred to use a baby walker. However, the fact that mothers in the same group continued to use a baby walker although they thought that it was harmful may be explained by the low education level of the families. Furthermore, it was emphasized that there was a low correlation between the frequency of injury and the use of baby walkers and that families should be informed about this issue by pediatricians (16).

In the literature, studies indicating that the use of baby walkers delays motor development, that crawling, standing and walking without support are observed later in children using a baby walker, draw attention (17-19). In some studies, no difference was observed in the age of walking between children who did and did not use a baby walker (20). In the study by Crouchman (21) on 66 infants, the effect of baby walkers on early movement skills was examined and a significant difference was revealed in facedown movement skills in infants, especially in the 8th,

9th, and 10th months. It was emphasized that the possibility of 'spending free time on the ground,' which is an important supporter of motor development during the hours when the infant is awake, might be restricted due to the use of a baby walker and this might cause a delay in motor development. In another study study conducted with 185 7-10–month-old infants, Thein et al. (18) reported that the use of baby walkers led to a delay in motor development. Talebian et al. (19) stated that the use of baby walkers caused retardation in motor development stages and therefore the researchers did not recommend using baby walkers. Garrett et al. (17) revealed that with every 24-hour's use of a baby walker, there might be a 3.3-day delay in unsupported walking and a 3.7-day delay in unsupported standing. The results of the mentioned studies are parallel to the results of the present study. However, what could be the cause of this developmental retardation has not been clarified in any of these studies.

In a study conducted using electromyography (EMG), Kauffman and Ridenour reported that there was no difference in the time of starting unsupported walking among infants who did and did not use a baby walker, but they indicated differences in the quality and parameters of walking between the two groups (22). According to the results, the researchers stated that the infants in the group using a baby walker 2 hours a day had decreased knee flexion and step length when they first started to walk. In a retrospective study, Krivova et al. (23) evaluated 749 children, 363 of whom used a baby walker. Accordingly, it was reported that the use of a baby walker might cause abnormal weight bearing due to its rigid structure and perhaps one of the causes of idiopathic toe walking in children.

While using a baby walker, infants sit and can move in different directions by establishing contact of the feet with the ground (21). However, during use, some deficiencies are observed in trunk control and the weight transfer necessary for motor development. Infants rest their hips and pelvis on the seat in the baby walker and reach out in different directions without the need to control their trunks due to the protective barriers surrounding the baby walker (24). During these reaching activities, they cannot release extension in the knees and hips by transferring the weight to their feet effectively as long as they do not feel the need to extend their height. Learning to transfer weight, improving the trunk, balance, and control constitute the basis for completing the milestones of motor development successfully (17).

It was demonstrated that the use of a baby walker had a negative effect on a neuromuscular basis. This effect emerges at every stage of motor development and in every region of the body. The main point of motor development, especially in the first years of life, is frequent repetition and experience. Infants who experience the same movement repeatedly develop motor skills in this way. Each motor skill gained forms the basis of the next stage of motor development. On the other hand, trunk control is the key point of motor development. Infants who do not need control due to the trunk support provided by a baby walker experience less neuromuscular training in motor development. The trunk, which is restricted to active working within the seat system during the day, cannot support development sufficiently. The muscles that should frequently experience an extension position against gravity in the stages of normal motor development remain insufficient in this experience within the seat system. The baby walker system causes a child to be passivized in a sense, leading to development and control retardation of the trunk and lower extremities. This effect may not be reflected in the entire motor development process by creating a domino effect. This is thought to be the reason for low trunk control scores in infants using a baby walker.

The limitation of the study is that the small size of the study population and the motor development of children cannot be followed after the study.

It was concluded that the use of baby walkers might adversely affect the motor development of infants and this may be due to impaired trunk control. It is thought that trying to support typically developed infants using a walker passivizes them in the development process, which may be harmful.

Ethical Committee Approval: Ethics committee approval was received for this study from the ethics committee of Gazi University (Approval No.: 77082166-604.01.02; Date: June 1st, 2016).

Informed Consent: Informed consent was obtained from the parents or legal guardian of all the study participants.

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