



# Examination of the Correlation Between Motor Developmental Steps, Pelvic Floor Muscle Activation, and Uroflowmeter Parameters in Children with Bladder and Bowel Dysfunction

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## Hypothesis / aims of study

The newborn's pelvis is different from that of adults. When the baby reaches an upright position, pressure is transmitted directly to the visceral mass and the organs tend to enter the pelvic cavity. The pelvic floor muscles contract to prevent this increase in pressure. When the child starts to stand up and walk, the diaphragm becomes more muscular. Thus, the pelvic floor adapts to its normal function at term (Wendell-Smith 1967). Musculoskeletal development causes significant changes to occur over the first six years of life with 90% of adult structure being achieved at this age (1). Little is known about the correlation between motor development and bladder-bowel dysfunction.

We hypothesize that there is a negative correlation between pelvic floor activation and uroflowmeter parameters of children with delays in motor development stages.

## Study design, materials and methods

This is a prospective, cross-sectional study conducted on children aged 5-12 years who were diagnosed with bladder and bowel dysfunction (BBD) by a pediatric urologist in 2022 and 2023. Before starting the study, ethics committee approval was obtained, and clinical trial registration was completed (NCT05182671).

Demographic characteristics, motor development (head control, sitting without support, crawling, standing with support, walking without support) months, pelvic floor EMG, and uroflowmetry measurements were completed on the same day by the same physiotherapist. Pelvic floor muscle activity (work and rest minimum, average, deviation, maximum voluntary contraction) and uroflowmetry measurement were assessed with relatively, the NeuroTrac Myoplus4 Pro device and AYMED® brand EMG uroflowmetry pot with a sensor system.

All data were analyzed with the SPSS software program (IBM, SPSS version 25, Chicago, IL, USA). Correlation analysis was done with the Pearson test.

## Results and interpretation

50 children (female=27, male=23) with a mean age of 9.12±2.67 years and a BMI of 18.18±4.03 kg/m2 were included in the study.

The participants' head control, sitting without support, crawling, standing with support, and walking months are 3.19, 7, 8.25, 12.3, and 12.87 respectively. The parents of 6 participants also stated that their child was not crawling. Work average value and functional bladder capacity, walking without support were positively correlated (r=0.32; p=0.026; r=0.36, p=0.009). Voided volume on uroflowmetry and head control, sitting without support, and walking without support were positively correlated (relatively r=0.33, p=0.020; r=0.30, p=0.035; r=0.32, p=0.022).

It was observed that the average of the participants' motor development stages was not too early or too late from their milestones. It has been shown with a positive correlation that walking without support, head control, sitting without support, and walking without support, which are among the motor development stages, are close to the normative timing and positively affect the control skill and activation of the pelvic floor muscles. At the same time, the increase in the activation ability of the pelvic floor muscles in parallel with the motor development stages increases the participants' ability to hold urine, indicating an increase in functional bladder capacity and urination volumes in uroflowmetry.

Table 1. Demographic and clinical characteristics of the patients

Variables	Total Mean± SD (n=50)
Age (y)	9.12±2.67
Height (cm)	134.05±19.23
Body weight (kg)	131±36.37
BMI (kg/m2)	18.18±4.03
Head control (months)	3.19±1.23
Sitting without support (months)	7±1.42
Crawling (months)	8.25±1.4
Standing with support (months)	10.32±1.38
Walking without support (months)	12.87±2.38
Abbreviations: SD: standard deviation, BMI: body mass index P: independent sample t-test	

Table 2. Correlation analysis for motor development parameters

Variables		r	p value
Work average (mV)	Walking without support	0.32	.026
Voided volume on uroflowmetry (ml)	Head control	0.33	.020
	Sitting without support	0.30	.035
	Walking without support	0.32	.022
Functional Bladder Capacity (%)	Walking without support	0.36	.009
Abbreviations: p: Pearson correlation			

## Conclusions

More comprehensive studies are needed to investigate the contribution of motor development stages to pelvic floor problems.

## References

1. Wendell-Smith C. Studies on the morphology of the pelvic floor. London: University of London; 1967. Chase, J., & Schrale, L. (2017). Childhood incontinence and pelvic floor muscle function: Can we learn from adult research?. Journal of Pediatric Urology, 13(1), 94-101.

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