

The Acute Effect of a Single Running Bout on the Posterior Urethral Vesical Angle in Females with and without Exercise-induced Urinary Incontinence

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Summary

Exercise-induced (EI) urinary incontinence (UI) is common in active females and may be linked to tissue strain. Larger posterior urethrovesical angles (PUVAs) have been observed in females with UI. This study found PUVA increased post-run in all runners and no difference between those with and without EI-UI. Running appears to transiently reduce proximal urethral support but not more so in those with EI-UI.

Introduction

Exercise-induced UI, thought to be a subtype of stress UI, affects ~30% of female athletes[1] and 16% of females while running[2]. Unlike daily activity-related stress UI, which involves multiple factors[3], the pathomechanics of EI-UI are less clear. Repetitive high-impact activities like running may strain pelvic organ support, as runners demonstrate enlarged levator hiatus' and lower bladder neck positioning after a single run[4]. The PUVA reflects the functional integrity of proximal urethral support and may be impaired among those with stress UI[3]. Therefore, among female runners, we aimed to determine if PUVA before a run, or changes in PUVA after a single bout of treadmill running differ between runners with and without EI-UI.

Methods

This case-control study was approved by the local ethics board. After providing informed consent, female runners (18+ years) who had run ≥10 km/week at ≥6 km/h for at least a year participated. Those with UI outside of exercise were excluded. In-lab data collection included measures of bladder volume (BV) and PUVA from ultrasound images acquired before and after a 38-minute treadmill run (6-minute warm-up, 30-minute self-paced run (Borg 12-14), 1-2-minute cool-down).

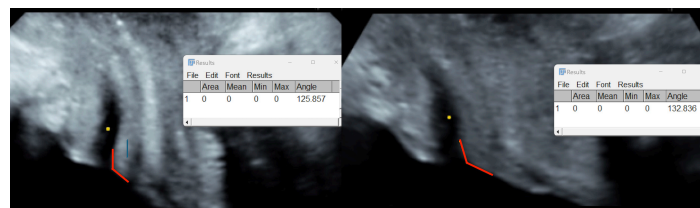


Figure 1: PUVA measured before and after the run from one participant

4D View (GE Healthcare) and ImageJ software (National institutes of Health, USA) were used to measure PUVA, defined as the angle between the posterior urethral wall and the bladder base from frames acquired in standing (Figure 1).

A repeated-measures GLM was used to determine the impact of time (pre/post-run) and group (continent vs. incontinent) on PUVA, including BV and PUVA before the run as covariates.

Results and Discussion

90 runners participated. In 13 participants, the PUVA was poorly visualized thus they were excluded from the analysis.

In the remaining sample (n=77; 54 continent; 23 with EI-UI), the incontinent runners were older and had higher parity than the continent runners (Table 1). Before the run, PUVA was not different between the groups. PUVA increased after running in all participants ($F(1,1)=0.16$, $p=0.03$), with no significant effect of group ($F(1,1)=0.36$, $p=0.54$), group x time interaction ($F(1,1)=0.16$, $p=0.68$), PUVA at baseline x time interaction ($F(1,1)=2.57$, $p=0.11$), BV by time interaction, nor BV main effect ($F(1,1)=1.51$, $p=0.22$).

Conclusions

Proximal urethral support appears to be compromised after a single bout of treadmill running. Runners with and without EI-UI show similar changes after the run, therefore an increase in PUVA does not appear to be a causative factor in EI-UI. Further research is needed to understand the pathophysiology of EI-UI.

Acknowledgments

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Table 1. Demographic data (median, range) and posterior urethral vesical angle (PUVA) (mean, SD); EI-UI: exercise-induced urinary incontinence; BMI body mass index. Significant differences between groups ($p<0.05$) are indicated in bold.

	Runners with EI-UI (n=23)	Runners without EI-UI (n=54)
Age (years)	42 (21-57)	36 (20-63)
BMI (kg.m ²)	22 (18-36)	22 (18-30)
Parity = yes (n,%)	14 (61)	18 (33)
Menopause = yes (n,%)	3 (13)	5 (10)
Running experience (years)	15 (3-44)	13 (1-41)
Weekly running distance (km)	30 (13-100)	26 (10-80)
Bladder Volume before the run (ml)	247 (30-750)	166 (42-350)
PUVA before the run (°)	124.9 (14.8)	121.0 (15.9)
PUVA after the run (°)	128.8 (16.6)	126.0 (15.9)

References

- [1] de Mattos Lourenco TR et al. (2018). *Int Urogynecol J*, **29**: 1757-1763.
- [2] Hamilton HM et al. (2023). *J Women's Pelvic Health Phys Ther*, **47**: 75-89.
- [3] Falah-Hassani K et al. (2021). *Int Urogynecol J*, **32**: 501-552.
- [4] Bérubé MÈ and McLean L. (2024). *Int Urogynecol J*, **35**: 127-13

