

# Investigation of lumbo-pelvic-hip muscle function, trunk/pelvis kinematics and joint loading in baseball pitching



## PRACTICAL SIGNIFICANCE

The trunk muscle strength influences trunk kinematics during pitching. The 8-week training focusing on lumbopelvic-hip muscles improved ball speed and trunk muscle function in adolescent pitchers.

## STUDY BACKGROUND

The throwing arm motion and loads on the shoulder and elbow joints during pitching are highly influenced by the movement of the proximal segments (i.e., trunk and pelvis). While the lumbopelvic-hip muscles are considered to play a critical role in controlling the trunk movement during pitching, direct evidence linking the lumbopelvic-hip muscle function and pitching biomechanics are currently lacking. Moreover, no study has evaluated whether the training that targets the lumbopelvic-hip muscle function can modify pitching kinematics or decrease joint loading.

## OBJECTIVE

To 1) examine the relationship between lumbopelvic-hip muscle function and pitching biomechanics in baseball pitchers, and 2) evaluate the effects of 8-week lumbopelvic-hip training on muscle function and pitching biomechanics.

## DESIGN & STUDY

Cross-sectional and non-randomized quasi-experimental study designs.

## SUBJECTS

75 (27 intervention group, 27 controls, and 21 baseline-only) high

school and collegiate baseball pitchers participated.

## MEASUREMENTS

Lumbopelvic-hip muscle function (i.e., Y balance test, single-leg hop test, plank test, isometric hip and trunk strength, trunk rotational power) and pitching biomechanics variables were measured to evaluate the relationship between lumbopelvic-hip muscle function and pitching biomechanics. The assessments were repeated in 23 pitchers who completed the intervention and 25 controls after 8-weeks to study the intervention effects.

## RESULTS

The weaker trunk rotation strength was associated with early trunk rotation, but not with greater joint kinetics. Intervention group pitchers improved ball speed, Y balance test in posterolateral direction, trunk flexion and rotation strength, hip abduction strength, and trunk rotational power.

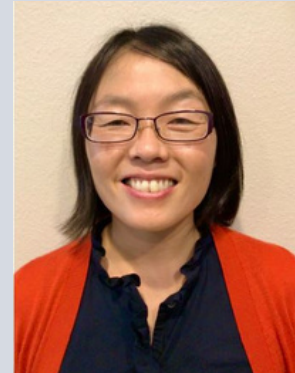
## CONCLUSIONS

The trunk muscle function influences trunk kinematics during pitching. The training program can improve ball speed and trunk muscle function. The analysis of the effects of intervention on pitching biomechanics is in progress.

NATA FOUNDATION  
GENERAL RESEARCH GRANT:  
2018-2022

FUNDING: \$54,996

## PRINCIPAL INVESTIGATOR



**SAKIKO OYAMA, PHD, ATC**

Dr. Oyama is an Associate Professor in the Department of Kinesiology at University of Texas at San Antonio. She is the director of the Applied Biomechanics Research Laboratory, where she conducts research that aims to identify and modify movement patterns and physical characteristics that are associated with injuries. Many of her research projects involve analysis of baseball pitching biomechanics. She has published over 40 papers in the peer-reviewed journals.



*Supporting and advancing the Athletic Training profession through research and education*

www.natafoundation.org | @natafoundation