

Practical Chiropractic Applications of Functional Testing: Bodyweight Squat as a Movement Screen for Patients

Chris Fahs, PhD
Christopher.Fahs@Logan.edu

LOGAN UNIVERSITY

Conflicts of Interest

- None.

Learning Objectives

- Evaluate movement patterns observed during the bodyweight squat.
- Recommend potential corrective strategies for faulty movement patterns observed for the feet, ankles, and hips during the squat.
- Recommend potential corrective strategies for faulty movement patterns observed in the spine and shoulder complex during the squat.

Why Movement Screens?

- **General: Evaluate preparedness for activity**
- **Bodyweight squat: Fundamental human movement used in daily life**
 - No equipment needed
 - Can be used to assess multiple areas
 - Can help identify stability or mobility deficits
 - Facilitates: Test → Intervention → Retest

Bodyweight Squat Assessment Domains

- **Upper body – postural control**
 - Head/neck
 - Thoracic spine
 - Lumbar spine
- **Lower body – movement mechanics**
 - Hips
 - Knees
 - Feet/ankles

Bodyweight Squat Assessment Roles

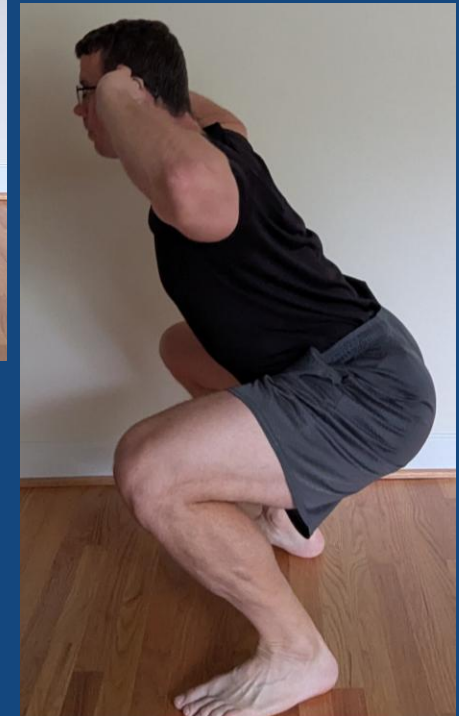
- **Client – performs the bodyweight squat**
 - Barefoot
 - Wearing form-fitting clothing
 - Standing on a firm surface
- **Clinician – records the client**
 - Slow-motion replay and/or still images are useful for evaluation

Small-Group Activity

- **Please form groups of 2-5 members**
 - One or more “client(s)” willing to perform the bodyweight squat
 - Remaining group members will be the recorders

Client Instructions

- **Starting position**
 - Stance: Place your heels shoulder-width apart and toes forward or slightly outward ($\leq 10^\circ$)
 - Adjust as needed
 - Arm position: Touch your fingers to your ears and point your elbows out to the sides of your body
- **Execution**
 - “Squat down until you believe that the top of your thighs are parallel to the ground, and then return to the initial starting position. Perform 10 continuous repetitions at a consistent, moderate pace, or until you are instructed to stop.”



Myer, G. D., Kushner, A. M., Brent, J. L., Schoenfeld, B. J., Hugentobler, J., Lloyd, R. S., Vermeil, A., Chu, D. A., Harbin, J., & McGill, S. M. (2014). The back squat: A proposed assessment of functional deficits and technical factors that limit performance. *Strength and Conditioning Journal*, 36(6), 4–27.

Stance Width Adjustment



Wider Stance



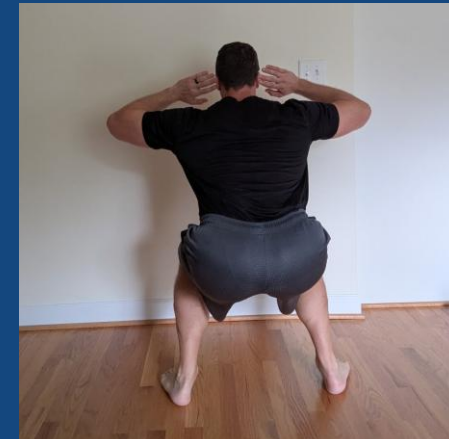
Shoulder Width Stance

- Adjust stance width to the individual; standardize for repeated assessments

Clinician Instructions

- **Record from three views**

- Lateral
- Anterior
- Posterior



- **Each view should have all body segments clearly visible**

- Camera height: level with the client's navel when standing

Upper Body Assessment

- **Perform the assessment**
- **Review as a group and evaluate the upper body**

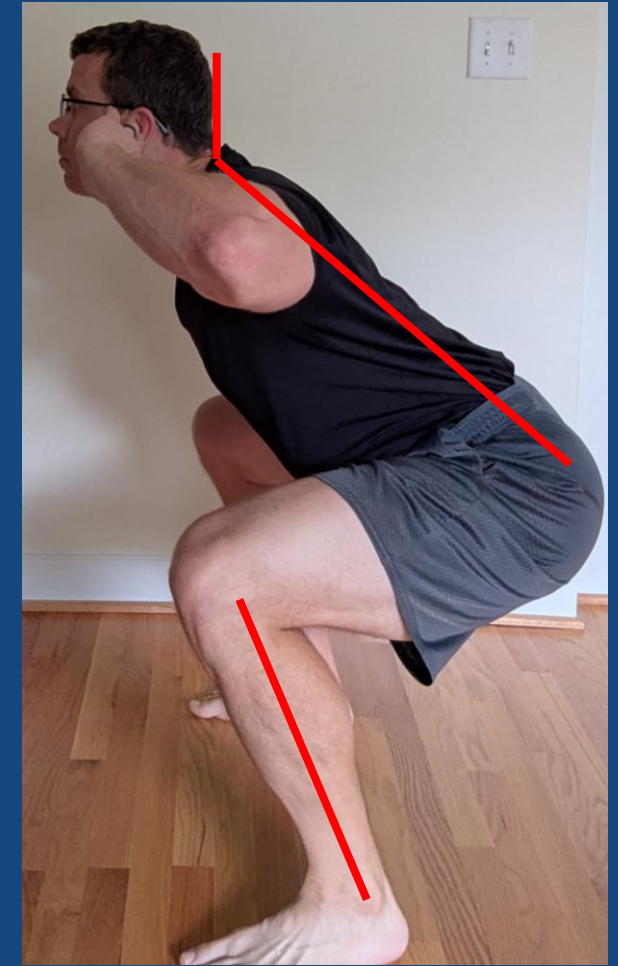
Anatomical Region	Areas to Evaluate	Optimal Viewing Position
Head	Cervical spine (position/movement)	Lateral
	Direction of gaze	Anterior
Thoracic Spine	Thoracic spine (position/movement)	Lateral
	Scapulae position	Posterior
Lumbar Spine	Lumbar spine (position/movement)	Lateral

Evaluating Upper Body Patterns

LOGAN UNIVERSITY

Head: Gaze, Cervical Spine

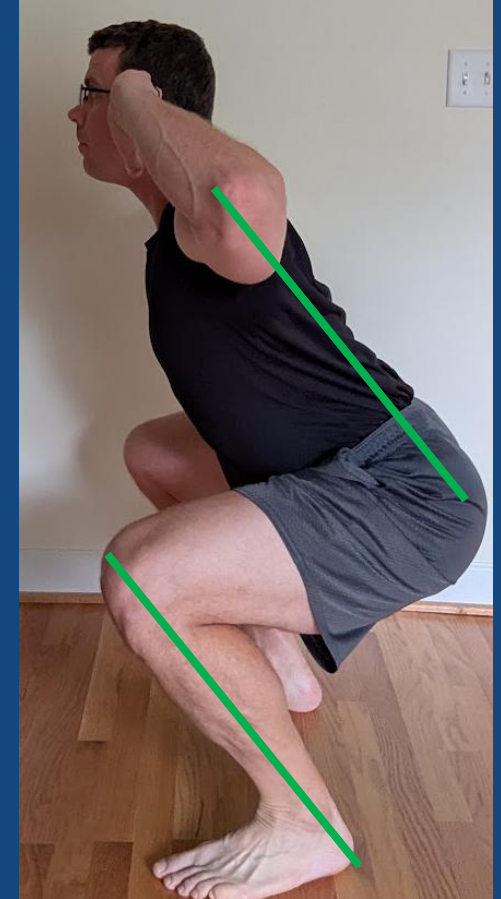
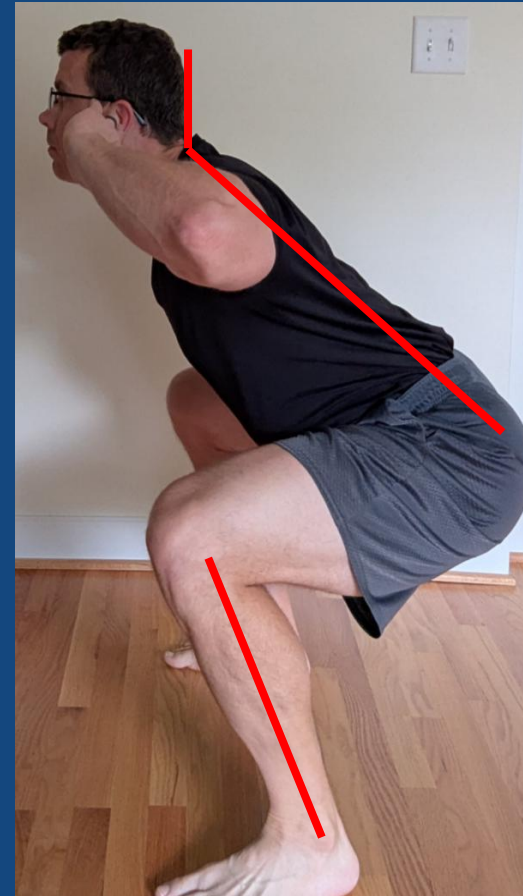
	Optimal Patterns	Faulty Patterns
Gaze	Looking straight ahead or slightly upward	Downward
Cervical Spine	Neutral, stable	Movement of the head forward or back (cervical flexion or extension)



Kritz, M., Cronin, J., & Hume, P. (2009). The bodyweight squat: A movement screen for the squat pattern. *Strength & Conditioning Journal*, 31(1), 76-85.

Head: Gaze, Cervical Spine

Fault	Potential Correction
Downward gaze	Verbal and visual cueing
Cervical flexion/head down	Improve proprioception (bean bag drill)
Forward head posture	Chin tucks, isometric cervical exercises
Extension of cervical spine	Restore torso : tibia relationship



Kushner, A. M., Brent, J. L., Schoenfeld, B. J., Hugentobler, J., Lloyd, R. S., Vermeil, A., ... & Myer, G. D. (2015). The back squat part 2: Targeted training techniques to correct functional deficits and technical factors that limit performance. *Strength and Conditioning Journal*, 37(2), 13-60.

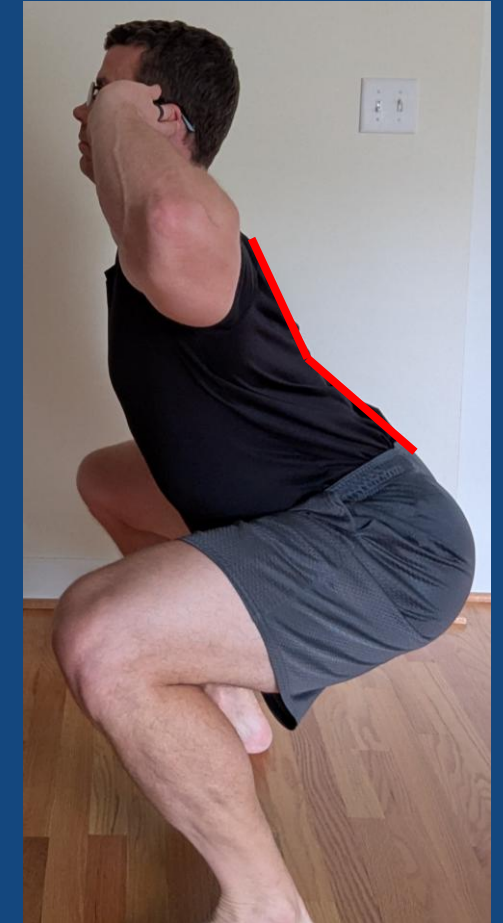
Thoracic Spine and Scapulae Position

Optimal Patterns

- Neutral or slightly extended thoracic spine, held stable
- Scapulae adducted

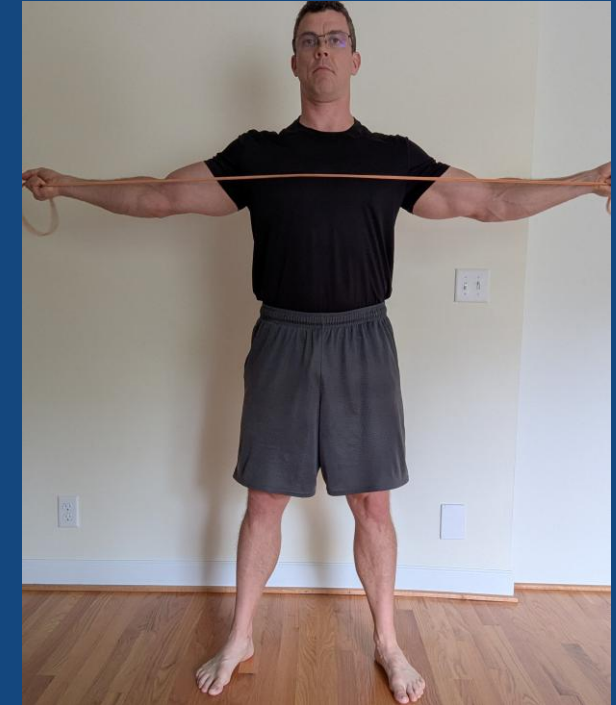
Faulty Patterns

- Flexion or excessive extension of the thoracic spine
- Scapulae abducted



Thoracic Spine and Scapulae Position

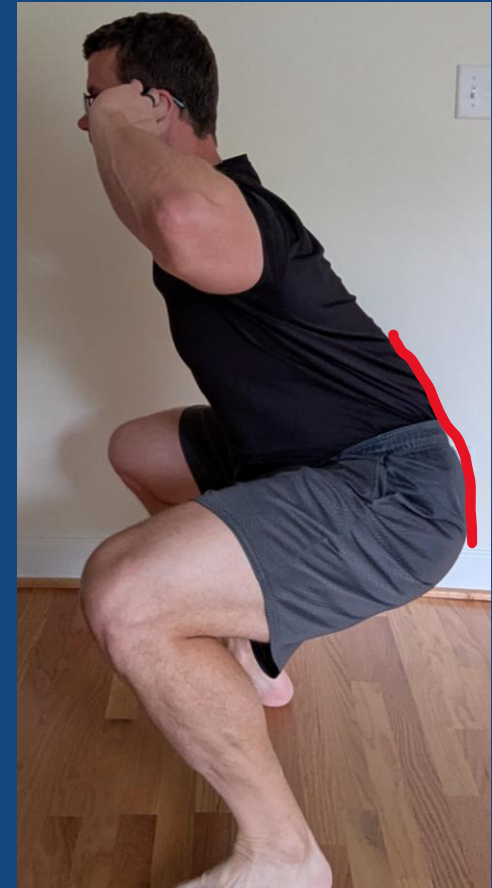
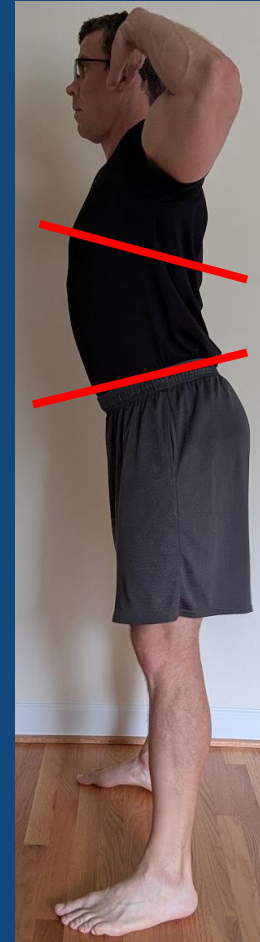
Fault	Potential Corrections
Thoracic movement	Strengthen upper back musculature Thoracic mobility exercises (pec or lat restrictions) Improve ankle dorsiflexion
Scapular abduction	Scapulae stabilizing exercises (middle/lower trapezius, rhomboids)



Kushner, A. M., Brent, J. L., Schoenfeld, B. J., Hugentobler, J., Lloyd, R. S., Vermeil, A., ... & Myer, G. D. (2015). The back squat part 2: Targeted training techniques to correct functional deficits and technical factors that limit performance. *Strength and Conditioning Journal*, 37(2), 13-60.

Lumbar Spine

Optimal Patterns	Faulty Patterns
Neutral, held stable	Extension or flexion movement at any time during the squat

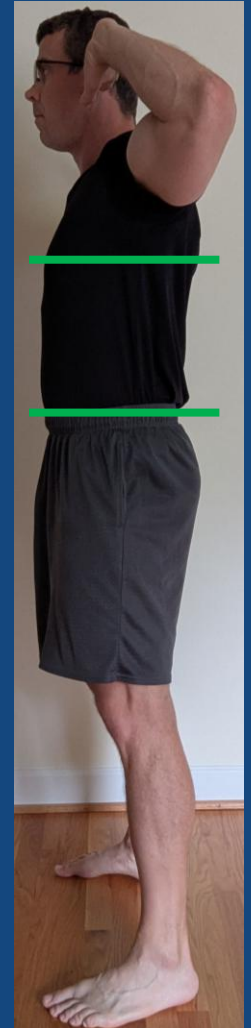


Kritz, M., Cronin, J., & Hume, P. (2009). The bodyweight squat: A movement screen for the squat pattern. *Strength & Conditioning Journal*, 31(1), 76-85.

LOGAN UNIVERSITY

Lumbar Spine

Fault	Potential Correction
Lumbar extension at the top of squat	“Draw the ribs down” Diaphragmatic breathing and core exercises
Excessive lumbar flexion and/or rounding at bottom of squat	Hip extensor activation, mobilize hip flexors, IT band



Kushner, A. M., Brent, J. L., Schoenfeld, B. J., Hugentobler, J., Lloyd, R. S., Vermeil, A., ... & Myer, G. D. (2015). The back squat part 2: Targeted training techniques to correct functional deficits and technical factors that limit performance. *Strength and Conditioning Journal*, 37(2), 13-60.

Lower Body Assessment

- **Rotate positions and repeat the assessment**
- **Review as a group and evaluate the lower body**

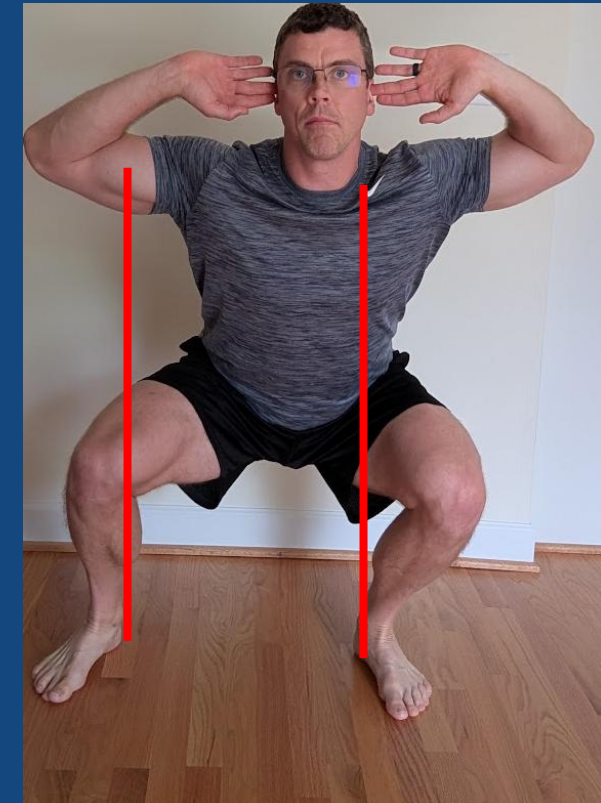
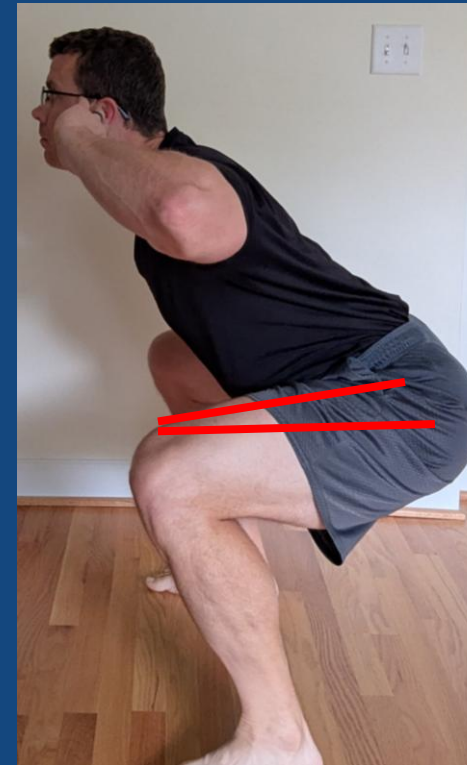
Anatomical Region	Areas to Evaluate	Optimal Viewing Position
Hip Joints	Top of thigh (depth)	Lateral
	Alignment with knees	Anterior
Knees	Position relative to toes at bottom of squat	Lateral
	Alignment with hips and feet	Anterior
Feet/Ankles	Tibia angle relative to the trunk	Lateral
	Foot interaction with the ground	Anterior or Posterior

Evaluating Lower Body Patterns

LOGAN UNIVERSITY

Hips: Depth, Movement

Optimal Patterns	Faulty Patterns
• Top of the thigh reaches parallel to the ground at the bottom position	• Top of the thigh does not reach parallel to the ground • Uncontrolled deep (hamstring-calf contact) squat
• Symmetrical movement, aligned with knees	• Lateral shift or asymmetrical movement



Hips: Depth, Movement

Fault	Potential Correction
Inadequate depth	Widen stance Hip mobility drills Split squat, goblet squat Increase ankle dorsiflexion
Uncontrolled deep squat	Verbal cues
Lateral hip shift / asymmetric movement	Hip abductor/external rotator strengthening Hip adductor/internal rotator mobility Unilateral exercises

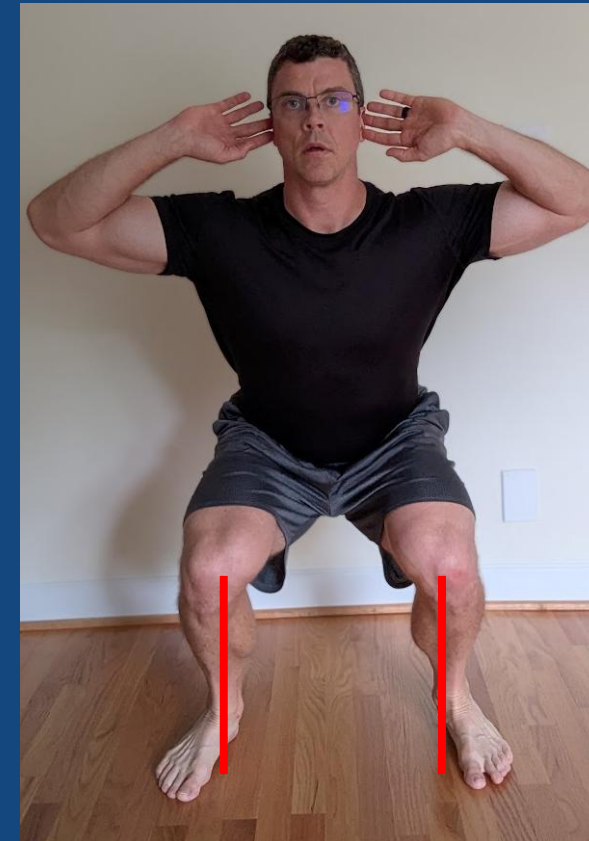


Kushner, A. M., Brent, J. L., Schoenfeld, B. J., Hugentobler, J., Lloyd, R. S., Vermeil, A., ... & Myer, G. D. (2015). The back squat part 2: Targeted training techniques to correct functional deficits and technical factors that limit performance. *Strength and Conditioning Journal*, 37(2), 13-60.

LOGAN UNIVERSITY

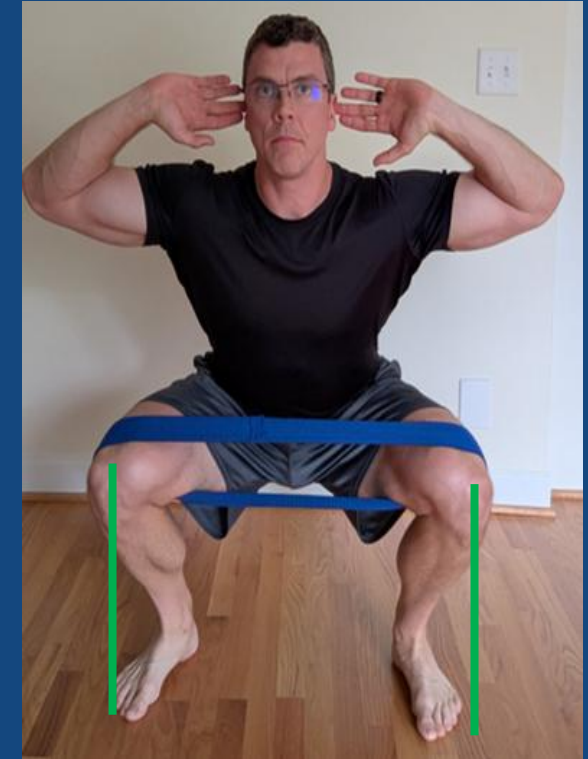
Knees: Anterior Movement and Lateral Stability

Optimal Patterns	Faulty Patterns
• Knees move slightly past toes	• Excessive movement past toes
• Aligned with hips and knees	• Excessive medial or lateral movement



Knees: Anterior Movement and Lateral Stability

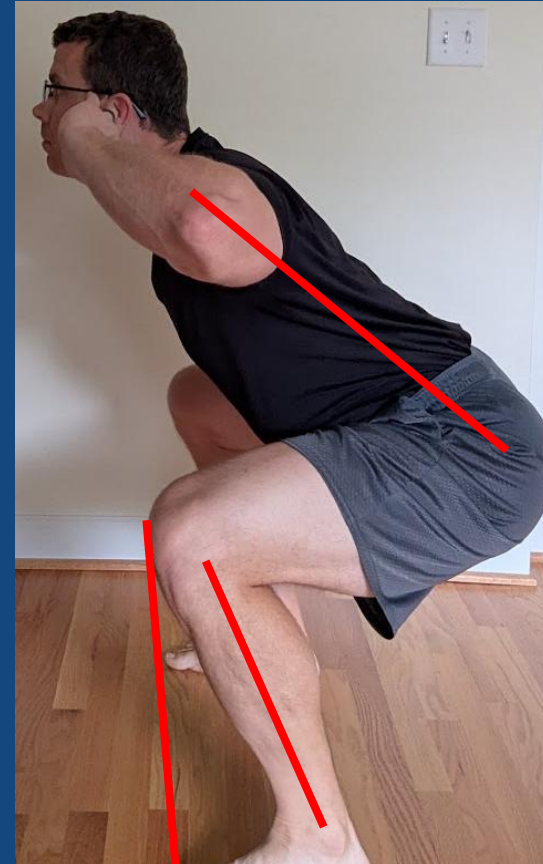
Fault	Potential Correction
Excessive movement past toes	Wall-facing squat Tempo squat
Excessive knee valgus	Banded squats Unilateral training



Kushner, A. M., Brent, J. L., Schoenfeld, B. J., Hugentobler, J., Lloyd, R. S., Vermeil, A., ... & Myer, G. D. (2015). The back squat part 2: Targeted training techniques to correct functional deficits and technical factors that limit performance. *Strength and Conditioning Journal*, 37(2), 13-60.

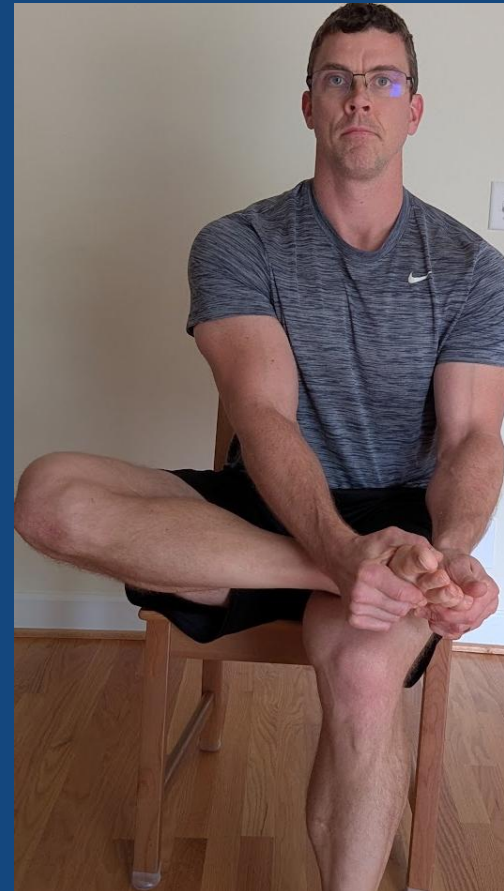
Feet/Ankles: Tibia Angle, Foot Contact

Optimal Patterns	Faulty Patterns
• Tibia is near parallel with the torso at bottom of the squat	• Significant mismatch between torso and tibia angle at bottom of the squat
• Foot stability • Entire foot remains in contact with the ground	• Excessive pronation or supination of the foot • Heel coming off ground



Feet/Ankles: Tibia Angle, Foot Contact

Fault	Potential Correction
Inadequate dorsiflexion	Plantarflexor stretches Ankle mobilization
Excessive foot pronation	“Grip the ground” with feet • Great toe: Down and back Foot preparatory drills • Single leg balance Banded ankle squats Calf raises



Kushner, A. M., Brent, J. L., Schoenfeld, B. J., Hugentobler, J., Lloyd, R. S., Vermeil, A., ... & Myer, G. D. (2015). The back squat part 2: Targeted training techniques to correct functional deficits and technical factors that limit performance. *Strength and Conditioning Journal*, 37(2), 13-60.

Questions?

Discussion

Christopher.Fahs@Logan.edu

LOGAN UNIVERSITY

Resources

- Kritz, M., Cronin, J., & Hume, P. (2009). The bodyweight squat: A movement screen for the squat pattern. *Strength and Conditioning Journal*, 31(1), 76-85.
- Myer, G. D., Kushner, A. M., Brent, J. L., Schoenfeld, B. J., Hugentobler, J., Lloyd, R. S., ... & McGill, S. M. (2014). The back squat: A proposed assessment of functional deficits and technical factors that limit performance. *Strength and Conditioning Journal*, 36(6), 4-27.
- Kushner, A. M., Brent, J. L., Schoenfeld, B. J., Hugentobler, J., Lloyd, R. S., Vermeil, A., ... & Myer, G. D. (2015). The back squat part 2: Targeted training techniques to correct functional deficits and technical factors that limit performance. *Strength and Conditioning Journal*, 37(2), 13-60.
- Nelson, N. (2012). Diaphragmatic breathing: the foundation of core stability. *Strength and Conditioning Journal*, 34(5), 34-40.
- McGill, S. (2010). Core training: Evidence translating to better performance and injury prevention. *Strength and Conditioning Journal*, 32(3), 33-46.
- McCurdy, K., & Vela, L. (2015). Resistance training for shoulder complex stabilization. *International Journal of Sports Science & Coaching*, 10(5), 933-947.