

How do key biomechanical variables (step length, ground contact time, and knee flexion) change with increasing speed, and what does this mean for football performance?

Football involves moving at different speeds, from walking to sprinting
Faster speeds need more force and better movement technique

Key factors:

Step length

Time the foot stays on the ground

Bend in the knee

Why they matter:

Affect speed and acceleration

Influence risk of injury, especially in the knee

Aim:

Study how these factors change between walking, jogging, and running

Understand what this means for football performance

Methods

- Participants:**

- 20 recreationally active people (P01–P20)

- Test conditions:**

- Walking (~1.4 m/s)
- Jogging (~2.8 m/s)
- Running (~4.0 m/s)

- What was measured:**

- Step length (meters)
- Ground contact time (seconds)
- Knee bend when the foot first hits the ground (degrees)

- How data was collected:**

- Movement recorded using Dartfish

- How data was processed:**

- Average (mean) values calculated for each variable at each speed

- Limitations:**

- Small sample size (20 people)
- Differences in individual running styles
- Speeds may not be exactly the same for everyone

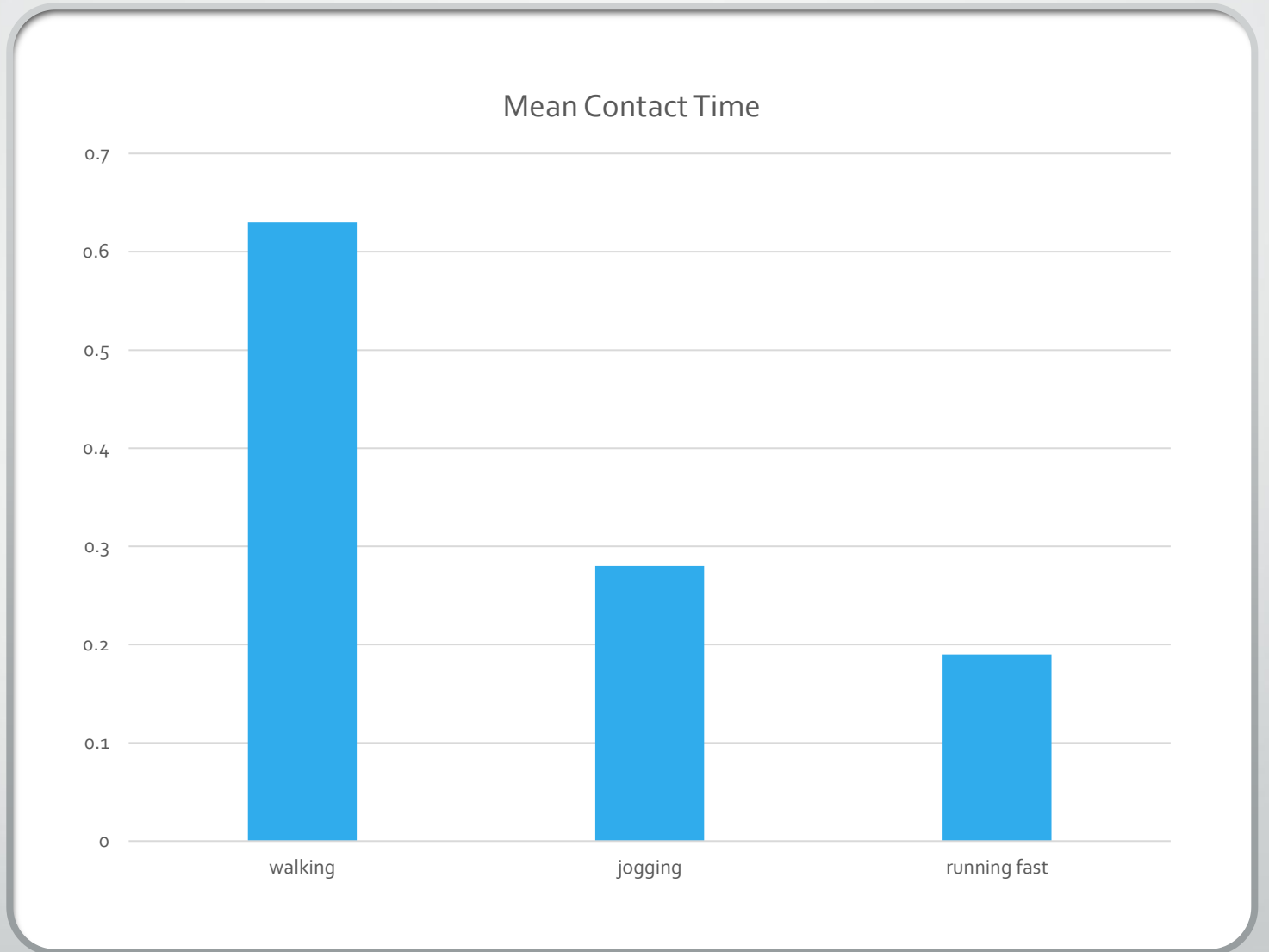
Step length (M)

Figure 1 was used to show how stride changes with speed, as step length is important for running speed and football performance.



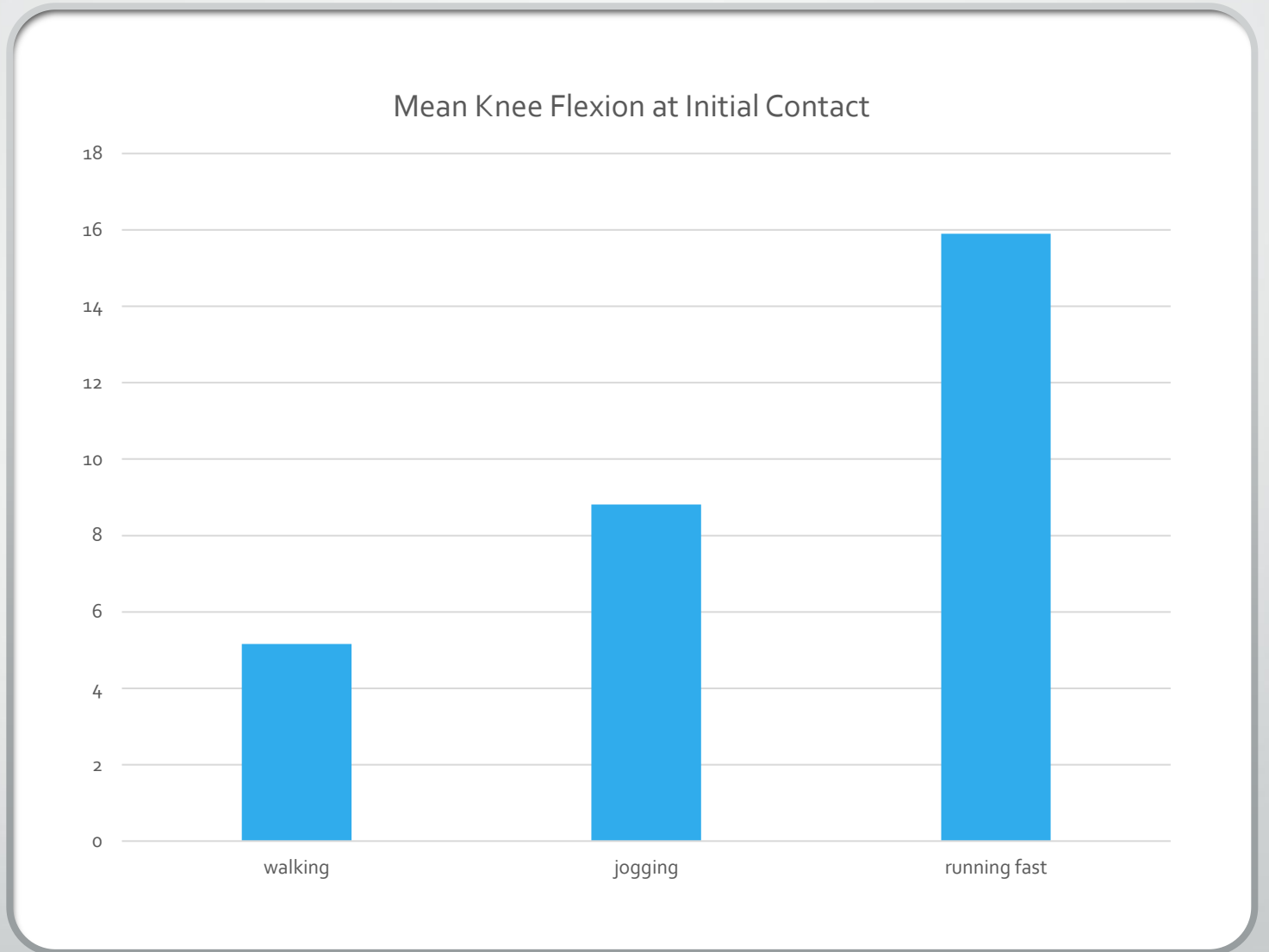
Ground contact time (S)

Figure 2 shows how quickly force is applied at different speeds, as shorter ground contact times are linked to more explosive movements in football.



Mean Knee Flexion at Initial Contact

Figure 3 shows how knee movement changes with speed, as knee flexion affects both force absorption and injury risk.



Discussion

Step length increased with speed

Ground contact time decreased with speed

Knee flexion slightly decreased at higher speeds

Faster speeds require greater force production

Shorter contact times improve acceleration and sprint performance

Reduced knee flexion may increase stiffness and injury risk

Findings align with biomechanical principles of sprinting

Relevant to football actions (sprinting, pressing, transitions)

Limitations

Small sample size

Individual technique differences

Limited speed control

knee joint angles were measured manually

A soccer ball with black and white hexagonal panels is positioned on a green grass field. The ball is in the lower-left corner of the frame. A decorative graphic consisting of a blue and grey diagonal line separates the image from the text area.

Conclusion

- **Conclusion:**
- Higher speeds require more forceful and efficient movement patterns
- These changes directly relate to football sprint performance and agility
- **Slide content**
- Step length increased with speed
- Ground contact time decreased with speed
- Knee flexion slightly decreased at higher speeds

Recommendations:

Develop

Develop lower-body strength and power (e.g. sprint training, plyometrics)

Focus on

Focus on sprint technique (longer stride + reduced contact time)

Include

Include injury prevention work (knee stability, eccentric strength)



Any questions?