RUHR-UNIVERSITÄT BOCHUM

# Can 2D motion capture validly detect gait events during overground human walking?


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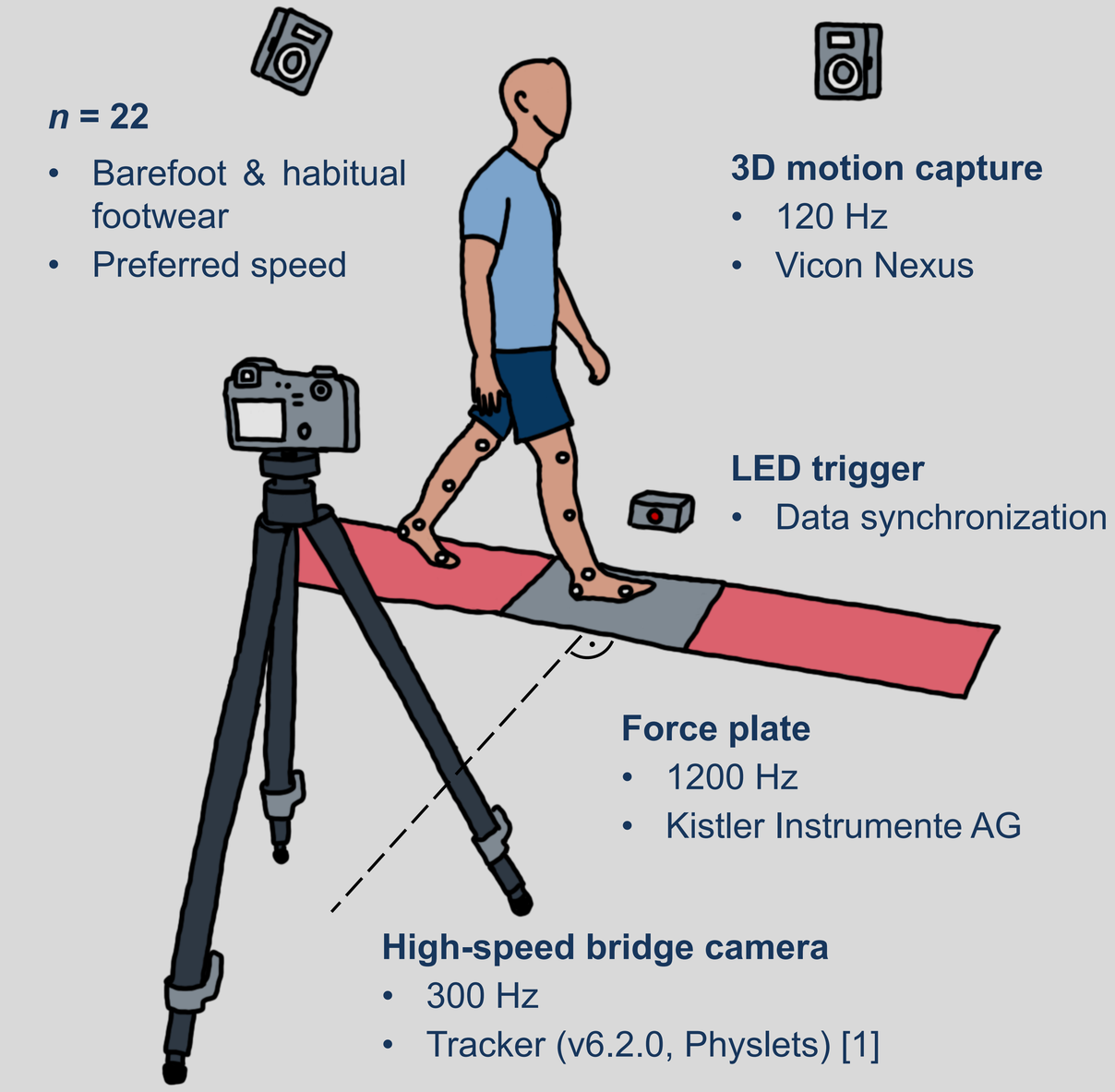
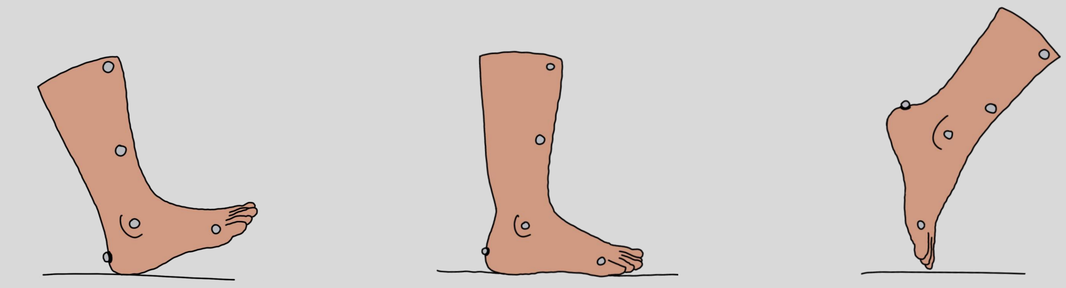
## Setup




## Data Analysis



Heel Strike **(HS)** Ground Contact Time **(GCT)** Toe Off **(TO)**

**Force Plate (FP)**

1. **HS & TO**: 20 N threshold
2. **GCT**: Duration between detected HS and TO

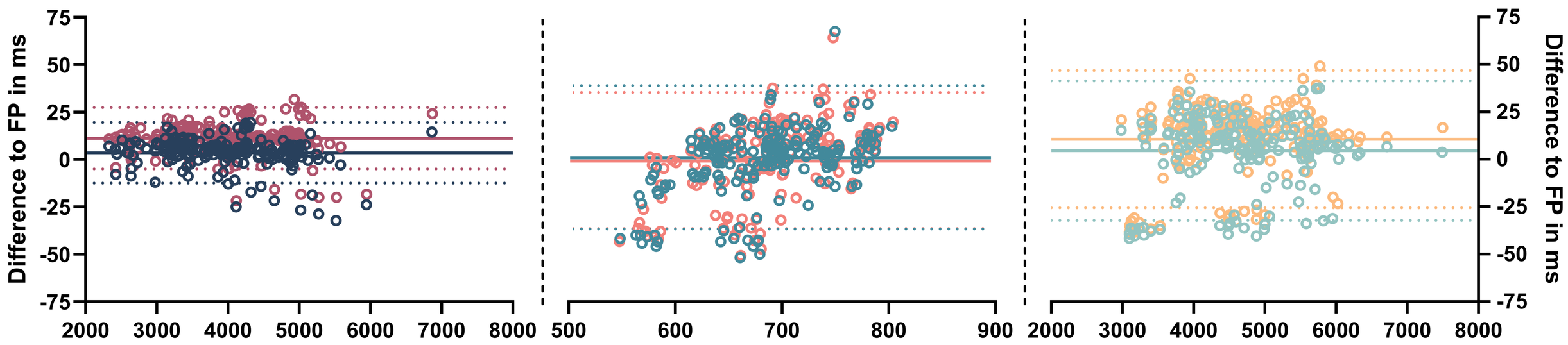
**Motion capture (2D & 3D)**

1. **HS & TO**: 2nd-order 6 Hz low-pass dual-pass Butterworth filter
2. **Peak vertical acceleration approach** [2]
3. **GCT**: Duration between detected HS and TO

**Error detection & agreement**

- Mean of 9 shod trials per subject (range: 5-12), 195 trials in total
- Repeated-measures Bland-Altman analysis
- Error: <2 frames (2D = 6.6 ms & 3D = 16.6 ms) deemed acceptable

## Results




| | HS in ms | GCT in ms | TO in ms |
|---|---|---|---|
| | 11±8 ms (<2% error) | -0.7±18 ms (<1% error) | 11±19 ms (<2% error) |
| | 4±8 ms (<1% error) | 1±19 ms (<1% error) | 5±19 ms (<1% error) |
| **2D vs. 3D:** | -7±3 ms (1% error) | 2±7 ms (<1% error) | -6±7 ms (<1% error) |

## Conclusion

- 2D tracking showed acceptable agreement compared with force-plate-based detection
- 2D tracking agreed with 3D tracking regarding HS detection, GCT and TO detection
- **2D motion capture validly detected gait events during overground human walking!**

## References / Contact


[1] https://opensourcephysics.github.io/tracker-website/

[2] Hreljac, A., & Marshall, R. N. (2000). Algorithms to determine event timing during normal walking using kinematic data. *Journal of biomechanics, 33*(6), 783-786.



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