When Are We Least Stable During Walking?

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Hypothesis
People are least stable to forward slips between 15 and 20% of the gait cycle

Methods
• 10 subjects walked on a split-belt treadmill (Fig 1A)
• Belt slips were applied 10x to each leg at 6 times
• 10, 15, 20, 30, 40, and 50% gait cycle (Fig 1B)
• Balance metrics were calculated from motion capture (Fig 1C)

Results
• "*" in Fig 2 represents that slip timing had a significant effect on that step
• Bars in Fig 2 represent two timings were significantly different
• "L" represents value is normalized to leg length

Dynamic Stability Margin (Fig 2A)
• Larger during first step after 20 and 30% slips

Step Width (Fig 2B)
• Larger during second and third steps after 20% slips

Step Length (Fig 2C)
• Lower during second step after 20 and 30% slips

Foot Placement (Fig 2D)
• Most different for second step after 30% slips

Key Take-Away Points
1. People are least stable to forward slips between 20-30% of the gait cycle
2. Slips at 20% influence width more than length of foot placement
3. Slips at 30% influence length more than width of foot placement

References