

Effects of Immersive Visual Feedback Distortion on Step Length Symmetry Using Augmented Reality

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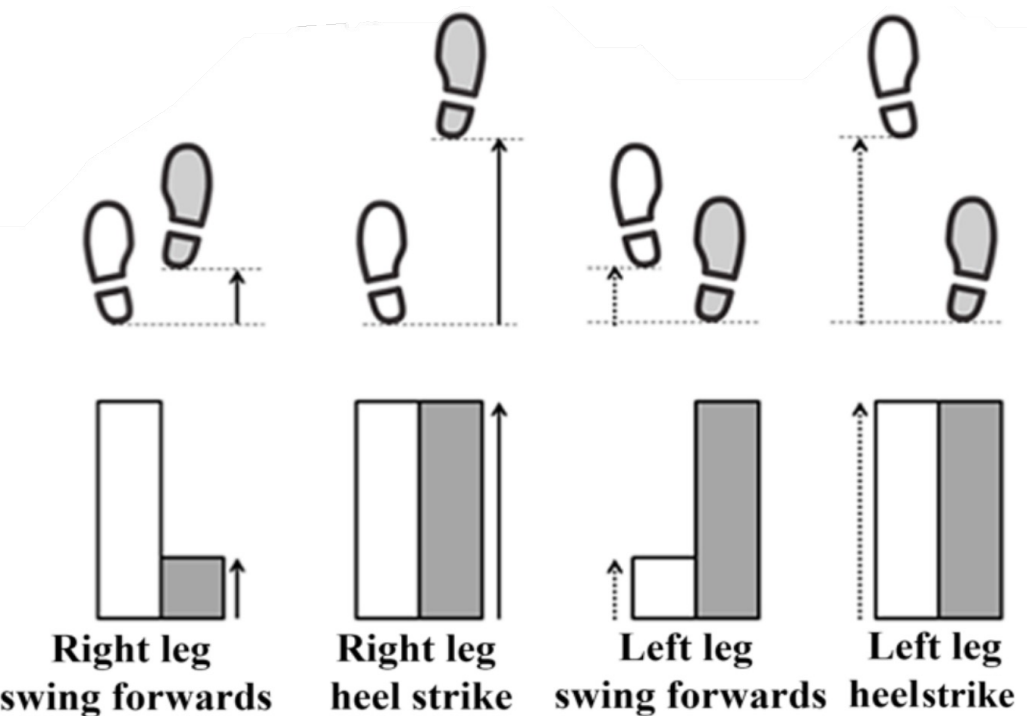


INTRODUCTION

- Gait Asymmetry**
 - Caused by neurological disorders, injuries, and/or aging
 - Hinders mobility, balance, & energy efficiency
- Visual Feedback Distortion (VD)**
 - Distorts visual feedback by misrepresenting step lengths
 - Enhances motor adaptation
- Augmented Reality (AR)**
 - More interactive & engaging
 - Keeps feedback within view
 - Reduces distractions
- Hypothesis:** AR-VD will lead to greater gait symmetry adaptation & longer-lasting aftereffects compared to monitor-based VD (M-VD).

METHODS

- 2 Visual Feedback (VF) Bars**
 - Right step length (RSL)
 - Left step length (LSL)
- Step Length Symmetry**
 - LSL = RSL
 - Equal bar heights at heel strike
- 1 Healthy Subject**
 - 1 AR-VD session
 - 1 M-VD session



- PHASE 1: Baseline**

VF: undistorted (2 min)
Instructions: match bar heights
- PHASE 2: Adaptation**

VF: distorted (10 min)
Instructions: match bar heights
- PHASE 3: Post-Adaptation**

VF: none (9 min)
Instructions: keep gaze ahead

METHODS

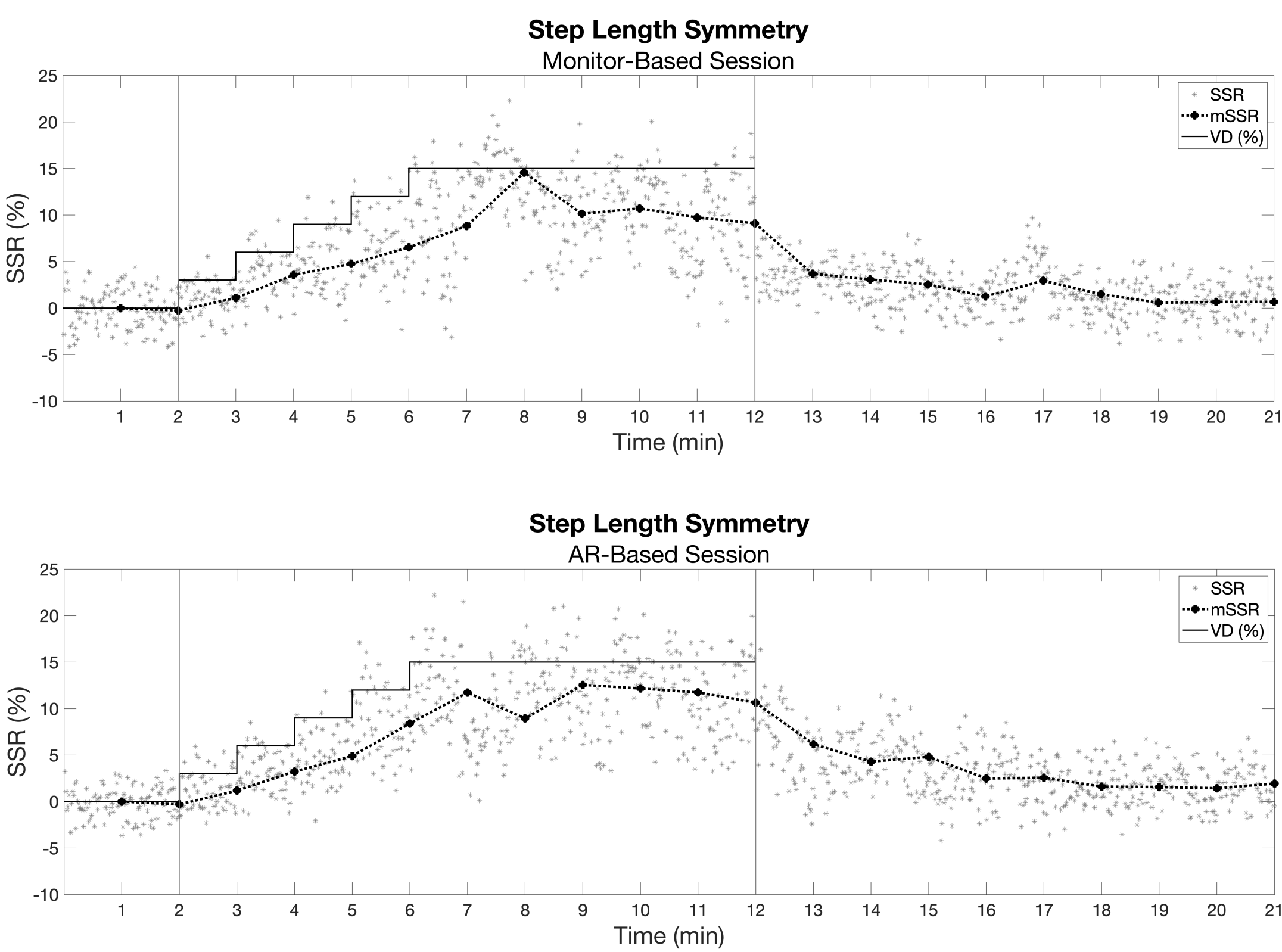
- Visual Feedback Distortion (VD)**
 - Each minute for first 5 minutes of adaptation phase:
 - Increase VD by 3%
 - Decrease RSL bar height by 3% of actual RSL
- Data Analysis**

Step Length Symmetry Ratio (SSR)
 - Calculated for each gait cycle

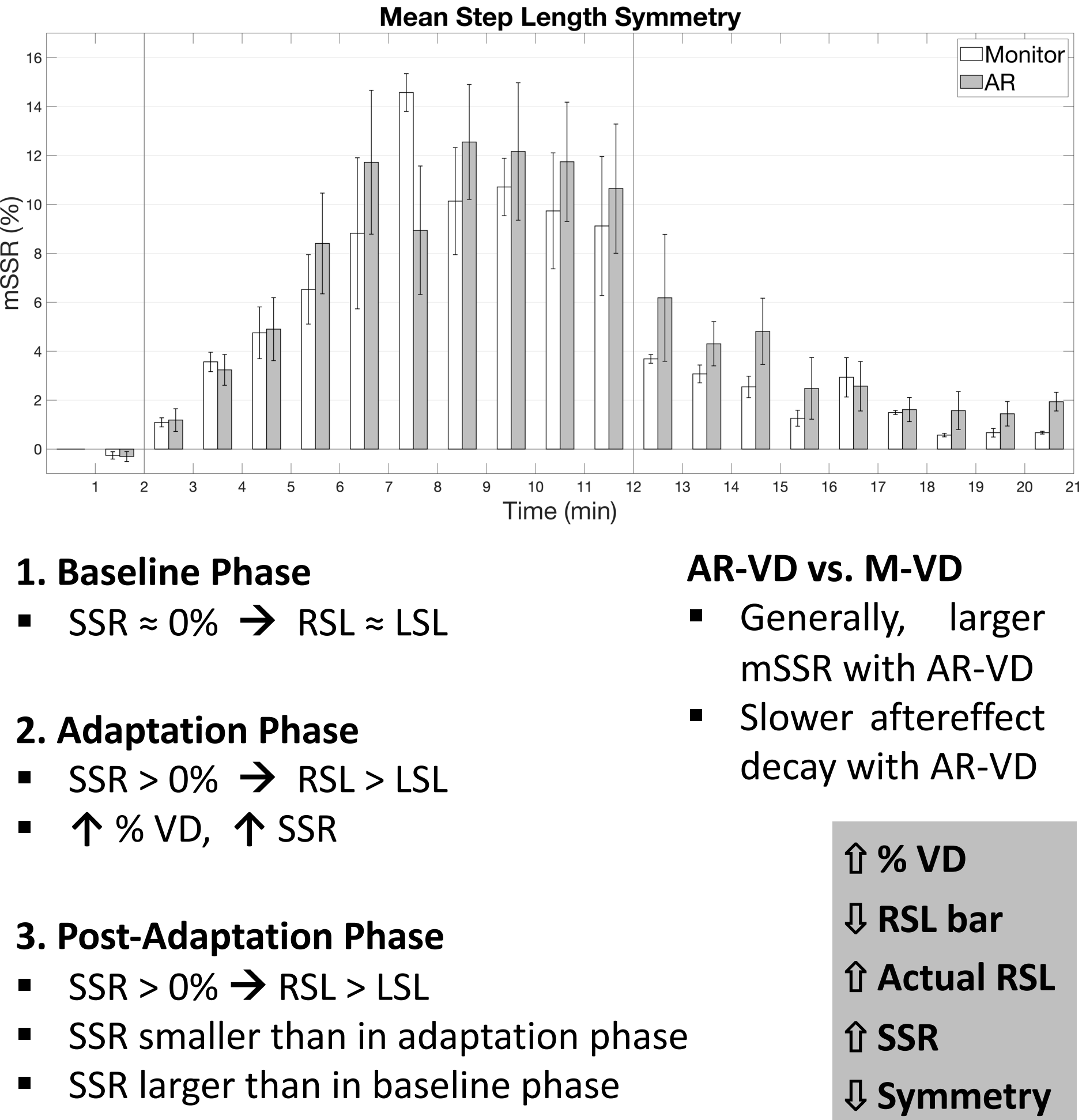
Mean SSR (mSSR)
 - Average SSR each minute

$$SSR(\%) = \frac{RSL - LSL}{\frac{1}{2}(RSL + LSL)} \times 100$$

INITIAL RESULTS



INITIAL RESULTS



CONCLUSIONS

- Initial results suggest AR-VD leads to greater gait symmetry adaptation & longer-lasting aftereffects compared to M-VD.**
- AR-VD holds potential to improve rehabilitation outcomes & functional independence for individuals with gait asymmetry
- Future Directions:**
- ↑ sample size
 - Incorporate metric to quantify subject engagement