# **Supplementary material**

## **Training program**

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| Table S1: Training program progression plan. Exercises further down the list are increasingly difficult. Progression to more difficult exercises was based on the physical therapist’s observation during the training sessions; if the participant was able to perform the task for 60 seconds, the difficulty would be increased. | | |
| **Exercises** | | **Duration/Frequency** |
| Warm-up: Head rotations, back stretching, trunk rotations | |  |
| Balancing   * one leg stance * switch legs * unstable surfaces | | 3 x 60 seconds  2 repetitions |
| Balancing, eyes-closed   * one leg stance (when possible) * switch legs * unstable surfaces | | 3 x 60 seconds  2 repetitions |
| Displacement of weight   * one leg stance * switch legs * unstable surfaces | | 3 x 60 seconds  2 repetitions |
| Passing/throwing around a ball in groups of 4 | | 5 rounds, both directions  3 repetitions |
| * fitness ball   + one leg   + unstable surface | * 2 kg ball   + one leg   + unstable surface |
| Alternative approaches for more trunk rotation:   * bigger circle * backs towards each other | |
| Pass big ball around: stop ball with foot and roll it back | | 5 rounds, both directions  3 repetitions |
| * fitness ball   + one leg   + unstable surface | * 2 kg ball   + one leg   + unstable surface |

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| *A group of different types of exercise equipment  Description automatically generated* |
| Figure S1: Equipment used during the training sessions. |

## **Experimental setup and model representation**

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| Figure S2.1: The experimental setup of a participant in unipedal stance on the robot-controlled mediolateral rotating platform. | Figure S2.2: Example of the model, constructed from the cluster markers, from which the kinematic parameters are obtained. |

## **Complete overview statistics – Lateral perturbation**

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| --- | --- |
| **A** | **B** |
| **C** | **D** |
| **E** | **F** |
| **G** | **H** |
| **I** | **J** |
| **K** | Figure S3: SPM1d statistics of the recovery responses after lateral perturbation for all parameters. Each panel displays the mean response per session (left top), ANOVA F-statistic (left bottom), and post-hoc t-statistic (right) over time for a single parameter. The degrees of freedom for all ANOVAs and dependent sample t-tests were [2,38] and [1,19], respectively. Effects were significant if the test statistic exceeded the critical threshold (red dotted lines). For the t-tests Bonferroni correction was applied. **p\*** represent the test’s omnibus p-value. If more than one cluster was present, their individual p-values are stated after the omnibus value in chronological order. |

## **Complete overview statistics – Medial perturbation**

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| **A** | **B** |
| **C** | **D** |
| **E** | **F** |
| **G** | **H** |
| **I** | **J** |
| **K** | Figure S4: Statistics of the recovery responses after medial perturbation for all parameters. Each panel displays the mean response per session (left top), ANOVA F-statistic (left bottom), and post-hoc t-statistic (right) over time for a single parameter. The degrees of freedom for all ANOVAs and dependent sample t-tests were [2,38] and [1,19], respectively. Effects were significant if the test statistic exceeded the critical threshold (red dotted lines). For the t-tests Bonferroni correction was applied. **p\*** represent the test’s omnibus p-value. If more than one cluster was present, their individual p-values are stated after the omnibus value in chronological order. |

## **Variability kinematics – Lateral perturbation**

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| A group of graphs showing different types of data  Description automatically generated with medium confidence |
| Figure S5: Kinematic responses to lateral perturbations. Group mean (solid lines) and standard deviation over subjects (coloured patches) per session. |

## **Variability kinematics – Lateral perturbation**

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| A group of graphs showing different types of data  Description automatically generated with medium confidence |
| Figure S6: Kinematic responses to medial perturbations. Group mean (solid lines) and standard deviation over subjects (coloured patches) per session. |

## **Variability EMG – Lateral perturbation**

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| A screenshot of a graph  Description automatically generated |
| Figure S7: EMG responses to lateral perturbations. Group mean (solid lines) and standard deviation over subjects (coloured patches) per session. The letters D & N in the titles indicate muscles on the dominant and non-dominant side, respectively. TA: tibialis anterior, SO: soleus, VL: vastus lateralis, RF: rectus femoris, GM: gluteus medius, ES: erector spinae, AL: adductor longus, PL: peroneus longus, GL: gastrocnemius lateralis, and BF: biceps femoris. |

## **Variability EMG – Lateral perturbation**

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| A collage of graphs  Description automatically generated |
| Figure S8: EMG responses to medial perturbations. Group mean (solid lines) and standard deviation over subjects (coloured patches) per session. The letters D & N in the titles indicate muscles on the dominant and non-dominant side, respectively. TA: tibialis anterior, SO: soleus, VL: vastus lateralis, RF: rectus femoris, GM: gluteus medius, ES: erector spinae, AL: adductor longus, PL: peroneus longus, GL: gastrocnemius lateralis, and BF: biceps femoris. |