Research Proposal

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1 Introduction

- General Area to be studied
  - Personalization of Prosthesis / Orthoses / Exoskeleton design [1]
- Why this area is important
  - many people suffer from locomotor defects, thus significantly modify the biomechanics and muscle activity of joints (e.g. asymmetrical gait patterns) [2]
  - correct locomotion (e.g. gaits) defect for disabilities [3]
  - reduce energy cost for long-distance locomotion [4]

2 Research Questions

- what is already known in the field (with several critical studies)?
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- Why these studies are not sufficient, thus requiring my further research?
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- **Key Research Questions, and Relevant Rationale**
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3 Plans and Methods

4 Significance, Conclusion

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References

[1] P. Slade, M. J. Kochenderfer, S. L. Delp, and S. H. Collins, "Personalizing exoskeleton assistance while walking in the real world," *Nature*, vol. 610, no. 7931, pp. 277–282, 2022.

[2] L. Nolan, A. Wit, K. Dudziñski, A. Lees, M. Lake, and M. Wychowañski, "Adjustments in gait symmetry with walking speed in trans-femoral and trans-tibial amputees," *Gait & posture*, vol. 17, no. 2, pp. 142–151, 2003.

[3] J. F. Lehmann, S. M. Condon, R. Price, *et al.*, "Gait abnormalities in hemiplegia: their correction by ankle-foot orthoses.," *Archives of physical medicine and rehabilitation*, vol. 68, no. 11, pp. 763–771, 1987.

[4] K. L. Poggensee and S. H. Collins, "How adaptation, training, and customization contribute to benefits from exoskeleton assistance," *Science Robotics*, vol. 6, no. 58, p. eabf1078, 2021.