**THESIS ABSTRACT**

THE EFFECT OF TRANSVERSE ROTATION AND LONGITUDINAL TRANSLATION BETWEEN PROSTHETIC COMPONENTS DURING THE GAIT OF UNILATERAL TRANS-TIBIAL AMPUTEES

Martin Twiste

United National Institute for Prosthetics & Orthotics Development, University of Salford, Salford.

Email: m.twiste@salford.ac.uk
Supervisor: Dr. Shyam Rithalia
Degree program: PhD
URL (This thesis is published online): [http://usir.salford.ac.uk/46433/](http://usir.salford.ac.uk/46433/)

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During stance phase of amputee gait, considerable forces are transmitted across the residual limb-socket interface. These loads and associated gait patterns can be altered by introducing compliant elements into the prosthesis. However, previous studies have failed to adequately describe the effects that components with such compliances have on amputee gait. In particular, despite manufacturers’ claims, it was not yet clearly demonstrated that the use of those devices results in clinical improvements regarding the loads on the residual limb. This thesis addresses such a lack of evidence in order to establish whether or not compliant elements are beneficial for amputee gait and the reduction of residual limb-socket interface pressures.

Devices with compliant elements allow two types of motion including angular and linear displacements around and along the longitudinal axis of a prosthesis. Whether they affect the gait pattern and loads on the residual limb was determined by permitting these displacements separately, together and not at all during gait tests. Customised pros-theses and measuring equipment were specifically designed and manufactured. Data were collected with regard to lower limb motion, ground reaction forces, displacements at the device with compliant elements and residual limb-socket interface pressures. Purpose-written programs served to process the data for calculating appropriate gait parameters.

The results showed that when mobility of the described device with the compliant elements was permitted, in-socket pressures were reduced. This demonstrated that both angular and linear displacements have a positive effect on amputee gait parameters, and this was even more beneficial when these two motions were combined. Particularly advantageous was the delay and decrease in peak ground reaction forces that consequently lowered shock impacts. In conclusion, the current investigation demonstrated that the two compliant elements have the potential for reducing the risk of damaging residual limb tissues.

**CITATION**


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**KEYWORDS**

Prosthetics, Rehabilitation, Amputee, Lower limb amputee, Prosthetic socket, Residual limb tissues, interface pressures.