

# The effectiveness of total surface bearing compared to specific surface bearing prosthetic socket design on health outcomes of adults with a trans-tibial amputation: a systematic review

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A thesis submitted by

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in partial fulfilment of the requirements for the Degree of  
Master of Clinical Science (MClinSc)

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February 14<sup>th</sup> 2014

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# **Abstract**

## **Background**

Lower-limb prostheses enable life participation for people with amputation. The aim of this systematic review was to synthesise evidence on the effectiveness of total surface bearing (TSB) compared with specific surface bearing (SSB) prosthesis designs on health outcomes.

## **Inclusion criteria**

### ***Types of participants***

Trans-tibial amputees aged 14 years and older utilising a TSB or SSB prosthesis.

### ***Types of interventions and comparators***

The intervention was the TSB and the comparator was the SSB design.

### ***Types of studies***

This review considered all relevant quantitative study designs.

### ***Outcomes and outcome measures***

Outcome measures relating to function and mobility, comfort and pain, quality of life and energy expenditure were considered.

## **Search strategy**

A three-step search strategy across 13 databases and discipline-specific resources was pursued. Published and unpublished studies in English were considered, from database inception to June 2012.

## **Methodological quality**

Two independent reviewers, using the Joanna Briggs Institute MASTARI appraisal checklists, undertook critical appraisal.

## **Data collection**

Data about interventions, populations, study methods and outcomes of significance were extracted using the MASTARI tool from the Joanna Briggs Institute.

## **Data synthesis**

Quantitative data was pooled in statistical meta-analysis using the Cochrane Review Manager Version 5.2 where possible. Where not possible, findings were presented using narrative and tables.

## **Results**

This review identified and analysed 28 measures assessing the health domains, presenting mixed findings. Twenty-one measures found no difference between socket designs; four found a significant difference favouring the TSB and three found a significant difference favouring the SSB design.

Suspension and interface variation was found. Sub-group analysis assessed TSB with gel interface and SSB with foam interface, to examine interface influence. Four measures found no difference and two measures, walking speed and cadence, found a significant difference favouring the TSB design.

Further sub-group analysis assessing the influence of pin suspension with TSB compared to supra-condylar suspension with SSB found significant difference favouring TSB design for walking speed and socket preference outcomes.

## **Conclusions**

The available evidence on the effectiveness of prosthetic socket designs suggests no clear choice between the TSB and SSB. This may be due to variation in interface and suspension utilised. Interpreting the findings, the TSB was as effective as the SSB design in improving health outcomes relating to function, comfort and quality of life.

## **Implications for Practice**

In finding that the TSB is as effective as the SSB design in improving health outcomes implies that prescription may depend on clinician knowledge and skill-set, funding availability and patient preference.

Prosthetists require the skill-set to deliver the TSB design. TSB prescription involves a gel interface, with additional costs; therefore funding is required to enable this prescription.

## **Implications for Research**

Additional high quality studies involving a larger sample size, across aetiologies are required. Consistency in measures is critical to facilitate comparison and enhance meta-analysis.

Studies on cost-effectiveness of socket designs are required to inform choice from a societal perspective.

## **Keywords**

Total surface bearing, specific surface bearing, patellar tendon bearing, prosthetic, trans-tibial, amputee, systematic review

## Declaration

I certify that this work contains no material which has been accepted for the award of any other degree or diploma in my name, in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. In addition, I certify that no part of this work will, in the future, be used in a submission in my name, for any other degree or diploma in any university or other tertiary institution without the prior approval of the University of Adelaide and where applicable, any partner institution responsible for the joint-award of this degree.

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## **Acknowledgments**

I extend gratitude to Dr Sarahlouise White and Dr Judith Streak Gomersall and JBI staff for their support and expertise in the development of the systematic review report, as well as Edward Ko Ko Aung MBBS for serving as the second assessor in the review.

I acknowledge and thank SA Health, Repatriation General Hospital, for providing me with study leave to undertake the critical learning coursework to enable me to commence the systematic review process.

A special thank you is reserved for my husband and children who have encouraged me, with pride and gusto to achieve this body of work, and who have allowed me the indulgence of time to complete it. Thank you to my Mother, who has assisted my family in every way possible, so that I may indulge in this process.

Most importantly, I dedicate this work in memory of Jane Hunt, my beloved Aunt, who never tired of searching for answers to her cause, to mine, and to all whom she met. A contributor and keeper of knowledge, and my inspiration for continuation of learning.