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**Title**

Contextual enquiry and development of a new type of transfemoral interface

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**Summary**

Connect TF is a new type of transfemoral interface, developed specifically for low active amputees. A contextual enquiry collects and interprets qualitative data in a novel manner. This paper details the contextual enquiry, interpretation and features of the resulting product it helped to define.

**Introduction**

To design and develop a new type of prosthetic interface for low active amputees a contextual inquiry was conducted. A contextual inquiry is a user-centred design process, in which researchers collect data where people are living and apply these findings to a final product.[1] Contextual design can be an alternative to engineering and feature driven models of creating new systems. To put this into context instead of asking an amputee to rate interface comfort on a scale of 1-5, the amputee is visited in their home and asked to physically act out their daily activities. This begins by asking the amputee to get into their bed and asking them to show how they get out of bed in the morning, show how they go to the toilet, show how they get showered and so on through all activities in a typical day. This process of acting out provides the investigators with “key insights” and prompts the amputee to state the “real” issues they are facing day to day.

**Methods**

The contextual enquiry process was conducted with amputees from a range of different activity levels, the aim being to better understand and contrast high activity amputees with low activity amputees. In addition to this data interviews were conducted with certified prosthetists/ orthotists, physiotherapists, carers and care managers.

This qualitative data was then interpreted and consolidated using story boards (work-flow) and spider diagrams. This data was then used to inform the development and create requirements of Connect TF, a transfemoral product, specifically created for low active amputees.

## **Results**

When an amputee engages in an activity of daily living, walking did not present as the most significant problem. Activities such as donning and doffing posed many issues for users. In the worst case some users were able to walk on their prosthesis but not able to don it alone. Many amputees described issues using the toilet. All amputees stating showering was problematic. Sitting comfort was poor regardless of activity level as all amputees were sitting in a hard, conventional prosthetic socket.

This data informed the requirement of the product that was designed specifically for low active amputees. The main new requirements for a new type of prosthetic interface were, easy to don, comfortable to sit in and volume adjustable. Donning is difficult for low-active amputees as it requires physical effort, cognitive effort and time. As such Connect TF was designed to “open up” to allow ease of donning. To close (tension) Connect TF a deliberately large handle is utilized. This allows those with very poor hand strength and/or dexterity to operate. Sitting is the activity most low active amputees do day to day. However, conventional sockets are typically designed for walking only and can cause discomfort during sitting. The Connect TF was designed for walking and sitting. Conventional sockets are a hard-fixed shape which do not adapt to volume changes. Connect TF is volume adjustable and is able to adjust comfort and fit in real time by a CPO.

## **Conclusion**

Using the contextual enquiry method permitted conclusions and product requirements to be created that may have been omitted if more traditional design approaches were utilized alone. The resulting product Connect TF contains specific design features intended to allow low active amputees to successfully use the device.

A negative to conducting a contextual enquiry is that it is very resource intensive requiring travel to the amputee’s home, significant time (hours) with each and every amputee, then further time

to interpret the subjective data gathered. This criticism of contextual enquiry has been noted by other researchers [2]

### **References**

[1] Beyer, H. & Holtzblatt, K. (1998). Contextual Design: Defining Customer-Centered Systems. San Francisco: Morgan Kaufmann. ISBN 1-55860-411-1

[2] Holtzblatt, K., Wendell, J.B., & Wood, S. 2005. Rapid Contextual Design: A How-to guide to key techniques for user-centered design. San Francisco: Morgan-Kaufmann.