

# MEASURING USER EXPERIENCE OF A SENSORY ENABLED UPPER LIMB PROSTHESIS

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## BACKGROUND

New technologies that restore sensory feedback to upper limb prosthesis users have the potential to greatly improve quality of life. One such technology is the sensory restoration systems (SRS) developed at Case Western Reserve University. Measuring the impact of SRS is challenging, given that existing measures do not quantify likely psychological impacts of SRS.

## PURPOSE

To describe the development of a multi-dimensional subjective experience scale that is responsive to change associated with use of an SRS.

## METHODS

### Content development

Measure content was identified through informal conversations with two subjects implanted with an SRS, discussion with subject matter experts and literature review. Preliminary item banks were drafted and reviewed by measurement workgroup members. Items were refined based on feedback. Subscales were created for: self-efficacy of prosthesis use, prosthesis embodiment, body image, prosthesis efficiency and social touch.

### Patient Experience Measure

Items are graded using a 5 point Likert Scale (strongly disagree to strongly agree). The self-efficacy subscale asks subjects to rate confidence using the prosthesis to complete 7 items which are typically challenging for prosthesis users. The Embodiment subscale consists of 8 items that ask about prosthetic embodiment (e.g. the prosthesis is a part of me) The 9-item Body Image subscale asks about impact of the prosthesis on self-image (e.g. when I remove my prosthesis I feel more confident). The 3-item Prosthesis Efficiency scale includes items relating to speed and focus required to use the prosthesis. Finally, the social touch subscale consists of 11 items pertaining to prosthesis use in social interactions.

### Data collection

Two subjects with implanted SRS participated in a home study. During the intervention stage, each wore an experimental hand system with embedded sensors and received nerve stimulation. During the Pre-test and Post-test stages, subjects wore the experimental hand system, without stimulation. At the end of each stage, subjects completed the Patient Experience Scale.

### Data analysis

Item scores for each subscale were averaged. Descriptive analyses were conducted by subject and stage.

## RESULTS

Scores for self-efficacy, embodiment, efficiency and social touch subscales were higher for the sensory stimulation stage for both subjects. Scores for body image were highest for subject 1 at post-test and highest for subject 2 during sensory stimulation.

## CONCLUSIONS/IMPLICATIONS

Findings provide preliminary evidence of the validity and responsiveness of the Patient Experience Scale, a unique measure designed to quantify impact of prosthetic sensory restoration. Data collection in additional subjects will enable examination of scale internal consistency.