Australian Government
Australian Research Council

EI 2018 ENGAGEMENT AND IMPACT

# Engagement and Impact 2018

## La Trobe University

## LTU11-BCS (HLS) - Impact

## Overview

### Title

*(Title of the impact study)*

| |
|---|
| An effective neuroscience intervention to change practice and improve function after stroke |

### Unit of Assessment

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| 11 - Medical and Health Sciences |

### Additional FoR codes

*(Identify up to two additional two-digit FoRs that relate to the overall content of the impact study.)*

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|---|
| 17 - Psychology and Cognitive Sciences |

### Socio-Economic Objective (SEO) Codes

*(Choose from the list of two-digit SEO codes that are relevant to the impact study.)*

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| 92 - Health |
| 97 - Expanding Knowledge |

### Australian and New Zealand Standard Industrial Classification (ANZSIC) Codes

*(Choose from the list of two-digit ANZSIC codes that are relevant to the impact study.)*

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|---|
| 84 - Hospitals |
| 85 - Medical and Other Health Care Services |

### Keywords

*(List up to 10 keywords related to the impact described in Part A.)*

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|---|
| Stroke rehabilitation |

Somatosensory disorders

Upper extremity

Neuroscience

Recovery

Learning

Allied Health Professionals

**Sensitivities**

Commercially sensitive

No

Culturally sensitive

No

**Sensitivities description**

*(Please describe any sensitivities in relation to the impact study that need to be considered, including any particular instructions for ARC staff or assessors, or for the impact study to be made publicly available after EI 2018.)*

**Aboriginal and Torres Strait Islander research flag**

*(Is this impact study associated with Aboriginal and Torres Strait Islander content?*
*NOTE - institutions may identify impact studies where the impact, associated research and/or approach to impact relates to Aboriginal and Torres Strait Islander peoples, nations, communities, language, place, culture and knowledges and/or is undertaken with Aboriginal and Torres Strait Islander peoples, nations, and/or communities.)*

No

**Science and Research Priorities**

*(Does this impact study fall within one or more of the Science and Research Priorities?)*

Yes

| **Science and Research** | **Practical Research Challenge** |
|---|---|

| Priority | |
|---|---|
| Health | Better models of health care and services that improve outcomes, reduce disparities for disadvantaged and vulnerable groups, increase efficiency and provide greater value for a given expenditure. |

# Impact

### Summary of the impact

*(Briefly describe the specific impact in simple, clear English. This will enable the general community to understand the impact of the research.)*

‘After my stroke my hand felt like it was blind.’ One in two people who experience stroke lose the sense of touch. Due to difficulties using simple objects such as a fork, and learn not to use their hand. This loss negatively impacts return to daily activities and work. La Trobe’s Professor Leeanne Carey has translated new discoveries in how the brain learns and recovers into an effective rehabilitation therapy to help these people regain their sense of touch, and use it in daily activities. With new clinical assessments and therapy tools, changes in brain function were demonstrated. Called SENSe, the approach is now recognised and being used in clinical settings nationally and internationally. Therapists are being upskilled, improving outcomes for more stroke survivors.

### Beneficiaries

*(List up to 10 beneficiaries related to the impact study)*

Stroke survivors

Family and caregivers of stroke survivors

Occupational therapists and physiotherapists who deliver stroke rehabilitation

Rehabilitation services and health networks

Allied Health professions and organisations

Emerging researchers and PhD students

Organisations that develop and audit national and international stroke guidelines

### Countries in which the impact occurred

*(Search the list of countries and add as many as relate to the location of the impact)*

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| Australia |
| England |
| United States of America |
| Canada |
| Israel |
| Hong Kong (SAR of China) |

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| Singapore |
| Sweden |

**Details of the impact**

*(Provide a narrative that clearly outlines the research impact. The narrative should explain the relationship between the associated research and the impact. It should also identify the contribution the research has made beyond academia, including:*
*- who or what has benefitted from the results of the research (this should identify relevant research end-users, or beneficiaries from industry, the community, government, wider public etc.)*
*- the nature or type of impact and how the research made a social, economic, cultural, and/or environmental impact*
*- the extent of the impact (with specific references to appropriate evidence, such as cost-benefit-analysis, quantity of those affected, reported benefits etc.)*
*- the dates and time period in which the impact occurred.*

*NOTE - the narrative must describe only impact that has occurred within the reference period, and must not make aspirational claims.)*

One-in-six people suffer a stroke and stroke adds $5 billion per year to Australian health costs. Of an estimated 220,000 Australian stroke survivors, half are living in the community with residual disability. More than half lose the sense of touch, which affects their limb use in daily life and impairs return to previously valued activities and work. The lifetime costs and burden on the individual, their carers, and the Australian community are cumulative, ongoing and profound.

Carey and her team have translated discoveries of how the brain learns and recovers after stroke into a novel therapy to help restore the sense of touch in stroke survivors. The therapy, known as SENSe (Study of the Effectiveness of Neurorehabilitation on Sensation) is founded on learning and neuroscience principles, and designed to forge new connections in the brain. Specially designed training tasks are used to improve a stroke survivor's ability to discriminate textures, sense where their limbs are positioned in space and recognise objects through touch. The person learns how to apply these skills in self-selected valued daily activities. This specialised rehabilitation results in skill acquisition and recovery, even months and years after their stroke. The approach shifts the clinical emphasis (and evidence base) from compensation and non-use of the arm to regaining the sense of touch and using it in daily activities.

Improvement in sensory function, arm use, and return to previous life activities has been demonstrated across a series of studies, including a double-blind randomised control trial. Independent interviews and thematic analysis of stroke survivors' experiences of participating in SENSe highlight the personal impact of these outcomes. Survivors revealed distinct awareness of gains and differences in bodily sensations: "Yeah, 100%. It just like when I didn't have the retraining to when I done it, it's like chalk and cheese, just, chalk and cheese [...] It done wonders for me, like, um, in sensation. [...]" (Michael, a young carpenter); and awareness of improved functioning, with increased control and choice in daily performance: "I always use my right (affected) hand. In our daily life, sensory retraining does a lot of things for me [...] I can do all the things at work, at home, the driving" (Kevin).

The intervention was systematically developed and tested in line with the Medical Research Council Framework for Development of Complex Interventions; providing an exemplar to researchers in the field. The approach is recommended in the National Health and Medical Research Council's (NHMRC) national stroke guidelines. SENSe therapy is also recommended in the international 'app' on best practice upper limb therapy for stroke: an application developed over 5 years by an international panel of expert clinicians and researchers. A 7-minute video animation, available on YouTube (>5,000 views), was produced in 2013 to increase awareness of restorative approaches to rehabilitation for physicians, therapists, stroke survivors and neurorehabilitation communities. Therapy may be delivered by occupational or physical therapists across sub-acute, rehabilitation and community services.

However, creation of the therapy and demonstration of its effectiveness does not alone change practice. Therapists need to have the skills and resources to change. Carey and her team have developed and produced clinical assessment and therapy training tools to support delivery of SENSe therapy in practice settings. Clinical practice protocols and multimodal training packages of DVDs, manuals, and case scenarios, have been developed to 'upskill' therapists. During the reference period more than 25 training workshops were delivered; reaching >800 therapists nationally and internationally, including UK, Canada, USA, Singapore, Israel, Hong Kong, and Sweden. More than 350 training packages were sold. During the reference period, six Health Networks in Victoria and NSW committed therapist time and resources (n=80 therapists) to change practice via involvement

in the SENSe Implement study. A network of sites and upskilled therapists continues to be created to increase access to this therapy for stroke survivors.

For people who experience stroke the approach provides new hope. The neuroscience-based SENSe program garnered national and international media attention, with several media interactions during the reference period including: That's Life magazine (2013); the Herald Sun (2013); Brain Matters (2013); The Global Mail (2012); ABC 7.30 (2011). Keynote and invited presentations on the topic, >23, were presented nationally and internationally. The approach has also been highlighted in three podcasts presented by the National Stroke Foundation (on neuroplasticity, sensory loss, and pain) and in a stroke information session held by Member of Parliament Jenny Macklin in 2015.

The approach is having broader impact with application to other populations. SENSe equipment and therapy have been modified to help children with cerebral palsy learn to better feel with, and use their hands to engage in activities important to them. Successful outcomes have been achieved in collaboration with a team of therapists and paediatricians in Western Australia. This work was featured on Channel 7 News Perth (2013).

Development and refinement of the SENSe approach has continued to be supported by national and international researchers and funding since the success of the original SENSe study (2011). This has included support from the NHMRC to investigate associated changes in brain networks; NHMRC Centre for Research Excellence in Stroke Rehabilitation and Recovery; National Institute of Health (NIH) Neurological Toolbox project; and the James S. McDonnell Foundation international collaboration Advancing the Science of Rehabilitation: Translating Neuroscience into Everyday Life.

**Associated research**

*(Briefly describe the research that led to the impact presented for the UoA. The research must meet the definition of research in Section 1.9 of the EI 2018 Submission Guidelines. The description should include details of:*
*- what was researched*
*- when the research occurred*
*- who conducted the research and what is the association with the institution)*

The Study of the Effectiveness of Neurorehabilitation on Sensation (SENSe), funded by the National Health and Medical Research Council, was the first successful randomised control trial of sensory rehabilitation. Leeanne Carey, Professor in Occupational Therapy at La Trobe, led this program of research, developing a novel neuroscience and evidence-based approach to sensory rehabilitation after stroke. The study, published in 2011 (IF = 4.711; highest ranked journal in the field; >80 cites), found that the intervention improves sensation and functional use of the arm after stroke.

Prof Carey has systematically provided evidence of how robust principles from neuroscience can be operationalized into learning-based rehabilitation protocols and better outcomes for stroke survivors. Novel findings of longitudinal changes in activation of sensory brain regions following touch discrimination training were demonstrated in stroke patients with cortical and/or subcortical somatosensory lesions.

Quantitative assessments have been developed and empirically tested, including the Tactile Discrimination Test, Wrist Position Sense Test and functional Tactile Object Recognition Test.

The research is innovative, represents a shift in rehabilitation focus, and is recognised internationally. Findings are published in some of the highest-ranking journals across fields of Rehabilitation, Neurology and Cognitive Neuroscience.

**FoR of associated research**

*(Up to three two-digit FoRs that best describe the associated research)*

| |
|---|
| 11 - Medical and Health Sciences |
| 17 - Psychology and Cognitive Sciences |

**References (up to 10 references, 350 characters per reference)**

*(This section should include a list of up to 10 of the most relevant research outputs associated with the impact)*


Carey, L.M., Macdonell, R. Matyas, T. (2011). SENSe: Study of the Effectiveness of Neurorehabilitation on Sensation. A randomized controlled trial. Neurorehabilitation and Neural Repair. 25:304-313.

Carey, L.M., Abbott, D.F., Harvey, M.R., Puce, A., Seitz, R.J., Donnan, G.A. (2011). Relationship between touch impairment and brain activation after lesions of subcortical and cortical somatosensory regions. Neurorehabilitation and Neural Repair. 25: 443 – 457

Carey, L.M. (2012) SENSe: Helping stroke survivors regain a sense of touch: A Manual for therapists. Melbourne, Florey Neuroscience Institute. 202 pages. (accompanying DVD, La Trobe university).

Carey, LM (editor) (2012) Stroke Rehabilitation: Insights from Neuroscience and Imaging. Oxford University Press. ISBN 978-0-19-979788-2 (304 pages). Also (2013) Oxford Medicine Online. (eISBN: 9780199353279) doi: 10.1093/med/9780199797882.001.0001.

5. Dunn, W., Griffith, J.W., Morrison, M.T., Tanquary, J., Sabata, D., Victorson, D., Carey, L.M., Gershon, R.C. (2013) Somatosensation assessment using the NIH Toolbox. Neurology. 80; S41-S44 doi:10.1212/WNL.0b013e3182872c54

Pumpa, L., Cahill, L.S., Carey, L.M. (2015). Somatosensory assessment and treatment after stroke: An evidence-practice gap. Australian Occupational Therapy Journal, 62: 93-104

McLean, B., Taylor, S., Valentine, J., Parsons, R., Carey, L., Elliott, C. (2015). Preliminary outcomes of a novel treatment for somatosensory discrimination for children with hemiplegic cerebral palsy Proceedings of the 69th Annual Meeting of American Academy of Cerebral Palsy and Developmental Medicine, Austin, Texas. 21st-24th October.

Carey LM, Abbott DF, Lamp G, Puce A, Seitz RJ, Donnan GA. (2016) Same intervention-Different reorganisation: The impact of lesion location on training-facilitated somatosensory recovery after stroke. Neurorehabilitation and Neural Repair 30 (10): 988-1000.

Carey, L.M., Lamp, G., Turville, M., (2016) The state-of-the-science on somatosensory function and its impact on daily life in adults, older adults and following stroke: a scoping review. OTJR: Occupation, Participation and Health, 36 (2 Suppl), 27S-41S doi: 10.1177/1539449216643941

Cahill, L. S., Lannin, N. A., Mak-Yuen, Y., Turville, M., & Carey, L. M. (2016). Achieving practice change in stroke rehabilitation: a research translation study of upper limb therapy for sensory loss. 5th Annual NHMRC Symposium on Research Translation, Melbourne, Australia. 23rd November.

# Additional impact indicator information

**Additional impact indicator information**

*(Provide information about any indicators not captured above that are relevant to the impact study, for example return on investment, jobs created, improvements in quality of life years (QALYs). Additional indicators should be quantitative in nature and include:*
*- name of indicator (100 characters)*
*- data for indicator (200 characters)*
*- brief description of indicator and how it is calculated (300 characters).)*