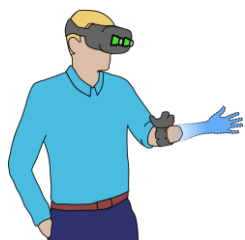


ANNUAL HIGHLIGHTS IN CNAP

The ambition of CNAP is to discover the role of pain neuroplasticity in the transition from acute to chronic pain by using methods from an array of different research disciplines ranging from neuro- and biomedical engineering to neuroscience and medicine. Advanced mechanistic pain *provocation* and *probing* platforms are used with the aim of designing and utilising new models and methods for *modulating* features of pain neuroplasticity.

Research highlights from 2018 include a human model aiming at preferential activation of nociceptive fibres by a unique electrical stimulation protocol crucial for *provoking* central manifestations of pain neuroplasticity. Prolonged pain models with pain and increased sensitivity for up to 20 days have been used to *provoke* neuroplastic manifestations in the brain, demonstrating a highly important finding that such a neuroplastic process is fast (hours or days). Moreover, brain manifestations of pain-related neuroplasticity could be *modulated* by activating/occupying specific brain centres, demonstrating an option for modulation of pain neuroplasticity in humans. Furthermore, the effect of visual input during pain may be a factor in modulating pain neuroplasticity. Phantom limb pain patients are characterised by brain neuroplasticity and a very novel finding shows how the use of augmented reality to visualise the missing extremity in these pain patients reduced pain and *modulated* neuroplastic manifestations on brain imaging.



Central mechanisms controlling pain inhibition and pain facilitation in humans were studied before and during prolonged pain models. Interestingly, pain facilitation mechanisms probably related with short-term neuroplasticity, recorded at baseline, predicted partly the degree of pain developed in the prolonged pain model. Such findings may likely help understanding the vulnerability to conditions of pain neuroplasticity during prolonged pain. Epigenetic modifications, like the actions of non-coding RNAs, may confer susceptibility to pain neuroplasticity in chronic pain. MicroRNAs assessed before chronic pain patients went through surgery showed dysregulation and were predictive for the pain relief after surgery. These highlights illustrate novel openings for *provoking*, *probing* and *modulating* pain neuroplasticity in humans.

Funding

In 2018, CNAP affiliated staff received generous additional funding. A large part of this was funding from Aalborg University's Talent Management Programme to an Associate Professor. Moreover, CNAP seniors received substantial amounts from Danish foundations and several junior researchers received travel grants from international organisations and foundations.

Recruitment and Training

CNAP consolidated its excellent and international staff profile by recruiting four new PhD fellows under the FRESCO@CNAP programme. By the end of 2018, CNAP accommodated staff from 13 different countries and maintained a very balanced gender distribution. Besides, issues like career clarification, planning and career strategies have been in focus, providing CNAP early stage researchers with an extra perspective on their future career.

Congresses and Events

At the 17th World Congress on Pain in Boston, which was organised by the International Association for the Study of Pain (IASP) and visited by more than 5,000 participants, CNAP was one of the most visible research groups present. The CNAP Annual Research Seminar focused on links between the individual research projects, future perspectives, and new interdisciplinary initiatives. Finally, CNAP had the privilege of hosting several guest researchers and continuing ongoing collaborations in 2018.

Public Outreach

In 2018, CNAP focused on new ways of engaging the public. CNAP researchers participated e.g. in the outdoor Bloom Festival on nature and science in Copenhagen and gave several public presentations. Besides, the CNAP Twitter profile, @CNAP_AAU, was launched with a successful growth of followers.

