

## Smart physical practice with wearable biofeedback

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**Research area:** Neurotechnology for health

### Project outline:

Physical activity is well recognised to have significant body and mental health benefits. Yoga in particular is known to increase strength, flexibility, balance and mental health. Wearable sensing technologies are creating new opportunities to benefit global wellness and healthcare by encouraging fitness, supporting safe practices, and personalising training. While these technologies have been successfully integrated to promote movement-based exercise (e.g. cardiac activity), other popular forms of exercise focusing on strength and pose alignment (e.g. yoga, Pilates, body workout) have been relatively neglected. Current technological solutions to augment pose practice are mostly focused on improving 3D skeletal alignment. However, for effective and injury-free practice, the brain must engage specific muscles in a specific order, and develop a motor skill. EMG could provide arguably better (earlier and more precise) insight into whether a given exercise is executed correctly and safely and EMG signal could also be integrated in a biofeedback loop, or fed to a trainer, to allow the user to develop the motor skill necessary for safe practice. But we need to understand how to best support motor learning and enhance practice benefits.

We will develop a suit of cognitively-informed technological solutions for improving yoga practice and mindfulness, using an interdisciplinary approach combining engineering, cognitive neuroscience and yoga experts. Outstanding questions include: sensors design and wearability (e.g. soft materials), optimal neural and cognitive integration of feedback, training curricula and mental benefits of feedback. To understand these processes, we will combine experimental lab-based models with neurocognitive testing and real life (studio) collaborations.

**BBSRC DTP main strategic theme:** Transformative technologies

**BBSRC DTP secondary strategic theme:** Bioscience for an integrated understanding of health