

THE INSPIRE Foundation

'raising money for research into spinal cord injury'



Towards independence: Using technology to restore quality of life through physical exercise after Spinal Cord Injury. Welcome to iCYCLE

INTRODUCTION: It used to be thought that recovery was impossible after spinal cord injury but in the past 15 years a few people have demonstrated significant improvement by using electrical stimulation while trying to use their legs.

WHAT ARE WE DOING ABOUT IT: The INSPIRE Foundation is pioneering a new way of taking the exercise regime into the homes of individuals. This will allow them to benefit from frequent exercise to maximize the therapeutic effect without cost to the NHS.

WHY ARE WE APPROACHING YOU? There is no Government funding for SCI Research and we are appealing to you to help fund this potentially life-changing project.

WHAT IS iCYCLE? The project is designing, developing and testing a Functional Electrical Stimulation (FES)-cycling machine or *iCYCLE*, initially under laboratory conditions. Individuals participate in virtual reality cycle races with routes chosen to suit each of their needs. Longer term, and once fully researched, *iCYCLE* will enable the SCI to exercise at home while being monitored electronically by therapists in central laboratory hubs. In lay terms, our goal is to take a more effective therapy from clinics and spinal centres into the users' homes, thereby negating the complications, inconvenience and expense of travelling. Where suitable, this remarkable development could eventually bypass the need for outpatient/physiotherapy appointments.



First prototype iCYCLE

The new version has several important changes including a much larger screen.

HOW MUCH, HOW LONG & WHERE? The project now at its mid-way point will finish in July 2016. It is costing **£46,032**, spread over three years and is being conducted at Royal National Orthopaedic Hospital Stanmore, the University of Southampton and University College London. Although the INSPIRE Foundation has underwritten this research we still need to raise funds to secure its successful conclusion.

WHO WILL BENEFIT? There are more than 40,000 individuals living with SCI in the United Kingdom. The potential for recovery seems to remain long after injury so many might benefit if this treatment is found to be effective.

THE INSPIRE RESEARCH TEAM

Principal Investigator:	Mr. Ahmad Alahmary	PhD Exchange student from Kingdom of Saudi Arabia
Co-investigators:	Professor Jane Burridge	School of Health Professionals & Rehabilitation Sciences, University of Southampton
	Professor Nick Donaldson	Department of Medical Physics & Bio-engineering University College London
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BACKGROUND & OBJECTIVES: Repeated exercise and particularly cycling has shown a great effect on motor learning for incomplete spinal cord injury (SCI) patients. Functional electrical stimulation (FES) is the only known way to activate paralysed muscles of incomplete SCI patients and has shown a therapeutic effect on these muscles' functions. Most FES-bikes currently available for SCI patients are passively driven (ie motorized cycles) hereby denying the motivation to voluntarily activate muscles and optimising opportunities for motor learning. To the best of our knowledge, no research has examined if combining FES and voluntary effort when cycling, results in a greater functional recovery for lower limb. We have therefore designed an INSPIRE FES-cycling machine or iCYCLE in which the participant's own effort is augmented by FES of the leg muscles and a motor to drive the pedals. iCYCLE links to a virtual reality racing game and a monitoring device to provide feedback on performance i.e. amount of voluntary effort. This study will test the feasibility of using iCYCLE with incomplete spinal cord injured patients and to collect preliminary data on whether it is effective in recovery of lower limb functions. Modifications will be made both to iCYCLE and the training protocol in response to the results of this study.

THE EXPECTED OUTCOME: If the iCycle is found to be both feasible to use at home and effective in improving walking it could be a cost effective rehabilitation device that would enable people with incomplete spinal cord injury to achieve greater independence. It will also enable people to continue to exercise at home after discharge from hospital rehabilitation and accrue the potential benefits not only of improved functional recovery but also better fitness. Further it is anticipated that home users may be monitored by central hubs in effect offering physiotherapy and Occupational Therapy expertise by remote control. The study is also exploring a new intervention that could provide better understanding of recovery, particularly the relationship between neural and functional recovery. This knowledge may also be useful in predicting which individuals are likely to experience recovery and what other factors are important such as level and severity of the lesion and intensity of training.