We are delighted to be able to offer children, young people and adults with neurological injury or conditions a specialist treatment using the Computer Assisted Rehabilitation Environment or CAREN. It is versatile multi-sensory Virtual Reality system for treatment and rehabilitation of human locomotion, back pain, posture, balance, spinal stability and motor control integration. The virtual-reality system puts patients at the helm of life-size ‘real life’ activities, forcing them to use atrophied muscles and teaching the basic skills necessary to rewire connections in the brain. The CAREN uses cutting edge technology developed in Israel and the Netherlands by Motekforce Link.

This technology is revolutionary in its ability to immerse the patient in a variety of virtual environments with games and exercises programmed to help with specific motor actions. The circular platform, which is three meters in diameter, has six degrees freedom of movement. It integrates a treadmill and force plate to measure movements on the platform. The patient is attached to a harness to remove any fear of falling. Then sensors are placed on relevant parts of the body. Ten cameras are mounted around the platform giving a 360 degree view of the motion as the patient runs through different virtual programs. A 180 degree extended screen is in front of them. Measurements can then provide real-time feedback to help improve performance.

**CAREN is the GOLD STANDARD of Rehabilitation used for:**
- Brain Injury Rehabilitation
- Stroke Rehabilitation
- Cognitive Rehabilitation
- Managing Long-Term Neurological Conditions
- Spinal Injury rehabilitation
- Orthopaedic injury rehabilitation
- Mental Health Intervention
- Rehabilitation for Amputees & Wounded Soldiers
- Recovery from sports related injuries

**We Offer:**
- Assessment
- Rehabilitation
- Gait Analysis
- Gait training
- Falls prevention
- Improving vestibular conditions
- Functional activity for the upper limbs
- Balance & Postural training
- Assisted daily living training
- Pain Management
The CAREN is a virtual reality environment that takes force measurements as a patient is engaging a program on the screen. These precise measurements can be mapped along the body in front of the patient to show which muscles were used as they light up in green. If a muscle is red it shows it was at rest during the exercise. With this type of visual feedback, when the therapist asks them to exercise a particular muscle, the patient can now see in front of them which one they mean. This provides an excellent way to address a variety of issues in physical therapy.

**Balance:** Since six degrees of freedom is part of the system, the patient can be challenged to keep their balance during the routines. The sensors will be able to track the range of motion and give real time feedback to adjust the posture to maintain a better balance during the activities.

**Individual muscles:** If only one muscle needs to be stimulated, the routine can be changed to do more repetitions on the one muscle and be able to measure it accurately. The muscle mapping program enables the patient to visually pick out the muscle that needs to be exerted.

**Muscle groups:** The virtual environment can be programmed to include sophisticated routines that will help the patient exercise a group of muscles, not just one, if that is needed. The programs are exciting and novel and include scenarios such as sailing a boat and manoeuvring it with the hips or exploring a castle with targets to hit, doors to open and stairs to climb. The patient is completely immersed to the point where they are fully engaged with the physical therapy.

**Cognitive feedback:** CAREN works well with brain injury patients because it provides the cognitive feedback in real time making it easier for these patients to adjust their motions within the session. Since it does it automatically, the patient can receive that feedback instantly and have more time to process the changes rather than trying to remember complicated instructions after the fact.

Creating enriched environments for humans in a clinical setting is highly problematic leading to practical constraints like clinician time, budget limitations and safety concerns. This is where virtual reality makes a very significant contribution. Research shows it speeds up the recovery rate and enables the patient to practice real life situations in a safe and controlled environment.

"We have had fantastic results in our research with stroke patients using CAREN. All of the participants improved their walking abilities, with some who couldn't walk at the beginning being able to jog up and down hills. The fact that there is a safety harness enables people to push themselves and try things they wouldn't normally do"

Dr Andy Kerr, MCSP, Research Fellow, Centre of Excellence in Rehabilitation and Research, Strathclyde University
The CAREN has several advantages when compared to traditional therapies for rehabilitation and can provide:

- Analysis of movement in real-time, to provide immediate feedback to therapist and patient
- A software system, named the human body model (HBM), that computes body movement in real-time in 300 muscle elements.
- Exposes patients to environments that are physically challenging without putting them in danger
- Cueing Stimuli to support ‘error-free’ learning
- A system that mimics changes in terrain, encountered in the virtual environment e.g. crossing the street, walking on uneven surfaces while in the safety of a harness
- It simulates real life experiences with concurrent cognitive demands e.g. working on balance while engaging in a boat slalom task, walking while interacting with targets, opening doors and climbing stairs or walking over uneven ground with target recognition
- Provides movement analysis reports and statistical objective data reports
- It can be tailored to the patient's specifications and to their rehabilitation needs
- Improves practise time
- Improves confidence
- Improves motivation
- Gains can be transferred into real world environments
- It can be beneficial even when the patient is experiencing pain
- It is subjectively rated by patients as accelerating their progress with rehabilitation
- Attitudes of participants towards virtual reality interventions are more favourable than traditional rehabilitation
- There is evidence that the CAREN can be used successfully in lieu of traditional therapy post stroke and post-traumatic brain injury.

"We have some amazing stories in relation to the project at BASIC: a boy who sustained a significant head injury who couldn't stand when he first came, and is now kicking a football whilst standing up! A young man who can only move his head, and who is now able to use our Virtual Reality physiotherapy sessions to recruit more activity in his core and trunk, and therefore use his seating systems more effectively” Mike Greaney, Neuro Physiotherapist

"The virtual reality machine is amazing, it really immerses you into the games and helps with all areas of development both physically and mentally, The CAREN system has been a real-life saver for me – for the first time in nine years I feel like I will be able to walk normally again. The virtual reality system has a football game which allows me to ‘virtually’ get back onto the pitch and kick a ball again – something I never thought I would do again” Male head injured patient
"I attended the Brain And Spinal Injury Centre having suffered TIAs and had extensive spinal surgery over the past three years. I met with the physiotherapist Sylvia who carried out an assessment, organised a plan of treatment and introduced me to the Computer Assisted Rehabilitation Environment (CAREN). I was at all times held safely in a harness so I could not injure myself. Each treatment consisted of a series of exercises within virtual reality scenery. I steered boats around islands, skied, snowboarded, and many other virtual scenarios. I never realised exercise could be such fun or so beneficial. I worked extensively with Carol and Jamie who were always caring in their treatment during my exercise sessions. After each session I could quantify how I had improved. My balance was better in fact I would say the CAREN sessions help me to improve my physical stamina, improved my cognitive skills helped with my balance and gave me the courage to learn to walk. I now walk daily though I’m still using two sticks. I would recommend this course of treatment would be of benefit to many veteran’s with cognitive or physical health challenges.” Military Veteran, 2018

"We are very grateful as a family from the time and support that the staff at BASIC have given for this opportunity to use the CAREN. Our son’s core stability, sitting and balance was very impaired following brain surgery. He now has more control of his balance and can reposition and redirect himself if he falls to one side. He can now initiate movements such as sitting forward in his chair which he was unable to do previously. This means his carer has less manual handling to do as he can now assist in sitting forward for his washing/cleaning/teeth and using a straw which gives him some degree of independence”

"My expectations were met and more, I found the CAREN amazing. My walking and balance have improved so much. I loved every minute of this experience and staff were amazing and helpful”

"My improvement happened from first to sixth session using the maze, walking downhill on the rope bridge, sailing and skiing. The variety of activities covered balance, walking up and down hill, concentration. It’s improved my thinking skills and my outlook on life”

"It more than met my expectations. I’m shocked at the difference in my ability for example I can now stand on one leg. I’m amazed, at being able to stand at the bus stop and I’m not swaying anymore. It’s really boosted my confidence”. 

"It brought everything together using my brain in sync with my body, Its the most I have had to concentrate in the last eighteen months. The scores registered on the CAREN week by week confirmed that I have progressed”

"I successfully completed a 3k walk in rugged and undulating woods. I have rediscovered my ability to garden”

"My expectation was exceeded, my thinking has speeded up and my coordination improved”
Many of the patients at BASIC are left with **walking and balance problems** as a result of a head injury, stroke, brain haemorrhage or brain tumour. Balance problems can be caused by injury to the brain causing weakness to one side of the body, loss of sensation, perceptual problems, drop foot, Ataxia etc. Many are at risk of falls which can lead to further injury and setback their recovery.

### The C-Mill

Is a dynamic learning environment to improve walking patterns and balance using an interactive treadmill. It uses cutting edge technology that incorporates Augmented Reality and Virtual Reality to re-train balance and walking problems in a safe and challenging environment. Everyday objects are projected onto the treadmill e.g. stepping stones, footprint patterns to follow or objects to avoid. The system can help people from early rehabilitation, learning to stand, step and walk again, all the way to clients who need to improve their overall walking performance and reduce the risk of falling.

Training takes place in a safe environment with safety features integral to the system. The addition of a harness encourages patients to experience movements in a safe environment. Virtual reality allows patients to walk through nature e.g. the Italian Alps, to take part in games and tasks that are both motivating and fun. Virtual reality has great potential in helping speed up recovery. The C-Mill has multiple applications to train patients walking adaptability, using visual and acoustic cueing. The C-Mill has the capacity to provide temporal and spacial data as part of a gait analysis.

Virtual reality has been shown to help those recovering from: Traumatic Brain Injury, Stroke, Cognitive injury, Long-Term Neurological Conditions, Mental Health Problems, Amputees & Wounded Soldiers.

### The DYNstable

Is a Dynamic Stability and Balance Learning Environment. The DYNSTABLE is an innovative piece of equipment that uses virtual reality. It is able to assess and improve every aspect of balance through training applications.

The patient groups who can benefit are those with: Acquired head injuries, vestibular disorders, musculoskeletal problems, strokes, neurological conditions.

A registered neuro-physiotherapist will provide an assessment and identify which training programmes will be best to achieve the joint goals identified on the first session.

“The staff have been most supportive and dedicated at all times, they never miss a trick in supporting me. There is a quiet air of industry prevailing throughout the Centre, which is welcoming and is a confidence booster to the clientele treatment”

*Patient quote*
WHAT'S THE EVIDENCE FOR VIRTUAL REALITY AND NEURO REHABILITATION


Powell and Simmonds, (2014).


Roosink et al., (2016).


Above is a sample of the research, please contact us for further details of research references.
How to Make a Referral

Referral can be made via our website at www.basiccharity.org.uk. We are able to arrange visits to the Centre and can provide demonstrations of the technology. Alternatively we are happy to discuss your needs by telephone or email. We generally provide patients with ten to eighteen CAREN sessions and can undertake gait assessments if required. We can provide a cluster of intensive sessions over five days or longer or two sessions a week dependent upon circumstances. Wheelchair users with good brakes can be accommodated on the CAREN. There is a cafe on site, car parking facilities and good transport links to and from Manchester city centre.

On referral a patient will have an assessment with one of our neuro physiotherapists. Sessions will be tailored to the individual’s specification and their rehabilitation needs. CAREN will provide accurate movement analysis and statistical data reports. Age appropriate validated clinical measures at the start and end of the therapy are also used to evidence improvement. We are able to generate statistical reports from CAREN software that can include video footage of before and after treatment affects on request.

Our Neuro Physiotherapists and Physical Therapists work with children, young people, adults, older people and military veterans using state-of-the-art virtual reality technologies.

BASIC is a not for profit organisation and all income generated from our Centre services go towards funding rehabilitation sessions for those with no income stream and on a low income.

To find out about our pricing policy please contact us for further details.

Contact us on 0161 707 6441
Email at enquiries@basiccharity.org.uk
Visit our website at www.basiccharity.org.uk

BASIC - Brain And Spinal Injury Centre is the North West Charity of the Year 2018/19

BASIC is a registered charity No 518806 and Company limited by guarantee No 01944414