



# A stroke of genius: changing approaches to rehabilitative physiotherapy



*International Innovation* speaks with expert physiotherapist **Professor Birgitta Langhammer**, who shares an insight into her 40-year career in the field, and the advances she has helped bring about in stroke care and rehabilitation

## **How has your research background led you to focus on stroke rehabilitation, and why are you so passionate about this field?**

As a young physiotherapist, I worked with many elderly patients – and stroke was a common diagnosis. I was overwhelmed by the debilitating impacts this disease could have. There were really no good care methods for helping these patients in the early 1970s, and definitely no evidence-based approaches. The majority got no care or rehabilitation at all, because the common understanding was that if you had a brain injury there was no possibility for retraining. The neurons that were destroyed could not be replaced, and so we were told that there was really nothing to be done – a brain injury was definite and without any remedy. Physiotherapy consisted of different treatments and methods that were contradictory, and it was very much up to the individual therapist what therapy the patient would be given. But as a keen clinician I realised, like many of my colleagues, that my patients got better if they got exercise.

## **What did your studies on different methods of improving skills and activities post-stroke reveal?**

In many ways, these studies confirmed that you could improve a patient's quality of movement by the use of activities; walking on a treadmill, for example, improves symmetry as well as endurance. That quality of movement is measurable to the extent that standardised measurements actually

enhance what therapists often describe as quality of movement. The truth is that there is no mystery to quality of movement – and the notion that only an experienced therapist can evaluate and observe it is overrated. In fact, calling that movement 'normal' is meaningless until you compare your results to the general population and confirm that the movements are somewhere in the vicinity of the mean average; this is 'normal'. My point, anyway, is that there is more than one way to skin a cat – and treatment can be standardised to give results in both quantity and quality of movement.

## **Are there any major challenges you have faced in your research?**

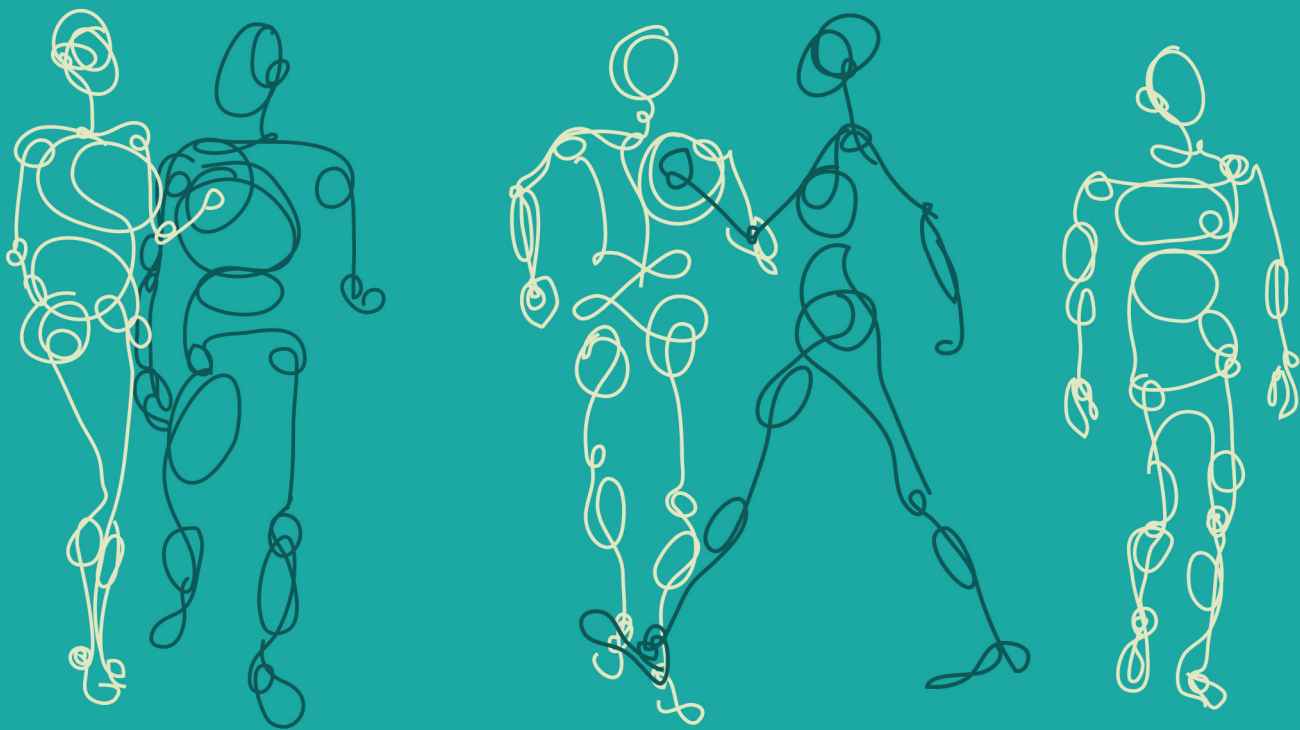
In the long term, the major difficulties in my research have related to the paradigm shift that my first study brought about in the field, a divisive development that has provoked much debate among my colleagues. In my current Sunnaas International Networks (SIN) Stroke Study, on the other hand, the difficulties surround the multicentre design, with different time scenarios around the globe for contact and discussion giving rise to unique challenges. It was also important to establish a personal relationship between participants in the study in order to maintain loyalty to the design and to enhance honesty in delivering results. Equally important was to have workshops, so that we could be sure that we interpreted the goals within the study, the outcome measures, and the interviews with as much concordance as possible.

## **What impact have your research endeavours over the years made on improving the rehabilitation of stroke patients to date? Would you like to highlight any major personal achievements?**

The most important impact, I would say, has been in establishing goal- and task-orientated therapies as evidence-based practice. Our study was the first, but since then, the field has exploded with a diversity of randomised controlled trials on a condition that was once deemed 'too heterogeneous' to be amicable to these kinds of investigations. Our SINs stroke study is also the first of its kind, and encompasses three continents: Europe, Asia and North America. It is rather impressive and uplifting to reflect that, despite the differences between countries, we have seen similarities and profound idealism in all the persons we have worked with.

## **Where do you see your research leading you in future?**

I hope that we will be able to continue to build the knowledge base for stroke rehabilitation in general, both by presenting more material from this research and through new studies to come. In particular, I would envision new research with a focus on better organisation, varied interventions that are evidence-based and comparative investigations of institutional and community-based rehabilitation.



## Recovering lost movement

Clinician-researchers at **Sunnaas Rehabilitation Hospital** and **Oslo and Akershus University College** in Norway are making headway in their quest to improve and standardise physiotherapeutic approaches to stroke rehabilitation, a process that restores to patients their former abilities

**WITH A GLOBAL** ageing population, the burden of strokes is growing every year in many countries. In 2010, roughly 17 million people worldwide suffered a stroke, with around 40 per cent of those instances resulting in mortality. Some 6.7 million people were killed by strokes in 2012, making it a bigger killer of men than prostate and testicular cancer combined – and twice as deadly for women as breast cancer. But high as the burden of this disease in actual mortality is, the burden of care for people who have survived stroke is even more serious. About 33 million people worldwide are stroke survivors, and they often require significant care and rehabilitation to regain their old capacities.

When most people imagine the process of recovering from a stroke, they envision a lengthy journey, beginning with small steps like regaining a small degree of movement in affected areas, and working gradually towards more complex processes like walking symmetrically and manipulating objects. Neurological injuries, like strokes, are very complex in their impacts on the body, however, and it is not always the case that rehabilitation mimics recovery from a more straightforward muscular or skeletal injury. The way that a patient recovers their movement and bodily function can also be idiosyncratic, and vary between subjects.

### EVERY CASE IS DIFFERENT

Physiotherapy plays a vital role in bringing back the capabilities a patient had before they suffered the neurological injury – but approaches in this field have moved forward with leaps and bounds in the last few decades. In the 1970s and 80s, it was widely believed that there was little commonality between patients when it came to stroke rehabilitation – and randomised controlled trials were therefore deemed useless. At that time, physiotherapy methods took a bottom-up approach, with treatment programmes that required patients to build up their motor skills slowly and incrementally. A subject would advance through hierarchical levels of ‘normal movement’, with physiotherapists evaluating their progress subjectively.

When Professor Birgitta Langhammer first came to the field more than 40 years ago, this was the state of care that she was met with – but she has seen massive changes in the intervening decades, some of which she has been instrumental in driving. During that time she has practised in Sweden, Switzerland, the US, Zambia and Norway – where she is now based, working at Sunnaas Rehabilitation Hospital and Oslo and Akershus University College, collaborating on the Sunnaas International Networks (SINs) Stroke Study.

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Her current research is focused on creating international standards for stroke care and rehabilitation, as well as defining best practice and advancing the cutting edge of treatment.

### THE PLASTIC BRAIN

In the early 1980s, a new school of treatment known as motor relearning began to emerge, accompanied by the new view that the brain was plastic, and could remodel to allow functions controlled by injured regions to be resumed. By this time, Langhammer had seen strong anecdotal evidence to suggest that a top-down approach to physiotherapy – whereby patients were encouraged to walk, for example, rather than building up hip and knee skills separately – could be very effective. “I realised that in



## PHYSICAL REHABILITATION FOR STROKE PATIENTS

### OBJECTIVE

To improve physical rehabilitation for stroke patients.

### KEY COLLABORATORS

**Professor Johan K Stanghelle** (MD-PhD and Research Director of the Sunnaas International Network), Sunnaas Rehabilitation Hospital / University of Oslo, Norway

### Members of the Sunnaas International Network:

Researchers from Sunnaas Rehabilitation Hospital, Norway; China Rehabilitation and Research Center, China; Rusk Institute at New York University Langone Medical Center, USA; Polyclinica no. 2, Russia; Sheba Medical Center, Israel; Bethlehem Arab Society for Rehabilitation, Palestine; El Wafa, Islamic University, Palestine; Sahlgrenska University Hospital, Sweden; Sichuan Bayi Rehabilitation Center, China

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**BIRGITTA LANGHAMMER** works at Sunnaas Rehabilitation Hospital and Oslo and Akershus University College, and she is affiliated to the Norwegian University of Technology and Science Trondheim. She trained as a physiotherapist at Lund University and has practised in several institutions and hospitals in Sweden, Switzerland, the US, Zambia and Norway.

View from Sunnaas Rehabilitation Hospital, Norway's largest specialist hospital in the field of physical medicine and rehabilitation.

order to give my patients the best treatment, I needed to learn more and to evaluate the effect this treatment had," she explains.

Langhammer's initial study broke new ground in this area by comparing bottom-up and top-down physiotherapy approaches side by side. The study's results demonstrated that the ambitious top-down approach yielded superior patient outcomes – a finding that surprised much of the scientific community at the time, and remains controversial today. "The therapists in favour of bottom-up were – and, to some extent, still are – very passionate, and have made many attempts to discredit both me and my study," she states. But her work showed that the new concept of the plastic brain held water, at least when it came to stroke rehabilitation; it also cemented her relationship with long-time collaborator Sunnaas Rehabilitation Hospital, who aided in the study.

### FURTHER STUDIES

Although they were initially divisive, the results from this early study have now been accepted as evidence-based knowledge and incorporated into various national guidelines. Over the next few years, Langhammer led a number of investigations, with particular highlights being her studies into static and dynamic treatments, symmetry of gait and quality of movement. Developing on this theme, she then embarked on a programme of research examining the objective expression of 'quality of movement', a term which had previously been a subjective measure given by the physiotherapist in question. Langhammer and her collaborators, on the other hand, argued that quantitative measures of attributes like gait speed and goal attainment could be used to make a more useful statement of movement quality. "You wouldn't think something like that would be necessary, but unfortunately, it was!" she reflects.

As time has gone on, improvements in care have shifted the focus of Langhammer's research to new areas. The escalating efficiency of acute care, for example, has led to earlier hospitalisation, the creation of specialist stroke units, earlier mobilisation and enhanced public awareness; the knock-on impact of this has been a reduction in severe outcomes from stroke, shorter stays in hospitals and

less time spent in rehabilitation. This being the case, it makes more sense for the Norwegian researchers to investigate acute rehabilitation and its aftermath, an area that they have now been exploring for some time.

### THE SINS OF MAN

Langhammer's current endeavour, the SINS Stroke Study, builds on her previous work by aiming to evaluate stroke patients' outcomes in light of different rehabilitation models and cultural differences. The methodology is fairly straightforward: the British Society of Rehabilitation Medicine standards are applied to the different clinical approaches under evaluation at hospitals in China, Israel, Palestine, Russia, Scandinavia and the US, and then data are collected using questionnaires, interviews and workshops with key figures within these clinics. Using observation in the form of in-person visits to the clinic and documentary videos, the researchers are also looking at how the professionals in the clinic work together to achieve their goals.

The study showed that specialised rehabilitation for stroke patients with severe disabilities is not uniform across different cultures, and that cultural differences were intimately tied to societal and political systems. The majority of rehabilitation units, Langhammer and her collaborators found, were based on stroke units with broadened multidisciplinary teams and specialised, often high-tech, equipment. But the specialisation of the unit, in terms of both staff and equipment, varied widely between countries and clinics – meaning that an acute stroke patient might not receive the same care in Russia that they would in Sweden.

### MOVING FORWARD

As Langhammer points out, there is evidently a clear need "to get consensus on what specialised rehabilitation should encompass, internationally". Once this has been achieved, a minimum gold standard could then be established. Thus the next step for Langhammer and her team will be to step up their search for the ideal therapies and exercises that can be used in the clinic, in order to supply the basis for these new international standards.