Recovering from ischaemic stroke at a young age: the call for precision exercise intervention

Dominique Hansen

BRIEF HISTORY OF MY HEALTH CRISIS

On 16 October 2022, at the age of 42 years, sitting in my car at a parking lot, my left arm and leg suddenly became fully paralysed, and I could not speak anymore. I realised this could be a stroke, so I let myself fall out of my car, lying on the ground, in the hope somebody would call an ambulance. Luckily, somebody made that call, and I was rushed to the hospital: a thrombus in the CM1 segment of the right arteria cerebri media with subtotal occlusion was discovered (cryptogenic stroke), leading to a National Institutes of Health Stroke Scale (NIHSS) of 17–18. A thrombectomy was executed, with full revascularisation, and I was discharged from the hospital 2 weeks later. Two years later, a repeat MRI of my brain was made (figure 1), showing the damage done (mostly on the right hemisphere and deep in the brain behind the right eye).

ISOLATED ANATOMICALLY BUT NOT PHYSIOLOGICALLY

From the moment I regained consciousness and woke up in my hospital bed, the first goal I had was to regain mobility as soon as possible and progress to exercise training. Through my academic training (PhD in Rehabilitation Sciences), I knew that the brain may be isolated from the rest of the body anatomically but not physiologically. There are numerous molecules with the ability to pass the blood–brain barrier with neuroprotective or neuroplastic properties (ie, brain-derived neurotrophic factor, cathepsin-B and lactate), which can be secreted or synthesised by the skeletal muscles during exercise training.[1] Exercise training also suppresses inflammation and can even enhance brain perfusion. Hence, sitting or lying down and doing nothing ('taking it easy') would take away the opportunity to stimulate brain recovery. At my age and in my situation, there was no room for such a 'missed opportunity'. Hence, in the hospital, I was the (only) one riding the stationary bike every day (twice if I could) in the hallway, which puzzled the nurses sometimes. And I continued this road: when I got home, I went on to exercise daily, leading to a weekly (endurance and resistance) training load of around 10–14 hours for 6 months straight, in addition to physiotherapy, occupational therapy, speech therapy, cognitive training and psychotherapy. Even today (3 years later), I still exercise daily.

PRECISION EXERCISE TRAINING AFTER STROKE: THE MAJOR GAP IN KNOWLEDGE IN CONTEMPORARY NEUROLOGY

Exercise training is critical after stroke, in both the acute and the chronic phases. For example, in the chronic phase, endurance exercise training increases the brain excitability[2] and can acutely boost memory, attention and executive function.[3] Since I am a full professor of Exercise Physiology and Intervention in Cardiometabolic Disease (a cognitively high-demanding job), and I still suffer from an impaired working memory and limited/slowed sensory information processing (and mental exhaustion), the impact of exercise on memory, attention and executive function is particularly relevant to my return to work. Hence, every day I work a few hours, run 10–15 km or do high-intensity (interval) exercise training, and work a few hours again: it is this exercise training (in combination with the appropriate nutrition and glucose intake before and after) that makes my work resumption possible (also thanks to the flexibility and openness of my employer and colleagues and the never-ending support of my wife). And this approach surely paid off: since my stroke (in the first 3 years), I again delivered all my classes, gave invited lectures at international congresses and (co-)authored over 70 papers in international peer-reviewed medical journals,[4] with just enough energy left over to be a father and husband when I came home again after a working day.

However, what volume, type, intensity and timing of exercise is best to stimulate the recovery from stroke in the chronic stage remains virtually unknown: in the past 3 years I have scanned PubMed numerous times but remained in the dark. Hence, I combine high-volume endurance training (15 km runs) on some days for the cardiovascular and anti-inflammatory benefits with high-intensity (interval) endurance or resistance training for neurotrophic myokine secretion (for the stimulation of neuroplasticity) on the other days. The same questions exist

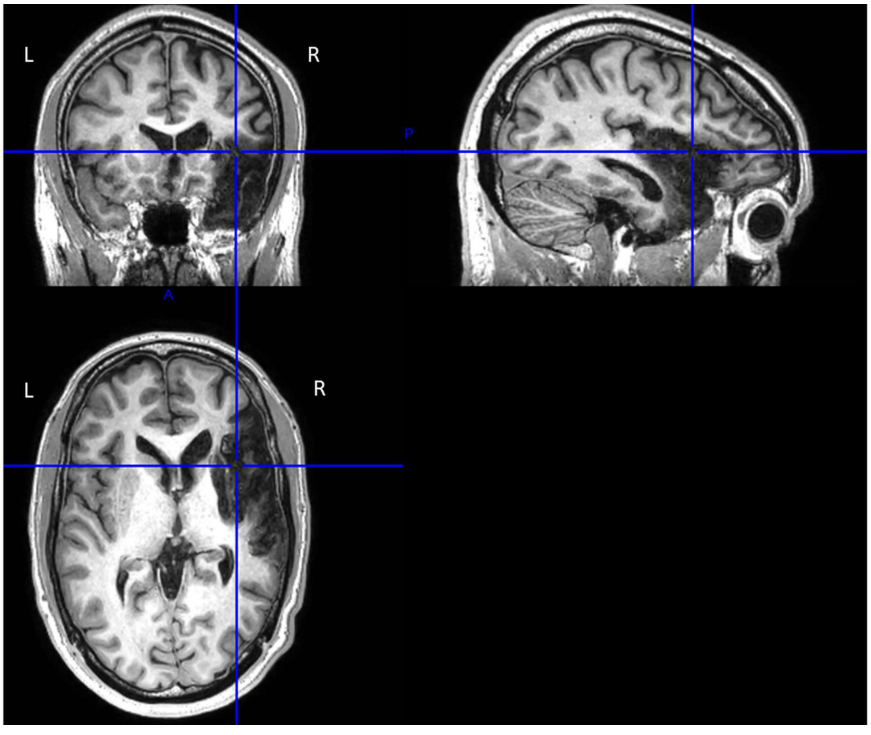

Figure 1 Repeat brain MRI at 2 years after my stroke. The black areas in this scan indicate scarred/destroyed brain tissue.

REVAL/BIOMED, Hasselt University, Diepenbeek, Belgium

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on how to exercise in the acute stage of stroke, although evidence is emerging that a greater exercise intensity is important to stimulate recovery.[5] More effort and investment are needed on this topic[6]: a stroke can be a devastating event, in particular in younger people (who need to go to work again, raise their children and be physically fit for the daily tasks/challenges)——thus, we need precision interventions.

Looking great…but feeling terrible

A nice side-effect of long-term exercise training is looking leaner and fitter, but this can come with a cost. Although we are often told not to read a book by its cover, this often happens to patients who 'look fit'. Hence, I look fit and lean but can feel terrible. An often overlooked aspect in survivors of stroke is the mental impact. Due to the ongoing inflammatory and recovery processes in the brain and impaired brain function, one can be drained mentally.[7] For 2–3 years, I felt like I just arrived from Japan (in Brussels, Belgium) by aeroplane (eg, jet-lagged) every single day. This did not prevent me from exercising (because physically you are not exhausted) but had a huge impact on my social life (at work, outdoors and at home) and almost pushed me to burnout. Hence, even the strong-looking survivors of a stroke can still suffer from the inside: healthcare professionals should be aware of this, as well as close friends and relatives.

Even when mental fatigue emerges, exercise training should not be postponed or avoided: there is evidence that exercise training, even when feeling mentally tired, can increase a patient's self-efficacy and confidence, thereby improving mood.[8] Long-term and precision exercise interventions are likely to provide both hope and benefit for patients recovering from stroke.

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ORCID iD

Dominique Hansen https://orcid.org/0000-0003-3074-2737

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