

A Policy for the Re-Activation of Long COVID-19 Patients

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Abstract:

A similarity of symptoms and dysfunction is clinically observed between Long COVID-19 patients and patients with autonomic dysfunctions, chronic fatigue syndrome and fibromyalgia. The content of the proposed bio-psychosocial case management rehabilitation program is based on the muscle fiber type composition, a novel policy aimed at priming Type-1 muscle fibers, the energy-saving function of the ligamentum nuchae, and the influence of viruses on movement patterns.

The start of the program addresses how to move safely, utilizing strategies involving neuromuscular efficiency, while later, moving more. If needed, getting stronger is the third step. These three steps are aimed at structural recovery, improving quality of life and social cohesion. Getting back to work and normal lifestyle is always the end goal that is kept in mind, depending on the age of the patient. Patients are re-evaluated using physical functions of some global, regional, and local anatomical areas. The inclusion and exclusion criteria at the intake are based on objectification of physical functions and some questionnaires. The program can be offered to individuals or in a group, either by direct interaction or by video call.

Key words: Long COVID, chronic fatigue, pain, virus, tensegrity, central sensitization.

Abbreviations:

ME / CFS Myalgic Encephalomyelitis / Chronic Fatigue Syndrome

TLS Timed Loaded Standing

SWECCT Stops Walking with Eyes Closed with a Secondary Cognitive Task

Introduction

The term 'Long COVID' was born in 2020 and is used when signs and symptoms are reported that develop during or after an acute COVID-19 infection, which continue for more than twelve weeks, and are not explained by an alternative diagnosis. Long COVID is emerging as a prevalent syndrome (Dani et al 2021) (NICE guideline 2020) and is often seen in post-intensive care patients (Biehl & Sese 2000).

The proposed rehabilitation program is based on two pillars: first, its content ensures a secure methodology for a fast recovery, based on scientific evidence. The second is related to the way this content can be prescribed.

On October 6, 2021, the World Health Organization published its definition of post COVID-19: "*Post COVID-19 condition occurs in individuals with a history of probable or confirmed SARS-CoV-2 infection, usually 3 months from the onset of COVID-19 with symptoms that last for at least 2 months and cannot be explained by an alternative diagnosis. Common symptoms include fatigue, shortness of breath, cognitive*

dysfunction but also others which generally have an impact on everyday functioning. Symptoms may be new onset, following initial recovery from an acute COVID-19 episode, or persist from the initial illness. Symptoms may also fluctuate or relapse over time.”

As far as rehabilitation is concerned, definitions of both Long COVID and Post COVID-19 Condition overlap. For this paper the authors will use the term ‘Long COVID’ in the text as the clinical picture of both groups requires the same policy for rehabilitation.

Muscles and ligaments used to move in space

Types of muscle fibers

On earth, patients with low back pain, muscle wasting diseases, those exposed to prolonged bed rest, but also elite athletes, show physiological changes like those observed in astronauts (Hides et al 2017). To move our bodies, being three-dimensional objects, primarily two types of muscle fibers are used. Type-1 fibers run on fats and function mainly aerobically and should normally contract first and do this slowly (Eyskens et al 2021). Type-2 fibers, working anaerobically, should contract later and will only be needed for fast and forceful movements (Eyskens et al 2021).

The composition of muscle mass is different in untrained persons compared to trained ones (Gollnick et al 1972).

The energy-saving function of the ligamentum nuchae in humans

Cat-like animals are ‘sprinters’, relying on visual information (Wooton 2016). Dogs, having a nuchal ligament and a lower percentage of Type-2 muscle fibers are, not surprisingly, slower than cat-like animals. Therefore, Wooton states that dogs possess the energetic capacity to walk with us an entire day while cats would not be able to.

In a vertical position, the center of mass of the human skull is positioned higher and more to the front of the flexion / extension axis between the skull and the first vertebra (Jung & Bhutta 2021). This is energy saving since the nuchal ligament ‘holds’ the head without using muscles. We could say that the head ‘falls’ upward.

Human heads are stabilized to ease their gaze (Sanford 2006). When compared to monkeys, Graebe et al (2004) inform us, enlarged loop-shaped canals in our inner ear are utilized to monitor our position in a three-dimensional space in relation to gravity and linear motion (e.g., going up and down in an elevator, moving forward or backward in a car).

The shift from Type-1 to Type-2 muscle fibers in people complaining of pain and fatigue

Chronic low back pain patients (Mannion 1999), ME / CFS (Vanhatalo A 2016) and fibromyalgia patients (Pietrangelo et al 2009) (Westerblad et al 2010) (Yunus et al 1986) show a significant shift from Type-1 to Type-2 muscle fibers (Henriksson 1988). Similar physiological changes have been observed in astronauts when in microgravity resulting in astronauts reporting fatigue and pain during their time in space (Vernazza-Martin et al 2000) (Eyskens et al 2021).

A correlation has been established between Long COVID-19 patients and individuals presenting with signs of central sensitization (Goudman et al 2021) (Neblett et al 2013).

When, on earth, typical exercises, provided for the good of the patient and delivered in a controlled therapeutic setting, most often provoke the use of Type-2 muscle fibers. Therefore, the compliance to the proposed policy is more often low with ‘dropouts’ being an understandable consequence. Lieberman (2013) asks the question, are we not made for walking and running and not for sitting, often and for long periods of time in front of screens, big or small? So, obviously, exercising is not what Homo Erectus is designed for.

New strategies required

To return to a way of functioning using mainly Type-1 fibers, it is important to pay attention to the means used to function. According to Staring (2005) and Loram et al (2017) the quality of movements should take precedence over their quantity. To return to the use of Type-1 muscle fibers, not ‘exercises’ but

‘études’ (Vsevolod Meyerhold) are required, this in order to learn how to move as a first phase in the rehabilitation of patients with the above-mentioned complaints and diagnoses (Eyskens et al 2020) (Eyskens et al 2021).

‘Etudes’ are making primary use of endogenic, health-promoting data during functioning thus providing a more energy-efficient way of functioning (Botta et al 2019) (Sirotkina & Smith 2019). This has also been demonstrated to lead to an increase in general well-being (Bauer et al 2019) (Varela & Maturana 1980).

Physical and mental symptoms in viral diseases

Viral infections have been shown to lower the thresholds in the dorsal horns of the spinal column (Melzack & Wall 1965), creating a shift from the use of Type-1 muscle fibers to Type-2 muscle fibers (Horowitz et al 1994). Since ‘Long COVID’ is seen primarily as a disease of blood vessels and with little or no data to reference, it seems reasonable to suggest there could be a relation between the shift from Type-1 muscle fibers towards Type-2 fibers since Type-1 fibers depend more on blood supply (RIZIV 2021).

The NICE guideline and more recent research mention common symptoms of ongoing symptomatic COVID-19 and Long COVID-19 Syndrome that are highly variable and wide-ranging, overlapping the symptoms of autonomic dysfunction patients regardless of their specific syndromes or diagnoses (Carfi et al 2020) (Dani et al 2021) (Sharkey 2021). In scientific literature generalized symptoms are mentioned (such as fatigue, fever, pain), and also musculoskeletal symptoms (joint pain, muscle pain), respiratory symptoms (breathlessness, cough), cardiovascular symptoms (chest tightness, chest pain, palpitations), neurological symptoms such as cognitive impairment ('brain fog', loss of concentration or memory issues), headache, sleep disturbance and peripheral neuropathy symptoms ('pins and needles' and numbness), dizziness (Carfi et al 2020) (Dani et al 2021) (Sharkey 2021). Mental complaints and dysfunctions are also commonly experienced by patients with the chronic fatigue syndrome, fibromyalgia, post-traumatic stress syndrome, burn out, etc. (RIZIV 2021) (Sharkey 2021).

In Long COVID-19 patients, delirium (in older people), psychological / psychiatric symptoms (symptoms of depression, of anxiety) have been noted. The latter underpins the need for a transdisciplinary policy (NICE guideline 2020).

The same is true for the gastrointestinal symptoms (abdominal pain, nausea, diarrhea, anorexia, reduced appetite and ear, nose, and throat symptoms including tinnitus, earache, painful throat, dizziness, loss of taste and / or smell (Sharkey 2021). As well, dermatological problems such as skin rashes are mentioned (NICE guideline 2020).

Postural problems have also been reported in Long COVID-19 patients (NICE guideline 2020). The ability to counter gravity in chronic fatigue patients was lower in patients fulfilling the diagnostic Fukuda criteria compared to women with osteoporosis, nondisabled women, and women from non-industrialized countries (Eyskens et al 2015a).

Note, that in the means used to move, and to change position in space, it was seen that CFS patients needed more visual and cognitive information (top-down) to walk and were not able to habitually use their embodied endogenous bottom-up data (Eyskens et al 2015b). Holding oneself upright and changing one's position can be quantified and used to objectify the subjective complaints of fatigue and other dysfunctions, related to how the body is engaged in its daily functioning (Eyskens et al 2019).

A novel framework

Based on the literature regarding physical complaints and dysfunctions in astronauts, such as pain and fatigue, we propose a novel concept to underpin a strategy based on how to move as a basic attitude (Eyskens et al 2021). We coined the concept YESBODY® since it primarily uses the bottom-up, endogenous, salutogenic data to manage and control bodily functions in a coordinated, economically, and ergonomically efficient way. This concept is based on priming the use of Type-1 muscle fibers in such a way that this functioning becomes the novel way these patients will habitually use during their daily activities. Type-1 fibers allow our bodies to expand in all directions. By priming the auxetic properties of Type-1 fibers, the vertical vector, countering gravity, can be created (Eyskens et al 2021).

How to move then becomes the primary target of the rehabilitation strategy, rather than how much to move. Quality precedes quantity; efficiency precedes strength. The authors stress that such a program should be performed with a strict engagement, that it must be coded, and that the patient's context should offer the possibilities needed in such a way that he / she has the option to implement the changes in their daily life (Eyskens et al 2021).

Physiotherapy is a domain with many facets. We tried to standardize its applications emphasizing the dual gate theory of pain (Melzack & Wall 1965), also considering the time the patient is not in the clinic, emphasizing the importance of the time the patient is out of the hands and sight of the therapist (Eyskens, 1992). Both basic ideas were outlined in two articles by the first author, one related to low back pain (Eyskens 2000a), the other to ongoing fatigue (Eyskens 2000b).

A problem with rehabilitation programs is the low compliance of patients during their home time, regardless of whether it consists of relaxation or of dynamic muscle training (Eyskens 2004). Two basic concepts regarding movement and functioning were explained in the book *Body in Peace*: the aspect of timing in the brain, and the concept of tensegrity (Eyskens 2007). 'Timing' pointed to the fact that most of the time a movement has already started before the mover is aware of it. "Clock time is different from brain time" is a quote made by Benjamin Libet (Libet 1985) and Daniel Wegner (Wegner 2003). This means that the quality of the movement, the means whereby, is not under the conscious awareness of persons, nor in patients. The second, tensegrity, points to the fact that the classical biomechanics by Giovanni Borelli (1608-1679) needed a remake towards 'Biotensegrity' (Sharkey 2018).

Parallel to the above-described concepts and the many years of practical experience with various people, who we collectively classify under the term 'autonomic dysfunction' patients, a policy will be proposed to help Long COVID-19 patients that can be tailored to every patient's personal physical and mental condition. From the onset of the pandemic, the course under the supervision of prof. Peter Piot from the London School of Hygiene & Tropical Medicine was very helpful (Piot 2019).

THE 'LAGOM', GRADED ACTIVITY PROGRAM FOR LONG COVID

We have chosen to name the program LAGOM, a non-translatable Swedish expression to emphasize the concept of 'not too much', as well as 'not too little' (<https://en.wikipedia.org/wiki/Lagom>). 'Lagom' means 'appropriate' (see *Figure 1*).

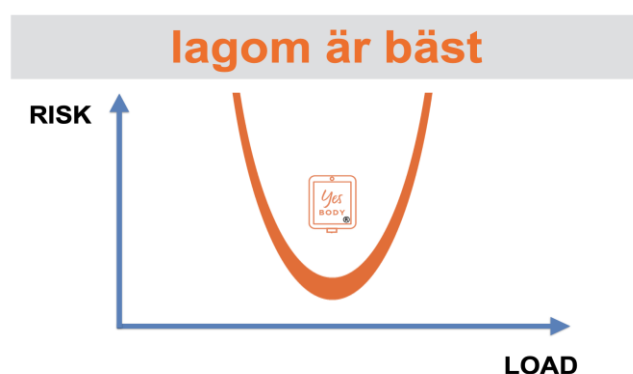


Figure 1. This curve from Lieberman's book (Lieberman 2013) shows the concept of Lagom: too little is not good, neither is too much. Balance is important!

In this way, the classic over- and underuse attitudes of many patients are avoided from the outset, providing a novel approach. This is necessary in order to work with the model 'physical load / load-bearing capacity' (Eyskens 2000a) and with gradual building-up of aerobic and later non-aerobic activities (Lindström 1992) (Twisk & Maes 2009). The Lagom program is a graded activity program (Vermeulen & Hijdra 2008) and has three phases: 'how to move', 'moving more', and 'getting stronger'.

We always start by providing information. The possibility of feedback is evident (‘How were you doing / feeling last week?’). Experiences with patients having various autonomic dysfunctions taught us that it is important to present things in an interwoven way. So not one lesson about one part and the next one about another. One can say that doing nothing, staying bedridden for example, will not offer a solution, since the necessary incentive data to recover, are not produced. This is shown on the left side of the curve.

The right side corresponds to an exaggerated use of Type-2 muscle fibers. This can be related to ‘exercising’ or to always wanting to do one’s best. This corresponds to a very tense, strained posture.

By using the ergonomic advice and hints offered by the Lagom program during daily functioning, the patient will make more use of the Type-1 muscle fibers. These fibers will progressively be addressed and used before it will progressively become a new habit as well.

This use will ensure self-confidence, a safe start-up of functions, and the prevention of injuries and negative experiences.

THE THREE STEPS OF THE LAGOM PROGRAM

The start of the program: how to move safely

The emphasis is primarily on how to move in a coordinated manner (Rothenberg & Rothenberg 1995). It starts with learning to (re)feel the body, this in a coded way, so that the patient can also work with it at home, using the available handout.

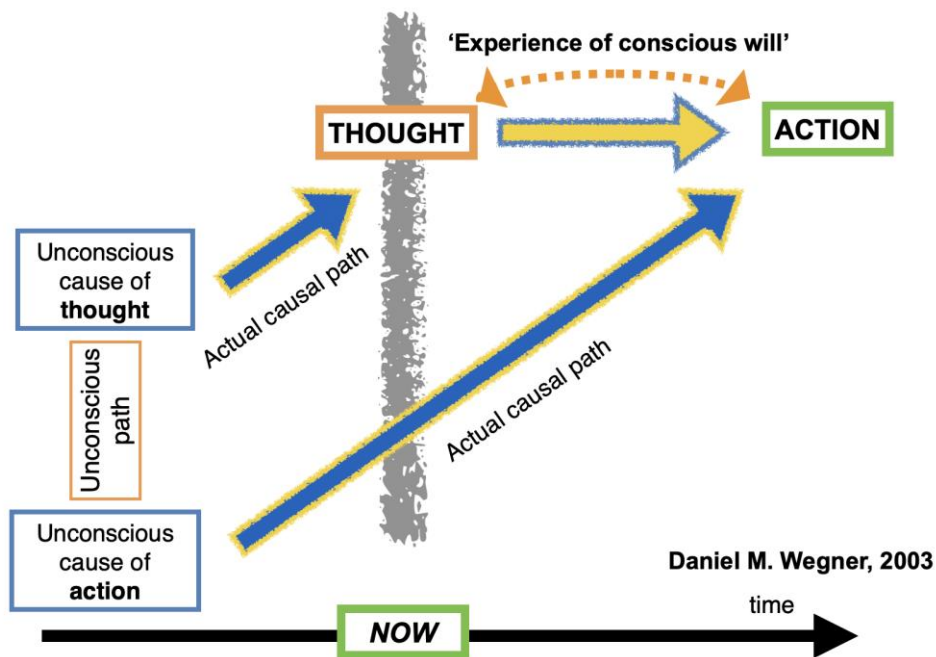


Figure 2. Sub- and unconscious causes of thoughts that lead to language, parallel with sub- and unconscious causes of actions, result in changes in one’s body shape. It is a kind of ‘reshaping’, leading to movements (related to objects in the environment) and eventually to changes in someone’s position in space. Both ‘streams’ are connected via different unconscious paths (after Wegner 2003).

Teaching the movement sequences from the YESBODY® program is based on optimizing the readiness potentials as described by Benjamin Libet (Libet 1985) and Daniel Wegner (Wegner 2003). This means that a specific tool, imagining (Nicholson et al 2019), is important to prime the energy-efficient Type-1 muscle fibers (Horowitz et al 1994).

Imagery invokes appropriate body-surface sensations with the potential to bring patients a more effortless and sturdier structure to move from (Appleton 2007). The body surface includes a previously unknown organ, composed of mechanosensitive glial cells. These cells may have a direct excitatory functional connection with unmyelinated nociceptive nerves, transmitting nociceptive information (Abdo et al 2019).

The ‘études’ as we call them, include basic skills such as getting up and lying down, how to sit, how to stand (up), how to walk. Moreover, attention is also given to the skills needed for personal, regular daily activities. Eventual comorbidities will be taken into account.

In parallel, a start will be made with teaching safe daily and weekly schedules so that both over- and underuse can be prevented (Kos et al 2015).

If cognitive complaints persist after the first phase, dual-task training can be included in the individual program. After all, automation of basic functions reduces the mental load (Mulder 2001). All this can be understood through a figure by Wegner (see *Figure 2*).

When patients are able to move safely, they can start the second step of moving more

A second stage can only be safely started when it is possible to move in a keenly sensitive way. This stage consists of improving the patient’s cardiovascular condition, totally in agreement with the patient’s wishes (by walking, cycling, swimming, etc.) but always in such a way that over- and underuse will be avoided by using a program agreed to by the patient. This part of the Lagom program promotes better blood circulation in the muscles and other body tissues. Using graded exercise and / or exposure, the 70 % rule could be used to avoid overload (RIZIV 2021). All the time the patients receive clear home programs that can be followed up using e-mail.

If needed: getting stronger as the next step

Only with satisfactory taxability, this muscle enhancing stage can be started via the Nordic medical training therapy (De Ridder et al 2015) (<https://holteninstitute.co.uk/about-us/oddvar-holten/>). The functions chosen by the patient him / herself are taken into consideration (family, hobby, work). According to Sharkey (2021) physical activities involving high intensity loads concentrate on muscle fiber hypertrophy resulting in multiplex degradation of the fascial matrix. While strength is a warranted consideration at the appropriate stage of recovery, neuromuscular efficiency, myofascial stabilization, and reactive efficiency, which having been achieved, can then be progressed to whatever variation of strength is appropriate to the patient’s needs such as: starting strength, absolute strength, maximal strength, relative strength, strength endurance, speed strength, functional strength, agile strength (Sharkey2021). As a basis for strengthening, we use a modified version of Matt Roberts' program, always paying attention to how movements are deployed (Roberts 2002).

The emphasis is on increasing general resilience, with the aim of regaining the original activities with the speed and effort, as carried out as usual before the start of their COVID-19 infection.

If necessary, attention will certainly go to long-term static loads and to working from home.

INCLUSION AND EXCLUSION CRITERIA

The program is always proposed and explained to patients before asking for their consent. The program can be followed individually or in group sessions, depending on the possibilities and circumstances. In each case, the specific hygiene rules to be observed at that time, will be indicated to the patient, and have to be complied with.

Before the start of the program, participants receive a handout with the content and the strategy so that they are informed of what will be offered as a policy, and what will be expected from them from the beginning. Only after this information, their compliance may be expected.

A transdisciplinary assessment

The medical (Declercq et al 2010) and the physiotherapeutic field models (Eyskens et al 2020) are useful during assessing patients, presenting themselves with functional complaints. What looks like a puzzle

(Veening 2019) at first, is unraveled once available information and data are put down within a bio-psycho-social model. This model facilitates the communication between physicians, physiotherapists, and other care providers who all use their professional terminology and now are presenting a clear report in a uniform terminology. For example, they make acquaintance with a new concept: ‘The emphasis is on teaching or learning to move correctly, not on exercising’. All this is based on

- 1) the International Classification of Diseases (www.who.int/classifications/icd/en/),
- 2) the International Classification of Functioning, Disability and Health (www.who.int/classifications/icf/en/),
- 3) and the International Classification of Primary Care Criteria (www.domusmedica.be/sites/default/files/coderen_voor_dummies-congresmap.pdf).

The physio’s model uses a local, a regional, and a central / generalized layer. Parallel use of ICD, ICF, and ICPC criteria

- (www.who.int/classifications/icd/en/)
 (www.domusmedica.be/sites/default/files/coderen_voor_dummies-congresmap.pdf)
 (www.who.int/classifications/icf/en/).

This procedure simplifies collaboration between physicians, physiotherapists, and last but not least: the patient who is actively involved in his/ her trajectory of getting better. This also increases adherence (Babatunde et al 2017). Both models overlap (see *Figure 3*).

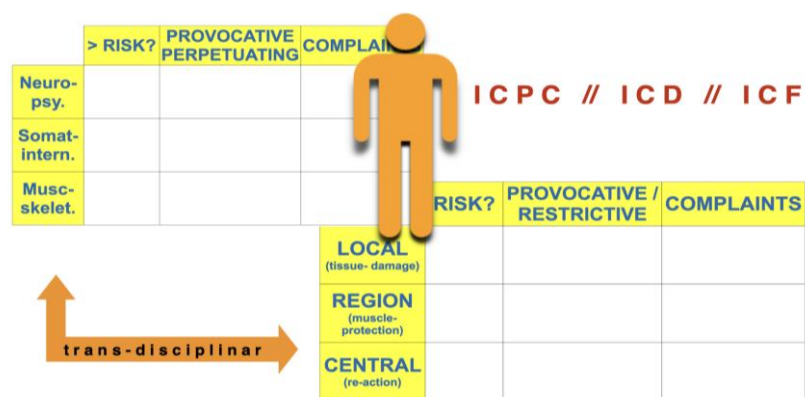


Figure 3. An overview of the medical and physiotherapy field models. Both use the same horizontal timeline (risks; provocative / perpetuating / restrictive elements and functions; complaints). The medical field model has three layers: the neuropsychiatric; the somato-internal; and the musculoskeletal. The physiotherapeutic model’s three layers are: local (tissue damage); regional (muscle protection); and central (re-action).

Based on the initial findings during assessments, shared decision-making is important to discuss and agree with the patient, a procedure also recommended by the NICE protocol.

Objectification of physical and mental capabilities and limitations

The patient needs to be proposed a policy aimed at a positive outcome. From the beginning, attention should be paid to decreased heart / lung function, loss of muscle mass, and other patient-specific problems. Inadequate control of a patient’s body as a whole is often characterized by reduced cognitive functioning (Loram et al 2006). The NICE guideline proposes to adapt the standard procedures in the case of children and older people, and always to use a clinical assessment.

Assessment should not cause symptom exacerbation (Frontline 2021). The following physical tests will be incorporated: Timed Loaded Standing (TLS), measures one's taxability while standing (Eyskens et al 2015a), and the Stops Walking with Eyes Closed with a Secondary Cognitive Task (SWECCT), measures the method of control when moving in space (Eyskens et al 2015b). Two maximal muscle contractions (hand squeeze and quadriceps strength) provide an idea of the load-bearing capacity of the upper and lower limbs (Langius et al 2016) (Lesnak et al 2019). The ability to bring the thumb in radial abduction (see *Figure 4*) is added to provide an idea of the strain in the body as a whole (Schreuders 2010).

Regarding exercise intolerance, the 1-Minute Sit-to-Stand Test (Ozalevli et al 2007) (Briand et al 2018) and recording levels of breathlessness, heart rate, and oxygen saturation are proposed in the NICE protocol. Regarding the common autonomic postural symptoms as palpitations or dizziness on standing, the protocol proposes - although not yet reviewed - measuring lying and standing blood pressure, and heart rate recordings.

Not only physical, also mental health of Long COVID, as major collateral damage of the COVID-19 pandemic, will be considered (RIZIV 2021). The NICE panel agreed that when mental health symptoms are identified during assessment, people need to be referred for support, this in line with a relevant guidance.

The questionnaires used are the Mindfulness Attention Awareness Scale (Brown & Ryan 2003), and the Multidimensional Assessment of Interoceptive Awareness Scale (Mehling et al 2018).

Through this objectification, an ergonomic balance is drawn up, enabling an individualized approach. This can be written out in a report.



Figure 4. Active radial abduction of the thumb. The flat hand is placed on a piece of paper with the thumb maximally in abduction. By making the outline with a pencil, the ranges of both thumbs are objectified, and the improvement can be shown to the patient.

Discussion

Long COVID-19 patients experience clinical signs and complaints that mimic those seen in some patients with autonomic dysfunctions such as myalgic encephalomyelitis / chronic fatigue syndrome, fibromyalgia, or spasmodophilia (Strussman et al 2020) (Lindheimer et al 2020) (McManimen & Jason 2017).

Long COVID-19 patients move less ergonomically and less economically. It may be assumed that, in those patients, habitual readiness potentials have changed, with a shift from Type-1 to Type-2 muscle fibers to start their movements (Eyskens et al 2021). The result is that these patients find it more difficult to hold themselves up and to move. Most of them also want to lie down more often and for a longer time.

According to the Dutch Health Council's 2018 advice, a wide range of physical and mental factors (infections, trauma, surgery, chronic sleeping problems, etc.) play a role in the etiology of autonomic dysfunctions (Dutch Health Council 2018). Scientific research does not provide a clear insight into the interactions between these two factors (Belgian High Council of Health 2020). Usually, they can be classified in a broad bio-psychosocial framework of vulnerability, provoking, and sustaining factors (Belgian High Council of Health 2020).

During recovery, the functional symptoms in Long COVID-19 patients relate to the problem they seem to have with their positioning in space and with countering gravitational vertical forces (Eyskens et al 2015a) (Eyskens et al 2021b).

It is well documented that some viral infections (but also other etiologies such as bacterial and parasitic infections or traumata) can cause severe and long-lasting physical problems in some patients. It has also been documented that individual patient's vulnerability depends on unknown, social, and emotional factors, and is influenced by provoking and sustaining factors (Belgian High Council of Health 2020).

That could also explain their reluctance to exercise and to follow standard physiotherapy guidelines or to execute recovery training programs. Although the commonly proposed management of recommended physical activity, in the referenced syndromes, is not quite the same, there are a few recommendations that apply to all cited autonomic dysfunctions (Goudsmit et al 2012) (Morris et al 2019).

In applying evidence-based care, a specific policy is needed to help the patient understand, not only what is going on, but also what his / her part of the remedial strategy will be. Without such a condition, the necessary compliance will be difficult to sustain (Eyskens 2004). Another aspect is that of the collaboration with other care providers, specifically physicians (Declercq et al 2010).

Due to the mix of symptoms and underlying dysfunctions, based on the scientific underpinning and on personal experience, we came to the concept: "How to move becomes the primary target of the rehabilitation strategy, rather than how much to move" (Eyskens et al 2021). The approach now includes occupational therapy, cognitive behavioral therapy, practical philosophy, all aspects indeed that are necessary to achieve 'rehabilitation', the state to become and feel oneself 'able again'. Healthcare professionals should have a range of specialist skills, with expertise in managing complaints of fatigue and treating respiratory symptoms (including breathlessness).

Each program needs the inclusion of the concept of 'pacing' (Abonie et al 2020), together with implementing a daily and weekly planning based on safe functioning. The policy that is described here, is an important strategy to help patients in coping with the situation they are in. Of course, it helps to fight post-exertional complaints like pain, fatigue, emotional, and mental dysfunction.

All this is in parallel with the literature of autonomic dysfunctions of different kinds, of the literature regarding muscle fiber type in people suffering from parallel complaints such as the one uttered by Long COVID-19 patients.

The results accomplished in individuals with Long COVID, using the principles of the Lagom program, could generate new evidence and a new body of knowledge, not only for Long COVID-19 patients but also for patients with well-defined autonomic dysfunctions. The need for such research has been put forward as a priority by different patient groups. Such a trial can be randomized, single, or multi-centric and compare patients engaged in the Lagom program with those having the same baseline figures but who did follow a rehabilitation of another kind or none at all.

Key recommendations for research are the changes in the postural and movement quality, using subscales such as TLS and SWECCCT and in radial abduction of the thumb, but also of the change in the ratio of Type-1 / Type -2 muscle fibers since Long COVID is seen as primarily a disease of blood vessels, endothelitis (RIZIV 2021). Other outcome measurements could be the quality of life, the daily activities, and the return to work, etc.

The value for money (the size of the budget compared to the impact of the results) can be calculated afterwards to compare the Lagom program to other programs.

Conclusion

Content and policy

The term 'Long COVID' reflects that the acute phase has ended, not that the person has recovered from his / her viral infection. A personalized rehabilitation policy is to propose to the patients some ways to self-manage their symptoms, including the setting of realistic goals.

Long COVID is considered to produce huge economic costs (RIZIV 2021). Therefore, there is a need for innovative approaches, from the start as early as possible. This will help a return to the workplace or to start an alternative work condition (RIZIV 2021).

As stated before, the definitions of ‘Long COVID’ and ‘Post COVID-19 Condition’ overlap. We used ‘Long COVID’ in this text, also to indicate that not every Post COVID patient should be offered a rehabilitation program. Nevertheless, for those patients who previously experienced an autonomic dysfunction or still had traces of it at the start of the acute infection, it may be appropriate to offer a short, primary preventive program. The physical tests as mentioned (TLS, SWECCT) and the exercise intolerance expressed by the patient in daily life can be used as a general guideline.

A policy can be started after the holistic medical assessment, using a shared decision with the person (and their family or health caretaker, if appropriate) regarding what support and rehabilitation they need and how this best can be provided (de Ridder 2019). This should include advice on supported self-management, support from integrated and coordinated primary care providers, referral to an integrated multidisciplinary assessment service, with a return to work as an important component.

The ‘medical field model’ (Declercq et al 2010), proposed in 2010 to help the assessment of patients complaining of ongoing fatigue, provides a method to arrive at a shared decision-making together with the patient, an aspect emphasized in the NICE proposal. This model already contains a link to physiotherapy, since the first author of this paper, being a physiotherapist, was one of its co-authors. The field model for physiotherapy was published in 2020 (Eyskens et al 2020). Both models overlap and provide a transdisciplinary policy.

Since each patient - based on the medical diagnosis - is evaluated by a physiotherapist, individual differences and comorbidities will be considered when proposing an evidence-based practice policy (Declercq et al 2010) (Eyskens et al 2020). The load-bearing capacity of the local and regional parts of the body will be taken into consideration, based on the quantification of some physical (sub)functions (Eyskens et al 2015a) (Eyskens et al 2015b). The individual patient’s functioning capacities will be used to designate safe thresholds to start the program and to point out safe endpoints. It is wise to do this for periods not shorter than eight weeks and not longer than fourteen weeks and to explain to the patient not to overdo as well as not to underdo.

Due to the risk of post-exertional malaise, the safest way to start an active program for Long COVID-19 patients is to start by giving attention to the quality of the movements rather than to the quantity. When their organisms, as a whole, can be used in a novel, safe and efficient way, patients will feel well when moving and living their lives.

Graded exercise programs often prove to have negative results when used from the start of the program, since, what is expected asks for muscular effort - especially from the Type-2 neck extensors. Consequently, their organisms will not respond with positive feelings. This is often seen in patients who ‘have to do their exercises’, as it frequently leads to therapy dropout (Eyskens 2004).

Regarding future research, this program for Long COVID-19 patients can also provide new insights for programs aimed to help patients with autonomic dysfunctions. Biopsies of changes in muscle fiber type could underpin the policy used in this Lagom program.

Settings, locations, follow-up, and monitoring

The proposed strategy can be used in group settings, in an individual setting, or even using video connections. A mix or a change of these settings will be possible since the program will be coded. Also, therapy can be proposed in a primary setting or in a rehabilitation center at a hospital, depending on the patient’s possibilities and choice.

Where to rehabilitate (at home, in a primary or a secondary medical setting, or using video calls..., eventually a mix of these possibilities) can be decided from findings during assessments and on the personal preferences of the patient. It is important to have a procedure to support people in discussions with their employer, school, or college and to provide information about whom to contact if patients are worried about changes in their symptoms or if they need support with self-management (Eyskens 2004).

Sharing information helps continuity of care. Encouraging people to keep a record of and to monitor their goals and functions, of recovery, and regarding any changes in their symptoms, is important during the

follow-up using an app or in a simple way, using standardized XL-files. This is found to be very helpful to help sustain therapy compliance (The “YESBODY® APP”) (Murali et al 2021).

This monitoring could include a few sub-scales: symptom management regarding breathlessness, fatigue and ‘brain fog’, and some that were found specific and relevant during assessment. Follow-up will be easy in the Lagom program since the syllabus of ergonomic tips, the YESBODY® coded system regarding the ‘études’ (to be given attention to during the day), will be made available to participants (YESBODY®).

The patient is motivated by interim re-evaluations of complaints and sub-functions, mentioned above, after regular periods of time.

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