http://www.casestudiesjournal.com/
Impact Factor: 4.428

The Vertical Vector in Chronic Fatigue Syndrome Observations in a Pilot Study

Author Details: Jan b Eyskens, PhD
Dr. Medical Sciences, Dr. Rehabilitation and Physiotherapy, D.O., Pr. Ph.
email: jan@yesbody.be.

Abstract:
A pilot study was set up in 1998 to eventually improve the assessment of patients with chronic fatigue syndrome (CFS). ***(1)*** *The idea of this pilot study emerged from observing how patients with CFS performed their exercises. Already at the start of their movements, an inefficient habit could be observed. In a vertical position, during either sitting or standing, it seemed as if they were pulling their head down - pulling their head to their neck - as the first procedure in reshaping their body. We even noticed that when lying on their back, their head was pulled in their necks - downwards - before engaging in a movement. The pilot study's major aim was to test whether patients with CFS differed from patients with Spasmophilia (SPS) as well as patients with Fibromyalgia syndrome (FMS) in their ability to hold their body up against gravity*

Keywords: *Chronic Fatigue Syndrome (CFS). Fibromyalgia Syndrome (FMS). Timed Loaded Standing test (TLS). Tensegrity.Fatigue assessment.Gravity and posture.Neuroscience of movement. Rational rehabilitation.*

INTRODUCTION

After years of experience with patients diagnosed with fibromyalgia we progressively encountered more patients where fatigue rather than pain was their primary complaint. At that time the literature did not indicate a clear limiting factor that could be used to help these patients. What stood out was that many reported relief only when lying down. This marked the beginning of a long journey of exploration.

The results of the later measurements presented in this article were the starting point of what would eventually become a PhD thesis. The findings were initially published in Dutch in 2000 under the title *Op zoek naar een Consensus - model voor de aanpak van rugpijn* (In Search of Rational Rehabilitation for Chronically Fatigued Patients). **(2)**

These results necessitated a search for explanatory factors. A book by Theo Mulder, *De geboren Aanpasser. Over beweging, bewustzijn en gedrag*. (The Born Adaptor. About movement, consciousness and behavior) and his numerous articles proved to be crucial in this process. **(3)** In 2007 the book *Body in Peace* by the author of this article was published emphasizing the context of these patients; the concept of tensegrity; and the importance of timing in the brain. **(4)** Attention was also given to the work of Benjamin Libet **(5 6)** (a movement begins before you are aware that the movement begins...) and that of Posner **(7)** (the endogenous, salutogenic data have an effect duration of 20 seconds, thereby exerting a coordinating influence).

In collaboration with general practitioners, affiliated with the universities of Ghent and Antwerp, two field models were developed to guide these patients. **(8)**

The tests from the pilot study led to the use of a test previously applied by K. M. Shipp et al., the 'Timed Loaded Standing test' (TLS) to evaluate patients with osteoporosis. **(9)** Their results aligned with those of this pilot tests. This article presents the results of the pilot tests as well as those of the TLS test and the extensive summary of the doctoral thesis. **(10)**

METHODS

Pilot study populations

Clinical populations based on referrals by general practitioners were used. The criteria were not the same as is customary for scientific research. In eventual follow-up research, each individual's functional abilities in daily life and eventual traumatic experiences during their lifespan could better be quantified.

The populations consisted of patients with a medical diagnosis of Chronic Fatigue Syndrome **(11)**, Fibromyalgia Syndrome **(12)** or Spasmophilia Syndrome **(13)**, the latter being the control group. The three groups were selected from the patient's files of the department of general internal diseases at the University Hospital of Antwerp and invited for a physical examination. Objectifying the patients' functional status was done by means of anamnesis and clinical examination, executed by the referring medical doctor, specialized in internal medicine, aimed to define the degree of dysfunction.

In total 261 patients were invited by postal mail, of which 241 indeed received their letter of invitation (51 CFS, 57 FMS and 153 SPS patients).

In search of a rational rehabilitation of chronic fatigued patients 99 patients responded positively (38%). Finally, 92 patients (34%) participated in the study: 19 of the 51 CFS patients (37 %), 14 of the 57 FMS group (24%) and 55 of the 153 SPS group (35%). The average age among the groups was similar. For CFS mean age 40,6 yr, (range 23–61 yr); for FMS mean age 40,9 yr, (range 18–60 yr); and for SPS mean age 41,0 yr, (range 19–66 yr). Prior examinations indicated that the general cardiac condition did not differ from that of a normal population, nor was there a difference between the three groups of testees.

All physical measurements were done by the same clinical researcher.

Methods used in the pilot study

Intensity of fatigue

By a visual analogue scale (VAS) **(14)**, participants were asked to compare the actual intensity of their fatigue.

Measurement of pain thresholds and muscle force

Pain thresholds at eighteen tender points (topographically defined by the American College of Rheumatology) **(15)** were measured by using a pain threshold meter so that not only the number of positive points, but also the Myofascial Pain Index (MPI) could be calculated according to the 1990 guidelines of the American College of Rheumatologists. **(16, 17)**

Muscle force was also measured making use of a Wagner Pain TestTM Algometer with the addition of a pressure pad. (**See Figure 1**).

Psychological parameters

The Tampa Scale for kinesiophobia **(18)** was used to evaluate differences in fear of movement.

Morphological parameter

The possibility of the presence of short humeri being a provocative factor in myofascial pain as stated by Travell & Simons was checked. **(19)** Travell and Simons referred to the book of reference, 'Humanscale 1/2/3', being an important tool for everyone who designs furniture for the human body. Dr. Travell prescribed her patients with short upper arms, amongst them the late president J. F. Kennedy, to elevate the armrests of their office chairs and even to use older style rocking chairs. **(20)**

Functional parameters

The parameters used for the evaluation of muscle strength of the arms in an upright standing position were the power to push each arm upwards and downwards from a standing position (arms stretched forward by 90°, **see Figures 2 and 3**), exo- and endorotations of both arms (elbows flexed, **see Figures 4 and 5**).

Given the fact that the project was a pilot investigation to observe differences between the three populations tested, no normal values were used. Today, it is evident that the lack of a healthy control population in this pilot project represents a significant limitation. **(21)**

RESULTS

Fatigue

Fatigue intensity was similar in the groups that were studied. The CFS group reported more fatigue in the past; actual fatigue was most severe in the FMS group. **(22 23)**

By splitting up groups according to the length of their upper arms, we found a correlation between 'fatigue now' on a VAS scale and short humeri as a specific morphological characteristic particularly in the CFS group.

Pain

Both FMS and CFS groups met the ACR criteria regarding the number of tender points, scoring 11 or more points reported to be painful with a pressure less or equal than 4 Kg/cm2 measured at 18 topographically defined places. The SPS group scored slightly lower.

However, the myofascial pain index (MPI) data as measured (the mean value measured on these 18 topographic points) were, as could be expected, lowest (low values pointing to more sensitivity and thus felt as more painful for the same pressure) in the FMS group, followed by the CFS group, and highest in the SPS group. **(24)**

Measuring MPI values may therefore be more useful to evaluate the difference between CFS and FMS patients compared to only counting the number of Tender Points.

A recent article by McManimen and Jason **(25)** implies that when patients with CFS also meet the criteria of fibromyalgia as a secondary diagnosis, this situation appears to amplify their complaints of post-exertional malaise and worsens patients 'physical functioning compared to those meeting only CFS criteria. **(26, 27)**

Kinesiophobia

The Tampa Scale for kinesiophobia (having a cut off value of 36) proved only for FMS to be significantly positive. However, another phenomenon arises in relation with this scale. Tampa scores, spread out versus patients' ages, demonstrate that the fear of moving increases with age in all three groups (**see Figure 6**). In other words, the chance that patients will revert to move more spontaneously decreases with the duration of their symptoms.

Patients who lack motivation to engage in structured, ergonomically sound, and energetic movement from the onset of their complaint may experience further deconditioning.

Muscle strength

The strength to lift each arm upwards from a standing position is weaker in the CFS and FMS groups compared to a non-diseased population. We looked at the relationship between reported values of fatigue and measured values for 'lifting the arms.' The weaker the strength to lift the arms, the greater the complaints of fatigue (**see Figure 7**). This is compatible with the provoking activities and postures as reported by these patients.

In order to exclude generalized muscle weakness **(28)**, bilateral measurements of shoulder exo- and endorotation (elbows flexed) as well as the value of pushing each arm caudally (from a stretched forward position at 90% elevation) were taken.

We obtained the ratio ‘posture to movement apparatus’ by dividing the average value of lifting both arms by the average of the six other measurements: arms caudally, endo- and exorotation left and right shoulders. This ratio was lowest in the CFS group.

Reported intensity of fatigue (measured using a VAS scale) was higher in CFS patients when the above-described ratio was lower, confirming a selective weakness of their ‘posture apparatus’ muscles (**see Figure 8**). As far as we know, this line of reasoning and the calculation of the ratio of the ‘posture to movement apparatus’ are original and not yet introduced in the medical literature. This finding can be important, because it can serve to assess, to retest and to compare results of a rehabilitation approach.

This pilot study confirmed that the lower posture to movement ratio is linked to the habitual tendency of these patients to pull their head into their neck.

DISCUSSION

The start of a search for low tech tests

This pilot study revealed that CFS patients show a reduced capacity to load their anti-gravitational means used when standing as a specific weakness that asked for more substantiated research. **(29)** Since the results were compatible with the provocative (upright standing and sitting) and reducing (lying down or slumped sitting) factors when asked for at intake in patients with these complaints and fulfilling Fukuda et al’s. criteria **(30)**, this was the start of a search for low tech tests.

Three research questions

Since the pilot study pointed towards a deficiency in postural musculature of CFS patients, two main research questions were formulated.

In order to test whether CFS patients differ from other populations in holding themselves upright, either while sitting or standing, the first research question was: “Do patients with CFS have a deficiency in holding themselves upright against gravity?”.

To find an answer to that question, an already validated test was used, ‘Timed Loaded Standing: a measure of combined trunk and arm endurance suitable for people with vertebral osteoporosis), TLS. **(31)**

The second research question originated as a result of responses given by CFS patients when asked what (for them) constitutes a provocative or reducing factor while walking. Often their answer was that walking at the seaside or in a quiet environment was not that bad, whereas walking in busy shopping streets was very difficult and provoked their typical fatigue, sometimes for a time span of several days after the walk.

This led to the second research question: “Does automaticity of gait in a population of patients with CFS differ from that of a healthy control population?”.

In order to be able to answer this question, we adapted Lundin and Olsson’s ‘Stops Walking While Talking’ test (SWWT) **(32)** to a ‘Stops Walking with Eyes Closed with secondary Cognitive Task’ (SWECCT) test with only a few minor changes. **(33)**

Both research questions resulted in an objectivation of dysfunction: TLS and SWECCT show to be impaired in CFS patients compared to a healthy population.

Two physical functions—trunk-arm endurance and the automaticity of gait—appear to be reduced in a population of patients with CFS who meet Fukuda et al.'s criteria. Additionally, personal data from individuals in this population were collected using self-report questionnaires, including the 'Checklist Individual Strength’ **(34, 35)** and the 'Short Form Health Survey’. **(36, 37)**

For the measurement of self-reported fatigue levels, the CIS ’total score and its subscale ‘fatigue’ were used and for self-reported physical functioning and vitality two SF-36 subscales (‘physical functioning’and ‘vitality’) were evaluated.

These data provided the opportunity to formulate the following research questions:

1. Does a relationship exist (and if so, in what way) between CFS patients ’trunk-arm endurance and self-reported levels of fatigue, physical functioning and vitality?
2. Does a relationship exist (and if so, in what way) between CFS patients’ automaticity of gait and self-reported levels of fatigue, physical functioning and vitality?

The published results of these questions

The results of this pilot study allowed us to continue with the idea that standing upright and moving around in space could be factors that indicated the limitations reported by patients with CFS.

The TLS and SWECCT tests were therefore used and also gave results in line with expectations.

The combined trunk-arm endurance of Shipp et al. proved indeed to be lower in patients with CFS compared with a healthy control population, and equally lower than in patients with osteoporosis who were more than 25 years older and also to be lower than the endurance of a non-industrialized population. That is why we proposed to emphasize the quality of the movements rather than the quantity of movement during the rehabilitation process. **(38, 39)**

The SWECCT test, adaptation of Lundin and Olsson’s ‘Stops walking while talking’ showed that when initiating gait, 23.5% of the patients with CFS looked toward the ground compared with only 2.6% of a healthy control group. **(40)** After walking seven meters, the test subjects were asked to close their eyes, and after another seven meters, they were asked: “How much is 100 minus 7?”. 59.9% of the patients with CFS stopped walking, compared to 5.3% of the healthy control group.

When combined with SWECCT test results, the predictive value of the TLS test became even stronger. Only trunk-arm endurance, measured by using the TLS test, proved to be statistical significantly related to the ‘physical functioning’ data from the ‘Short Form Health Survey’ questionnaire. **(41)**

The abstract of the TLS paper

Patients with chronic fatigue syndrome, like patients with osteoporosis, have similar difficulties in standing and sitting. The aim of the study was to compare combined trunk and arm endurance among women with CFS ($n = 72$), women with osteoporosis ($n = 30$), nondisabled women ($n = 55$), and women from non-industrialized countries ($n = 58$) using the Timed Loaded Standing (TLS) test. (**See Figure 9**).

TLS measures how long a person can hold a 1 kg dumbbell in each hand in front of him or her with straight arms. TLS was higher in the industrialized nondisabled population than in the non-industrialized study population ($p < 0.001$) and in patients with osteoporosis ($p = 0.002$). TLS was lower in patients with CFS than in nondisabled controls ($p < 0.001$). After adjusting for age, body height, and weight, combined trunk and arm endurance was lower in CFS patients than in osteoporotic patients, even though the patients with osteoporosis were more than 25 yr older ($p < 0.001$). In CFS, TLS was lower than in the non-industrialized group ($p = 0.02$). Since only women were studied, external validity of the results is limited to adult female patients with CFS. TLS revealed a specific biomechanical weakness in CFS patients that can be taken into account from the onset of a rehabilitation program. We propose that influencing the quality, rather than the quantity, of movements could be used in the rehabilitation.

Here follows the extensive summary of the doctoral thesis presented.

Extensive summary of the doctoral thesis (42)

Once in a while everyone happens to feel tired. But what if this fatigue does not pass away and no underlying cause for it can be identified? How can we, to the best of our ability, deal with the patient's complaint?

In the early eighties, more and more patients presented themselves complaining of generalized pain and persistent fatigue in primary care physiotherapy practices. No low-tech test existed to individualize exercise programs. **(43)**

Since the etiology of CFS is still unknown, although different biomarkers were studied, the search for a 'gold standard' that can be used to assess the fatigue of the patients with the chronic fatigue syndrome at the intake interview and the evaluation of the progression during the recovery is still an important issue. **(44)**

This thesis focuses on finding low-tech parameters that could help during the assessment at the intake and the follow-up of patients with chronic fatigue syndrome, fulfilling the criteria of Fukuda et al. **(45)**

At the start of the search, the personal computer was not yet in use and PubMed was not available. What helped was reading, carefully listening to patients and observing the way they were standing, walking, moving. Their fatigue seemed to be provoked by standing upright for a prolonged time. On the other hand, the patients suggested that lying down reduced their complaints.

The principal aim of our 2000 pilot study dealt with testing patients with CFS and compared them with patients with the Spasmophilia or Fibromyalgia syndrome, regarding their ability to hold their body upright against gravity and to make (forceful) movements in order to move in space. **(46, 47)**

The pilot study "In search of a rational rehabilitation of chronic fatigue patients" **(48)** actually pointed at the fact that in patients with chronic fatigue the relative force of the muscular system to keep their bodies in the upright position, compared with the force of the muscular system that was used to make (forceful) movements and to move themselves in space, was markedly weaker. A first research question presented itself: "Do patients with CFS have a deficiency in holding themselves upright against gravity?".

To answer this question a test was used Timed Loaded Standing, validated by Shipp (TLS). This test measures the combined trunk-arm endurance. The results of the test reveal how long a person can keep himself standing up with arms stretched in front of the body and with a one kg. dumbbell in each hand. The test is validated for a non CFS population of patients, that is patients with osteoporosis. **(49)**

The research was designed as a case-controlled study. The combined trunk-arm endurance proved indeed to be lower in patients with CFS compared with a healthy control population, and equally lower than in patients with osteoporosis who were more than 25 years older and also to be lower than the endurance of a non-industrialized population. **(50)** That is why we proposed to emphasize the quality of the movements rather than the quantity of movement during the rehabilitation process.

If maintaining the standing up position was dysfunctional in CFS patients, what about changing their position in space? More concretely what about initiating gait and what about walking itself?

The second research question is formulated like this: "Is there a difference of automaticity of gait if we compare patients with CFS with a healthy control population?". To measure this we have adapted the classical test of Lundin and Olsson: "Stops walking while talking" **(51)** to: "Does the patient who walks with closed eyes stops if he or she gets an additional arithmetic task?" (Stops walking eyes closed and a secondary cognitive task, SWECCT). **(52)** (**See Figure 10**).

This study was designed as a transversal and case-controlled research. When initiating gait, 23.5% of the patients with CFS looked toward the ground compared with only 2.6% of a healthy control group. After walking seven meters, the test subjects were asked to close their eyes, and after another seven meters, they were asked: "How much is 100 minus 7?" 59.9% of the patients with CFS stopped walking, compared to 5.3% of the healthy control group.

When combined with SWECCT test results, the predictive value of the TLS test became even stronger. It was proposed that dual tasking could be helpful to tackle the functional limitations that emerged in this particular study.

A third and twofold research question only came up later, with a first part formulated as: “Is there in patients with CFS a relation between their trunk-arm endurance – measured using the TLS test – and the results of their answers obtained using self-report questionnaires about the degree of fatigue, vitality and physical functioning?”. In parallel a second part was formulated: “Is there in patients with CFS a relation between their automaticity of gait – measured using the SWECCT test – and the results of their answers obtained using self-report questionnaires about the degree of fatigue, vitality and physical functioning?”.

In order to be able to answer both questions, we chose out of the available questionnaires the total score and the ‘subscale’ fatigue of the ‘Checklist Individual Strength’ scale **(53, 54)** and equally two subscales from the ‘Short Form Health Survey’ questionnaire **(55, 56)**, that is to say: ‘vitality’ and ‘physical functioning’. ‘Vitality’ as the opposite of ‘being fatigued’ and ‘physical functioning’ due to its direct relation to the ability of being active during daily life.

Only trunk-arm endurance, measured by using the TLS test, proved to be statistical significantly related to the subscale ‘physical functioning’ from the ‘Short Form Health Survey’ questionnaire. Although the way of walking appeared to be dysfunctional in patients with CFS, the degree of it did not appear to be related to the individual level of patients with CFS complaints. **(57)**

General conclusions regarding the results of this thesis can be summed up as follows: trunk-arm endurance proved to be reduced in a population of female patients with CFS, fulfilling the criteria of Fukuda et al. but its degree could only be related to the results of one of the four selected self-reported questionnaires, namely the ‘Short Form Health Survey’ subscale ‘physical functioning’.

This insight can be used for the assessments of patients with CFS and to evaluate results of rehabilitation programs.

Regarding the automaticity of gait, this has to be seen as an epiphenomenon and more research is needed to evaluate whether the degree of automaticity of gait is relevant for patients with chronic fatigue syndrome.

Some study limitations have to be mentioned: only women were studied, without regarding among others their menopausal state, the level of education, possible vision problems, and possible comorbidities. The same is true for the ‘blinding’ of the observer and those limitations specific for self-report questionnaires as described in the dissertation.

In order to investigate the stability of these findings, longitudinal follow up data are required especially of a disorder such as CFS, characterized by high fluctuations in health status over time.

The practical implementation of these results

The findings form the basis of the YESBODY® policy, a structured approach designed to help patients recover and improve their physical and functional health. The therapeutic strategies that can be offered were detailed in an article on long COVID-19 symptoms which often resemble those of CFS. **(58)**

The program begins by teaching patients safe, coordinated movements to reconnect with their bodies. This phase emphasizes basic skills such as standing, sitting, walking, and managing daily activities. Guided by the YESBODY® program and instructional handouts, patients use imagery techniques to activate efficient muscle fibers and improve body structure. Personalized schedules prevent overuse, while dual-task training may address cognitive challenges for those with persistent difficulties.

Once patients can move safely, the program shifts focus to improving cardiovascular health through activities like walking or cycling. These activities are tailored to individual preferences and follow the 70% rule to avoid overexertion, promoting gradual progress and better circulation. Home exercise plans and regular follow-ups via email ensure consistency and sustained engagement.

In the final phase, patients work on building strength with training programs tailored to their personal goals. This stage enhances resilience and targets specific strength types, such as endurance or agility, while addressing ergonomic considerations and managing long-term physical loads, especially for those working from home.

To track progress, remeasuring MPI (Myofascial Pain Index) values may provide a more nuanced understanding of differences between CFS and FMS patients than simply counting Tender Points. This approach should be incorporated from the start of therapy, fostering collaboration between the physician and the movement mentor. Together, they use a field model to map the patient's medical history, identifying triggers and alleviating factors for symptoms. For patients whose primary complaint is fatigue, this model often reveals underlying issues that contribute to their condition. A transdisciplinary approach allows both the physician and the movement mentor to address these issues in parallel.

This adaptation needs to be implemented from the start of therapy both by the physician **(59)** and the movement mentor. **(60)** Both can utilize a field model to collaboratively map the patient's timeline of medical history triggering and alleviating activities and symptoms. For patients whose primary complaint is fatigue this model can reveal that the fatigue often stems from underlying issues. In a transdisciplinary approach the physician and movement mentor can address these issues together and in parallel.

The movement coach can also provide explanations that help the patient understand the origin of these problems and the resulting symptoms. For instance, it is insightful to explain that astronauts—who cannot fall and therefore do not need to use balance strategies to stay upright—also often report fatigue. **(61)** This serves as a valuable illustration during instruction.

Figure 1. ***Algometer used to measure pain thresholds of tender and trigger points in test subjects with myofascial pain and fibromyalgia expressed in Kg/cm2. Equipped with a pressure distributing surface, it can be used to measure the amount of force performed by the test subject and is expressed in Kilograms***.

The arrows in **Figures 2**, **3**, **4** and **5**, next page, indicate where and in which direction the device was placed to measure the resistance of the 1MR (maximal resistance) force exerted by the test subject.

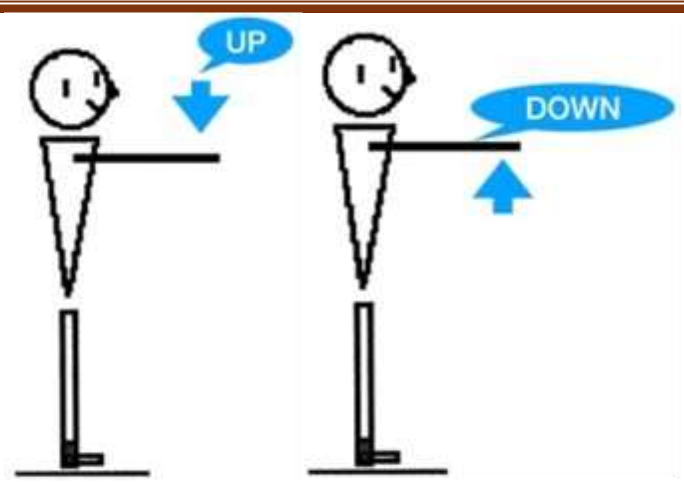

Figure 2 (left). ***Testing the strength to push each arm upward from a standing position.***

Figure 3 (right). ***Testing the strength to push each arm downwards from a standing position.***

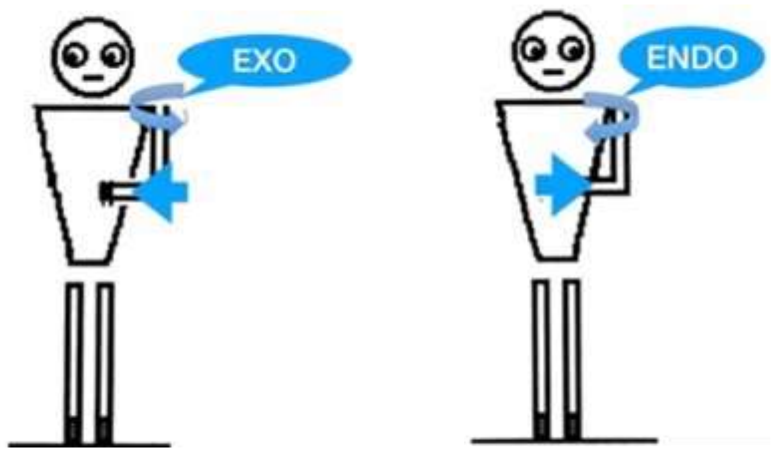

Figure 4 (left). ***Exo-rotation of the upper arm, elbow flexed. The algometer was placed at the wrist level on the outer side of the forearm.***

Figure 5 (right). ***Endo-rotation of the arms, elbow flexed. The algometer was placed at the wrist level on the inner side of the forearm.***

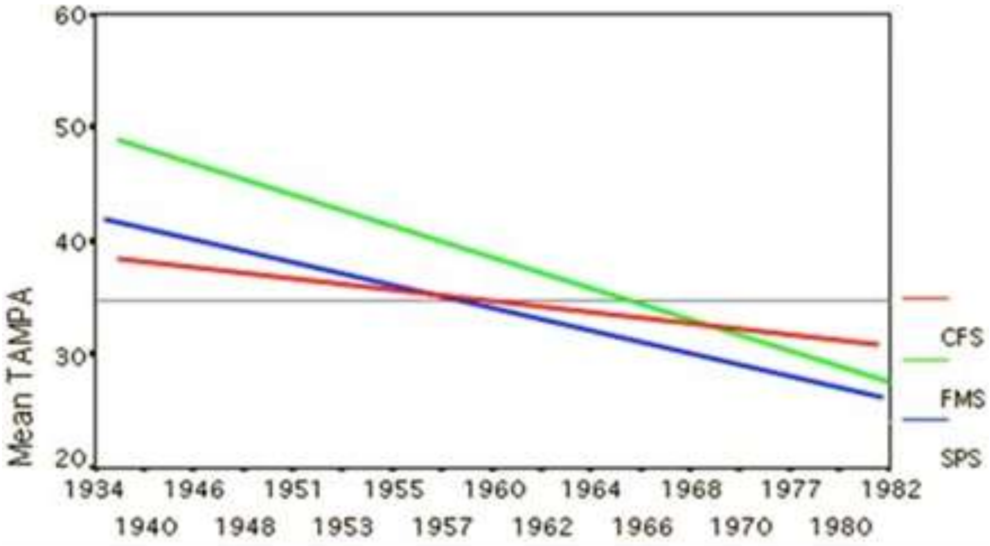

Figure 6. ***The Tampa Scale for kinesiophobia versus date of birth of CFS, FMS and SPS patients.***

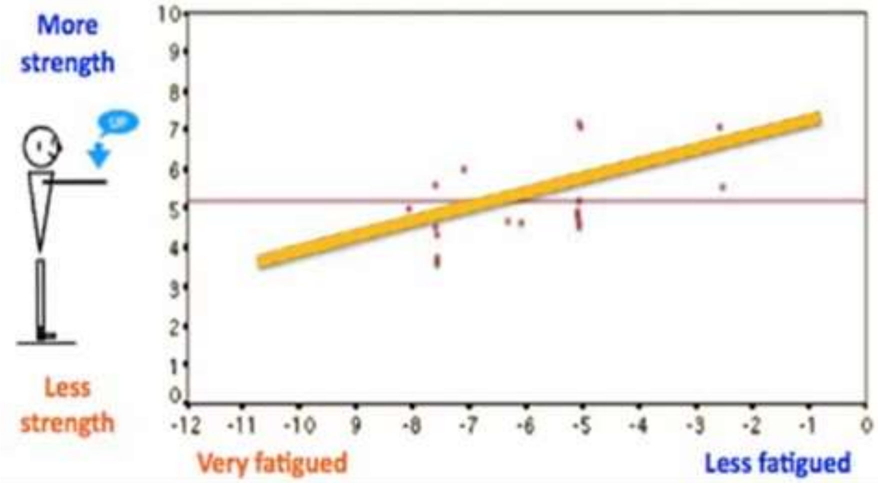

Figure 7. ***The strength to lift each arm up (forward stretched by 90° to the body) compared to 'fatigue now' obtained using a visual analogue scale.***

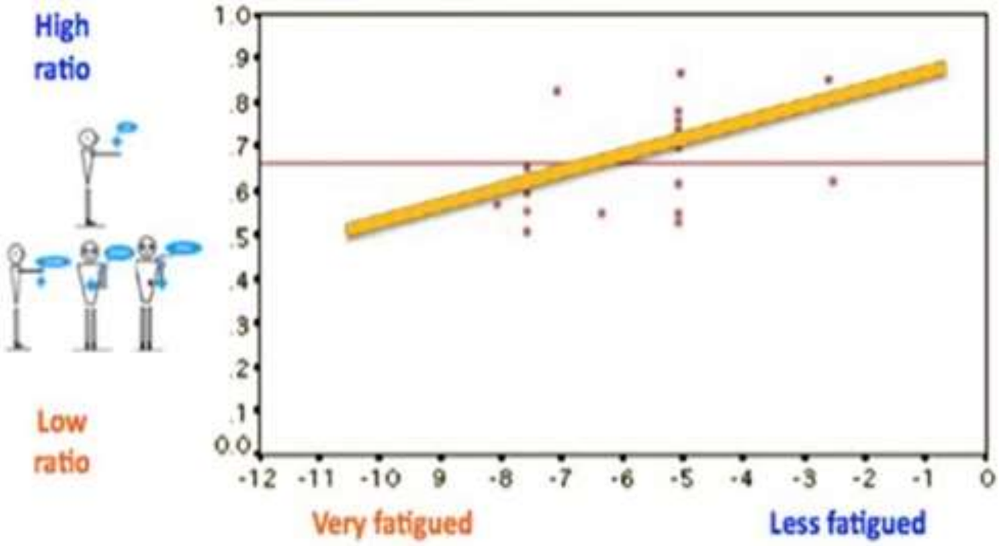

Figure 8. ***The ratio 'posture to movement apparatus' - obtained by dividing the average value of lifting both arms by the average of six other measurements: arms caudally, endo- and exorotation of left and right shoulders - opposite to the reported fatigue on a visual analogue scale. This ratio was lowest in the CFS group.***

Figure 9. ***Timed Loaded Standing Test holding a 1 kg dumbbell in each hand***.

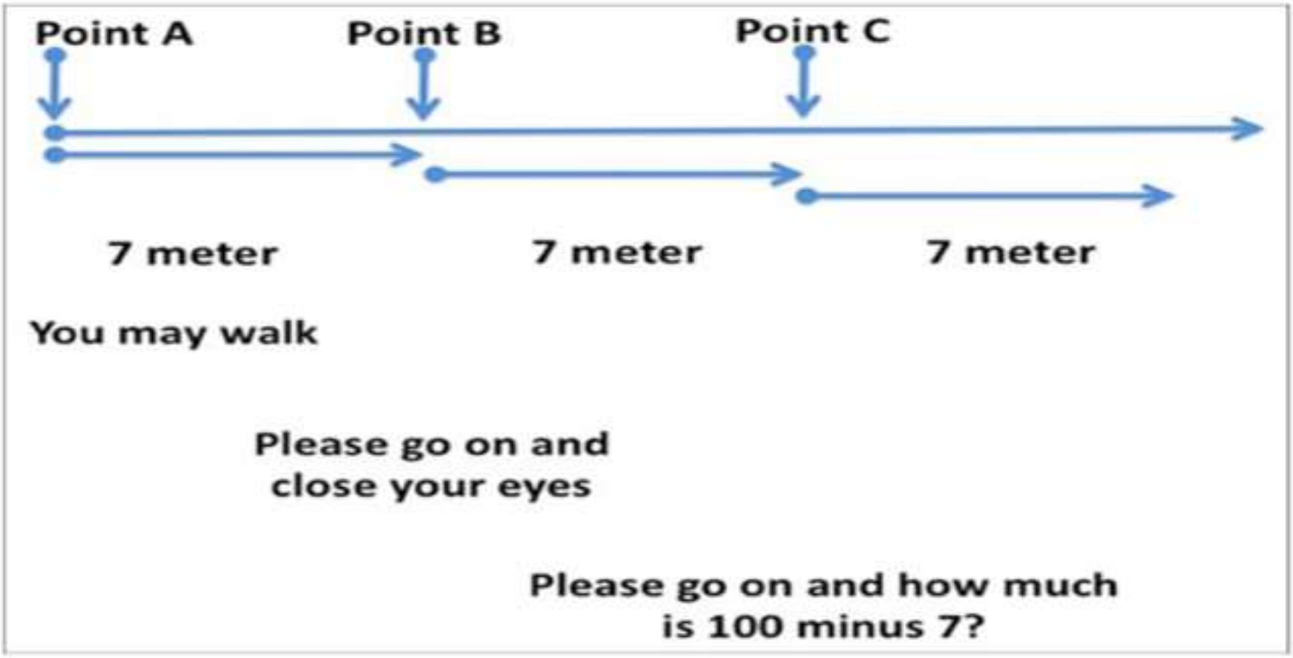

Figure 10. ***Scheme of "stops walking with eyes closed with secondary cognitive task" test. Point A: Starting position, subject standing with eyes aimed at end of corridor. Point B: After 7 m, ask subject to close eyes while walking. Point C: After another 7 m, ask subject to continue walking with eyes closed and ask "How much is 100 minus 7?".***

REFERENCES

1 Eyskens J.b, Wijnants H., Moorkens G. Pilot study: in search of a rational rehabilitation of chronic fatigue patients. Department of Internal Medicine at the University Hospital of Antwerp. Abstract presented at a conference in University Centre Sint Jozef, Kortenberg, University of Leuven, in 1998, entitled: "Chronic fatigue: a multidisciplinary and proactive approach'. ('Chronisch Moe: een multidisciplinaire én proactieve aanpak').

2 Eyskens Jan b. ’Op zoek naar een rationele revalidatie van langdurig vermoeide patiënten’, Wetenschappelijk Tijdschrift Fysische Therapie. 3/2000. (In search of a rational rehabilitation of chronic fatigue patients.

3 Mulder Theo. De geboren aanpasser. Over beweging, bewustzijn en gedrag. 2001. Uitgeverij Contact. Nederland.

4 Eyskens Jan b. Body in Peace, Standaard Uitgeverij, 2007, ISBN 978 90 0222344 0, Antwerpen. or check www.yesbody.be

5 Libet Benjamin (1985). Unconscious cerebral initiative and the role of conscious will in voluntary action. Behavioral and Brain Sciences, 8.

6 Wegner, D.M. 2003. The mind’s best trick: how we experience conscious will. Trends in Cognitive Sciences. Vol 7 no 2.

7 Posner, M.I. & Koninck, A.F. (1966). Short-term retention of visual and kinesthetic information. Organizational Behavior and Human Performance, 1, 71-86.

8 T. Declercq, H. Stuer, S. Heytens, S. Blancke, R. Rogiers, J. Eyskens. ‘De behandeling van CVS in de eerste lijn. Uitdaging of verplicht nummer?’ (The treatment of CFS in primary care. Challenge or mandatory task?), HUISARTS & PRAKTIJK; Huisarts Nu; december 2010; 39(10), 379 – 384.

9 Shipp K.M., Purse J.L., Gold D.T., Pieper C.F., Sloane R., Schenkman M., Lyles K.W. Timed loaded standing: a measure of combined trunk and arm endurance suitable for people with vertebral osteoporosis. Osteoporos Int. 2000;11(11):914-22.

10 Eyskens Jb., Nijs J., D’Août K., Sand A., Wouters K., Moorkens G., Timed Loaded Standing in Female Chronic Fatigue Syndrome compared to other populations. Journal of Rehabilitation Research & Development. Volume 52, Number 1, 2015/ Pages 21–30.

11 Fukuda K., Straus S.E., Hickie I., Sharpe M.C., Dobbins J.G., Komaroff A. International Chronic Fatigue Syndrome Study Group. The chronic fatigue syndrome: a comprehensive approach to its definition and study. Ann Intern Med. 1994;121(12):953-959.

12 Wolfe F., Smythe H.A., Yunus M.B., Bennett R.M., Bombardier C., Goldenberg D.L., et al. The American College of Rheumatology 1990 criteria for the classification of fibromyalgia: report of the Multicenter Criteria Committee. Arthritis Rheum 1990;33: 160 –72.

13 Bazzichi L. et al. Spasmophilia comorbidity in fibromyalgia syndrome. Clin Exp Rheumatol 2010; 28 (Suppl. 63):S94-S99.

14 Kersten P., White P., Tennant A. Is the pain visual analogue scale linear and responsive to change? An exploration using Rasch analysis. PLoS One. 2014 Jun 12;9(6):e99485.

15 Wolfe F., Clauw D.J., Fitzcharles M.A., Goldenberg D.L., Katz R.S., Mease P., et al. The American College of Rheumatology preliminary diagnostic criteria for fibromyalgia and measurement of symptom severity. Arthritis Care Res (Hoboken). 2010;62(5):600-10.

16 Nijs J., Loggia M.L., Polli A., Moens M., Huysmans E., Goudman L., Meeus M., Vanderweeën L., Ickmans K., Clauw D. Sleep disturbances and severe stress as glial activators: key targets for treating central sensitization in chronic pain patients? Expert Opin Ther Targets. 2017 Aug;21(8):817-826.

17 Collin S.M., Nijs J., Meeus M., Polli A., Willekens B., Ickmans K. Endogenous Pain Facilitation Rather Than Inhibition Differs Between People with Chronic Fatigue Syndrome, Multiple Sclerosis, and Controls: An Observational Study. Pain Physician. 2017 May;20(4):E489-E497.

18 Malfliet A., Van Oosterwijck J., Meeus M., Cagnie B., Danneels L., Dolphens M., Buyl R., Nijs J. Kinesiophobia and maladaptive coping strategies prevent improvements in pain catastrophizing following pain neuroscience education in fibromyalgia/chronic fatigue syndrome: An explorative study. Physiother Theory Pract. 2017 Aug;33(8):653-660.

19 Shah J.P., Thaker N., Heimur J. Myofascial Trigger Points Then and Now: A Historical and Scientific Perspective. PM R. 2015 Jul;7(7):746-61.

20 McDermott R. The politics of presidential medical care. The case of John F. Kennedy. Politics Life Sci. 2014 Fall;33(2):77-87.

21 McManimen S.L., Jason A.J. Post-Exertional Malaise in Patients with ME and CFS with Comorbid Fibromyalgia SRL Neurol Neurosurg. 2017; 3(1): 22–27.

22 Fukuda K., Straus S.E., Hickie I., Sharpe M.C., Dobbins J.G., Komaroff A. International Chronic Fatigue Syndrome Study Group. The chronic fatigue syndrome: a comprehensive approach to its definition and study. Ann Intern Med. 1994;121(12):953-959.

23 Wolfe F., Smythe H.A., Yunus M.B., Bennett R.M., Bombardier C., Goldenberg D.L., et al. The American College of Rheumatology 1990 criteria for the classification of fibromyalgia: report of the Multicenter Criteria Committee. Arthritis Rheum 1990;33: 160 –72.

24 Bazzichi L. et al. Spasmophilia comorbidity in fibromyalgia syndrome. Clin Exp Rheumatol 2010; 28 (Suppl. 63):S94-S99.

25 McManimen S.L., Jason A.J. Post-Exertional Malaise in Patients with ME and CFS with Comorbid Fibromyalgia SRL Neurol Neurosurg. 2017; 3(1): 22–27.

26 Meeus M., Ickmans K., Struyf F., Kos D., Lambrecht L., Willekens B., Cras P., Nijs J. What is in a name? Comparing diagnostic criteria for chronic fatigue syndrome with or without fibromyalgia. Clin Rheumatol. 2016 Jan;35(1):191-203.

27 Bazzichi L., Consensi A., Rossi A., Giacomelli C., De Feo F., Doveri M., Sernissi F., Calabrese R., Gonsoli G., Ciapparelli A., Dell'Osso L., Bombardieri S. Spasmophilia comorbidity in fibromyalgia syndrome Clin Exp Rheumatol 2010; 28 (Suppl. 63): S94-S99.

28 Haney E., Smith M.E., McDonagh M., Pappas M, Daeges M., Wasson N., Nelson H.D. Diagnostic Methods for Myalgic Encephalomyelitis/Chronic Fatigue Syndrome: A Systematic Review for a National Institutes of Health Pathways to Prevention Workshop. Ann Intern Med. 2015 Jun 16;162(12):834-40.

29 Shah J.P., Thaker N., Heimur J. Myofascial Trigger Points Then and Now: A Historical and Scientific Perspective. PM R. 2015 Jul;7(7):746-61.

30 Fukuda K., Straus S.E., Hickie I., Sharpe M.C., Dobbins J.G., Komaroff A. International Chronic Fatigue Syndrome Study Group. The chronic fatigue syndrome: a comprehensive approach to its definition and study. Ann Intern Med. 1994;121(12):953-959.

31 Shipp K.M., Purse J.L., Gold D.T., Pieper C.F., Sloane R., Schenkman M., Lyles K.W. Timed loaded standing: a measure of combined trunk and arm endurance suitable for people with vertebral osteoporosis. Osteoporos Int. 2000;11(11):914-22.

32 Lundin-Olsson L., Nyberg L., Gustafson Y. "Stops walking when talking" as a predictor of falls in elderly people. Lancet. 1997 Mar 1;349(9052):617.

33 Eyskens J.b, Nijs J., Wouters K., Moorkens G. Reduced gait automaticity in female patients with chronic fatigue syndrome: Case-control study. Journal of Rehabilitation Research and Development, 2015, 52(7), 805–14.

34 Bultmann U., de Vries M., Beurskens A.J., Bleigenberg G., Vercoulen J.H., Kant I.J. Measurement of prolonged fatigue in the working population: determination of a cut-off point for the checklist Individual Strength. J Occupat Health Psycho. 2000;5:411–416.

35 Vercoulen J., Alberts M., Bleijenberg G. 1999 The checklist individual strength (CIS). Gedragstherapie, 32:131–6.

36 Ware J.E., Sherbourne C.D. The MOS 36-item short form health survey (SF-36): conceptual framework and item selection. Med Care. 1992;30:473–483.

37 Komaroff A.L., Fagioli L.R., Doolittle T.H., Gandek B., Gleit M.A., Guerriero R.T., Kornish R.J., Ware N.C., Ware J.E., Bates D.W. Health status in patients with chronic fatigue syndrome and in general population and disease comparison groups. Am J Med. 1996;101:281–290.

38 'Op zoek naar een Consensus-model voor de aanpak van rugpijn'. Wetenschappelijk Tijdschrift voor Fysische Therapie. 1/2000. (Searching for a consensus-model in dealing with backache).

39 'Op zoek naar een rationele revalidatie van langdurig vermoeide patiënten', Wetenschappelijk Tijdschrift Fysische Therapie. 3/2000. (In search of a rational rehabilitation of chronic fatigue patients.

40 Eyskens Jb., Nijs J., Wouters K., Moorkens G. Reduced Gait Automaticity in Chronic Fatigue Syndrome Patients: a case-control study. Journal of Rehabilitation Research & Development. Volume 52, Number 7, 2015/ Pages 805–814.

41 Eyskens Jb, Illegems J., De Nil L., Nijs J., Kampen J.K., Moorkens G. Assessing chronic fatigue syndrome: Self-reported physical functioning and correlations with physical testing. Journal of Bodywork & Movement Therapies. Volume 23, Issue 3, July 2019, Pages 598-603.

42 Eyskens Jan b. Objective parameters in the rehabilitation of patients with chronic fatigue. PhD dissertation, 2017. University Antwerp, Free University of Brussels.

43 Muscio B. (1921). Is a fatigue test possible? British Journal of Psychology, 31-46.

44 Larun L., Brurberg, K.G., Odgaard-Jensen, J., Price, J.R. (2016) Exercise therapy for chronic fatigue syndrome. Cochrane Database Syst Rev. Dec 20;12:CD003200.

45 Fukuda K., Straus, S.E., Hickie, I., et al. (1994). International Chronic Fatigue Syndrome Study Group. The chronic fatigue syndrome: A comprehensive approach to its definition and study. Annals of Internal Medicine, 121(12):953–59.

46 Eyskens J.B., Wijnants H., Moorkens G. Pilot study: in search of a rational rehabilitation of chronic fatigue patients. Department of Internal Medicine at the University Hospital of Antwerp.

47 Op zoek naar een rationele revalidatie van langdurig vermoeide patiënten (In search of a rational rehabilitation of chronic fatigue patients). FYSISCHE THERAPIE 3/2000.

48 Eyskens J.B., Wijnants H., Moorkens G. Pilot study: in search of a rational rehabilitation of chronic fatigue patients. Department of Internal Medicine at the University Hospital of Antwerp.

49 Shipp K.M., Purse J.L., Gold D.T., Pieper C.F., Sloane R., Schenkman M., Lyles K.W. Timedloaded standing: a measure of combined trunk and arm endurance suitable for people with vertebral osteoporosis. Osteoporos Int. 2000;11(11):914-22.

50 Eyskens J.B., Nijs J., D'Août K., Sand A., Wouters K., Moorkens G. Timed loaded standing in female chronic fatigue syndrome compared with other populations. Journal of Rehabilitation Research and Development 52(1), 21–30. (2015).

51 Lundin-Olsson L., Nyberg L., Gustafson Y. "Stops walking when talking" as a predictor of falls in elderly people. Lancet. 1997 Mar 1;349(9052):617.

52 Eyskens J.B., Nijs J., Wouters K., et al. Reduced gait automaticity in female patients with chronic fatigue syndrome: Case-control study. Journal of Rehabilitation Research and Development, 2015, 52(7), 805–14.

53 Vercoulen J., Alberts, M., Bleijenberg, G. (1999). The checklist individual strength (CIS). Gedragstherapie, 32:131–6.

54 Bültmann U., Vries, M., Beurskens, A.J., Bleijenberg, G., Vercoulen, J.H., Kant, I. (2000). Measurement of prolonged fatigue in the working population: determination of a cutoff point for the checklist individual strength. J. Occup Health Psychol., 5(4):411-6.

55 Ware J.E. Jr., Sherbourne, C.D. (1992). The MOS 36-item short-form health survey (SF- 36). I. Conceptual framework and item selection. Medical Care, 30(6), 473–483.

56 Ware J.E., Snow K.K., Kosinski M., et al. (1993). SF-36 Health Survey Manual and Interpretation Guide. The Health Institute, New England Medical Center. Boston, Massachusetts.

57 Eyskens J.B., Illegems J., de Nil L., Nijs J., Kampen J., Moorkens G. Reduced trunk-arm endurance, but not impaired gait automaticity, relates to self-reported physical functioning in adultwomen with chronic fatigue syndrome. Under review.

58 Eyskens Jb, De Nil L, van den Keybus G, Van Puyvelde L, Sharkey J, Staring J. A policy for the re-activation of long COVID-19 patients. Case Studies Journal ISSN (2305-509X) – Volume 11, Issue 5–May-2022.

59 T. Declercq, H. Stuer, S. Heytens, S. Blancke, R. Rogiers, J. Eyskens. 'De behandeling van CVS in de eerste lijn. Uitdaging of verplicht nummer?', HUISARTS & PRAKTIJK; Huisarts Nu; december 2010; 39(10), 379 – 384.

60 Eyskens Jb, De Nil L, Staring J. A tool to reorient physiotherapy: The use of the field model. Ann Anesth Pain Med 2020; 3(1): 1007.

61 Eyskens Jan b, Sharkey John J, Appleton John A, De Nil Luc, Staring Jeroen. QUEST FOR SPACE: What Patients with Chronic Widespread Pain and Fatigue can Learn from Astronauts. Case Studies Journal ISSN (2305-509X) – Volume 10, Issue 2–Feb-2021.