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Long COVID with Parosmia and Exertional Malaise: A case report

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Narrative: A 66-year-old retired military officer suffered symptoms of long COVID including dizziness, exercise intolerance, olfactory deficits, and 'pins and needles' paresthesia. Exercise tolerance as measured by steps per day progressed from 3,000 steps per day at presentation to 5,000 by the time of this report.

Reported sense of smell was almost normal by the end of the study, and episodes of parosmia had become infrequent. These significant improvements were noted after less than three months of chiropractic care (16 visits).

Care included Chiropractic Adjustments and instruction in cervical post-isometric relaxation and oropharyngeal exercises. Possible complications include the side-effects of *Paxlovid*™, emotional distress related to his father's illness and subsequent death, and possible reactivation of obstructive sleep apnea.

Indexing Terms: Chiropractic; Subluxation; Long COVID; dizziness; olfactory deficits; exercise intolerance.

Introduction

There is a small but growing literature concerning the Chiropractic management of patients suffering from the relatively new phenomenon of long COVID. Blum has discussed the potential benefit of nutritional and other lifestyle interventions as well as chiropractic adjustments and allied approaches. (Blum, 2021) *The Veterans Administration of the United States* included chiropractic under '*consults to consider*' in a booklet on long COVID. (Veterans Administration, 2022) A survey of more than 89,000 patients found that 14.4% of people with long COVID symptoms used Chiropractic care for relief. (Bilc and Cramer, 2024)

> *... We hypothesise there is survival value of unpleasant odours as warnings of tainted food, smoke, and mildew ... in other words, the nervous system may have evolved to prioritise unpleasant odours over pleasant ones'*

We have previously reported four cases of long COVID under a course of Chiropractic care. (Masarsky & Todres-Masarsky, 2022; Masarsky & Todres-Masarsky, 2022; Masarsky & Todres-Masarsky, 2023; Masarsky & Todres-Masarsky, 2024)

The patient described in this paper responded to the same call for subjects (Appendix 1) and executed the same informed consent document (Appendix 2)

as the previous subjects. He was made aware of the call for subjects by a friend, who noticed our flyer when visiting for her own chiropractic care. Questioning regarding the patient's long COVID complaints were partially guided by a list of topics inspired by the COMPASS 31 questionnaire and a subjective scale of olfactory function, along with our general knowledge of long COVID. (Appendix 3). (Sletten et al, 2021; Gupta et al, 2013).

Past history

The patient is a 66-year-old retired military officer. His first episode of COVID took place in September 2021, from which he recovered after a brief hospitalisation. A second episode took place in February 2024, for which he was prescribed *Paxlovid*™. Most of his long COVID symptoms apparently date from this second episode. These symptoms include chronic fatigue, muscle aches, 'brain fog', and light headedness. If he reads anything requiring concentration, he experiences a headache after approximately 10 minutes.

The following month (March 2024), he experienced fatigue after driving for nine hours. The next morning, his fatigue remained, but he drove for another 2-3 hours. Severe fatigue, which he described as a '*crash*' overtook him at lunch that day. Fearing a heart attack, he went to a hospital emergency room, where testing for myocardial infarction proved negative. The severe fatigue lasted approximately one week. Symptom exacerbation twelve to forty-eight hours after a seemingly innocuous exertion is sometimes referred to as '*post-exertional malaise*'. Long COVID victims frequently suffer attacks of post-exertional malaise, which recent research has associated with a number of pathophysiologic factors, including depressed mitochondrial function. (Appelman et al, 2024) As a result of this March 2024 episode, the diagnosis of long COVID was established.

In May of 2024, a '*pins and needles*' sensation began over his entire body, particularly the torso. This paresthesia worsened with stress. He previously would enjoy 3-4 alcoholic drinks per week, but he has been avoiding this since March of 2024 due to what he described as '*fear of alcohol intolerance due to long COVID*'. Socialising, including enjoyable visits with friends, often creates an episode of deep fatigue. Surgical history includes a ligament procedure on the left thumb, which the patient states was to relieve arthritic symptoms. There have also been multiple Mohs surgeries [Ed: Microscopically controlled surgery used to treat common types of skin cancer] for skin cancer (presumably basal cell carcinoma). He experienced a fractured mandible as a child and a fractured foot as an adult, both related to baseball injuries.

He was diagnosed with obstructive sleep apnea approximately ten years ago, for which he was prescribed a continuous positive airway pressure (CPAP) unit. Frequent job-related travel made CPAP inconvenient, so he switched to a dental apnea appliance. A follow-up sleep study performed in May of 2024 revealed no abnormal results.

Left shoulder and scapular pain and low back pain is long-standing and apparently precedes long COVID.

Findings at presentation

The initial Chiropractic visit took place on November 13, 2024. The patient took an Uber to his appointment, stating he usually finds driving stressful due to his long COVID fatigue and brain fog. Informed consent was obtained.

The long COVID interview guided by our questionnaire (Appendix 3) revealed that the patient experienced lightheadedness with some tachycardia and occasional palpitations when standing after sitting or lying down. He reported an episode of constipation several months before presentation. He was unable to tell whether he had trouble driving at night, since he had been mostly avoiding driving.

Regarding his sense of smell, he stated he had some loss after his first infection, which had not completely recovered. Currently he rated his sense of smell as '3' on the Gupta et al scale. He also described 1 to 2 parosmia episodes per week, with each episode lasting several hours. During these episodes he perceived a '*dumpster smell*' unrelated to the presence of garbage in his vicinity.

He stated he experienced more fatigue and less exercise tolerance than he used to prior to COVID. His only current exercise is walking around the house supplemented by some walking outside. He measures 3,000 steps of walking per day.

He stated his sex drive seems reduced but felt this may be based on an avoidance of fatigue that would follow sexual activity.

He was experiencing distress because his father was in hospice some distance away from the patient's home. He would have preferred to be with his father at this time, but felt long-distance travel was out of the question.

His current medications included *Terazosin*™ (for prostate enlargement), *Zyrtec*™ (for allergies), and *Lipitor*™ (for hypercholesterolemia). Nutritional supplements consisted of coenzyme Q-10, vitamin D, vitamin B-12, magnesium, melatonin, a multivitamin, and a probiotic.

He reported visiting an acupuncturist once per month.

On examination

The patient stated his height is 5'11" (180.5cm) and his weight is 200 (90.7kg). He noted some minor weight gain due to his low activity level.

Active cervical range of motion was restricted in rotation and lateral flexion bilaterally. Right lower rib excursion (LOREX) was restricted. Motion palpation and static palpation augmented by '*heads up palpation*' and '*inspiration palpation*' techniques revealed hypomobility at the right sacroiliac, T11-12, T12-L1, T5-7, and C1-occiput motion segments. These techniques were previously described. (Masarsky 2024) Briefly, in '*heads up palpation*' the prone patient lifts his or her head. This action causes contraction of *multifidus* and *rotatores* muscles. In a subluxated motion segment, irritation of spinal nerves will cause these muscles to contract in a hypertonic, hypotonic, or asymmetrical manner, causing the motion segment to become prominent to the palpating examiner. In '*inspiration palpation*' the prone or sitting patient takes a deep inspiration while the examiner palpates the thoracic spine. In a subluxated motion segment, irritation of the spinal nerves will cause the external intercostal muscles to contract in a hypertonic, hypotonic, or asymmetrical manner, causing the motion segment to become prominent to the palpating examiner.

A left expiration assist cranial fault was revealed by challenge according to Applied Kinesiology protocols.

The Weber test revealed lateralisation of sound to the right ear, indicating a probable conductive hearing deficit in the right ear. The vibrating tuning fork was then placed on the patient's glabella. The patient reported that the perceived tuning fork vibration seemed to be moving down his nose. Asymmetrical perception of the vibration of a tuning fork placed along the mid-sagittal plane of the patient's skull has been referred to as a positive '*leaky vibe*' test. (Masarsky, 2024;5)

Single leg balance was 25 seconds on the left, 30 seconds on the right. Reverse digit span was 4. Ely's test provoked mild pain at the right anterior thigh. The left *sternocleidomastoid*, right *piriformis* and right t*ensor fascia latae* muscles were inhibited on manual muscle testing.

Interventions and outcomes

All vertebral and extremity adjustments were high-velocity, low-amplitude diversified adjustments unless otherwise specified. Cranial adjustments were performed with respiratory

assist technique, following Applied Kinesiology protocols. Neurolymphatic and neurovascular stimulation also followed Applied Kinesiology protocols.

Care on 13 November '24

Adjustments were administered at C1, the right sacroiliac, L1, and the right glenohumeral. The yintang acupressure point was stimulated. (Young-Chang et al, 2011) Suboccipital muscles were relaxed by the clinician gently curling his fingers under the inferior border of the supine patient's occiput (*suboccipital* release). Neurolymphatic stimulation was administered to the reflex points for the right *piriformis* and right *supraspinatus* muscles.

The patient was asked whether the demands of the case history, examination, and adjustment caused an exacerbation of his fatigue. He replied that he noticed no significant drop in his energy level.

Care on 13 November '24

Conventional manual muscle testing of the *sternocleidomastoid* muscle was negative. However, the left *sternocleidomastoid* was inhibited when manual muscle testing was performed simultaneously with Valsalva manoeuvre. Using the Valsalva manoeuvre to augment other examination steps has been previously discussed. (Masarsky, 2024)

Prior to adjustments, cervical post-isometric relaxation was performed in rotation and lateral flexion. For rotation, the patient turned his head to the left as far as possible. He was asked to look up slightly to respect the normal cervical lordotic curve. With the clinician's hand against the right side of the patient's face, the patient was asked to try to turn his head to the right, using as much force as possible without causing pain or strain. After ten seconds, the patient was asked to stop pressing, but to hold the position. The patient was instructed to take a deep breath in, then turn further to the left during expiration. The procedure was repeated with right rotation, left lateral flexion, and right lateral flexion.

Adjustments were administered to C1-2, T11, and L5. Yintang stimulation and suboccipital release were performed. The patient was instructed to perform cervical post-isometric relaxation at home.

Care on 18 November '24

Adjustments were administered to the right sacroiliac, L4, T11, T5-7, C1-occiput, and the left glenohumeral joint. Neurovascular stimulation for the *pectoralis major clavicular* muscles was performed bilaterally. Neurolymphatic stimulation was performed for the left *psoas*, left *deltoid*, and left *subscapularis* muscles.

The possible benefit of yogic alternate nostril breathing was discussed. The patient indicated he was already practicing this technique. The possible benefit of certain herbs for mitochondrial function was discussed. The patient indicated he was already taking green tea and ginseng tea.

Care on 20 November '24

Cervical post-isometric relaxation was administered as previously described. The left *pterygoid* muscle was released, following Applied Kinesiology protocols. This was followed by Cottam technique for the temporomandibular joint. (Cottam, 1936) Briefly, a gentle manual traction force is applied to the pinnae of both ears in the superior direction as the patient opens and closes his or her mouth. This procedure is repeated with the force applied in posterior, inferior, and anterior directions.

For the anterior manoeuvre, a very light pressure is applied by the clinician's finger within the auditory canal. The Cottam technique mobilises the temporomandibular joint by taking advantage of the location of the ear immediately behind the articulation. Adjustments were administered to C1, C7, T5-7, and T12.

The patient was taught oropharyngeal exercises to build the tone of the soft tissues of the tongue, mouth, and throat (Appendix 5). The rationale and research basis of these exercises has been previously discussed. (Masarsky, 2023)

Care on 25 November '24

Adjustments were administered at L5, T12, and T2. C2 was adjusted with respiratory assist technique, following Applied Kinesiology protocols. Neurolymphatic reflexes were stimulated for the left *psoas*, right *quadriceps femoris*, and right gluteus maximus muscles. *Suboccipital* release and yintang techniques were performed.

Care on 27 November '24

The patient stated detailed reading remains stressful. He reported putting together three-dimensional models to rehabilitate aspects of cognitive function as well as for recreation. He noted exacerbation of left shoulder and arm pain of several days' duration, with no apparent trauma. Gazing to the right and downward caused inhibition of an indicator muscle; this is known as '*ocular lock*' in Applied Kinesiology. The left *deltoid* muscle was inhibited on manual muscle testing.

Adjustments were administered to the right sacroiliac joint, L3, T7-5, C5, and the left glenohumeral joint. Neurolymphatic reflexes for the left *deltoid* and *supraspinatus* muscles were stimulated. Ocular lock was addressed by stimulation of visual righting reflexes (light skin traction superior to the orbits) and acupressure stimulation of the K27 point and umbilicus. Yintang and suboccipital release techniques were administered.

Care on 4 December '24

Adjustments were administered at L4, L1, T7-5, C5, and the left glenohumeral joint. Soft tissue manipulation at the superior ilium adjacent to the right iliolumbar ligament attachment was performed. Neurolymphatic reflexes for the left deltoid and biceps brachii muscles were stimulated.

In terms of fatigue, the patient related that he frequently experienced severe fatigue one to two days after attempting vigorous exercise, post-exertional malaise. He was advised to try alternate nostril breathing while listening to music after exertion.

Care on 6 December '24

At this point, the patient had been adjusted seven times over approximately three weeks. He reported no improvement in headache provocation when reading, daily walking tolerance, and fatigue. He still rated his sense of smell as '3' out of '5'. However, he noted the frequency of his '*dumpster smell*' parosmia seemed to have reduced. When asked about light-headedness and tachycardia when standing, he stated that it occurs '*sometimes*'.

On examination, right lower rib excursion was no longer reduced in comparison to the left. Tuning fork sensation at the glabella continues to be felt down the nose, but '*not too much*'. On Weber test, sound continued to lateralise to the right.

Adjustments were performed at the right sacroiliac, T12, and C6. The right occiput was adjusted with respiratory assist technique. Neurolymphatic reflexes for the right *piriformis* and right *gluteus maximus* muscles were stimulated, as was the yintang acupressure point. *Suboccipital* release was administered.

Care on 9 December '24

On conventional manual muscle testing, the left *biceps* and *deltoid* were functioning normally. However, when muscle testing was augmented by having the patient perform a Valsalva manoeuvre, both muscles were inhibited. The use of the Valsalva manoeuvre to disclose muscles that are slightly inhibited has been previously discussed. (Masarsky, 2024)

Adjustments were performed at L1, T2, C5, and the left glenohumeral joint. Neurolymphatic reflexes were stimulate for the left *psoas*, left *deltoid*, left *biceps*, and *diaphragm* muscles. Neurovascular stimulation for the diaphragm was performed as well. Yintang and *suboccipital* release techniques were performed.

Care on 14 December '24

On this 10th visit, a progress examination was performed. Headache following detailed reading continued to be a problem. More specifically, the patient stated '*The immediate feeling is dry eyes*'. This was reportedly followed by a dull headache located behind the eyes.

His usual daily walking distance remained at 3,000 steps. However, he related walking 5,600 steps three days previous to this visit, concerning which he admitted he '*overdid it*' and suffered some post-exertional malaise afterwards.

Standing continued to provoke '*some*' light-headedness and tachycardia. He continued to experience brain fog.

The patient noted improvement in the sense of smell, with a score of '4' out of '5' on the Gupta et al scale, and with the frequency of '*dumpster*' parosmia decreasing.

Tuning fork vibration at the glabella no longer produced '*leaky vibe*' down the nose. The left *biceps brachii* was normal and the left *deltoid* was inhibited on manual muscle testing. Left Ely's test provoked soreness at the right sacroiliac joint. On Weber test, sound continued to lateralise to the right ear.

Adjustments were performed at the right sacroiliac, L2-3, and T5-7. Suboccipital release and yintang techniques were administered.

Care on 16 December '24

Adjustments were performed at C4, T6, T11, and L1. Neurolymphatic stimulation was performed for the *diaphragm*, left *psoas*, and right *sartorius* muscles. Digital release of the left *pterygoid* muscle was performed to normalise temporomandibular joint function.

Care on 20 December '24

The patient reported that dry eye and headache following detailed reading continued. During a visit to his medical ophthalmologist three days before this visit, he was assured that there is no apparent eye pathology.

He had to walk an unexpectedly long distance to reach his ophthalmologist's office, yet he experienced no post-exertional malaise during the ensuing days. On an average day, he was now walking between 3,000 and 4,000 steps.

He noted his sense of smell was now almost normal, almost '5' out of '5' on the Gupta et al scale. The frequency of his '*dumpster*' parosmia episodes continued to decrease.

Brain fog continued. Standing continued to cause light-headedness and tachycardia, but only '*sometimes*'.

Weber test remained as before, with sound lateralising to the right ear. Bilateral Ely's test produced mild sacroiliac soreness. Manual muscle testing was now negative for the *deltoid* and *biceps brachii* muscles.

When considering his condition overall, the patient stated he is slightly improved.

Adjustments were administered to T6, T10, and the left glenohumeral joint. C2 was adjusted with respiratory assist technique. Neurolymphatic stimulation was performed for the right *psoas* and left *supraspinatus* muscles.

This was the last visit under the research protocol. However, the patient expressed his wish to continue as a regular patient. We continued to follow his progress during these subsequent visits.

Care on 30 December '24

The patient reported no improvement in reading discomfort. The '*dumpster smell*' parosmia continued to be less frequent than at presentation. Walking an average of 3,500 steps per day was now well-tolerated, compared to an average of 3,000 at presentation. He took a particularly long walk on 29 December with no post-exertional malaise so far. Tachycardia and dizziness on standing took place '*not so much*'. Right lateralisation of sound on Weber test remained unchanged.

Adjustments were administered at the right sacroiliac, L4, L2, T8-9, T7-5, and C2. Neurolymphatic reflexes for the left *psoas* and *diaphragm* muscles were stimulated. The neurolymphatic reflex for the left upper extremity was stimulated as well. Soft tissue manipulation of a tender point at the left *levator scapulae* muscle was performed, as were *suboccipital* release and yintang procedures.

Care on 10 January 2025

The patient reported no change in reading discomfort since the last visit. He was now walking an average of 4,000 steps per day.

Adjustments were performed at the left sacroiliac, T11-12, T5-6, C5, and the left glenohumeral joint. C1 was adjusted with a light thumb-flick manoeuvre. Neurolymphatic stimulation was performed for the left *gluteus maximus* and left *supraspinatus* muscles. Neurovascular stimulation was administered to the *pectoralis major clavicular* muscles. Suboccipital release and yintang procedures were performed.

Care on 24 January '25

Prior to this visit, the patient had traveled from Virginia to Florida for his father's funeral. The unaccustomed travel, the stress of the funeral itself, and the necessity to deal with many other people made this something of an undertaking. He experienced an episode of tachycardia in the Orlando airport, and he mentioned '*brain fatigue*' when in crowded conversation with relatives and friends of the family. However, he stated '*I juggled it pretty well*'. Asked how he felt now that he has returned, he stated '*I feel about as good as I did before I left, so that was a plus*'.

Adjustments were administered to the left sacroiliac, T11, T9, and C6. Neurolymphatic stimulation was administered for the left *piriformis*, left *psoas*, and left *subscapularis* muscles. The sagittal suture of the skull was decompressed with respiratory assist techniques. *Suboccipital* release and yintang manoeuvres were performed.

Care on 5 January '25

At this point, there had been 16 visits since 13 November 2024. Detailed reading continued to provoke dry eye and headache, as did working jigsaw puzzles. The Weber test was unchanged. He had repaired his toilet tank, and this provoked some fatigue.

The pins and needles sensation mentioned at the first visit is now mild and occurred only with exertion. He was now walking an average of 5,000 steps per day; is an improvement of more than 66% in this measure of exercise tolerance.

Adjustments were administered to T2 and T11. C2 was adjusted with respiratory assist technique. Yintang and *suboccipital* release procedures were performed.

Discussion

While this former military officer is certainly not '*back to himself*', his improvement in less than three months is significant. His olfactory perception is approaching normal and frequency of '*dumpster*' parosmia is abating. The unpleasant nature of his parosmia is reminiscent of the experience of one of our previous long COVID patients. (Masarsky and Todres-Masarsky, 2022) That previous patient perceived an illusory '*house on fire*' odour at unpredictable times.

Furthermore, when her olfaction began to improve, unpleasant odours were more easily perceived than pleasant ones.

> We hypothesised that this had to do with the survival value of unpleasant odours as warnings of tainted food, smoke, and mildew, to name a few examples. In other words, the nervous system may have evolved to prioritise unpleasant odours over pleasant ones.

Of particular note is the patient's improvement in exercise tolerance. He has progressed from an average of 3,000 steps per day to 5,000 steps per day without paying the price of post-exertional malaise. This is significant in that a sedentary lifestyle and long COVID are risk factors for many of the same maladies. For example, a review of 42 million records identified history of COVID-19 infection as a risk factor for cardiovascular maladies, including stroke. (Wang et al, 2022) A sedentary lifestyle is a long-recognised cardiovascular risk factor as well. Physical activity builds resilience against all sorts of maladies, including cardiovascular. Therefore, it is reasonable to suppose that facilitating physical activity through improved exercise tolerance reduces the cardiovascular risk of the long COVID victim.

At our current level of understanding, there is no way of knowing whether or not side effects of *Paxlovid*™ were complicating factors for this patient. Skin irritation has been reported as a side effect of this drug, so it is plausible as an exacerbating factor in the patient's '*pins and needles*' paresthesia. (Katella, 2024) In this regard, it is gratifying that the patient's '*pins and needles*' paresthesia has become mild.

The patient had been diagnosed with obstructive sleep apnea years before his COVID-19 infections. Although he had been responding well to treatment, it should be noted that COVID-19 infection is a significant risk factor for obstructive sleep apnea. (Lin et al, 2024) It is not unrealistic to suspect that the patient's sleep apnea may have been reactivated at some point during long COVID. Our recommended oropharyngeal exercises, combined with Chiropractic Adjustments may have improved the tone of the soft tissues of the tongue, throat, and mouth.

Our care of this patient came at a time of emotional distress in his life due to the illness and subsequent death of his father. It is reasonable to assume that stress-related physiological changes tend to exacerbate long COVID.

Positive Weber test did not change during this patient's care. In all likelihood, this left-right asymmetry in hearing acuity is of long standing and precedes long COVID.

Conclusion

This case report joins several others in highlighting the potential benefit of Chiropractic care for long COVID sufferers. Our patient exhibited significant improvement in exercise tolerance and olfactory function during less than three months of chiropractic care.

Interactions among long COVID, emotional stress, obstructive sleep apnea, and pharmaceutical side-effects could have been factors in this case, although the nature of these interactions await study.

Conflict of interest statement

The authors report no conflict of interest.

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About the Chiropractors

Charles S. Masarsky DC

Chuck Masarsky was born in the Bronx and grew up on Long Island. His BS is from Cornell University and his DC is from New York Chiropractic College. He also took graduate work at SUNY Stony Brook. He served in the US Army Reserves as a medic and as Chair of the Research Committee of the Virginia Chiropractic Association.

Dr Masarsky has published extensively in professional journals and lectures here and abroad. He co-edited the textbook SOMATOVISCERAL ASPECTS OF CHIROPRACTIC: An Evidence-Based Approach with Dr Todres-Masarsky. They also created and published the research newsletter, Neurological Fitness, encouraging dialogue within the profession.
When he's not in the office, he's an adjunct professor at Northern Virginia Community College. He enjoys movies, classical music and playing with his cats. If you're lucky, you may catch him doing standup at open mikes in the area.

Marion Todres-Masarsky DC

Dr Todres, originally from New Jersey, took her BA and MA (English) from the University of Massachusetts/Boston and her DC is from New York Chiropractic College. She did additional graduate work at SUNY/Binghamton and Rutgers GSE.

She has been a lab instructor on the college level and tutored in English and anatomy. She's worked in libraries in N.J., Colorado and Massachusetts and still thinks of an old-fashioned card catalogue as a candy store for the curious.

She has served as Chair of the New Practitioners Committee of the Virginia Chiropractic Association and was the first woman elected to the board of that organization, serving as the Northern District Representative, covering Northern Virginia. She has published papers in professional journals as well as co-editing SOMATOVISCERAL ASPECTS OF CHIROPRACTIC: An Evidence-based Approach. With Dr Masarsky, she created and published the research newsletter, Neurological Fitness, to encourage dialogue within the profession.

Outside the office, she loves to cook, garden, hunt for fossils along the beach and laugh. An evening of blues, bluegrass or world music will definitely make her heart sing, as will dinner and conversation with friends. Watching a movie with her cats and Dr Masarsky is good too.

https://www.youtube.com/@viennachiropractic4145

Appendix 1: Call for Research Volunteers

Call for Research Volunteers: Long Haulers (COVID)

What Is Our Hypothesis (Research Question)?

It is not uncommon for COVID-19 survivors to have residual problems for weeks or months after the fever and acute symptoms are gone. These people are sometimes referred to as "long haulers". Common long-haul symptoms include headache, fatigue, attention deficit, and difficult breathing.

We know from both published research and our own clinical experience that chiropractic adjustments often help people with these symptoms whether or not they are infection related. The possibility that chiropractic adjustments can help people with these same symptoms post-COVID seems reasonable.

In a previous newsletter, we provided a brief discussion of a COVID-19 survivor who had lost her sense of smell and seemed to regain it immediately after her adjustment.

Our hypothesis: *In some cases, chiropractic adjustments can reduce the severity of COVID-19 long-haul symptoms.*

How Do You Qualify for the Project?

We are calling for volunteers who are COVID-19 survivors with lingering symptoms who have had no chiropractic care for at least one month. We will need written documentation of your COVID-19 diagnosis. If you may still be contagious, we will delay your participation.

What Can You Expect During Your Participation?

If you are an established patient, we will perform a brief case history and exam focused on your long-haul symptoms as well as our usual chiropractic checkup. If appropriate, an adjustment will be performed. This visit will last approximately 30 minutes.

If you are a new patient, we will perform the same case history and examination that any other new patient would experience, along with specific questions related to long-haul symptoms. If appropriate, a chiropractic adjustment will be performed. This visit will last approximately one hour.

There will be two follow-up visits for additional chiropractic adjustments, lasting approximately 15 minutes each. At the fourth and final research visit, a progress exam will be conducted.

What Will We Do with the Data?

We hope to publish these cases in a peer-reviewed, indexed clinical journal. Published papers will not include your name or any information that can be used to identify you. Your privacy and your safety will always be our paramount consideration.

Will There Be Payment?

This research is not grant-funded, so we cannot offer cash payment. All chiropractic services received as part of your participation in this research will be free of charge.

Contacting Us

If you are interested in volunteering, or if you have a friend or family member who would like to, contact us by phone: 703-938-6441. Feel free to spread the word by forwarding this e-mail, or by copying and sharing this flyer.

Thank you!

Appendix 2: Consent for Research Participation

VIENNA CHIROPRACTIC ASSOCIATES, P.C.

243 Church Street NW, #300-B, Vienna, VA 22180
703-938-6441
Directors: Charles S. Masarsky, D.C. & Marion Todres-Masarsky, D.C.

Thank you for helping us investigate the chiropractic management of long-haul COVID-19 symptoms.

We will measure the severity of your symptoms before and after a brief series of chiropractic adjustments.

We are committed to your safety and well-being during your participation in this research, as we would be with anyone under our care. Nevertheless, you have the right to withdraw your participation at any time for any reason.

We hope this research leads to publication in a clinical journal. In compliance with standard rules for such publications, we will not reveal your name, initials, unique characteristics, or any other information that poses a foreseeable threat to your privacy.

"I have read the above, asked any questions I have about the project described, and I understand the information presented. I consent to participate."

Printed Name of Participant:_____

Signature of Participant:_____

Today's Date:_____

Appendix 3: History Questions Relevant to Long COVID

Some History Questions Relevant to Long COVID (discuss frequency, severity, + whatever other details patient can add)

Autonomic Function

Since COVID, when standing after sitting or lying down do you feel:

- Dizzy?
- Shaky/weak?
- Do you break into a sweat?
- Does your vision blur?
- Does your heart race (palpitations)?

Do you get dry mouth more than you used to? Excess salivation more than you used to?

Do you get dry eye more than you used to? More tearing up than you used to?

Are you experiencing more diarrhea than you used to? More constipation than you used to?

Do you have more difficulty emptying your bladder than you used to?

Are you more sensitive to bright light than you used to be?

Do you have more difficulty seeing/driving at night than you used to?

Olfactory Function

Since COVID, what score would you give your sense of smell if "0" means you are unable to smell anything, and "5" is completely normal sense of smell?

If your score is less than "5", do you find yourself using more salt and other seasonings?

Cognitive Function

Do you have more trouble concentrating than you used to?

Do you have more trouble with your memory than you used to?

Do you feel more mentally "foggy" than you used to?

Breathing

Do you have more trouble than before taking a deep breath?

Do you have to stop to take a breath when speaking more often than you used to?

Endocrine (Glandular)

Do you get tired more easily than you used to?

Do you have less sex drive than you used to?

Are you more sensitive to heat or cold than you used to be?

Do you have more of a craving for salt than you used to?

(**Sletten et al, 2012; Gupta et al, 2013**)

Appendix 4: Exercises for obstructive sleep apnea

EXERCISES FOR OBSTRUCTIVE SLEEP APNEA

Say "Ah"

When an examining doctor looks into your mouth and asks you to say, "Ah," they look for elevation of the soft palate. The same vocalization can be used as an exercise to tone the soft palate.

Say, "Ah" for 10-60 seconds, according to comfort. Alternate staccato vocalization ("Ah-ah-ah-ah…" etc.) with longer efforts of "holding the note" ("Ahhhhhhhh…"). Shoot for a total of at least 3 minutes per day.

Variations: You can say, "Ah" with your mouth wide open and your tongue all the way out and down. This recruits additional throat and tongue muscles. For those familiar with yoga, this somewhat resembles the "lion" pose. Also, instead of just saying, "Ah," you can sing something, with "Ah" as the lyric.

Resisted Tongue Thrust (Forward)

Press your lips together, and press your tongue forward against the resistance. Do this for 10-60 seconds according to comfort, shooting for a total of at least 3 minutes per day.

Variation: You can open your mouth and press your tongue against your fingers or a spoon.

Tongue to the Roof

Press your tongue to the roof of your mouth. Assist the pressure with suction, so your tongue is actually being sucked upward against your palate. Hold for 10-60 seconds according to comfort, shooting for a total of at least 3 minutes per day.

Tongue to the Floor

With the tip of your tongue touching your lower teeth, press the rest of your tongue down against the floor of your mouth. Hold for 10-60 seconds according to comfort, shooting for a total of at least 3 minutes per day.

Tongue to the Cheek

Press your tongue against your right cheek, with the tongue and cheek resisting each other. Hold for 10-60 seconds according to comfort, shooting for a total of at least 3 minutes per day. Repeat with left cheek.

Variation: To emphasize the cheek muscles, your can place your fingertip in your mouth and use it for resistance rather than your tongue.

Back-Lick

Pressing your tongue against the roof of your mouth just behind your front teeth, move your tongue as far back as possible, licking the roof of your mouth from front to back. Then lick from back to front. Repeat for 10-60 seconds according to comfort, shooting for a total of at least 3 minutes per day.