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No One Touched My Head:

Bowen Therapy for Adult Long Term Post Concussion Syndrome—A Case Series Study

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Abstract

Study Participants

Six adults medically diagnosed with post concussion syndrome (PCS) volunteered for the study. Each received eight (8) free sessions of Bowen Therapy from one certified Bowenwork practitioner between January and April, 2016. Five of the six were female. Participant ages ranged from 31 to 64. Each was suffering from symptoms two or more years after the concussion. Only one of the six was able to work.

Each participant presented with symptoms resulting from brain injuries at and opposite the impact location on the skull (occipital, temporal, frontal or parietal bone), and from the manner of the accident, whether a car accident, a fall, or a wrenching blow to the head. Every case was unique, and damage was not limited to the brain. For example, several had unresolved skeletal alignment and chronic pain issues despite extensive physiotherapy and massage in the years prior to the study. Participants agreed to discontinue all other bodywork therapies while receiving Bowen Therapy. They continued to take their medications.

Bowen Procedures

Because the damage to the body and brain was unique to each participant, it quickly became apparent that the selection of therapeutic procedures had to be customized to each participant. The practitioner noted during sessions 1 to 4 that many symptoms appeared to be traceable to severe muscle tension, especially in the neck, and associated skeletal misalignment. In the second half of the study she selected procedures accordingly. While all participants received the Bowen Therapy Concussion Resolution Protocol (BRM2, BRM3, UR/TMJ), in sessions 4 to 8 participants received additional procedures to address issues specific to that participant. Procedures were documented.

Assessments

A third party—a retired registered nurse—used a SCAT3 concussion assessment tool that was adapted for this case-series study. (See Section 6.2.) There were three assessments: before the first session; after the fourth session; and after the eighth session. Symptom severity scores (SSS) were calculated at each assessment.

Symptom Severity Score Results

Participant	Assessment 1 30 Jan 2016		Assessment 2 5 March 2016		Assessment 3 16 April 2016		SSS Improve-ment
	Number of Symptoms	SSS	Number of Symptoms	SSS	Number of Symptoms	SSS	%
A	26	114	20	71.5	26	61	**46**
B	29	111	22	47.5	18	31	**72**
C	22	76	18	57.5	21	48	**37**
D	21	**59**	23	**47**	24	**76***	**-29%**
E	17	54	13	37	—	—**	**31**
F	23	89	20	60	21	42.5	**52**

Four of the six participants had significantly improved scores after eight sessions of Bowen Therapy. Participant B, the youngest at 31 years old, experienced the greatest improvement of 72 percent. Given the complexity of the physical issues, eight sessions of Bowen Therapy were insufficient to resolve the PCS symptoms.

It is noteworthy that Bowen Therapy, a neuromuscular approach that addresses the entire body, stimulated healing two to four years after the participants' concussions.

*Participant D had a moderate migraine on April 16.
**Participant E, the only male, was unable to attend the third assessment. The SSS improvement was calculated using the scores from Assessments 1 and 2.

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1. Introduction

1.1 Definition of Concussion

Post Concussion Syndrome (PCS) is a debilitating condition that is diagnosed when the brain does not heal within a certain period from a mild traumatic brain injury (mTBI), more commonly called concussion.

The Mayo Clinic staff definition of concussion is as follows:

A concussion is a traumatic brain injury that alters the way your brain functions. Effects are usually temporary but can include headaches and problems with concentration, memory, balance and coordination.

Although concussions usually are caused by a blow to the head, they can also occur when the head and upper body are violently shaken. These injuries can cause a loss of consciousness, but most concussions do not. Because of this, some people have concussions and don't realize it. Concussions are common, particularly if you play a contact sport, such as football. But every concussion injures your brain to some extent. This injury needs time and rest to heal properly. Most concussive traumatic brain injuries are mild, and people usually recover fully.[1]

Symptoms resulting from a concussion often resolve within a few days or weeks for most victims. Multiple concussions can result in cumulative injury and even death. Adolescents may have longer recovery times than adults. A select few adults and children continue to experience symptoms that last for months or years. For some unknown reason, their brains do not heal.

The complex, delicate structures comprising the nervous system — the brain, spinal cord and nerves — are susceptible to injury as varied as trauma, cancer and neurodegenerative diseases. Unfortunately, because of the complexity of the brain and spinal cord, ***very little spontaneous nerve regeneration or healing occurs*** [McBride's emphasis]. *Injuries to the spinal cord and peripheral nerves are often permanent and incapacitating.*[2]

The incident causing the mTBI, whether a fall, a hit to the head, or other forces may also have caused injuries to other parts of the physical body. The impact forces may affect alignment of the skeletal structure of the physical body. For example, misaligned neck vertebrae from whiplash can exacerbate headaches. Misaligned jaws contribute to pain and tinnitus.

1.2 Diagnostic Criteria for Post-Concussion Syndrome

A 2005 study published in *The Journal of Neuropsychiatry and Clinical Neurosciences* compared two sets of criteria for diagnosis of post concussion syndrome as follows.[3]

The Diagnostic and Statistics Manual (DSM-IV) defines these criteria for a diagnosis of postconcussional disorder:

- history of TBI causing significant cerebral concussion;
- cognitive deficit in attention and/or memory;
- presence of at least three of eight symptoms (e.g., fatigue, sleep disturbance, headache, dizziness, irritability, affective disturbance, personality change, apathy) that appear after injury and **persist for 3 months or longer** [McBride's emphasis];
- symptoms that begin or worsen after injury;
- interference with social role functioning; and,
- exclusion of dementia due to head trauma and other disorders that better account for the symptoms.

In comparison, the World Health Organization's International Classification of Diseases (ICD-10) sets clinical criteria to diagnose PCS. There must be a history of TBI as well as the presence of three or more of the following eight symptoms:

- headache;
- dizziness;
- fatigue;
- irritability;
- insomnia;
- concentration or memory difficulty; and,
- intolerance of stress, emotion, or alcohol.

Other researchers published this 2016 paper in *Frontiers in Neurology* that recommends that persons suspected of having post concussion syndrome should undergo extensive testing that will document the extent and severity of the issues.

The physical examination should include assessment of cranial nerve, motor, sensory, reflex, cerebellar, gait, and balance testing. In addition, a focused vestibulo-ocular examination that includes objective testing of convergence, smooth pursuits, saccades, and the vestibulo-ocular reflex should be performed. All patients should undergo a cervical spine examination that includes range of motion, palpation, and provocative ligament and cervical dizziness testing. Patients that report monocular visual symptoms should undergo careful testing of pupillary function, visual acuity, visual fields, color vision, as well as fundoscopy to rule out optic nerve or retinal pathology. Those that report a history of intermittent vertigo should undergo the Dix-Hallpike maneuver to test for benign paroxysmal positional vertigo (BPPV).[4]

2. Concussion Assessment Tools for Athletes

Concussion assessment tools available to the general public are intended to assist a sports team coach or parent in determining whether a hit on the head of a young athlete has resulted in a concussion. More recently, athletic coaches are being encouraged to have baseline testing done for each athlete prior to the start of the season. This enables a comparison of pre- and post-concussion results, contributing to removal-from-play and return-to-play decisions.

These tools do not replace medical assessments and imaging tests**.** A person may have a concussion even if assessment tool results are normal. Every person who is suspected of having a concussion should always seek medical attention, and subsequently receive authorization from a physician to return to the sport.

Below are descriptions of three of the most popular assessment tools in use in Canada for young athletes: The **Sports Concussion Assessment Tool (SCAT3)**, the **King-Devick Test**, and **ImPACT Testing**. The author was unable to find a tool designed for those with post concussion syndrome.

2.1 Sports Concussion Assessment Tool (SCAT3)

SCAT3[5] is the third iteration of a tool developed by international experts. The most recent version is an outcome of the *4th International Consensus meeting on Concussion in Sport* held in Zurich, Switzerland in November, 2012. SCAT3 is intended to be used by medical professionals to assess symptoms, cognitive function, coordination, and balance of athletes 13 years and older. It is a mix of **objective** and **subjective** testing. Pre-season baseline testing enables comparison to results after a hit to the head.

2.2 King-Devick Test

Predominately of use to sports-team coaches and sports therapists, this two minute **objective** test is a remove-from-play assessment tool. It assumes that players who have suffered a concussion during the game have compromised eye movement called saccades—quick simultaneous movement of both eyes. The test does not have to be administered by a medical professional. It can be administered in person using paper charts or computer/tablet, or remotely.

The athlete reads aloud single digit numbers on a screen or chart. The position of the single numbers scattered across the page requires the player's eyes to crisscross the screen or chart. The test is timed, and repeated three times. Scores are based on number of reading errors and length of time to complete each test. Scores of the three tests are added and compared to norms. See kingdevicktest.com for more information.

The Mayo Clinic's protocol for remote concussion evaluation incorporates the King-Devick Test along with elements of the Sports Concussion Assessment Tool, including the Standardized

Assessment of Concussion and the Balance Error Scoring System. Assessments are performed at baseline and also at the time of suspected injury.

2.3 ImPACT Testing

Medical professionals and sports trainers may be trained to offer computer-based *Immediate Post Concussion and Cognitive Testing* (ImPACT). The provider claims to offer a medically-accepted assessment system that objectively evaluates neurocognitive function. One advantage of ImPACT is that assessment results can be compared to those of a baseline test (if one was done for that athlete) or to a database of normative data. See www.impacttest.com for more information.

Carleton University Sports Medicine Concussion Clinic in Ottawa, Canada offers ImPACT testing for a fee to university and local athletes.[6]

3. Current Treatment of Post-Concussion Symptoms

3.1 Publicly-funded Health Care

The conventional health care system is unable to medically-resolve long term PCS neurological damage. Often patients are prescribed medication(s) to manage symptoms such as headache, nausea and depression. Otherwise, they are told to rest until symptoms resolve.

3.2 Allied Health Care Services

Certain therapeutic services are covered by private health care plans or accident insurance settlements. Depending on the insurance plan, these may include but are not limited to:

- vision therapies & corrective lens;
- sound therapy;
- occupational therapy;
- psychological counseling;
- naturopathic services and nutritional counseling;
- neurofeedback;
- acupuncture;
- craniosacral therapy; and,
- bodywork such as chiropractic, physiotherapy, and massage.

In general, physicians are reluctant to recommend non-insured complementary health care options for the simple reason that there is little evidence-based, peer-reviewed research to support these modalities. Unfortunately the patient is left to research the plethora of complementary options at a time when cognitive function and/or vision is compromised, with

no professional guidance. If they have insurance coverage or sufficient funds, they may try some of these options in a trial-and-error approach.

Severe unresolved symptoms prevent adults from reading, driving, attending school, or working at their occupations. They are disabled, unable to return to their "normal" lives, with the commensurate economic and lifestyle implications.

4. Description of Bowen Therapy

4.1 History

Bowen Therapy is an emerging soft tissue therapy that originated in the mid 20th century with an Australian, Tom Bowen (1916-1982), who developed his therapeutic skills under the mentorship of Ernie Saunders and worked on injured players at sports games before establishing his own clinic. The history is available on the Bowen Therapy Academy of Australia's website at www.Bowtech.com.

Oswald (Ossie) Rentsch, a massage therapist, met Tom Bowen in 1974 and began observing him in Tom's clinic until his death in 1982. At least four chiropractors and an osteopath watched Tom Bowen work on hundreds of clients as he developed and refined his clinical skills over time.

Ossie taught his interpretation of Tom's technique for the first time in 1986 and soon after founded the Bowen Therapy Academy of Australia. In the 1990s other interpretations of Tom's work began to be taught. To differentiate his version from other forms also known as Bowen Therapy or Bowen Technique, Ossie created an international training program under the banner Bowenwork® / Bowtech®, and branded it "the Original Bowen Technique." Ossie expanded the training content from three or four days to 24 days and established a world-wide network of instructors and a common set of instruction materials in English and other languages. The other interpretations/schools as yet have not achieved an equivalent international reach. The Bowen Therapy Academy of Australia trains a worldwide cadre of practitioners and instructors, issues a quarterly journal, has a conference, and updates the core training materials at intervals.

4.2 Training

An estimated 30,000 people have been trained by Bowen Therapy Academy of Australia-accredited and registered instructors in 25 countries. In Canada, training and certification is provided by the Academy-licensed Canadian Bowenwork/Bowtech Group. See www.cbbg.ca.

To be certified as a Bowenwork/Bowtech practitioner anywhere in the world, students must complete a curriculum of Bowen Therapy Academy of Australia Modules 1-7, have completed acceptable courses in anatomy, physiology and First Aid/CPR, submit case studies, and pass an

in-person assessment and exam provided by a senior instructor. A practitioner is considered fully Bowtech-trained after completing advanced Special Procedures 1 & 2 workshops (Modules 9-12). To maintain certification, continuing education is required. Bowtech instructors offer many additional workshops that allow a practitioner to develop a specialty if desired. As well, former Bowtech instructors and others have built on the foundation of Modules 1-12. They offer supplementary workshops and books on assessments and additional procedures that further develop assessment skills and manual therapy expertise.

Note that the hands-on application of "Bowen Therapy" may vary among practitioners because of the influence of any prior bodywork training (osteopathy, chiropractic, massage, etc.), the various schools' differing approaches, the duration of training, whether training is on-line or in-person under the supervision of an instructor, and the number and type of additional Bowtech and/or non-Bowtech courses taken.

4.3 Description of Bowen Therapy/Bowenwork

Bowen Therapy is a manual neuromuscular soft tissue bodywork modality that addresses every part of the body and a long list of physical, systemic and neurologically-based dysfunctions and ailments.

It is easier to describe what Bowen Therapy is not: it is not massage or physical therapy. It involves no forceful manipulation of the vertebrae as in chiropractic treatment. There is no aggressive manipulation of muscle and other tissues, application of heat, or insertion of needles as in some osteopathy, massage, acupuncture, and physiotherapy treatments. And yet, anecdotal evidence and a small but growing number of informal research studies (see Section 5: Literature Review) document that the therapy has successfully accelerated healing from physical injury; reduced anxiety, inflammation, and fatigue; resolved chronic pain; and much more, when mainstream therapies have failed.

4.4 Application of Bowen Therapy

Clients may remain fully clothed in light, loose clothing. If the client is unable to lie on a massage table, Bowen Therapy moves may be applied to persons sitting, standing, on a bed, or in a wheelchair. A session usually lasts 45 - 60 minutes.

Bowen Therapy success relies on three essential aspects: precisely-located moves in sets called **procedures**, the **pause** after each set, and the **three to five day wait** without any additional bodywork.

Procedures
Practitioners select and apply "procedures"—a series of moves in a defined sequence. The fingers and thumbs are anatomically located on the body. The practitioner's fingers or thumbs press against or "challenge" the edge of a muscle or tendon. A slow rolling move is made over the tissue, which creates a signal—an electrical impulse or electromagnetic wave.

The Pause
After every set of Bowen moves, the practitioner pauses two minutes or longer to give the body's nervous system adequate time to respond without interference from additional input. Bowtech instructors emphasize that the pause is important to allow time for the body to respond.

Three to Five Day Wait
Clients are told that the body will continue to process the therapy for three to five days. That is, the moves stimulate the body to heal, and that stimulation will continue for several days. They are cautioned not to have any other bodywork such as massage, physical therapy, craniosacral therapy or chiropractic treatment during that period. As well, they are told pulsating showerheads, jet tubs, heating pads, very hot baths, and any therapy that electrically or manually stimulates the physical body are contraindicated. The effect of those interventions is to "stop" the Bowen Therapy from working.

This can be explained by an analogy. Electrical interference disrupts a signal—for example, static on a telephone line. The more static, the more the message is disrupted. Similarly, additional input to the nervous system—the body's wiring—by other therapies may disrupt signals induced by the Bowen Therapy moves. Refer to Appendix 3 for more on the theory of how Bowen Therapy influences the body's nervous system.

4.5 Bowen Therapy Effects

A Bowen move influences many of the body's systems. It activates the stretch reflex, joint proprioceptors, fascia, segmental viserosomatic spinal reflexes, autonomic nervous system, neurolympthatic points and circulation, and more. Moves are precisely located, and many are made over acupressure/acupuncture points. However, it is important to note that a Bowen move is not strictly acupressure. It may also be intended to stimulate the muscle or nerve at that location.

Very simply, moves over the nerves stimulate the **autonomic nervous system**. Cross-fiber moves over **muscles, tendons and fascia** trigger them to relax. **Tension patterns** in the body normalize.

Autonomic Nervous System
Moves over nerves exiting the spine shift the autonomic nervous system from sympathetic dominance to parasympathetic dominance. When not stressed (i.e., not in fight, flight or freeze mode), the body's innate healing mechanisms are better able to operate. In simple terms, by putting the body in a state of deep relaxation, the body goes into repair mode.

The Bowen Therapy Concussion Resolution Protocol appears to reduce the inflammatory response in the body and brain, which is why outcomes of a Bowen session within 48 hours of a concussion are so positive. See the Mattimoe and Howe case-series studies in Section 5.

The theory is that biochemical changes and inflammatory response in the brain are forestalled or reduced at the outset, instead of after they have taken hold in the days and weeks after the impact injury.

Muscles, Tendons, Fascia
Signals are sent to the brain and return to the muscles and tissues in a nervous system loop. Contracted muscles and tendons respond by relaxing. This approach of relaxing muscles to restore function is in contrast to the widespread practice of trying to stretch a spasmed muscle, which may damage muscle fibers and increase inflammation.

Additional effects of Bowen Therapy on soft tissue are that inflammation, swelling/edema and bruising resolve more rapidly. Often areas far from the place where the moves were made are affected, based on the principle that every part of the body is connected through the fascia. For this reason Bowen Therapy is described as a therapy that addresses the entire body.

Tension Patterns
Clients who have suffered falls or been in accidents in which force has been absorbed by the body often have misaligned musculoskeletal systems. Muscle tension and misalignment of the neck vertebrae or jaw, for example, may exacerbate headaches and tinnitus. By relaxing the muscles, the abnormal tension that has affected the alignment is released, and pressure on sensitive nerves is eased. The aim is to restore balanced muscle tension, eliminate torsion and stiffness, and normalize alignment and function of skeletal elements such as pelvis, jaw, vertebrae, and shoulders.

Bowen Therapy induces the body to relax, repair, realign and return to homeostasis, a balanced state.

4.6 Side Effects, Contraindications & Limitations

Side Effects
There are no known significant adverse side effects. Some clients may feel dizzy or light-headed for a few minutes upon sitting up after a session. Some clients experience pain for a day or two after a session if their skeletal structures are realigning. Clients may be more fatigued for a day or two as their bodies direct resources to healing. Because Bowen Therapy mitigates the effects of stress, weekly sessions over a period of a month or longer may lower blood pressure to the point that blood pressure medication must be adjusted. Bowen Therapy is safe for patients recovering in hospital, infants and the elderly.

Contraindications
Clients who have had breast implants, insertion of a pacemaker, or insertion of another electrical device (such as for deep brain stimulation) cannot have certain Bowen procedures. Moves at the sides of the neck are contraindicated for persons with blockages in neck arteries, or who have had surgery for such blockages. The temporomandibular joint (TMJ) procedure is contraindicated for those who have had jaw surgery.

Limitations
The Bowen Therapy Academy of Australia Modules 1-12 incorporate extremely limited training in assessment. Experience is important: practitioners learn to read muscle tension in the body by feel and observation over time, and are therefore more likely to select appropriate procedures. Some practitioners fill the gap by taking supplemental training in assessment elsewhere.

5. Literature Review – Bowen Therapy for Concussion

A literature review was undertaken by Jenna Howe (Appendix 1). Madeline McBride, the author of this study, also searched for published research on the use of Bowen Therapy for concussion, and similarly did not find any published peer-reviewed research papers. To the author's knowledge, no formal research studies have been done on the effects of Bowen Therapy on adults with long term, chronic post concussion syndrome. However, there are many anecdotal articles and testimonials available on the internet. See Appendix 2 for a partial list.

Two informal studies of adolescents and young adults with concussions are of particular interest: the **Craig Mattimoe study** and the **Jenna Howe study**. They used the Bowen Therapy Concussion Resolution Protocol.

Bowen Therapy Concussion Resolution Protocol
The protocol taught by the Bowen Therapy Academy of Australia involves several moves in a particular order over the muscles, tissues and nerves in the upper back, neck, perimeter of the jaw and at the temporomandibular joints. It includes these Bowtech procedures:

- BRM2: Upper Back (1-8 minimum)
- BRM3: Neck (1-6 minimum)
- Upper Respiratory
- TMJ
- Additional TMJ (if warranted)

If a person has had surgery on the mandibular condyle of the jaw, the TMJ Procedure's moves over that part of the jaw are contraindicated because they have the potential to alter bite alignment.

Craig Mattimoe Study
U.S.-based Bowen Therapy practitioner Craig Mattimoe developed the concussion resolution protocol that was subsequently integrated into the Bowen Therapy Academy of Australia training. He applied it to 33 athletes between the ages of 15 and 29 who were medically diagnosed with post concussion syndrome. Of that number, 31 experienced a significant reduction in symptom severity within one hour after the first treatment. Within 72 hours of the session, 26 were independently declared fit to return to play by team trainers or doctors. All 33

eventually returned to play, and the longest recovery period was 12 days. He described his results in a 2005 article entitled *Bowen as Sports Medicine – Safely Resolving Post-Concussion Syndrome* (PCS).[7]

Jenna Howe Study
Jenna Howe partnered with Sandra Gustafson, RN, a Bowen Therapy Academy of Australia instructor, to develop a case-series study proposal. Part of the proposal is attached with Jenna's permission as Appendix 1.[8] As of the date of this paper, Jenna's study results are not yet available.

Jenna determined in her practice in British Columbia that 88.8% of adolescent athletes treated between 2003 and 2014 were symptom-free in 72 hours or less. Note that these athletes received treatment within days after the concussion.

In summary, two Bowen Therapy practitioners have documented that, when adolescent male athletes are treated using the Bowen Therapy Concussion Protocol within 48 hours of a concussion, symptoms resolve within a week (Mattimoe, Howe cited earlier).

6. This Case-Series Study for Adults with Long Term PCS

6.1 Objective

The objective of the study was to determine if eight sessions of Bowen Therapy would partially or fully resolve post concussion symptoms in adults diagnosed with Post Concussion Syndrome (PCS) who had chronic symptoms six months or longer after suffering a concussion.

6.2 Case-Series Study Design & Methods

The Practitioner
The success of a complementary therapy can often be attributed to the education, training and experience of the therapist. It is important for the reader to know the author/practitioner's background and experience at the time of this case-series study.

The author, Madeline McBride, has a Master's degree in Applied Science, and is a licensed professional civil engineer. She began the Bowen Therapy Academy of Australia training in May 2012. By January 2016, the start of this study, the author had been certified (2013), had completed Module 10 (SP-1), and had been exposed to a few SP-2 procedures. She had a small part-time practice, and had only worked with four PCS clients, all of whom were experiencing symptoms years after their accidents.

Spurred by what she discovered during the course of this case-series study in terms of the association of PCS symptoms with skeletal alignment issues, chronic muscle tension, hormone imbalances, and TMJ issues, the author subsequently took additional training. See Appendix 8

for details. Improved understanding of muscle tension, fascial lines, and skeletal alignment issues post study informed the suggestions for practitioners in Section 9.

Funding
There was no funding for this study. Madeline McBride and retired nurse Mary Leung, third party assessor, volunteered their services. The participants did not pay for their Bowen Therapy sessions.

Qualifying Criteria for Participants
The number of participants for this study was limited to six (6) volunteers, simply because that was the number of non-remunerated sessions that the practitioner could accommodate each week.

Study participants had to:

- live in the Ottawa, Ontario, Canada region;
- be 18 years or older;
- have experienced a concussion at least six months prior to the start of the study (see Section 1.2);
- have been medically diagnosed with Post Concussion Syndrome;
- have chronic symptoms that have not responded to conventional medical treatment;
- sign a consent to treatment agreement (Appendix 5);
- agree to minimize vibration and signals that may interfere with the Bowenwork; and
- agree to not have other types of alternative/complementary therapeutic treatment during the 11 week period between the first and third assessments (excluding Vision Therapy). See below for a list of treatments that are not allowed.

The goal of the study was to isolate the Concussion Resolution Protocol treatment from other forms of complementary/alternative therapeutic treatment. Otherwise there could be no clear attribution of symptom resolution to Bowen Therapy.

Therefore, between the occurrence of the first and third assessments, participants agreed to:

- no bodywork (no physiotherapy, massage, shiatsu, chiropractic, osteopathy, myofascial release, etc.);
- no alternative treatment that impacts the nervous system or meridians (no neurofeedback, acupuncture, acupressure, energy healing such as Reiki, reflexology, etc.);
- no electric devices in contact with the body (no electric blankets, electric heating pads, electric razors, or electric toothbrushes, or any other electric appliance that touches the body). Screens—phones, tablets and computers— were allowed; and,
- no jetted hot tubs or pulsing showerheads.

Throughout the study period, participants continued their medications, supplements, vision therapy, sound therapy, psychological counseling, regular exercise routines, and normal activities.

Six adults volunteered to be part of the study. Five females and one male ranged in age from 31 to 64. Each participant was medially diagnosed with post concussion syndrome resulting from concussion(s) incurred two to four years prior to the study.

Number of Sessions
Each participant received eight Bowen Therapy sessions from Madeline McBride. The quantity of eight sessions was selected because Jenna Howe's clinical experience was that young, otherwise healthy athletes with chronic PCS require three to nine sessions to resolve symptoms.

Assessments
The third party assessor was Mary Leung, a retired registered nurse with 31 years of experience who worked as an operating room nurse at the Ottawa Hospital Heart Institute. She has never had any training in Bowen Therapy. She administered a **SCAT3 tool** adapted for this Bowen Therapy case-series study in **three assessments** at the beginning, midpoint and end of the study.

<u>Adapted SCAT3 Assessment Tool (Appendix 4)</u>
The SCAT3 tool was adapted by the author because this study's assessments took place six months or longer after a participant's initial concussive injury.

The SCAT3 Glasgow coma scale (#1), Maddocks Score (#2), and Balance (#6) and Coordination (#7) examinations were deleted because they apply to assessment immediately post injury. Neck examination (#5) was part of the practitioner's physical assessment.

The objective Cognitive Assessment (#4) and SAC Delayed Recall (#8) memory tests were retained.

The subjective Symptom Evaluation (#3) "How do you feel?" chart was changed to add these typical symptoms of adults with PCS and space for reporting of additional symptoms:

- Pain in _____
- Numbness/Tingling in ____
- Poor appetite
- Double vision or other issues
- Hearing impairment
- Ringing in ears/Tinnitus
- Feeling restless
- Forgetful
- Difficulty staying asleep (e.g., pain)

- Other symptoms

The SCAT3 “More emotional” symptom was deleted because the symptoms of irritability, sadness, and nervous or anxious on the list are more precise. Refer to the adapted assessment tool in Appendix 4.

Vision impairment is a common PCS symptom, but the third party assessor only asked the participant for subjective evaluations of vision symptoms. The assessor did not have the expertise or equipment to objectively test vision.

Number of Assessments

Three third party assessments were scheduled, at the beginning, middle and end of the study. Five of the six participants had three assessments. One participant was unable to attend the third assessment due to a family emergency.

At the first treatment session, the Bowen practitioner asked each participant to complete a detailed intake form including health history. The practitioner performed and documented a physical assessment. For five of the six participants, this included photos taken with a postural assessment app to document neck, shoulder and pelvic alignment.

Study Time-Frame

The study took place between January and April, 2016. The schedule is described below.

Week		Activity
1	Sat, Jan 30	Pre-treatment third party assessment using an adapted SCAT3 assessment tool (Appendix 4).
2	Feb 1-7	Physical assessment and initial Bowen Therapy session to balance body.
3	Feb 8-14	Bowen treatment #2 with Concussion Resolution Protocol
4	Feb 15-21	Bowen treatment #3 with Concussion Resolution Protocol
5	Feb 22-28	Bowen treatment #4 with Concussion Resolution Protocol
6	Mar 5	Mid-treatment assessment (#2) by third party. No treatment the week of Feb 29 – March 6.
7	Mar 7-13	Bowen treatment #5 with Concussion Resolution Protocol
8	Mar 14-20	Bowen treatment #6 with Concussion Resolution Protocol
9	Mar 21-25	Bowen treatment #7 with Concussion Resolution Protocol
10	Mar 26 –Apr 3	Break
11	Apr 4-10	Bowen treatment #8 with Concussion Resolution Protocol
12	Sat, Apr 16	Assessment #3 by third party
50+	Mar/Apr 2017	Self-assessment approximately one year after 8th Bowen treatment

One Year Follow-up
In the spring of 2017, the author contacted the six participants and asked them to complete the symptom evaluation form. One participant did not complete the self-assessment. The results are included in the case studies.

Data Analysis, Results & Confidentiality
Data from the physical assessments, Bowen Therapy treatments and third party assessments were compiled in a case-series report that maintained confidentiality of participants. Participants agreed to be identified by code, age, and gender only. No other personal information will be made public.

Record Retention
Bowen Therapy practitioner insurance requires that client records be retained for seven years post-treatment. For that period, records will be stored in paper format and on a hard drive, not on cloud storage.

7.0 Results

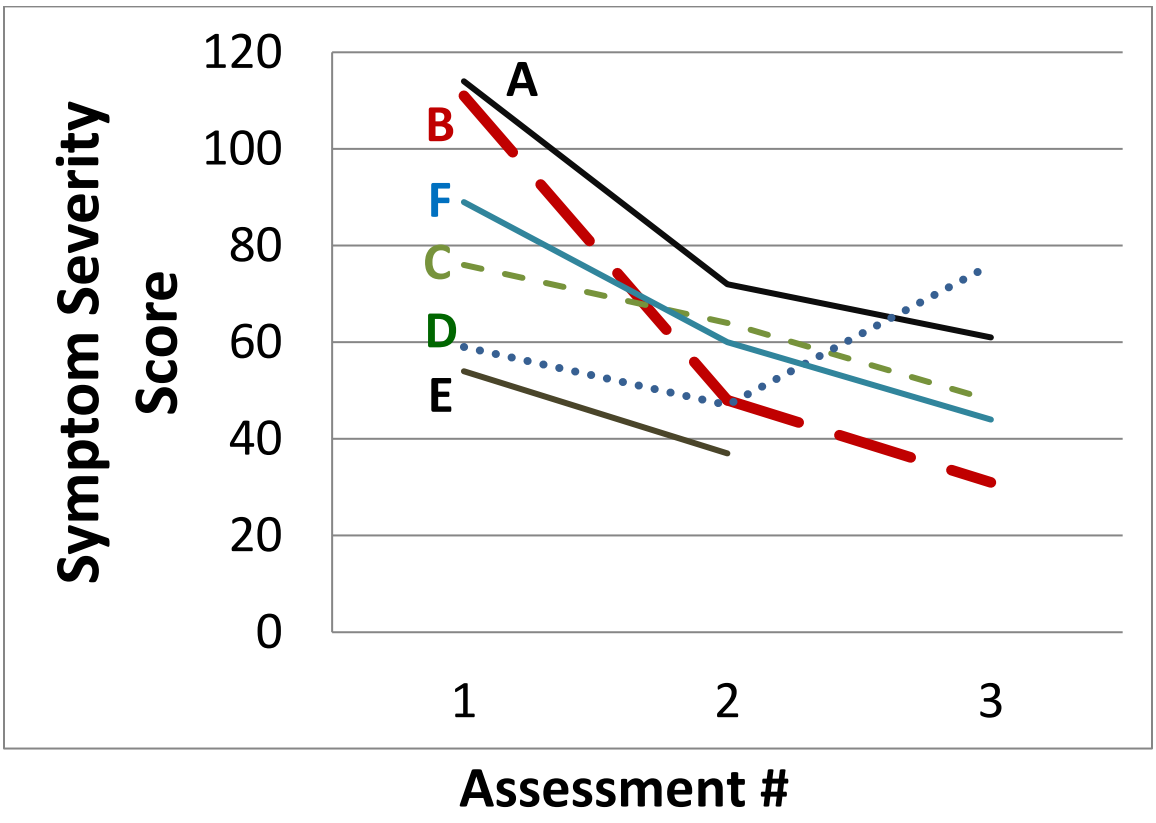
Refer to Appendices 9 – 14 for details of each case, including intake forms, scans if available, procedures used, practitioner observations and discussion, and one year follow-up.

Participant	Concussion Date & Type	Age	Gender	Scoliosis or Pelvic Issues	Notes
A	June 2012 Whiplash	46	**F**	Yes	Received 8 sessions of Bowen Therapy in 2014.
B	Sept 2012 Fell	31	**F**	Yes	Responded the most quickly to Bowen Therapy.
C	May 2014 Blow to head	41	**F**	Yes	Former elite athlete in contact sport.
D	Jan 2014 Blows to head	51	**F**	Yes	Suffered from shoulder pain for duration of study. Thoracic scoliosis predated concussion.
E	Dec 2012 Fell	53	**M**	Yes	Missed April final assessment due to family emergency.
F	March 2014 Blow to head	64	**F**	Yes	Leg length discrepancy. Long history of hits to head.

Symptom Severity Scores

Participant	Assessment 1 30 Jan 2016		Assessment 2 5 March 2016		Assessment 3 16 April 2016		SSS Improve-ment
	Number of Symptoms	SSS	Number of Symptoms	SSS	Number of Symptoms	SSS	%
A	26	114	20	71.5	26	61	**46**
B	29	111	22	47.5	18	31	**72**
C	22	76	18	57.5	21	48	**37**
D	21	**59**	23	**47**	24	**76***	**-29%**
E	17	54	13	37	—	—	**31**
F	23	89	20	60	21	42.5	**52**

*The day of the third assessment Participant D scored high on a scale of 0 - 6 for a cluster of symptoms related to headache and fatigue: Headache 4, Sensitivity to noise 5, Feeling slowed down 5, Feeling in a fog 4, Don't feel right 4, Forgetful 4, Fatigue or low energy 5, Difficulty falling asleep 5, Difficulty staying asleep (e.g., pain) 5.



SCAT 3 Immediate Memory Test

Recall list of five words (max score 15)

Participant	Assessment #		
	1	**2**	**3**
A	15	15	15
B	15	15	15
C	15	14	15
D	15	15	15
E	15	15	--
F	15	14	15

SCAT 5 Concentration Test
Repeat digit series backwards (max score 4).

Participant	Assessment #		
	1	**2**	**3**
A	4	3	2
B	3	3	4
C	2	2	2
D	4	4	4
E	4	4	--
F	4	4	3

As the results above indicate, the SCAT3 Immediate Memory and Concentration tests were not useful two or more years after the concussions for these participants.

8.0 Discussion

The six adults with post concussion syndrome had experienced concussions two or more years prior to the study. Five of the six were unable to work since their concussions. Those five were motivated to return to work or retrain, and were very frustrated that their healing had stalled. Basically, they were willing to try anything to get their lives back.

The participants had several characteristics in common:

- Every participant had skeletal alignment issues.
- They had a history of head trauma.
- They were all educated professionals.
- Apart from their concussion symptoms, they were healthy.

In a formal research study, each participant has the condition. Some participants are in a control group with no treatment and the rest receive exactly the same treatment. In this way, the results can be demonstrated to be reproducible. This approach is impossible with concussions. No researchers would hit a group of participants on the head in exactly the same place with exactly the same force in order to study the effects on their brains and efficacy of treatments or lack thereof.

Various combinations of impact forces in a fall, car accident, sports injury or other origin of blow to the head create a unique pattern and severity of damage to areas of brains and bodies. Every concussion victim consequently has a unique set of symptoms.

In this case series study, the original intent was to limit therapeutic treatment to the Bowen Therapy Concussion Resolution Protocol. However, during initial sessions a similar pattern of muscle tension, associated skeletal misalignment and symptoms quickly became evident in five of the six participants. In the second half of the study procedures were added to address muscles contributing to that misalignment.

The participants' responses to Bowen Therapy were individual, each making gains in different areas. Given the complexity of the physical issues, eight sessions of Bowen Therapy were insufficient to resolve their PCS symptoms.

Participant A: + 46% improvement (Appendix 9)
In June 2012 she had a car accident and suffered a double concussion and whiplash. This participant was the only one who had experienced Bowen Therapy prior to the study—eight sessions from this practitioner in 2014. During the period of the study she was dieting and missing meals. The nurse counseled her on how hypoglycemia can exacerbate symptoms such as dizziness. During the study she made some progress—a fascia "unwinding" in her torso which had been twisted in the accident.

Participant B: + 72% improvement (Appendix 10)
The youngest at 31, she was medically retired from her professional career. She suffered two successive blows to the back of her head in a September 2012 fall. During the short time frame of the study she experienced strong physical and cognitive gains. She reported that her friends and psychologist had noted personality changes; i.e., that she was "more her old self."

Participant C: + 37% improvement (Appendix 11)
When an elite athlete, she had successfully recovered from years of physical trauma, but it was a severe blow to the back of the head in May 2014 that rendered her incapable of continuing to work. Despite debilitating pain, mood, and vision issues, she proactively searched online for treatments to address her symptoms. Several months after this study ended she travelled to consult Dr. Lawrence Komer, an OBGYN neuro-endocrinologist specializing in brain injuries and hormone disruption. This physician was the only one, of all the medical specialists she'd consulted, to treat hormone disruption related to PCS. Participant C subsequently made this author aware of research that confirms a significant percentage of people with concussions suffer damage to their pituitary glands. (See Section 9.2.)

Participant D: - 29% (Appendix 12)
In January 2014 she suffered a double blow to the top of her head. In addition to the evidence of long term scoliosis on the August 2014 scan she provided, her right ribcage/thoracic spine was rotated posteriorly. This practitioner theorized that the scoliosis resulted from a fall from a horse more than two decades earlier. She had such severe fatigue and frequent migraines compared to the other participants that this author asked during the study if she had been referred to an endocrinologist or internal medicine specialist to assess if her concussion symptoms were complicated by Chronic Fatigue Syndrome or another illness. She had not.

Participant E: + 31% Improvement (Appendix 13)
He slipped on ice, fell, and hit the back of his head in December 2012. Prior to the study he'd completed eight months of physiotherapy for head, neck and jaw muscle tension, but still had significant pain, especially in the left neck. He undertook sound therapy during the study. The sound kept him awake at night, and lack of sleep may have impacted his response to Bowen Therapy. During the study he made some gains in his spinal alignment issues: his posteriorly-rotated right ribcage resolved. He was unable to participate in the third assessment.

Participant F: + 52% Improvement (Appendix 14)
She had a history of concussions, the most recent in March 2014. She was employed, was the least impaired, and was physically and cognitively able to enjoy social activities after a day at work. Despite a stressful on-going personal issue, her anxiety level dropped significantly and noticeably during the study.

9.0 Practitioner Observations & Suggestions

Author and journalist Gary Taubes wrote: *Most reliable medical knowledge emerged initially from anecdotal observations. Medical science can be thought of as a process that begins with such observations and, through relentless testing of hypotheses, eventually generates truth*.[9]

9.1 Treatment Context

Concussion clients are at an extreme disadvantage in the medical system unless they have an advocate to guide them to appropriate, effective therapies. Many physicians merely advise them to rest and stay away from screens, and prescribe medication when symptoms persist. If adult concussion rehabilitation services exist in their communities, PCS clients may have to wait for months or years to access them.

Cognitively and often visually impaired, victims of concussion have limited ability to access on-line resources. They often are not aware of community resources, or are not referred, or cannot find recommendations for legal and psychological services, support groups, and for occupational, vision, sound, and other therapies. They may have difficulty processing information when investigating treatment options.

They may not be able to drive or take public transportation to appointments. They may not be able to shop in grocery stores with bright overhead lights. They may not have the energy to prepare nutritious meals from scratch, and therefore rely on fast food.

Their stress levels may be extreme. Sources of stress may include finances due to loss of income, family responsibilities, loss of identity, and interactions with lawyers, insurance companies and workplace representatives.

9.2 Observations & Suggestions

Disclaimer: the following is intended for consideration by Bowtech/Bowenwork practitioners. Madeline McBride is not a Bowtech instructor nor a licensed medical professional such as a physician or registered nurse. If the reader has questions or concerns about any of these observations or suggestions, which are based on personal experience, please consult a Bowen Therapy Academy of Australia instructor. See www.Bowtech.com.

#1. Results can be significant with only basic Bowen Therapy

Prior to this study, the practitioner:

- had been studying Bowen Therapy for four years;
- had limited experience—had given sessions to four concussion clients;
- had not yet completed Modules 11 & 12; and,
- had limited postural assessment training (no muscle assessment training at all).

Despite the practitioner's inexperience and limited assessment skills, adults with PCS whose healing was stalled two or more years after their concussions experienced significant symptom severity reduction in only eight sessions.

Suggestions:

- Prior to treatment have the client fill out a SCAT3 Symptom Severity form (see Appendix 4 for the adapted version used in this study). Track progress by completing a new Symptom Severity assessment form every month.
- Document the areas of pain, and the severity of each pain, at every session.
- Remind PCS clients that the body decides how fast it will heal, every person's progress will be different, and that eight to ten weekly sessions will be needed to generate measurable results.
- To maintain healing momentum, do not "take a break" during treatment.

#2. There's a connection between muscle tension, skeletal alignment & PSC symptoms

A fall or car accident can result in a body that is twisted like a corkscrew, affecting individual vertebrae, sections of the spine, and dura mater—the outer membrane covering the brain and spinal cord. The pelvis may be misaligned. One hip can be pushed higher, creating scoliosis. Whiplash can torque the cervical spine. Asymmetrical muscle tension cements that skeletal misalignment. That is, some muscles may be too tight or spasmed, preventing the parts of the skeleton from returning to its natural alignment.

Nerve charts describe the links between a particular set of nerves exiting the spine and the parts of the body they affect. For example, tight muscles exert pressure on nerves at the cervical spine and in the neck that may exacerbate symptoms such as tinnitus, headaches, TMJ, tingling and numbness in arms and fingers, and of course neck pain. Pressure on the nerves exiting the lumbar spine may foster sciatica and lower back pain.

Although therapists may work on areas of pain such as neck, shoulders and back repeatedly, the muscle tension and pain may return unless the structural dysfunction in the body as a whole is addressed. In this author's experience with clients, lying prone on the massage table with the head twisted to one side can worsen neck tension.

Recent medical imaging of the entire spine, including the pelvis, is useful to a Bowen Therapy practitioner. Before and after photos document progress. Postural assessment apps are available for download to a tablet, which the author found to be a convenient size for using the features of the app.

Scans and postural assessment photos prior to treatment serve several purposes:

- they document the "before treatment" state;
- they help justify a treatment plan to address muscle tension dysfunction in the body as a component of treatment for concussion; and,
- the evidence bolsters the case for a relationship between skeletal alignment issues, resulting asymmetrical muscle tension and pressure on nerves, and concussion symptoms.

Suggestions:

- Use a postural app to document alignment before and during treatment, where warranted.
- Ask for digital copies of client's scans.
- Always use an adjustable neck cradle. Ensure there is no discomfort when the client is prone.

#3. "No one touched my head"

The study participants uniformly affirmed that, post concussion, no medical professional had ever palpated their skulls.

The skull is covered with a thin sheath of tissue that can knot or contract like any other tissue. More importantly, the tissue can be put in tension, exerting force (a pull) on the skull plates. Extreme muscle tension in the neck may actually displace the plates and affect the dura mater beneath. You may feel a ridge at the suture lines, where the edge of one plate is higher than the adjoining plate. This practitioner credits James Foo of the Qi-Matic Research Centre for bringing to her attention this contributing factor to concussion symptoms.[10]

Suggestions:

- Gently palpate the skull with the fingertips, especially at the suture lines. Feel for ridges, bumps, and contracted muscle. Compare the surface of the skull on the left with that on the right.
- Where warranted, add cross-fiber lateral moves over the thin tissue on the skull after the BRM3 procedure.

#4. Nutrition & regular meals are important

Bowen Therapy practitioners are taught the importance of hydration. In the case of adults with concussion, clients may not be eating regularly for various reasons; i.e., they may not feel hungry due to pain, may not have food in the home, or may be too fatigued to prepare healthy meals. In the first half of the study, two of the six participants arrived for their afternoon Bowenwork sessions not having eaten for more than five hours or even that day. The practitioner fed them snacks. Questions relating to diet were added to Assessment 2.

Suggestions:

- At every session ask clients with concussion when they last ate, and what they ate and drank that day.
- Suggest that they consult a nutrition specialist to help them plan and prepare simple, nutritious meals that support brain healing, and to recommend appropriate supplements such as quality fish oil. See the Michael D. Lewis, MD concussion protocol at www.brainhealtheducation.org.

#5. Damage to the pituitary gland can cause hormone disruption

Many concussion victims experience the onset of unusual (for them) symptoms such as anger, mood swings, depression, anxiety, poor concentration, mood swings, painful menses, and/or extreme fatigue.

Many research studies published since 2000 have examined neuroendocrine dysfunction and damage to the pituitary gland, known as Hypopituitarism, such as this 2015 paper published in the Journal of Neurotrauma.[11] Another 2015 study states: *Based on data in the current literature, approximately 15%-20% of TBI patients develop chronic hypopituitarism.*[12] That may be conservative, according to this 2005 study which makes statements that may be surprising to many, but also explain a lot: *Onset of pituitary deficits can evolve over years following injury. Pituitary failure can occur even in minor head injuries and is poorly recognized.*[13] There is a wealth of research information available, including guidance on screening and management of pituitary dysfunction in this free document on PubMed.[14]

Dr. Lawrence D. Komer co-wrote a book entitled *New Hope for Concussions TBI & PTSD* in which he discusses the importance of addressing brain inflammation and balancing hormones.

Suggestions:

- If clients develop symptoms as described above, suggest they ask their physician for neuroendocrine tests, or request a referral to an endocrine specialist. Hormone therapies are available to balance hormones.

Finally

For more suggestions based on practitioner experience, Jenna Howe made available a Learn it Live webinar entitled "Innovations in Concussion Recovery."

Endnotes

1 Definition of concussion, Mayo Clinic: http://www.mayoclinic.org/diseases-conditions/concussion/basics/definition/con-20019272

2 "Neurogenerative Medicine," Booklet MC5520-14, Mayo Clinic (2014): 3

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5 Sports Assessment Concussion Tool (SCAT3): http://bjsm.bmj.com/content/47/5/259.full.pdf

6 Carlton University Sports Medicine Concussion Clinic has a certified ImPACT consultant: https://www.impacttest.com/find_care_provider/id/1852.

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14 C.L. Tan et al. “The screening and management of pituitary dysfunction following traumatic brain injury in adults: British Neurotrauma Group guidance,” Journal of Neurology, Neurosurgery and Psychiatry (Nov 2017) Vol. 2017, Issue 88: 971–981, http://jnnp.bmj.com/content/88/11/971

Appendix 1—*Bowen Therapy for Concussion Resolution in Young Male Athletes: A Case-Series Research Proposal*

Authors:
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Sandra Gustafson - MHS, BSN, RN, Bowenwork practitioner and instructor.

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Acknowledgements:
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Abstract
Background: Sports-related concussion in young and older athletes has recently become a 'hot' topic within sporting organizations and the media. Current treatment for concussion is: physical, mental and cognitive rest until symptoms resolve of their own accord. Research indicates that 80-90% of concussions resolve in 7-10 days, with adolescents typically taking longer to recover. Once diagnosed with concussion, athletes are encouraged to return to play (RTP) as soon as possible and many hide their symptoms due to fear of losing game playing-time, despite not fully recovering. Recent studies indicate that head-related trauma can have serious complications if not properly diagnosed and treated, and repeated head trauma can lead to long-term complications such as dementia and personality disorders later in life. Between 1996 and 2003, a Bowen Therapist in Menlo Park, California, USA conducted a pilot-study on adolescent athletes diagnosed with concussion, and applied Bowen Therapy procedures [hereon known as the Concussion Resolution Protocol (CRP)] as a singular therapeutic intervention. Out of the 33 players treated, 90% of athletes were declared fit to return to play within 72 hours. All 33 players returned to play.

Objective: This proposal aims to generate a case-series study that will document the efficacy and rate of recovery in young male athletes diagnosed with concussion, and investigates whether Bowen Therapy, may reliably and consistently decrease recovery time needed to begin RTP protocols along with the current standard treatment for concussion injuries.

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Discussion:
Case-series reports are generally considered 'low-level research evidence'. As non-experimental studies, they do not attempt to provide comparative data for statistical analysis; rather, they serve as pioneering endeavors to study a phenomenon and explore the potential for further experimental, clinical research.

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Read the rest of this proposal at http://concussionresolution.com/wp-content/uploads/2014/03/BowenTherapyandConcussionResolutionStudyProposal.pdf

Appendix 2—Published & Media References to Bowen Therapy for Concussion, PCS and Neurological Conditions.

"Josh—a TBI Success Story" (2014): https://www.youtube.com/watch?v=KDnRJAy2NTk
This video shows a speech and language practitioner giving Bowen Therapy to Joshua Hayes, which was a factor in his remarkable improvement from devastating injuries.

Marianne Beacon, The Lacrosse Radio Network interview (Nov 30, 2011): http://www.blogtalkradio.com/laxradio/2011/11/30/boxla-beat-10. Marianne is a Peterborough, ON, Canada, Bowen practitioner who successfully treated a lacrosse player with a history of three concussions.

Jenna Howe, "Understanding Neuromuscular Therapy to treat Post Concussion Syndrome," interview, Real Life Radio (2010): http://www.blogtalkradio.com/realliferadio/2009/04/29/understanding-neuromuscular-therapy-to-treat-post-concussion-syndrome

Jenna Howe, interview, *Choices* (Feb 2014): https://www.youtube.com/watch?v=07VapZVh2co

Jenna Howe, "Innovations in Concussion Recovery," Learn it Live webinar (Dec 10, 2017): https://www.learnitlive.com/class/11528/Bowen-Therapy-Innovations-in-Concussion-Recovery. There is a $25 US charge for this webinar that offers suggestions to practitioners based on Jenna's experience.

Craig Mattimoe, "Bowen as Sports Medicine – Safely Resolving Post-Concussion Syndrome (PCS)," *Bowen Hands*: *the Journal of the Bowen Therapy Academy of Australia* (2005): http://www.bowtech.com/WebsiteProj/documents/1701-Post_Concussion_Syndrome.pdf

Stephen Stamp, "Alternative Therapy Shows Promise for Faster and More Complete Healing from Concussions,"*IL Indoor* (Nov 2011): http://www.bowtech.com/WebsiteProj/documents/1716-Bowenwork_Alternative_therapy_for_concussions.pdf

Appendix 3—The Effect of Bowen Therapy on the Body's Nervous System

The Nervous System is the Body's Electrical Wiring

There is much skepticism that such small Bowen Therapy cross fiber moves spaced two or more minutes apart "do anything," or that such small moves actually send electrical impulses/signals through the neuromuscular and nervous system circuitry.

The author was introduced to the concept of Bowen Therapy-induced piezoelectric impulses sent through the nervous system by Alexia Monroe, a senior US Bowen Therapy Academy of Australia instructor. An audio recording of Ms. Monroe's presentation "Neuroscience & Bowenwork" at a 2001 Bowtech conference is available to order from her website www.bowenworks.com.

To comprehend how Bowen Therapy affects the body, one needs a basic understanding about electricity and its medical use. Today's sensors are likely sensitive enough to detect the brief piezoelectric signal induced by a Bowen Therapy move, although to the author's knowledge no research study has attempted to measure the strength (volt) or frequency (Hz) of the Bowen move-induced signal.

Detailed interpretations of how Bowen moves affect the body are described in an article by John Wilks,[2] UK-based senior Bowtech instructor, and in an article in *Bowen Hands*.[3]

Endnotes

1 Alexia Monroe "Neuroscience & Bowenwork," presentation at the 3rd International Bowtech Conference, Cyprus, Greece, 2001. A CD of the audio recording is available to order at www.bowenworks.com/OrderForm.htm

2 John Wilks, "The Bowen Technique – Mechanisms for Action:" http://www.bowenseminars.com.au/bowen-technique-mechanisms-for-action/. John Wilks' website: http://www.therapy-training.com/john-wilks.html

3 "Tell Me Again, How Does Bowen Work," *Bowen Hands: the Journal of the Bowen Therapy Academy of Australia* (March 2015) 3.

Appendix 4—SCAT3 Assessment Tool Adapted by Madeline McBride for PCS Clients

Assessment # ___ Client: _____ Date: _____

Examiner: ☐ Self-rated ☐ Examiner Interview

1. Symptom Evaluation	None	Mild		Moderate		Severe	
Date:	0	1	2	3	4	5	6
Headache							
Neck pain							
Pressure in head							
Pain in _____							
Numbness/Tingling in _____							
Nausea or vomiting							
Poor appetite							
Dizziness							
Balance problems							
Blurred vision							
Sensitivity to light							
Double vision or other issues							
Hearing impairment							
Sensitivity to noise							
Ringing in ears/tinnitus							
Feeling “slowed down”							
Feeling “in a fog”							
“Don’t feel right”							
Feeling restless							
Difficulty concentrating							
Difficulty remembering							
Forgetful							
Confusion							
Fatigue or low energy							
Drowsiness							
Difficulty falling asleep							
Difficulty staying asleep (e.g., pain)							
Easily annoyed or irritable							
Feeling sad, depressed or tearful							
Feeling nervous or anxious							
Other symptoms							
Total # of symptoms							
Symptom Severity Score							

Do the symptoms get worse with physical activity?	☐ Y ☐ N
Do the symptoms get worse with mental activity?	☐ Y ☐ N

Regarding ability to do physical activities, how well can you perform today?

☐ Can do vigorous exercise ☐ Can do mild exercise ☐ Can walk ☐ Cannot be active because _____ (reason)

Regarding ability to read on screens, how well can you perform today?

☐ Can view all screens ☐ Can view screens for _____ (length of time) ☐ Cannot view screens today because _____

hours you sleep per night: ____ # hours you sleep during the day: _____

2. Cognitive Assessment

A. Immediate Memory

Trial 1: "I am going to read a list of five words. When I am done, repeat them out loud in any order."
Trial 2: "I am going to repeat the same list of words again. Repeat as many as you can in any order, even if you said the word before."
Trial 3: Same wording as for Trial 2.

Circle 1 for each correct response per trial. Add the points for each trial.

Words	**Trial 1**		**Trial 2**		**Trial 3**		**Word list** (select five words)		
	0	**1**	**0**	**1**	**0**	**1**	**Candle**	**baby**	**finger**
	0	**1**	**0**	**1**	**0**	**1**	**Paper**	**monkey**	**penny**
	0	**1**	**0**	**1**	**0**	**1**	**Sugar**	**perfume**	**blanket**
	0	**1**	**0**	**1**	**0**	**1**	**Sandwich**	**sunset**	**lemon**
	0	**1**	**0**	**1**	**0**	**1**	**Wagon**	**iron**	**insect**
Trial Total	**#1 =**		**#2 =**		**#3 =**		**Elbow**	**apple**	**carpet**
Immediate Memory Score (sum of all trials)**:**							**Saddle**	**bubble**	**ring**

B. Concentration: Digits Backwards

"I am going to say a series of numbers. Repeat them backwards."
For a point, numbers must be repeated backward in the correct order.

List	**Trial 1**		**Digit List** (transfer one column of numbers to List column)			
	0	**1**	**4-9-3**	**6-2-9**	**5-2-6**	**4-1-5**
	0	**1**	**3-8-1-4**	**3-2-7-9**	**1-7-9-5**	**4-9-6-8**
	0	**1**	**6-2-9-7-1**	**1-5-2-8-6**	**3-8-5-2-7**	**6-1-8-4-3**
	0	**1**	**7-1-8-4-6-2**	**5-3-9-1-4-8**	**8-3-1-9-6-4**	**7-2-4-8-5-6**
Total Points						

C. SAC Delayed Recall

"Do you remember the list of words I read to you earlier? Tell me as many of the words as you can remember, in any order."

Score 1 point for each correct word. **Total:**

Assessment adapted from the SCAT3 Sport Concussion Assessment Tool

Appendix 5—Participant Consent Form

Informed Consent for:
Bowen Therapy for Adult Long Term Post Concussion Syndrome - A Case-Series Study

Principal Researcher & Bowen Therapy Practitioner:
Madeline McBride, M.A.Sc., P.Eng.

Assessor:
Mary Leung

Participants
You have been provided with a copy of the study. Please take time to read it and this document carefully. Discuss the study with your family, your doctor, or others before you decide to participate in this study.

Your participation is completely **voluntary**. You have the right to refuse to participate in this study. If you decide to participate, you will be required to sign the consent form.

Participant Withdrawal
You may withdraw from the study at any time without consequences. To withdraw, please inform Madeline McBride that you no longer wish to participate (no questions will be asked). Your information will be destroyed and will not be used in the final report.

Objective of the Study
The objective is to determine if eight (8) sessions of Bowen Therapy will partially or fully resolve post concussion symptoms in adults diagnosed with Post Concussion Syndrome who have chronic symptoms six months or longer after suffering a concussion.

Who can Participate?
You can participate in this study if you:

- are 18 years or older;
- have experienced a concussion at least six months prior to the start of the study;
- have been medically diagnosed with Post Concussion Syndrome;
- have chronic symptoms that have not responded to conventional medical treatment;
- agree to minimize vibration and signals that may interfere with the Bowenwork;
- agree to not have other types of alternative/complementary therapeutic treatment during the 11 week period between the first and third assessments (excluding Vision Therapy). See page 13 of the study for types of treatments that are not allowed. This is to ensure that there can be a clear attribution of symptom resolution to Bowen Therapy, rather than to a combination of therapies.

What Does this Study Involve?
Following an initial assessment by a third party health professional using the adapted SCAT3 tool in Appendix 4, you will receive a series of Bowen Therapy treatments as subsequent assessments per the weekly schedule outlined on page 12 of the study.

You will remain fully clothed during each Bowen Therapy session. Please wear loose, light clothing such as a T-shirt and sweat pants, yoga pants, or pajama pants. Bowen Therapy is more effective if the person is well hydrated. Ensure you drink water prior to a session.

At your first 90 minute session, the Bowen Therapist will interview you about your symptoms and health history, and will perform physical assessments of your range of motion, areas of sensitivity and muscle tension. This may include taking baseline photos of the alignment of your skeletal structure. You will receive an initial Bowen Therapy treatment to relax and balance the body.

Subsequent Bowen Therapy session treatments will be 60-90 minutes, scheduled seven (7) days apart, with two one-week breaks.

Risks & Side Effects
These are minimal, and are described on page 8 of the study. Individuals who have had jaw surgery **must** make this known to the practitioner. The Bowen TMJ Procedure has the potential to affect bite alignment which may negate the effects of surgery. If you have had jaw surgery, you may choose to continue with Bowen Therapy without receiving the TMJ Procedure; however, the desired effects may not be the same as from the full treatment.

Can I Be Asked to Leave the Study?
If you fail to show up for two consecutive Bowen Therapy appointments, you will automatically be withdrawn from the study. The practitioner is flexible in terms of rescheduling an appointment, but please note that each participant must have a Bowen treatment during each of the weeks indicated in the schedule. As well, it is important to be available to the assessor during the days scheduled.

Benefits
There is no guarantee that you will experience any improvements in resolving your concussion symptoms as a result of receiving Bowen Therapy. Your participation will add to a growing body of knowledge of how the body responds to and heals from concussion, using Bowen Therapy as a single bodywork intervention along with resting and waiting.

At the conclusion of the study, each participant may request copies of his or her individual assessments for their records and to share with their physicians if they so choose. These copies of the original assessment documents will have your name on them.

The researcher will provide an electronic PDF copy of the **final report** to each participant, which may be shared without permission. It will contain no identifying information.

Cost
There is no cost to the participant. The practitioner and assessor are donating their time.

Confidentiality
Your participation in this study will remain confidential. In the final report there will be no link between your information, responses, results, and your identity, which will be concealed. Participants will be identified by number, age, and gender in the final report.

The assessor will turn over all original assessment sheets to the researcher/practitioner at the end of the study period. Information that contains your identity will remain only with the researcher/Bowen Therapy practitioner, and will be retained for seven years per practitioner insurance requirements.

Questions
Please note that you may ask questions of the assessor and Bowen Therapy practitioner at any time. Madeline McBride will be available to discuss your results with you when they become available.

Consent Form for Participants

In signing this form you are consenting to participate in the study entitled *Bowen Therapy for Adult Long Term Post Concussion Syndrome - A Case-Series study*.

- ☐ I have received a satisfactory explanation of what the study entails, and I have read and I understand the objective and procedures of this study.

- ☐ I voluntarily agree to participate. I understand that at any time during the investigation I will be free to withdraw without any consequences.

- ☐ I understand the contents of the study, the proposed procedures and possible risks. I have had the opportunity to ask questions and have received satisfactory answers to all inquiries regarding this study.

- ☐ I understand that my name, initials, address, etc., will not be published and that **my identity will remain anonymous and confidential**.

- ☐ I understand that material collated from this study will be presented for publication and will be seen by the general public.

- ☐ I give permission for my clinical information to be incorporated into a final case-series report authored by Madeline McBride that will be distributed on the internet in PDF.
- ☐ I give permission for my clinical information in the above final case-series report to be referenced in various media such as interviews, blog posts, PowerPoint presentations, articles, and other avenues of information dissemination.

Signatures

_____	**_____**	**_____, 2016**
Participant	Printed name	Date
_____	**Madeline McBride**	**_____, 2016**
Researcher/Bowen Therapy Practitioner		
_____	**Mary Leung**	**_____, 2016**
Assessor		

Appendix 6—Supplementary Questions at 2nd Assessment

Bowen Therapy for Adults with Long Term Post-Concussion Syndrome Study
Assessment of 5 March 2016
Supplementary Questions Completed by Participant

Participant: _____

Mark the boxes with an X or fill in the blanks.

1. Comparing the previous week to before you had the first Bowen Therapy session, how much can you do each day **physically**?

- ☐ I can do less each day. I am more fatigued.
- ☐ I can do about the same amount each day.
- ☐ I can do more on occasional days. I have more energy on
  - ☐ the day after the session.
  - ☐ two days after the session.
  - ☐ ____ days after the session.
- ☐ I can do more most days. I have more energy in general.
- ☐ I can do as much as I used to be able to do before the concussion. I'm back to normal.

---

2. Comparing the previous week to before you had the first Bowen Therapy session, how much can you do each day **cognitively (e.g., activities using your brain)**?

- ☐ I can do less each day. Reason _____.
- ☐ I can do about the same amount each day. No change.
- ☐ I can do more on occasional days, such as
  - ☐ the day after the session.
  - ☐ ___ days after the session.
- ☐ I can do more most days. I have noticeably better cognitive function.
- ☐ I can do as much as I used to be able to do before the concussion. I'm back to normal.

---

3. Since my concussion, I received diet counseling from a physician, dietician/ nutritionist, naturopathic doctor, other_____ ☐ YES ☐ NO
(circle applicable)

4. Since my concussion, I received recommendations for supplements: □ YES □ NO
I take the recommended supplements: □ YES □ NO □ Some of them

Who recommended these supplements?
□ physician □ naturopath □ friend/family □ nutritionist □ pharmacist
□ therapist (type) _____ □ other_____

---

5. **Quality of Diet**. Since my concussion, I consider my diet to be:

□ **Excellent**. I eat nutritious food every day.
□ **Good**. I eat nutritious food most days.
□ **Average**. I eat nutritious food half the time.
□ **Poor**. I do not have a balanced, nutritious diet.

6. **Frequency of Meals**. (A smoothie counts as a meal.) Since my concussion:

□ I always eat three meals a day……. □ plus snacks.
□ I eat three meals a day, most days…□ plus snacks.
□ I eat two meals a day…… □ plus snacks.
□ I eat one meal a day…….. □ plus snacks.
□ I only eat when I'm hungry.
□ Other_____

---

7. **Emotional response to Bowen Therapy**. Today, this is how I feel about my health improvements (or lack thereof) since the first Bowen session:

□ Very hopeful
□ Somewhat hopeful
□ Neutral
□ Discouraged
□ Very discouraged

Comments: Do you have anything to add that might be relevant to changes in your health since the first assessment? (Use the back of the sheet if necessary.)

Appendix 7—Supplementary Questions at 3rd Assessment

Bowen Therapy for Adults with Long Term Post-Concussion Syndrome Study
Assessment of 16 April 2016
Supplementary Questions Completed by Participant

Participant: **_____**

Mark the boxes with an X and fill in the blanks.

1. Comparing the previous week to how you felt in January, 2016 (i.e., before you started Bowen Therapy in February), how much can you do each day **physically**?

☐ I can do less each day. I am more fatigued.
☐ I can do about the same amount each day.
☐ I can do more on occasional days. I have more energy on
  ☐ the day after the session.
  ☐ two days after the session.
  ☐ ____ days after the session.
☐ I can do more most days. I have more energy in general.
☐ I can do as much as I used to be able to do before the concussion. I'm back to normal.

2. Comparing the previous week to January, how much can you do each day **cognitively** (i.e., activities using your brain)?

☐ I can do less each day. Reason _____.
☐ I can do about the same amount each day. No change.
☐ I can do more on occasional days, such as
  ☐ the day after the session.
  ☐ ___ days after the session.
☐ I can do more most days. I have noticeably better cognitive function.
☐ I can do as much as I used to be able to do before the concussion. I'm back to normal.

3. **Emotional response to Bowen Therapy**. Today, this is how I feel about my health improvements (or lack thereof) after eight Bowen Therapy sessions:

☐ Very hopeful
☐ Somewhat hopeful
☐ Neutral
☐ Discouraged
☐ Very discouraged

4. Indicate which other therapies you had at any time during the period of this Concussion Study, and whether, in your opinion, they were of no benefit, some benefit or a great benefit for reducing particular symptom(s):

□ Vision therapy: □ no benefit □ some benefit □ great benefit for _____
□ Counseling for anxiety: □ no □ some □ great benefit for _____ (symptom)
□ Sound therapy: □ no □ some □ great benefit for _____ (symptom)
□ Neurological therapy/brain training: □ no □ some □ great benefit for _____
□ Other _____ □ no □ some □ great benefit for _____ (symptom)

Comments: Do you have anything to add that might be relevant to changes in your health since the March assessment ? (Use the back of the sheet if necessary.)

Appendix 8—Profile of Madeline McBride

The success of a complementary therapy can often be attributed to the education, training and experience of the therapist. It is important for the reader to know the author/practitioner's background and experience at the time of this case-series study.

The author and Bowen Therapy practitioner, Madeline McBride, has a Master's degree in Applied Science, and is a licensed professional civil engineer. In 2012 she retired from a 30 year career in Canada's federal public service, which included a decade at National Research Council Canada, and began the Bowen Therapy Academy of Australia training.

Four years later, at the time of the study, the author had been certified (2013), had completed Module 10 (SP-1), *Postural Assessment for Bowenworkers* (Sean Wolf), the *Art of Bowen* (Alastair McLaughlin), *Clinical Assessment/Anatomy of Palpation* (Frank DiMaio), and had been exposed to a few SP-2 procedures. She completed Module 11 in July 2016 and Module 12 (SP-2) in December, 2016. She had a small part-time practice, and prior to January 2016, the start of the study, had only worked with four concussion clients.

While working at a clinic in 2014, Madeline participated in a trade show at a small conference for the brain-injured. There she learned that the brain-injured adults in attendance had not recovered from their injuries, had exhausted the treatment options offered by the medical system, were financially compromised due to being unable to work, and were desperate for affordable solutions. The author decided to complement Jenna Howe's case-series study in order to find out if Bowen Therapy could be a solution for adults with long term PCS.

If results were to be attributed to Bowen Therapy as taught in Modules 1-12, it was necessary to complete the case-series study prior to advanced training in techniques that would differnetiate Madeline's approach from that of the Bowtech Modules 1-12 - only practitioner.

Informed by what she was discovering during the course of her study in terms of the association of PCS symptoms with skeletal alignment issues, chronic muscle tension, hormone imbalances, and TMJ issues, Madeline subsequently took the following courses which included training in assessment as well as advanced procedures:

- *Lower Extremities*, *The Pelvis & Lumbar Spine*, *Upper Torso & Neck* (John Garfield), College of Applied Myoskeletal Therapy (AMT), March 29-April 3, 2016 (4 days during week 10 of the study)
- *TMD Core Program*, The Olab (Ron Phelan), May 12, 2017
- *Hormone Release – The Bowen Wa*y (Ron Phelan), May 14-15, 2017
- *Tensegrity Medicine* (anatomy trains/fascial lines) Northwest School of Structural Therapy (Kelly Clancy), June 17-20, 2017
- *The Importance of Symmetry*, Textbook Bowen Seminars (Graham Pennington), April 14-15, 2018

After the end of the case-series study the author began integrating these additional assessment techniques and procedures into her practice in order to improve outcomes. They were not used on any study participants prior to the third assessment. However, improved understanding of muscle tension, hormone imbalances, anatomy trains/fascia lines, and skeletal alignment issues did inform the recommendations in this study.

Madeline McBride's practitioner profile, including Bowtech training completed: http://www.bowtech.com/WebsiteProj/Pages/Practitioner/PractitionerProfile.aspx?studentid=21978

Appendix 9—Participant A Case

1. History

Participant A ("A") was a 46 year old female who suffered a double concussion and whiplash in a double-impact car accident in June 2012. At the time of the initial impact, her torso and neck were turned to the right. The back of her head hit the headrest twice. She suffered injuries to her brain, spine and upper body/neck muscles.

She had a CT scan one month after the accident. She had an MRI in 2015 and was diagnosed with micro hemorrhage in the right frontal lobe.

Since the accident she was unable to work in her professional capacity due to cognitive and vision issues, fatigue, and other post-concussion symptoms.

She was healthy prior to the car accident, with only one pre-existing condition: hypothyroidism. She suffered a concussion in 1990 and symptoms were 100 percent resolved.

2. Treatments for PCS Prior to the Study

Treatments from self-selected allied health care providers to address PCS symptoms included the following therapies or specialist consultations, which were discontinued during the study unless otherwise noted:

- Vision therapy
- Neuropsychology
- Psychological counseling
- Chiropractor
- functional neurology (chiropractor – 4.5 months, 2015)
- Bowen Therapy (8 sessions in 2014)
- Massage therapy
- Physiotherapy (dry-needling began 2.5 years post accident for 6-9 months)
- Occupational therapy (ongoing during study)
- Neurologist (cognitive therapy exercises ongoing during study)
- Ottawa Hospital Rehab Clinic (commenced consultations with neurologist midway through the study)

3. Intake Interviews by Third Party Assessor - Participant A

Mary Leung, RN (retired), interviewed the participants on January 30, 2016 and recorded answers on the Client Documentation form as follows.

Participant A January 30, 2016
Intake Interview Responses

Dominant Hand	Right
Able to read?	Y
Able to work/study?	N
When did you last pass out?	N/A
Able to view screens?	Y
Authorized to drive?	Y
Do you have seizures?	N
Do you have a learning disability/ dyslexia/ADD/ADHD?	N
Have you ever been diagnosed with depression, anxiety, or other psychiatric disorder? If yes, was this before any concussion?	N
Has anyone in your family ever been diagnosed with any of these problems?	N
Did you have headaches & migraines prior to any concussions? Details:	Y *Few prior to accident*
Concussion History	
# concussions prior to this one:	1
Date of concussion prior to this one:	1990
Were symptoms 100% resolved from the concussion prior to this one?	Y
If yes, how long did recovery take?	—
If no, what were the on-going symptoms?	—
Were you able to work/study after the most recent concussion? If no, how long were you off?	Y
Date of most recent concussion:	*June 2012*
Describe how it happened & other injuries, if applicable:	*Car accident*
Were you hospitalized?	N
Medical imaging of head? Results/Diagnosis: Area(s) of brain affected:	Y *Micro-hemorrhage* *Right front*
Other physical injuries?	Y *Spine & muscles*
Are you on medications? List.	Y *Thyroid –not related to concussion*
Describe current therapies/treatments:	*physiotherapy, neuropsychology, occupational therapy*

The assessor used an adapted SCAT3 symptom assessment form to record A's self-assessed symptom severity on a scale from 0 to 6, where 6 was severe.

At the January Intake interview, Participant A indicated she had 26 of the symptoms of a possible 31 symptoms. The symptom severity score was calculated to be 114 out of a possible 186.
In March, Participant A indicated she had 20 symptoms. The symptom severity score was 71.5.
In April, Participant A indicated she had 26 symptoms. The symptom severity score was 61.
Participant A did not participate in the one year follow-up.

Symptoms (2016)	30 January	5 March	16 April	
Headache	2	0	2	
Neck pain	2	3	2	
Pain in back and hip	2	2.5	0	
Nausea or vomiting	2	0	1	
Dizziness	6	0	1	
Balance problems	5	2	2	
Vision Issues				
Blurred vision	3	3	1	
Sensitivity to light	5	4	4	
Double vision or other issues	0	3	3	
Auditory Issues				
Hearing impairment	3	0	2	
Sensitivity to noise	3	3	3	
Ringing in ears/tinnitus	3	0	2	
Feeling “slowed down”	6	5	2	
Feeling “in a fog”	6	5	2	
“Don’t feel right”	6	5	2	
Feeling restless	3	0	2	
Cognitive issues				
Difficulty concentrating	6	3	3	
Difficulty remembering	6	3	2	
Forgetful	6	3	2	
Confusion	6	3	2	
Fatigue or low energy	6	5	3	
Drowsiness	5	5	3	
Difficulty falling asleep	5	4	3	
Difficulty staying asleep	5	5	3	
Easily annoyed or Irritable	4	4	3	
Feeling sad, depressed or tearful	4	0	3	
Feeling nervous or anxious	4	2	3	
Other Symptoms:	-	-	-	
Symptom Severity Score	**114**	**71.5**	**61**	

4. Initial Physical Assessment by Practitioner

4.1 Photos

Photos were taken on February 12, 2016 illustrating:
a) her neck was offset to the right;
b) right shoulder was anterior to the left (or left shoulder was posterior to right shoulder), indicating a rotation in the torso; and,
c) her right foot was posterior to the left foot, indicating a rotation in the pelvis.

4.2 Practitioner Health History Interview on February 5, 2016 – First Session

During the initial practitioner interview, Participant A reported a high stress level and a long list of symptoms that resulted from the accident:

- Knee problems due to unbalanced tension in her tight hamstrings and quads;
- Pain in her mid-upper back on the right side, lower back/lumbar pain, right pelvis and right ankle pain.
- Vision issues including difficulty focusing her right eye, "gaze instability"—her eyes drift to the left—and a divergence issue;
- Tinnitus in her right ear. She had a mild pre-existing inner ear issue;
- Dizziness and vertigo related to movement, vision, and light;
- Proprioception difficulty. That is, her brain had difficulty determining where her body was oriented in space. She staggered;
- TMJ issues;
- "Vestibular migraines" that could last a week;
- worsened PMS;
- Cold extremities;
- Restless legs that spasmed regularly; and
- Poor sleep of 0 to 7-8 hours per night, often only 4 hours.

The results of a physical assessment by the practitioner determined:

- right leg was shorter by about an inch;
- neck rotation was quite restricted; and
- vertical ridge on skull at intersection of occiput and right temporal plate.

5. The Procedures

Session 1: BRM1, BRM2 (1-8ab), 5a7a Medially, BRM3
Session 2: BRM1 (1-4), BRM2 (1-8ab), BRM3, UR/TMJ
Session 3: BRM1 (1-4), BRM2 (1-16ab), Teres Major, BRM3, UR/TMJ
Session 4: BRM1 (1-4), BRM2 (1-16ab), Teres Major, BRM3 + moves on back of skull, UR/TMJ
Break
Session 5: BRM1, BRM2 (1-16ab), Teres Major, BRM3 + moves on back of skull, UR/TMJ

Session 6: BRM1, 5a7a Medially, Prone Sacral, BRM2 (1-8), BRM3 + moves on back of head, Pelvic, UR/TMJ
Session 7: BRM1, 5a7a Medially, Prone Sacral for Piriformis & Sacrotuberous Ligaments, BRM2 (1-8ab), BRM3 + moves on back of head, Pelvic, Iliacus Release, UR/TMJ
Session 8: BRM1, 5a7a Medially, Prone Sacral, Piriformis, BRM2 (1-16ab), QL, BRM3 + moves on back of head, UR/TMJ

6. Practitioner Observations During the Study

6.1 Observations on March 11, 2016 (5th session)

The practitioner had discovered bunched muscle on the left rear of the skull (BRM3 (3-4). Releasing tight muscle on the neck, occiput, and jaw during the previous four sessions had stimulated more head pain that seemed to "travel." During one session Participant A reported, "Something is happening a half inch inside my head."

A reported that she'd been in pain for a week after the fourth session due to a significant release in her back. Pain was severe for three days, and it was located on a diagonal from the top right of her back down to lower left. This appeared to align with the placement of the seatbelt on the opposite side of the torso. It's assumed that the force of the rear impact propelled her right shoulder anterior around the restraint, twisting her torso and establishing a tension pattern in the back muscle/fascia. The release of that tension was very painful. However, A subsequently noticed an improvement in how she could sit further back in the driver's seat, and the change was permanent.

She reported that it felt as if her hips had shifted. "My love handles are in a different place."

At the fifth session the practitioner checked the muscles on the skull and discovered a vertical "ridge" at the right parietal/occiput/temporal junction. That is, one edge of a plate was slightly raised compared to the edge of the adjoining plate. The practitioner started working on the pelvis, and discovered a tight right sacrotuberous ligament and right hip restriction.

6.2 Final Assessment Photos

In photos taken of Participant A on April 16,
a) her neck is still offset to the right;
b) right shoulder and left shoulders are aligned, indicating the rotation in the torso was corrected; and,
c) her right foot is still slightly posterior to the left foot, indicating a rotation in the pelvis.

6.3 Observations on April 16, 2016

In the work on the pelvis during Sessions 6-8, the practitioner noted that Participant A had very tight muscles in the upper leg/pelvic area—sacrotuberous ligaments, psoas, piriformis, hamstrings, and adductors were all tight.

On April 16 Participant A reported that her knees had not been bothering her the past few weeks.

The practitioner noted A's leg lengths were even, the tension in her hamstrings had normalized, and her iliac crests were level. However, the tension was not completely resolved, and more sessions were needed to resolve the pelvic rotation.

Participant A's neck rotation to the right improved by 15 degrees, but rotation to left was still restricted – no improvement. She still had jaw alignment issues, but reported them as not as severe.

The practitioner palpated a small ridge on the top left parietal above A's left ear. On the right side of the skull there was still a long ridge at the parietal/temporal junction.

7.0 Supplementary Questions at Third Party Assessments

7.1 March 5 Questions & Participant A Responses

Q1. Comparing the previous week to before you had the first Bowen Therapy session, how much can you do each day **physically?**
X I can about the same amount each day.

Q2. Comparing the previous week to before you had the first Bowen therapy session, how much can you do each day cognitively?
X I can do about the same amount each day. No change.

Q3. Since my concussion, I received diet counseling from a nurse. YES

Q4. Since my concussion, I received recommendation for supplements: YES
I take the recommended supplements: YES

Who recommended these supplements: functional neurologist

Q5. **Quality of Diet.** Since my concussion, I consider my diet to be:
X Good. I eat nutritious food most days. Comment: *(more recently)*

Q6. **Frequency of Meals**. (A smoothie counts as a meal.) Since my concussion:
X I always eat three meals a day.

Q7. **Emotional Response to Bowen Therapy.** Today this is how I feel about my health improvements (or lack thereof) since the first Bowen Session:
X Somewhat hopeful

Comments
Neck - improvement when driving. Possibly less dizziness.

7.2 April 16 Supplementary Questions & Participant A Responses

Q1. Comparing the previous week to how you felt in January, 2016 (i.e., before you started Bowen Therapy in February), how much can you do each day physically?
X I can do about the same amount each day.

Q2. Comparing the previous week to January, how much can you do each day cognitively (i.e., activities using your brain)?
X I can do more on occasional days.
X I can do more most days. I have noticeably better cognitive function.

Q3. Emotional response to Bowen Therapy. Today, this is how I feel about my health improvements (or lack thereof) after eight Bowen Therapy sessions:
X Very hopeful

Q4. Indicate which other therapies you had at any time during the period of this Concussion Study, and whether, in your opinion, they were of **no benefit**, **some benefit** or a **great benefit** for reducing particular symptom(s):
X Occupational therapy
Neuropsychology (case manager)
Reported she went to the Ottawa Hospital Rehabilitation Clinic during the study.

Comments
More relaxed. Driving improved – relax.

8. Summary and Conclusions

8.1 Third Party Assessments

The results of two independent assessments by Mary Leung, RN (retired) using the adapted SCAT3 symptom assessment were as follows:

Participant	Assessment 1 30 Jan 2016		Assessment 2 5 March 2016		Assessment 3 16 April 2016		SSS Improve-ment
	# Symptoms	SSS	# Symptoms	SSS	# Symptoms	SSS	%
A	26	114	20	71.5	26	61	46

Total number of symptoms: max possible = **31**
Symptom Severity Score (SSS): max possible 31 x 6 = **186**
Percent improvement in SSS formula: (Assessment 1 SSS – Assessment 3 SSS) ÷ Original SSS

Third party assessment after eight Bowen Therapy sessions determined that the severity of the symptoms improved by 46 percent.

8.2 Practitioner Comments

Participant A's symptom severity score improved 46 percent—a significant improvement.

Symptoms of *Dizziness*, *Balance problems*, *Feeling "slowed down," "in a fog,"* and "*Don't feel right," Difficulty concentrating*, *Difficulty remembering*, *Forgetful*, *Confusion*, *Fatigue or Low Energy* all dropped from 6 to 2 or 3. However, improvements could potentially be attributed to improved food intake rather than Bowen Therapy. Participant A was on a diet (she lost seven pounds over the 10 weeks of the study). The practitioner noted that A was hungry upon arriving for the first two Bowen Therapy sessions, and discovered she was not eating regular meals. The practitioner mentioned hypoglycemia as a potential cause of dizziness, and a factor that could impede healing. The nurse also discussed diet with Participant A at the midpoint of the study. After these interventions, Participant A became more vigilant about eating regularly.

Although Participant A made significant progress on her healing journey during the study, eight sessions did not resolve Participant A's concussion symptoms.

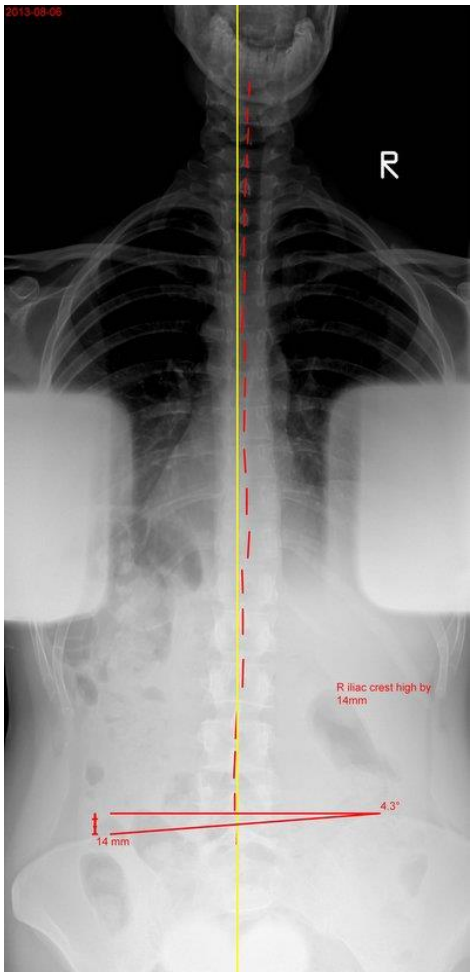
One Year Follow-up
Participant A did not wish to participate in the one year follow-up assessment.

Appendix 10—Participant B Case

1. History

Participant B ("B") was a 31 year old female who suffered severe blows to the occiput/back of the head in September 2012. She slipped and "landed on her right butt" on a rock, flipped backward in a somersault and hit the back of her head on another rock. She lost consciousness briefly. The next day she fell again. She did not see a doctor until three days after the initial fall. Medical imaging was taken two months later. In addition to concussion symptoms described below, the accident left her with right side numbness, lower back pain, and a coccyx fracture.

Several EEGs by an occupational therapist showed prefrontal cortex damage. Participant B had spinal X-rays taken in a chiropractor's office in 2013, and provided a copy of those scans for this study. The scans of the lumbar spine, sacrum, sacroiliac joints and pelvis showed a partially-healed coccyx fracture. B's 2013 scan below shows an elevated right iliac crest and associated scoliosis.



At the beginning of this study "B" was able to read to a limited degree and view screens for five minutes. She was unable to drive or take the bus. She had to leave her professional job due to vision issues, headaches & migraines, and cognitive impairment. She did not have any of these issues prior to the 2012 concussion. Regarding exercise, she was limited to short walks at the beginning of the study due to low energy.

Participant B had a history of blows to the head. She recalled hitting her head as a child, hitting her head and losing consciousness in her early twenties, and hitting her head a few times snowboarding. After the concussion in 2012, she hit her head a "couple" more times. She estimates she had three undiagnosed concussions prior to the 2012 concussion, but recovery was swift. As well, she had injured her left ankle and left knee in separate accidents, and had been diagnosed with mild depression & anxiety.

2. Treatments for PCS Prior to the Study

Participant B's medical team had prescribed medication for headaches and insomnia. She indicated her stress level over the year previous to the study had been medium to high. She saw a vision therapist and was prescribed prism glasses.

Prior to this study, B had "a lot of work on her pelvis" by a physiatrist, physiotherapist, and osteopath which did not resolve the pain in her right hip and leg.

Treatments from self-selected providers after September, 2012 to address PCS symptoms included the following modalities, which were discontinued during the study unless otherwise noted:

- Vision therapy
- Psychotherapy (continued during this study)
- Neuro feedback
- Physiatrist
- Massage therapy
- Physiotherapy
- Osteopathy
- Acupuncture
- Occupational therapy

3. Interviews by Third Party Assessor – Participant B

Mary Leung, RN (retired), interviewed the participants on 30 January, 2016 and recorded answers on the Client Documentation form.

Participant B, January 30, 2016
Intake Interview Responses

Dominant Hand	Right
Able to read?	Y
Able to work/study?	N
When did you last pass out?	N/A
Able to view screens?	Y
Authorized to drive?	Y (but she doesn't)
Do you have seizures?	N
Do you have a learning disability/ dyslexia/ADD/ADHD?	N
Have you ever been diagnosed with depression, anxiety, or other psychiatric disorder?	Y
If yes, was this before any concussion?	Y
Has anyone in your family ever been diagnosed with any of these problems?	Y
Did you have headaches & migraines prior to any concussions? Details:	Y Occasionally
Concussion History	
# concussions prior to this one:	*3-4 undiagnosed*
Date of concussion prior to this one:	*2011*
Were symptoms 100% resolved from the concussion prior to this one?	Y
If yes, how long did recovery take?	*Negligible*
If no, what were the on-going symptoms?	
Were you able to work/study after the most recent concussion? If no, how long were you off?	Y
Date of most recent concussion:	*September 2012*
Describe how it happened & other injuries, if applicable:	*Fell backward into lake, backward somersault, hit head on rock, no memory of incident*
Were you hospitalized?	N
Medical imaging of head? Results/Diagnosis: Area(s) of brain affected:	Y, *2 months later Concussion, Post-Concussion Syndrome* Left & right front, left back
Other physical injuries?	Y, *All right side very tender, tailbone fracture, misaligned spine*
Are you on medications? List.	Y
Describe current therapies/treatments:	*physiotherapy, massage, acupuncture, psychology, vision therapy*

The third party assessor used the adapted SCAT3 symptom assessment form to record B's self-assessed symptom severity on a scale from 0 to 6, where 6 was severe.

In January 2016, Participant B indicated she had 29 of the symptoms of a possible 31 symptoms on the form. The symptom severity score was calculated to be 111 out of a possible 186.
In March 2016, Participant B indicated she had 22 symptoms. The symptom severity score was 47.5.
In April 2016, Participant B indicated she had 18 symptoms. The symptom severity score was 31.
In May 2017, B indicated she had 28 symptoms. The symptom severity score was 108.

Symptoms 2016	**30 January**	**5 March**	**16 April**	**May 10, 2017**
Headache	3	3.5	2	5
Neck pain	2	2	3*	2
Pressure in head	**5**	3	3	6
Pain in right side butt/hip/leg	3	-	2**	2 *hip*
Numbness/tingling in right hand	1	-	2	1
Nausea or vomiting	**5**	2	0	3
Poor appetite				1
Dizziness	4	2	3	3
Balance problems	1	0	0	1
<u>Vision Issues</u>				
Blurred vision	2	2	0	1
Sensitivity to light	**6**	2	1	4
Double vision or other issues	**-**	-	-	1
<u>Auditory Issues</u>				
Hearing impairment	4	0	1	0
Sensitivity to noise	6	2	0	5
Ringing in ears/tinnitus	2	0	1	0
Feeling "slowed down"	4	0	2	6
Feeling "in a fog"	4	2	2	6
"Don't feel right"	4	2	1	6
Feeling restless	4	4	3	3
<u>Cognitive issues</u>				
Difficulty concentrating	4	2	0	5
Difficulty remembering	4	1	0	3
Forgetful	4	1	1	4
Confusion	4	2	0	4
Fatigue or low energy	4	2	1	6
Drowsiness	4	2	1	6
Difficulty falling asleep	4	2	0	4
Difficulty staying asleep	3	2	0	6
Easily annoyed or Irritable	**5**	2	1	4
Feeling sad, depressed or tearful	**5**	2	0	5

Feeling nervous or anxious	**5**	3	1	5
Other Symptom: Anger	**5**	0	0	0

* Hit her head on March 16. 2016.
** Fell on hip March 4, 2016

Symptom Severity Score	**111**	**47.5**	**31**	**108**

Do the symptoms get worse with physical activity?	Y	Y	Y	Y
Do the symptoms get worse with mental activity?	Y	Y	Y	Y
Regarding ability to do physical activities, how well can you perform today?	Can walk Cannot be active because low energy	Can do mild exercise	Can do vigorous exercise	Can do mild exercise Can walk
Regarding ability to read on screens, how well can you perform today?	Can view screens for 5 min	Can view screens for 45 min	Can view screens for 45 min	Can view screens for 30 min

4. Initial Physical Assessment by Practitioner

4.1 Photos

Photos were taken on 11 February, 2016 illustrating:
a) an elevated left ASIS, and
b) a difference between the alignment of the left hip/knee/ankle and the aligment of those joints on the right, indicating a rotation of the pelvis.

4.2 Observations on February 4, 2016 – First Session

Participant B reported tight muscles and the right side of her body, numbness and tingling in her feet, fingers, hands, and on the right side of her body. She had to push her "right hip forward" when she cycled. She had trouble breathing after the accident, and her right ribcage still felt tight. She used a night guard due to a teeth grinding issue, and reported a tense jaw. She said that PMS triggered pain in her coccyx, right glute, right hip, and right thigh. She reported that she needed to urinate every hour.

- The practitioner palpated B's skull and felt a vertical bony ridge approximately 2 inches long, on the back of skull on left edge of the occipital plate. There was also a bump on the left side of the occipital plate.
- B had distinct lordosis in her lower lumbar area. Her left Psoas muscle was tighter than the right.
- Leg lengths, measured supine, showed the left leg was marginally longer (less than 0.5 cm difference).

- She had good neck rotation both left and right.
- The C2 vertebrae seemed to have a slight clockwise rotation; that is, the right spinus process was more posterior than the left.

5. The Procedures

Session 1: BRM1, BRM2 (1-8ab), BRM3, North
Session 2: BRM1 (1-4), BRM2 (1-16ab), BRM3, UR/TMJ
Session 3: BRM1 (1-4), BRM2 (1-16ab), Teres Major, Respiratory, Gall Bladder, BRM3, UR/TMJ, North, East
Session 4: BRM1 (1-4), BRM2 (1-16ab), Teres Major, Chest, BRM3, UR/TMJ, Elbow/Wrist
Break
Session 5: BRM1, 5a7a Medially, Prone Sacral for Piriformis, BRM2 (1-8), BRM3 + moves on back of skull, UR/TMJ
Session 6: BRM1, 5a7a Medially, Coccyx Oblique, Prone Sacral, BRM2 (1-8), Pelvic, Iliacus Release, BRM3 + moves on back of head, UR/TMJ
Session 7: BRM1, Piriformis, BRM2 (1-16), Coccyx (left side), Iliacus Release, BRM3 + moves on back of head, UR/TMJ
Session 8: BRM1, Prone Sacral for Piriformis, BRM2 (1-16ab), QL Release, Teres Major, Respiratory, Gall Bladder, BRM3 + moves on back of head, UR/TMJ, Sinus Procedure.

6. Practitioner Observations During the Study

6.1 Sessions 1-5

Leg lengths prone were even. B's sacroiliac joints were tender (she fell on the right butt again the previous week). The left iliacus muscle was tight and tender. The muscles in the lumbar area were no longer tight.

At this midpoint of the study, the practitioner theorized that the rotation in the pelvis (and resulting scoliosis) might be contributing to concussion symptoms. Therefore, in the four remaining sessions, the practitioner added procedures to address B's pelvic rotation.

6.2 Final Assessment Photos

In photos taken of Participant B on April 16:
a) the alignment of the left hip/knee/ankle joints matched that of the right joint alignment, and
b) the left and right ASIS were aligned.

6.3 Observations at the Final Assessment – April 16, 2016

In the work on the pelvis the previous four sessions, the practitioner noted that Participant B had these tight muscles: hamstrings, right sacrotuberous ligament, piriformis, iliacus, right hip

flexors. As well, she had constricted fascia/muscles on the back of the head and up and over to the front hairline.

On the 16th, after eight sessions, B's neck rotation was excellent, she still had some issues in her shoulders as evidenced by restricted arm raises, her iliac crests were even, and her leg lengths were even. On her skull, the "bumps" in fascia and muscles were gone except for the vertical ridge on the left occipital plate.

7.0 Supplementary Questions at Third Party Assessments

7.1 Interim Assessment Questions & Participant B Responses – March 5

Q1. Comparing the previous week to before you had the first Bowen Therapy session, how much can you do each day **physically?**
X I can do more most days. I have more energy in general.

Q2. Comparing the previous week to before you had the first Bowen therapy session, how much can you do each day cognitively?
X I can do more on occasional days, such as the day after the session.

Q3. Since my concussion, I received diet counseling from a naturopathic doctor and an osteopath. YES

Q4. Since my concussion, I received recommendation for supplements: YES
I take the recommended supplements: YES

Who recommended these supplements: Osteopath.

Q5. **Quality of Diet.** Since my concussion, I consider my diet to be:
X Excellent. I eat nutritious food every day.

Q6. **Frequency of Meals**. (A smoothie counts as a meal.) Since my concussion:
X I eat three meals a day, plus snacks.

Q7. **Emotional Response to Bowen Therapy.** Today this is how I feel about my health improvements (or lack thereof) since the first Bowen Session:
X Very hopeful

Comments
"I started being able to take the bus to and from appointments. I was able to do my own groceries a few times since it started. I have noticed my energy improving as well as my ability to think more clearly, remember conversations, and navigate bus schedules/maps since starting Bowen Therapy. I have noticed that my gait feels more even and that I am walking straighter. I have increased sensation in my arms and legs (right side of my body.)"

From email March 21: “On the way home (March 18th), my friend noted how much better I seemed-saying that this is the first time she has seen the old me since my accident :)

Generally, I feel happier and like I have a lot more energy-even though I missed a bus stop, got lost on the way home, etc - I am exercising and engaging with the world more :)”

7.2 Final Assessment Supplementary Questions & Participant B Responses – April 16, 2016

Q1. Comparing the previous week to how you felt in January, 2016 (i.e., before you started Bowen Therapy in February), how much can you do each day physically?
X I can do more most days. I have more energy in general.

Q2. Comparing the previous week to January, how much can you do each day cognitively (i.e., activities using your brain)?
X I can do more most days. I have noticeably better cognitive function. Comment: “I took a course and got boating license.”

Q3. Emotional response to Bowen Therapy. Today, this is how I feel about my health improvements (or lack thereof) after eight Bowen Therapy sessions:
X Very hopeful

Q4. Indicate which other therapies you had at any time during the period of this Concussion Study, and whether, in your opinion, they were of **no benefit**, **some benefit** or a **great benefit** for reducing particular symptom(s):
X Psychology: great benefit

Comments
“Planning to decrease medication. Looks and feels much better.”

8. Summary and Conclusions

8.1 Third Party Assessments

The results of two independent assessments by Mary Leung, RN (retired) using the adapted SCAT3 symptom assessment were as follows:

Participant	Assessment 1 30 Jan 2016		Assessment 2 5 March 2016		Assessment 3 16 April 2016		SSS Improve-ment
	# Symptoms	SSS	# Symptoms	SSS	# Symptoms	SSS	%
B	29	111	22	47.5	18	31	72

Total number of symptoms: max possible = **31**
Symptom Severity Score (SSS): max possible 31 x 6 = **186**
Percent improvement in SSS formula: (Assessment 1 SSS – Assessment 3 SSS) ÷ Original SSS

Third party assessment after eight Bowen Therapy sessions determined that the severity of the symptoms improved by 72 percent.

8.2 Practitioner Comments

Participant B's symptom severity score improved dramatically in eight sessions of Bowen Therapy. After other bodywork therapies such as osteopathy and physiotherapy failed to improve her symptoms during the two years after her accident, there was a direct correlation between Bowen Therapy and B's ability to resume many of her activities. She was able to use her computer for longer periods, take the bus to appointments, and had more energy to exercise and engage in social activities. Her gait improved. Cognitive improvements allowed her to take an on-line course. Friends, family, and her psychologist noted that she was more "her old self."

Although Participant B made significant progress on her healing journey, eight sessions did not completely resolve B's concussion symptoms.

One Year Follow-up
Following the end of the study in April 2016, Participant B continued with massage therapy, physiotherapy, and psychological counseling. She learned mindful-based stress reduction, and had occasional osteopathy sessions. She participated in a Portable Neuromodulation Stimulator (PoNS) clinical trial from June 27-July 29, 2016 which included physical exercises and tongue stimulation. See braininjurytrial.com. Participant B subsequently discontinued her medication for sleep and headaches in August, 2016.

She improved cognitively in the year since the end of the study. She was able to be more involved in writing because she could spend more time on her laptop. She joined two writers' groups and began writing articles for a newsletter. She began to study Finance, and planned to take a university anatomy course in the fall of 2017.

She noted that she was much more socially and physically active compared to during the study. For example, she recently ran in a 5K marathon (which resulted in a sore hip). She was able to accomplish more than one activity each day. She said at the one year follow-up, “I forgot how much I improved with Bowen Therapy.”

On May 10, 2017 she had a headache when she self-assessed that she had 28 symptoms, with a symptom severity score of 108.

Symptom (2016)	**30 January**	**5 March**	**16 April**	**10 May 2017**
Symptom Severity Score	**111**	**47.5**	**31**	**108**

Appendix 11—Participant C Case

1. History

Participant C ("C") was a 41 year old female who suffered a severe blow to the lower right occipital area on the back of the head in May 2014 at her workplace. She landed face-first on the ground and was unconscious for several seconds. No medical imaging was done after her concussion.

At the beginning of this study, "C" was able to read and view screens to a limited degree, and drive, but had not worked at her professional job since the accident due to vision and balance issues, and cognitive impairment. She did not have any of these issues prior to the 2014 concussion. She did have "cluster"-type headaches prior to the concussion.

She was very athletic in high school and suffered a partial dislocation of her jaw. In her 20s she performed at an elite level in a contact sport, and experienced trauma to her body. She was diagnosed with whiplash "a couple of times." She had a car accident in 2005, tore ligaments in her right ankle, and had surgery to insert metal pins and rebuild the ligaments with a piece of hamstring taken from her right thigh. She wore a "boot" for eight weeks. The right ankle was reconstructed a second time in 2008. Her right leg was reconstructed three times. She had two stress fractures in the right lower leg/shin and tore the periosteum off the bone.

2. Treatments for PCS Prior to the Study

Participant C saw a physician immediately after the 2014 concussion, who prescribed medication for headaches. She was then was referred to a sports medicine specialist and saw him within the first month. She was on a waiting list for a year to see a physiatrist at the Ottawa Rehabilitation Centre, who prescribed medication to address her post-concussion syndrome (PCS) headache and mood issues. She continued to take prescribed medications during this study, as well as painkillers for headaches several times per week.

After the concussion she was diagnosed with pernicious anemia, started to suffer from extreme fatigue and digestive and mood issues, and her menstrual cycle was disrupted. Bright overhead lighting in stores and other public venues bothered her. Her vision suffered a mid-line shift, and prism glasses were prescribed. She began wearing a second set of prism glasses on 1 February 2016 as her vision had somewhat improved over the previous year. She had a history of headaches that may have been hormone-related, but, post-concussion, the headaches were different; i.e., "behind" her eyes.

Regarding exercise, this former athlete could tolerate only minimal exercise in the fitness center due to suffering from nausea and motion sickness when bending. She could not swim because she could not turn her head to the side for the same reason.

Other treatments from self-selected providers after May, 2014 to address PCS symptoms, as reported in January 2016, included:

- Neurologist
- Vision therapy (hiatus during this study)
- Prism lenses (new glasses February 1, 2016)
- Functional neurology from a chiropractor (continued during this study)
- Neuropsychologist (continued during this study)
- Naturopath (brain supplements, ongoing)
- Occupational therapist (continued during this study)
- Speech & language pathologist (concluded before this study, January 2016)

3. Intake Interviews by Third Party Assessor - Participant C

Mary Leung, RN (retired), interviewed the participants on 30 January, 2016 and recorded answers on the Client Documentation form.

Participant C January 30, 2016
Intake Interview Responses

Dominant Hand	Right
Able to read?	Y
Able to work/study?	N
When did you last pass out?	—
Able to view screens?	Y
Authorized to drive?	Y
Do you have seizures?	N
Do you have a learning disability/ dyslexia/ADD/ADHD?	N
Have you ever been diagnosed with depression, anxiety, or other psychiatric disorder? If yes, was this before any concussion?	N
Has anyone in your family ever been diagnosed with any of these problems?	N
Did you have headaches & migraines prior to any concussions? Details:	Y *Cluster type*
Concussion History	
# concussions prior to this one:	—
Date of concussion prior to this one:	
Were symptoms 100% resolved from the concussion prior to this one?	
If yes, how long did recovery take?	
If no, what were the on-going symptoms?	
Were you able to work/study after the most recent concussion? If no, how long were you off?	
Date of most recent concussion:	*May 2014*
Describe how it happened & other injuries, if applicable:	*Blow to back of head*
Were you hospitalized?	N

Medical imaging of head? Results/Diagnosis: Area(s) of brain affected:	N
Other physical injuries?	N
Are you on medications? List.	N
Describe current therapies/treatments:	*Rest, vision therapy, prism lenses, functional neurology*

The third party assessor used the adapted SCAT3 symptom assessment form to record C's self-assessed symptom severity on a scale from 0 to 6, where 6 was severe.

In January, 2016, Participant C indicated she had 22 of the symptoms on the form. The symptom severity score was calculated to be 76 out of a possible 186.
In March, Participant C indicated she had 18 symptoms. The symptom severity score was 57.5.
In April, C indicated she had 21 symptoms. The symptom severity score was 48.
In April, 2017, one year later, C self-assessed that, of the symptoms she had had a year earlier, she had 20 symptoms, with a symptom severity score of 34. She had developed a new pain in her shoulder, which was excluded from the April 2017 symptom severity score.

Symptom (2016)	**30 January**	**5 March**	**16 April**	**28 April, 2017**
Headache	4	4.5	1	1.5
Neck pain	3	5	2	2.5
Pressure in head	3	4	3	2
Nausea or vomiting	0	2	0	0
Poor appetite	2	2	0	0
Dizziness	2	0	0	0
Balance problems	2	0	1	1
Vision Issues				
Sensitivity to light	5	4.5	3	3
Auditory Issues				
Sensitivity to noise	4	4	3	3
Feeling "slowed down"	4	4	3	2
Feeling "in a fog"	5	3	3	1
"Don't feel right"	5	4	3	1.5
Feeling restless	4	4	2	1.5
Cognitive issues				
Difficulty concentrating	3	3	3	2
Difficulty remembering	3	2	2	1
Forgetful	3	2	2	1.5
Confusion	0	0	1	0
Fatigue or low energy	5	6	3	2.5
Drowsiness	4	4.5	2	1
Difficulty falling asleep	3	0	2	1
Difficulty staying asleep	4	0	2	1

Easily annoyed or Irritable	3	3	3	2
Feeling sad, depressed or tearful	3	0	2	1
Feeling nervous or anxious	2	1	2	2
Symptom Severity Score	**76**	**57.5**	**48**	**34**
Do the symptoms get worse with physical activity?	Y	Y	Y	Y
Do the symptoms get worse with mental activity?	Y	Y	Y	Y
Regarding ability to do physical activities, how well can you perform today?	Can do mild exercise	Can walk	Can walk	Can do mild exercise
Regarding ability to read on screens, how well can you perform today?	Can view screens for I/2 hour	Can view screens for 15 min	Can view screens for 30 min	Can view screens for 30-45 min

4. Initial Physical Assessment by Practitioner

4.1 Photos

Photos were taken of Participant C on 8 February, 2016 illustrating:
a) left leg extended laterally compared to right leg,
b) an apparent left hip rotation forward from neutral, and
c) slight angling of head to the left.

4.2 Practitioner Health History Interview on February 1, 2016 – First Session

Participant C had a leg length discrepancy—short left leg—when laying supine. The left leg was shorter by about half an inch. She did not wear orthodics or a lift in her shoes.

Her right knee was swollen that day. The right side of her neck was sore, and there was a muscle knot at mid-neck on the right side. The muscles on the right side of her body were tight from the ankle to the neck. Due to the tight muscles on the right side of the neck, she had restricted ability to rotate her head to the left (about 15 deg less than to the right). There was a bump on the back of the head on the right occipital bone.

5. The Procedures

Session 1: BRM1 (1-4), BRM2 (1-8ab), Knee Procedure, North
Session 2: BRM1 (1-4), BRM2 (1-8ab), BRM3, UR/TMJ
Session 3: BRM1 (1-4), BRM2 (1-16ab), Teres Major, BRM3, UR/TMJ
Session 4: BRM1 (1-4), BRM2 (1-16ab), Teres Major, Rhomboids, BRM3, UR/TMJ
Break
Session 5: BRM1, 5a7a Medially, BRM2 (1-16ab), BRM3 + moves on back of head, Pelvic, Iliacus Release, Ankle (no UR/TMJ)

Session 6: BRM1, BRM2 (1-16ab), Teres Major, BRM3, Iliacus Release, UR/TMJ
Session 7: BRM1, 5a7a Medially, Prone Sacral, Coccyx Oblique, BRM2 (1-8), Ankle, BRM3 + moves on back of head, UR/TMJ
Session 8: BRM1, 5a7a Medially, BRM2 (1-16ab), QL Release, Teres Major, Respiratory/Gall Bladder, BRM3 + moves on back of head, UR/TMJ.

6. Practitioner Observations During the Study

6.1 Sessions 1-5

At the midpoint of the study, the practitioner theorized that a rotation in the pelvis (and hence spine) might be contributing to muscle tension in the neck. Participant E also had a rotated pelvis and the same neck tension issue. That is, in order to face straight ahead, they would have had to continuously force their heads to turn a few degrees to counteract a slight rotation in the pelvis and spine. Therefore, in sessions 5 to 8, the practitioner added procedures to address C's pelvic rotation.

During an assessment at the fifth session prior to commencing treatment, the muscle knot on C's right occipital bone that was identified at the initial session was dissolved. However, the practitioner felt a vertical ridge on the right side of the back of the skull that seemed to be located where the parietal, occipital and temporal plates meet.

On finding this ridge on C's skull at this point in the study, the practitioner therefore theorized that neck muscle tension seemed to be pulling so hard on C's skull plates that it actually displaced one or more plates. The practitioner began to add Bowen Therapy-type cross-fiber lateral moves over those thin muscles.

6.2 Final Assessment Photos

In photos taken of Participant C on April 16, her
a) neck/head was straight (no longer tilted to the left),
b) the left leg was no longer extended laterally, and she was standing straighter,
c) the left hip was no longer rotated forward from neutral. However the right hip was slightly forward.

6.3 Observations on 16 April, 2016

After six sessions, C reported she was not noticing as much pressure in her head and not battling a headache all the time. She was able to tolerate more noise (e.g., kids playing), and reported that her anxiety level was lower. A friend C visited the previous summer recently said C "is not stuttering as much and is not as forgetful."

Relaxing the quadratus lumborum muscle in the eighth Bowen session on April 8 appeared to resolve the functional leg length discrepancy. However, it was only temporary. A week later on

April 16th, the day of the final assessment, the left leg was slightly shorter than the right and the right iliac crest was elevated again. She needed more sessions to rebalance the pelvic muscles and permanently resolve the leg length issue.

On the 16th, left neck rotation was measured to be 70 deg, compared to 45 degrees on March 7.
Neck rotation to the right was measured at 80 degrees, compared to 60 degrees on March 7.

However, Participant C continued to report uncomfortable muscle tension in her neck.

7. Supplementary Questions at Third Party Assessments

7.1 March 5 Questions & Participant C Responses

Q1. Comparing the previous week to before you had the first Bowen Therapy session, how much can you do each day **physically?**
X I can do less each day. I am more fatigued.
X I can do more on occasional days. I have more energy 2 or 3 days after the session.

Q2. Comparing the previous week to before you had the first Bowen therapy session, how much can you do each day cognitively?
X I can do more on occasional days, such as 3 days after the session.

Q3. Since my concussion, I received diet counseling from a naturopathic doctor and a chiropractor. YES

Q4. Since my concussion, I received recommendation for supplements: YES
I take the recommended supplements: YES

Who recommended these supplements: Naturopath, chiropractor.

Q5. **Quality of Diet.** Since my concussion, I consider my diet to be:
X Average. I each nutritious food half the time.

Q6. **Frequency of Meals**. (A smoothie counts as a meal.) Since my concussion:
X I eat three meals a day, most days.
Other: tried intermittent fasting every 5 days.

Q7. **Emotional Response to Bowen Therapy.** Today this is how I feel about my health improvements (or lack thereof) since the first Bowen Session:
X Somewhat hopeful

Comments
"Been interesting! Very skeptical at first. I'll try anything, but I'm noticing changes!

The week off was rough. 2 rough days this week. More positive outlook & generally stronger this past month. Had more clarity, felt stronger, more positive days – still can't string together full day, but it's encouraging. Today I feel like 'shit'. Can't wait for Monday (next session)."

7.2 April 16 Supplementary Questions & Participant C Responses

Q1. Comparing the previous week to how you felt in January, 2016 (i.e., before you started Bowen Therapy in February), how much can you do each day physically?
X I can do more on occasional days. I have more energy two days after the session.
X I can do more most days. I have more energy in general.

Q2. Comparing the previous week to January, how much can you do each day cognitively (i.e., activities using your brain)?
X I can do about the same amount each day. No change.

Q3. Emotional response to Bowen Therapy. Today, this is how I feel about my health improvements (or lack thereof) after eight Bowen Therapy sessions:
X Somewhat hopeful

Q4. Indicate which other therapies you had at any time during the period of this Concussion Study, and whether, in your opinion, they were of **no benefit**, **some benefit** or a **great benefit** for reducing particular symptom(s):
X Counseling for anxiety: some benefit
X Neurological therapy/brain training: some

Comments
"Breaks during the sessions – not good. I lost momentum of (improvement)."

8. Summary and Conclusions

8.1 Third Party Assessments

The results of two independent assessments by Mary Leung, RN (retired) using the adapted SCAT3 symptom assessment were as follows:

Participant	**Assessment 1 30 Jan 2016**		**Assessment 2 5 March 2016**		**Assessment 3 16 April 2016**		**SSS Improve-ment**
	# Symptoms	SSS	# Symptoms	SSS	# Symptoms	SSS	%
C	22	76	18	57.5	21	48	37

Total number of symptoms: max possible = **31**
Symptom Severity Score (SSS): max possible 31 x 6 = **186**
Percent improvement in SSS formula: (Assessment 1 SSS – Assessment 3 SSS) ÷ Original SSS

Third party assessment after eight Bowen Therapy sessions determined that the severity of the symptoms improved by 37 percent.

8.2 Practitioner Comments

The severity of Participant C's headaches decreased from 4 to 1 over the duration of the study—a significant improvement. Fatigue went from 5 and 6 to 3. Other improvements were incremental, but showed a steady trend of improvement from the first to the final third party assessments. Eight sessions of Bowen Therapy were insufficient to resolve Participant C's post-concussion symptoms two years after the accident.

One Year Follow-up
After the end of the study, C proactively continued with several therapies, including Bowen Therapy (5 sessions), vision therapy (10 sessions), physiotherapy with neuromuscular and cardiovascular physiologists, kinesiologists, and other concussion experts to address the chronic tension in her neck (25 sessions), a neuro-endocrinologist (4 visits) to address hormone deficiencies, and medication to control irritability and sensory overload. In April 2017 she verbally self-assessed that she was 60% recovered. Her symptom severity score indicated an overall improvement of 55 percent from January 2016 to April 2017 (from 76 to 34).

Eight sessions of Bowen Therapy helped resolve some of Participant C's muscle tension, and significantly reduced symptoms such as headache and fatigue. It appears that pro-actively adding an endocrinologist to her recovery team after the study ended in April 2016 was crucial to sustaining her gradual, ongoing recovery. Participant C indicated that she hopes to return to work two afternoons a week in the fall of 2017.

Symptom (2016)	**30 January**	**5 March**	**16 April**	**28 April 2017**
Symptom Severity Score	**76**	**57.5**	**48**	**34**

Discussion
In this practitioner's opinion, two factors appear to have impeded Participant's C's recovery from her 2014 concussion.

Spinal Rotation & Muscle Tension
This practitioner proposes that Participant C's chronic muscle tightness in her neck was exacerbated by a rotation of the pelvis that twisted the spine. That is, the force of the fall pushed the right shoulder and ribcage complex posterior, twisting the thoracic spine clockwise. Therefore, C's neck needed to rotate counter-clockwise slightly to compensate, creating chronic tension in the right SCM and other muscles on the right side of the neck above the thoracic

spine, and in the lower back/pelvis below. As well, there may have been rotation of one or more cervical vertebrae (unknown). An X-ray of the spine, including the neck, post-concussion would have been useful to allied health care practitioners.

Endocrine System Disruption – Pituitary Dysfunction

On her own initiative, Participant C discovered through on-line research that recent studies have indicated that there is a connection between concussion and hormone disruption due to damage to the pituitary gland in the brain. In the fall of 2016 she traveled to another city to consult with a well-known OBGYN neuro-endocrinologist specializing in brain injuries and hormone disruption.

The physician ordered testing for TSH, Free T3, Free T4, Reverse T3, DHEA, progeterone, estradiol, prolactin, cortisol, FSH, LH, feratin, zinc and magnesium levels. He discovered she was mildly hypothyroid, and that her prolactin level was very high. Subsequently, medication to lower the prolactin significantly reduced her fatigue. Prolactin also affects vision and balance. In January, 2017 she got new glasses and they are very close to being prism-free. This OBGYN was the only physician, of all the medical specialists she'd seen, to treat hormone disruption related to PCS.

Appendix 12—Participant D Case

1. History

Participant D was a 51 year old female who experienced two consecutive severe blows to the top and top right of the head in January 2014. She was diagnosed with Post Concussion Syndrome (PCS) and mild Traumatic Brain Injury (mTBI). She was unable to continue to work in her professional capacity due to chronic fatigue and compromised cognition. She was able to resume driving about nine months post-concussion. However, when driving, memory issues meant she occasionally forgot the route to take, and frequently got lost. She used a GPS on her phone unless she left it at home.

She had an MRI in May 2014, 3.5 months post concussion. During the MRI, a three minute sequence caused the table to vibrate in the horizontal plane. She felt her head shake. In the days after the MRI she noticed that her concussion symptoms had worsened. She started to have dizziness when she had never had it before, and three days after the MRI she experienced severe vertigo. Proprioception became worse and distorted. She reported to her doctors that the MRI had made her symptoms worse. Her visions issues began after the MRI. She experienced no vision issues during the period between the concussion and the May 2014 MRI, which identified two “hyperintensities” in her left frontal lobe (i.e., opposite the blow to the back right of her skull).

She had a pre-concussion history of insomnia, migraines (once per month) and intermittent anxiety and depression. As well, she had documented pre-concussion scoliosis in her thoracic spine, and provided a copy of an August 2014 X-ray (see below). She fell off a horse at 28 years old, and the impact affected her right shoulder and hip.

2. Treatments for PCS Prior to the Study

A neurologist provided treatment for migraines in September, 2014, but she was unable to tolerate the medication. Then at the Ottawa Hospital Rehabilitation Centre for adults with concussion, starting in September 2015 she was prescribed various medications for headache, mood and sleep, but she could not tolerate any of them and none successfully resolved any of her PCS symptoms in the year prior to the Bowen Therapy study.

Treatments from self-selected allied health care providers between February 2014 and January 2016 to address post-concussion syndrome symptoms included the following therapies or specialist consultations, which were discontinued during the study unless otherwise noted:

- Physiotherapy for shoulder and dry needling in neck muscles
- Massage
- Acupuncture
- Craniosacral
- Chiropractic
- Vision Therapy
- Functional neurology
- Psychological counseling (continued during the study)
- Mindfulness meditation
- Neurologist
- Physiatrist (Ottawa Hospital Rehabilitation Centre)

3. Intake Interviews by Third Party Assessor – Participant D

Mary Leung, RN (retired), interviewed the participants on January 30, 2016 and recorded answers on the Client Documentation form.

Participant D January 30, 2016
Intake Interview Responses

Dominant Hand	Right
Able to read?	Y
Able to work/study?	N
When did you last pass out?	N/A
Able to view screens?	Y *Limited*
Authorized to drive?	Y
Do you have seizures?	N
Do you have a learning disability/ dyslexia/ADD/ADHD?	N *I may have some dyslexia post accident, but not before*
Have you ever been diagnosed with depression, anxiety, or other psychiatric disorder? If yes, was this before any concussion?	Y Y

Has anyone in your family ever been diagnosed with any of these problems?	Y
Did you have headaches & migraines prior to any concussions? Details:	Y *Had tension headaches & migraines*
Concussion History	
# concussions prior to this one:	*I've never had any diagnosed concussion, but may have had one when I was 10 (bike accident) and have had whiplash a couple of times. Never associated symptoms with concussion so don't know if I actually had one & how long they would have lasted.*
Date of concussion prior to this one:	
Were symptoms 100% resolved from the concussion prior to this one?	
If yes, how long did recovery take?	
If no, what were the on-going symptoms?	
Were you able to work/study after the most recent concussion? If no, how long were you off?	
Date of most recent concussion:	*January 25, 2014*
Describe how it happened & other injuries, if applicable:	*Hit top of my head twice, second time was really hard to point where my glasses & phone flew off.*
Were you hospitalized?	N
Medical imaging of head? Results/Diagnosis: Area(s) of brain affected:	Y *Two non-specific hyperintensities in the white matter in frontal left lobe*
Other physical injuries?	N
Are you on medications? List.	Y
Describe current therapies/treatments:	*Supplements* *Physio* *Psychologist* *Occupational Therapy* *Vision*

The assessor used the adapted SCAT3 symptom assessment form to record D's self-assessed symptom severity on a scale from 0 to 6, where 6 was severe.

At the January 2016 intake interview, Participant D indicated she had 21 of the symptoms of a possible 31 symptoms. The symptom severity score was calculated to be 59 out of a possible 186.

In March, Participant D indicated she had 23 symptoms. The symptom severity score was 47.

In April, Participant D indicated she had 24 symptoms. The symptom severity score was 76. A year later, in April 2017, her self-assessed symptom severity score was 79.5. She reported that she was dealing with a very stressful personal situation. See the right column.

Symptom	**30 January**	**5 March**	**16 April**	**24 April 2017**
Headache	0	0	**4**	2
Neck pain	1	1	0	1
Pressure in head	2	2	2	3
Numbness/Tingling in head	0	2	2.5	3
Nausea or vomiting	1	0	1	0
Dizziness	1	1	1	1
Balance problems	0	1	1	1
Vision Issues				
Blurred vision	0	2	2.5	1
Sensitivity to light	3	1	1.5	1
Auditory Issues				
Hearing impairment	0	0	0	1
Sensitivity to noise	5	3	5	4
Ringing in ears/tinnitus	1	2	2.5	1
Feeling “slowed down”	4	2	4.5	4.5
Feeling “in a fog”	4	3	4	5
“Don’t feel right”	4	3	4	4
Cognitive issues				
Difficulty concentrating	3	3	3	4
Difficulty remembering	2	3	3	3.5
Forgetful	2	2	4	5
Confusion	3	3	2.5	4
Fatigue or low energy	4	3	5	5
Drowsiness	2	2	2.5	2
Difficulty falling asleep	5	2	4.5	5
Difficulty staying asleep	5	2	4.5	6
Easily annoyed or Irritable	2	1	2	3.5
Feeling sad, depressed or tearful	3	3	2.5	4
Feeling nervous or anxious	3	1	2	5
Symptom Severity Score	**59**	**47**	**76**	**79.5**
Do the symptoms get worse with physical activity?	Y	Y	Y	
Do the symptoms get worse with mental activity?	Y	Y	Y	
Regarding ability to do physical activities, how well can you perform today?	Cannot be active - low energy	Can do mild exercise	Can walk	
Regarding ability to read on screens, how well can you perform today?	Can view screens for 30 min	Can view screens for 30 min	Can view screens for 15 min	

4. Initial Physical Assessment by Practitioner

4.1 Photos

Photos were taken on February 9, 2016 showing evidence of:

- Scoliosis – thoracic spine
- Right shoulder higher than left
- Head tilts to right
- Rotation of pelvis, left side (visible in left lateral view and posterior view)

4.2 Practitioner Health History Interview on February 3, 2016 – First Session

Participant A reported a long list of symptoms that resulted from the accident:

- Foggy brain
- Cognitive issues – difficulty thinking, scattered thoughts, can't think sequentially, slow thought process
- Extreme chronic fatigue
- Head pressure
- Sensitivity to sound and light
- Difficulty dealing with stress
- Irritability
- Flat affect or extreme emotions
- Vision issues/difficulty reading (her eyes do not work together)
- Moderate tinnitus
- Occasional balance issues
- Numbness and tingling in face and head
- Loss of perception of sensation in body (proprioception),
- More twitches in body
- Clicking in her jaw
- Headaches and migraines. (After the concussion her migraines and headaches became more intense, persistent and frequent.
- Outside of left foot hurts when she walks.

At the onset of the study Participant D reported she had been suffering from left shoulder pain and compromised function for three weeks, and had been having physiotherapy for it, which was discontinued during the study.

The results of a physical assessment by the practitioner determined Participant D:

- Could not retract her left arm behind her body.
- When prone, the right thoracic ribcage lateral to the spine was elevated in comparison to the left side of the ribcage. [Note: This is possibly the result of a hard fall broken by an extended arm or shoulder, which can push one side of the ribcage posterior. It is the

practitioner's opinion, based on working with several people who suffered falls broken by an extended arm, that the fall from the horse in her 20s possibly shifted her spine to the left as well as pushed her right ribcage posterior.]

- Had very tight (contracted) muscles on right side of neck only, right levator scapula, back of neck, and at skull/spine interface. This resulted in restricted rotation to the left.
- Had TMJ issues— her jaw was not balanced, and muscles were tighter at the right jaw joint.
- There was a vertical ridge on the left side of the skull, at approximately the location where the occipital plate meets the temporal and parietal plates.

After documenting self-reported symptoms that included chronic fatigue, sleep disturbance, problems with her thinking process, difficulty concentrating, and chronic muscle tension, the practitioner noted to Participant D that she had most of the symptoms commonly attributed to Fibromyalgia, excluding the symptom of widespread pain in the body's tissues, and/or Chronic Fatigue. Participant D reported that she had never been referred to an endocrinologist nor an internal medicine specialist.

5. The Procedures

Session 1: BRM1 (1-2), BRM2 (1-16), Teres Major, BRM3
Session 2: BRM1 (1-4), BRM2 (1-16ab), Teres Major, BRM3, UR/TMJ
Session 3: BRM1 (1-2), BRM2 (1-16ab), BRM3, UR/TMJ
Session 4: BRM1 (1-2), BRM2 (1-8ab), Teres Major, Rhomboids, BRM3, Sternal, UR/TMJ
Break
Session 5: BRM1 (1-4), BRM2 (1-8ab), Teres Major, Supraspinatus, Respiratory Prone, BRM3 + moves over skull, East (left only), UR/TMJ
Session 6: North, BRM1, 5a7a Medially, Prone Sacral, BRM2 (1-8), BRM3 + moves over skull, UR/TMJ
Session 7: BRM1 (1-4), BRM2 (1-16ab), Teres Major, BRM3 + moves over skull, UR/TMJ, Shoulder, Upper Trapezius
Session 8: BRM1, Prone Sacral, QL, BRM2 (1-8ab), Teres Major & Minor, Upper Trapezius, BRM3 + moves over skull, UR/TMJ

6. Practitioner Observations During the Study

6.1 Sessions 1-5

At the fifth session, Participant D's neck rotation had slightly improved: 70 to the left, 90 degrees to the right.
Her left arm was still sore.

6.2 Final Assessment Photos

In photos taken of Participant D on April 16, 2016 the practitioner observed:

- Scoliosis – thoracic spine—no change
- Right shoulder elevation aligned with left — improvement
- Head tilts to right—no change
- Rotation of pelvis, left side (visible in left lateral view and posterior view)—partial correction

6.3 Observations on April 16, 2016 (8th session)

On the day of the third party assessment Participant D was suffering from a migraine.

The practitioner assessed that:

- Participant D's neck rotation to the left had improved by 10 degrees (80 degrees to the left), due to an easing of right side neck muscle tightness.
- The vertical ridge on the left skull had disappeared.
- Her leg lengths were even.
- Her right iliac crest was slightly elevated.
- The postural issues—scoliosis, rotated pelvis, raised right posterior ribcage—were unresolved, and her left shoulder was still sore.

7.0 Supplementary Questions at Third Party Assessments

7.1 Interim Assessment Questions & Participant D Responses – March 5

Q1. Comparing the previous week to before you had the first Bowen Therapy session, how much can you do each day **physically?**
X I can do about the same amount each day.

Q2. Comparing the previous week to before you had the first Bowen therapy session, how much can you do each day cognitively?

X I can do about the same amount each day. No change.

Q3. Since my concussion, I received diet counseling from a: *chiropractor/functional neurologist*.

Q4. Since my concussion, I received recommendation for supplements:
X Yes.
Who recommended these supplements:
X physician X chiropractor/functional neurologist

Q5. **Quality of Diet.** Since my concussion, I consider my diet to be:

X Good. I each nutritious food most days.

Q6. **Frequency of Meals**. (A smoothie counts as a meal.) Since my concussion:
X Other. Inconsistent. Sometimes one, two or three meals plus snacks. Mostly one or two meals plus frequent snacks (like cheese and crackers, almond butter, etc.)

Q7. **Emotional Response to Bowen Therapy.** Today this is how I feel about my health improvements (or lack thereof) since the first Bowen Session:
X Somewhat hopeful

7.2 Final Assessment Supplementary Questions & Participant D Responses – April 16

Participant's written comments are underlined.

Q1. Comparing the previous week to how you felt in January, 2016, how much can you do each day **physically**?
X I can do about the same amount each day. *More relaxed after sessions. Sleep better.*

Q2. Comparing the previous week to January, how much can you do each day cognitively?
X I can do about the same amount each day. No change.

Q3. Emotional Response to Bowen Therapy. Today, this is how I feel about my health improvements (or lack thereof) after eight Bowen Therapy sessions:
X Somewhat hopeful.

Q4. Indicate which other therapies you had at any time during the period of this concussion study, and whether, in your opinion, they were of **no benefit**, **some benefit**, or a **great benefit** for reducing particular symptom(s):
X Other *Psychological counseling* X no

8. Summary and Conclusions

8.1 Third Party Assessments

The results of the three independent assessments by Mary Leung, RN (retired) using the adapted SCAT3 symptom assessment were as follows:

Participant	Assessment 1 30 Jan 2016		Assessment 2 5 March 2016		Assessment 3* 16 April 2016		SSS Improve-ment
	# Symptoms	SSS	# Symptoms	SSS	# Symptoms	SSS	%
D	21	**59**	23	**47**	24	**76**	**-29%**

Total number of symptoms: max possible = **31**
Symptom Severity Score (SSS): max possible 31 x 6 = **186**
Percent improvement in SSS formula: (Original SSS – Final SSS) ÷ Original SSS

*The day of the April 16 subjective assessment, D scored high on a scale of 0 - 6 for a cluster of symptoms related to a bad headache and fatigue on that day:

- Headache, 4
- Sensitivity to noise, 5
- Feeling slowed down, 5
- Feeling in a fog, 4
- Don't feel right, 4
- Forgetful, 4
- Fatigue or low energy, 5
- Difficulty falling asleep, 5
- Difficulty staying asleep (e.g., pain), 5

8.2 Practitioner Comments

In this practitioner's opinion, Participant D's chronic and severe muscle tightness in the neck, jaw and shoulders put pressure on nerves and blood vessels, exacerbating dizziness and headaches.

Eight sessions of Bowen Therapy were not sufficient to:
a) resolve the rotation in her pelvis and spinal scoliosis, or
b) significantly reduce any of her PCS symptoms.

One Year Follow-up
On April 25, 2017, approximately one year after the end of the study, Participant D self-assessed her symptoms and had a symptom severity score of 79.5. She reported that she was under a great deal of stress.

After the end of the study, Participant D had 11 Bowen Therapy sessions with the same practitioner between June and December, 2016. Between April 2016 and April 2017.she also

had sessions with the Ottawa Hospital Rehab Centre physiatrist, a physiotherapist, an osteopath, and a psychologist.

Symptom (2016)	30 January	5 March	16 April	25 April, 2017
Symptom Severity Score	59	47	76	79.5

Discussion

Participant D's physiatrist's approach was to keep trying different medications in the search for one that worked without side effects. Therefore during the study Participant D consecutively used several prescribed medications. This practitioner noticed that when D was taking certain of these prescribed drugs, she appeared more cognitively impaired, listless, and exhausted. Because of the medication side effects, it is not possible to infer that Bowenwork had any positive effect on physical energy level or cognition.

Participant D's case was the most complex and resistant of the six study participants.

- She was the only one who experienced two blows to the *top* of the skull. The force of each impact would therefore have driven the brain toward the base of the skull.
- She had pre-existing scoliosis prior to the concussion.
- Her symptoms *increased in number and intensity* after an MRI performed 3.5 months post-concussion. She attributed the worsened symptoms to the fact the table shook during the MRI. The summer after the study, driving down a bumpy road worsened her symptoms.
- Her physiatrist prescribed a succession of medications (sleep aids, antidepressants, stimulants) with unpleasant side effects.
- She had severe fatigue and insomnia. Potential causes of her extreme fatigue were not investigated by physicians.

This practitioner believes the following questions bear investigation:

1. How is damage to the *bottom* of the brain different? Does it merit a different treatment strategy?
2. Could pre-existing scoliosis and other history of physical trauma compromising the spine impact healing from concussion?
3. Can the vibration experienced during an MRI (in this case horizontal movement of the table) cause more damage to a fragile, concussed brain?
4. Could the concussion and the associated trauma have damaged the pituitary gland and triggered endocrine system issues?

Appendix 13—Participant E Case

1. History

Participant E ("E") was a 53 year old male who slipped on ice in December, 2012. He landed on his right shoulder, fell backward and hit the back of his head on the concrete sidewalk. He had a soft tissue injury to the neck.

At the beginning of this study "E" was able to read and view screens to a limited degree, and drive, but had not worked at his professional job since the accident due to vision issues (tracking, saccades and visual processing) and cognitive impairment. He did not have cognitive, hearing or vision issues prior to the 2012 concussion.

Medical imaging—a CT scan of his brain in 2013 and a follow up MRI in 2015—were "clear."

He had experienced head trauma several times from childhood onward, most recently in 2002.

2. Treatments for PCS Prior to the Study

A functional neurologist specializing in concussion provided on-going treatment since Spring, 2013. Participant E was prescribed a medication to address his PCS symptoms. He continued to take prescribed medications during the study, as well as painkillers several times per week.

Other treatments from providers after December, 2012 to address PCS symptoms included:

- Physiotherapy for head, neck and jaw over eight months (concluded before this study)
- Attention process training (concluded before this study)
- Functional neurology (concluded before this study)
- Vision therapy and ocular vestibular exercises (on-going during the study)
- Sound therapy for noise sensitivity (began during the study)
- Hearing aids (obtained during the study)

3. Intake Interviews by Third Party Assessor - Participant E

Mary Leung, RN (retired), interviewed the participants on 30 January, 2016 and recorded answers on the Client Documentation form as follows.

Participant E January 30, 2016
Intake Interview Responses

Dominant Hand	Right
Able to read?	Y, *limited*
Able to work/study?	N
When did you last pass out?	2003
Able to view screens?	*Limited*
Authorized to drive?	Y
Do you have seizures?	N
Do you have a learning disability/ dyslexia/ADD/ADHD?	N
Have you ever been diagnosed with depression, anxiety, or other psychiatric disorder? If yes, was this before any concussion?	N
Has anyone in your family ever been diagnosed with any of these problems?	N
Did you have headaches & migraines prior to any concussions? Details:	Y, *very rarely*
Concussion History	
# concussions prior to this one:	N/A
Date of concussion prior to this one:	
Were symptoms 100% resolved from the concussion prior to this one?	
If yes, how long did recovery take?	
If no, what were the on-going symptoms?	
Were you able to work/study after the most recent concussion? If no, how long were you off?	
Date of most recent concussion:	*December 2012*
Describe how it happened & other injuries, if applicable:	*Slip and fell on ice. Soft tissue injury to neck.*
Were you hospitalized?	N
Medical imaging of head? Results/Diagnosis: Area(s) of brain affected:	Y *Clear*
Other physical injuries?	N
Are you on medications? List.	Y
Describe current therapies/treatments:	Vision therapy

The third party assessor used the adapted SCAT3 symptom assessment form to record or witness E's self-assessed symptom severity on a scale from 0 to 6, where 6 was severe.

In January, 2016 Participant E indicated he had 17 symptoms. The symptom severity score was calculated to be 54 out of a possible 186. As well, he indicated his ongoing stress level was high.

In March, Participant E indicated he had 13 symptoms. The symptom severity score was 37.

He was unable to participate in the final third party assessment on April 16.

On February 20, 2017 he supplied a self-assessment of his symptoms. The symptom severity score was 43. See the right column for the one year update.

Symptom (2016)	**30 January**	**5 March**	**16 April**	**February 20, 2017**
Headache	3	0		2
Neck pain	1	1		1
Vision Issues				
Sensitivity to light	2	1		2
Other vision issues	**4**	-		4
Auditory Issues				
Hearing impairment	3	3		3
Sensitivity to noise	5	5		4
Ringing in ears/tinnitus	4	3		2
Feeling "slowed down"	3	4		2
"Don't feel right"	5	4		4
Cognitive issues				
Difficulty concentrating	5	3		5
Difficulty remembering	2	2		2
Forgetful	2	2		2
Fatigue or low energy	4	4		4
Drowsiness	2	1		1
Difficulty falling asleep	2	0		1
Difficulty staying asleep	5	4		3
Easily annoyed or Irritable	2	0		1
Symptom Severity Score	**54**	**37**	**N/A**	**43**

Do the symptoms get worse with physical activity?	—	Y	—
Do the symptoms get worse with mental activity?	—	Y	—
Regarding ability to do physical activities, how well can you perform today?	Can do mild exercise	Can do mild exercise	—
Regarding ability to read on screens, how well can you perform today?	Can view screens for I hour	Can view screens for 30 min.	—

4. Initial Physical Assessment by Practitioner

4.1 Photos

Photos were taken of Participant E on 5 February, 2016 illustrating:
a) his neck and head were offset to the left; and,

b) apparent rotation at the pelvis. That is, the slope of the vertical alignment of the hip, knee and ankle on the left is more pronounced than on the right, indicating the left pelvis is rotated forward (or the right backward) from neutral.

4.2 Practitioner Health History Interview on February 5, 2016 – First Session

The practitioner did a physical assessment. Neck rotation was restricted on both sides, but more severely on the left where he had constant pain. He could not turn his neck sufficiently to the left to breathe when swimming. He had been diagnosed post-concussion with Upper Airway Restriction Syndrome (mild sleep apnea, treated by sleeping position.)

His jaw was pushed to the right. He had a TMJ issue on both sides of the jaw. He used a night guard.

His psoas muscle originating on the left lumbar spine was tight, causing mild lordosis in the lumbar area. His right ribcage was slightly posterior (i.e., raised when laying prone), indicating the force of the fall had pushed it posterior. In the practitioner's opinion, unverified by a scan, the force of breaking his fall with the right shoulder likely put a slight clockwise torque on the thoracic spine.

5. The Procedures

Session 1: BRM1, BRM2 (1-8ab), BRM3
Session 2: BRM1 (1-4), BRM2 (1-8ab), Teres Major, BRM3, UR/TMJ
Session 3: BRM1 (1-4), BRM2 (1-16ab), Teres Major, Chest, BRM3, UR/TMJ
Session 4: BRM1 (1-4), BRM2 (1-16ab), Teres Major, Rhomboids, BRM3 + moves on back of head, UR/TMJ, North
Break
Session 5: BRM1, 5a7a Medially, BRM2 (1-8), Teres Major, BRM3 + moves on back of head, UR/TMJ
Session 6: BRM1, 5a7a Medially, Prone Sacral for Piriformis, Pelvic, BRM2 (1-8), BRM3, UR/TMJ
Session 7: BRM1, Coccyx Oblique, BRM2 (1-8), Respiratory, Pelvic, BRM3, UR/TMJ
Session 8: BRM1, 5a7a Medially, Prone Sacral, Quadratus Lumborum, BRM2 (1-8ab), Teres Major, BRM3+ moves on back of head, UR/TMJ.

6. Practitioner Observations During the Study

6.1 Sessions 1-5

On March 11, the date of the fifth session, the practitioner noted that Participant E had been doing sound therapy overnight for three weeks, and it left "E" very fatigued from lack of sleep.

Participant E had very tight hamstrings. There was a "bump" on the left mid occipital.

After four sessions, the muscle tension in the neck had not resolved. The left SCM would be loose in the morning upon rising, but tighten up during the day. He once woke up in the morning with his head turned to the left. He had not been able to do this since the 2012 accident. However, the tension returned during the day. Clearly the origin of the recurring neck muscle tension lay elsewhere in the body.

At this midpoint of the study, the practitioner theorized that a rotation in the pelvis (and hence spine) might be contributing to muscle tension in the neck. Participant C also had a rotated pelvis and the same neck tension issue. That is, in order to face straight ahead, they would have had to continuously force their heads to turn a few degrees to counteract a slight rotation in the spine. Therefore, in the four remaining sessions, the practitioner addressed significant muscle tension in E's back (thoracic & lumbar), Piriformis, and hamstrings.

6.2 Final Assessment Photos

A second set of photos was not taken on Participant E as he was unable to attend the third assessment on April 16.

6.3 Observations on April 8, 2016 (8th session)

Before having any procedures on April 8, "E" had approximately a 20 deg improvement in neck rotation to the right compared to the measurement at the first session, but only about a 5 degree improvement in neck rotation to the left.

The "raised" posteriorly-rotated right ribcage had resolved, such that it was even with the left ribcage when prone.

Since "E" did not attend the final assessment, no photos were taken. However, as of April 8 there was still rotation in the pelvis, as evidenced by the procedures that the practitioner selected for the session.

7.0 Supplementary Questions at Third Party Assessments

During the first four sessions, the practitioner had to feed some of the participants before their sessions as they had not eaten a meal that day or had skipped a meal. She wondered if diet, low blood sugar or poor eating habits were exacerbating some of the participants' symptoms. Therefore she added some questions for the third party assessor to administer on March 5.

7.1 Interim Assessment Questions & Participant E Responses – March 5

Q1. Comparing the previous week to before you had the first Bowen Therapy session, how much can you do each day **physically?**
X I can do about the same amount each day.

Q2. Comparing the previous week to before you had the first Bowen therapy session, how much can you do each day cognitively?
X I can do about the same amount each day. No change.

Q3. Since my concussion, I received diet counseling. NO

Q4. Since my concussion, I received recommendation for supplements: Yes.
I take the recommended supplements: Yes

Who recommended these supplements: Physician.

Q5. **Quality of Diet.** Since my concussion, I consider my diet to be:
X Good. I each nutritious food most days.

Q6. **Frequency of Meals**. (A smoothie counts as a meal.) Since my concussion:
X I always eat three meals a day plus snacks.

Q7. **Emotional Response to Bowen Therapy.** Today this is how I feel about my health improvements (or lack thereof) since the first Bowen Session:
X Somewhat hopeful

7.2 Final Assessment Supplementary Questions & Participant E Responses – April 16

Participant E was unable to attend the final third party assessment.

8. Summary and Conclusions

8.1 Third Party Assessments

The results of two independent assessments by Mary Leung, RN (retired) using the adapted SCAT3 symptom assessment were as follows:

Participant	**Assessment 1 30 Jan 2016**		**Assessment 2 5 March 2016**		**Assessment 3 16 April 2016**		**SSS Improve-ment**
	# Symptoms	SSS	# Symptoms	SSS	# Symptoms	SSS	%
E	17	54	13	37	—	—	**31**

Total number of symptoms: max possible = **31**
Symptom Severity Score (SSS): max possible 31 x 6 = **186**
Percent improvement in SSS formula: (Assessment 1 SSS – Assessment 3 SSS) ÷ Original SSS

At Assessment 2, three symptoms dropped from severe to moderate—"Don't feel right", Difficulty concentrating, difficulty staying asleep.

Three symptoms—Difficulty falling asleep, Irritability and Vision issues (excluding Sensitivity to light)— dropped to 0 from 2, 2 and 4 respectively.

Participant E was not able to attend the final third party assessment. Third party assessment after four Bowen Therapy sessions determined that the severity of the symptoms improved by 31 percent. There was an improvement in symptom severity despite fatigue from the overnight sound therapy.

8.2 Practitioner Comments

This practitioner proposes that Participant E's chronic muscle tightness in his neck, jaw and back were exacerbated by a torque in the thoracic spine caused by the fall. That is, the force of the fall pushed the right shoulder and ribcage complex posterior, twisting the thoracic spine clockwise. Therefore, E's neck needed to rotate counter-clockwise slightly to compensate, creating chronic tension in the left SCM and other muscles on the left side of the neck above the thoracic spine, and in the lower back/pelvis below. Neck and jaw muscle tension put pressure on trigeminal nerves and other nerves to the ear, which could contribute to hearing issues.

An X-ray of the spine post-concussion would have been useful to allied health care practitioners.

Eight sessions of Bowen Therapy were insufficient to straighten Participant E's spine four years after the accident. A start was made: the posteriorly-rotated right ribcage resolved. More sessions would be required to straighten the spine in order to permanently resolve symptoms arising from chronic muscle tension.

One Year Follow-up

In February, 2017, approximately 10 months after his eighth Bowenwork session, and after continuing with vision therapy during the period between April 2016 and December, 2017, his symptom severity score of 43 indicated some regression, but a sustained improvement of 20% over the original symptom severity score of 54.

Symptom (2016)	**30 January**	**5 March**	**16 April**	**20 Feb 2017**
Symptom Severity Score	**54**	**37**	**N/A**	**43**

Appendix 14—Participant F Case

1. History

Participant F was a 64 year old female with a history of hitting her head. She had a severe concussion in 1990, when she fractured her skull in three places in a cycling accident. She had suffered head trauma—hits to her head—at least six times since 2007. The most recent concussion was in March 2014. She suffered a whiplash injury in the summer of 2015. She had medically-diagnosed post-concussion syndrome and unresolved symptoms.

She had an MRI in 2010 that showed her brain was normal, and another MRI in 2013 that indicated issues with alignment of her cervical spine.

At the beginning of the study she reported that she was able to work part-time, read, and engage in social activities. She did not drive, but was able to take the bus with accommodations—dark glasses to protect against bright light, and ear plugs for noise protection. She was able to walk to and from work, appointments, etc. Her stress level was high due to a situation involving her accommodation that was out of her control to resolve, and for part of the study forced her to sleep elsewhere for health reasons.

2. Treatments for PCS Prior to the Study

At the initiation of the study, Participant F was under the care of a neurologist, but not taking any medications or having therapies to address her symptoms.

Treatments from self-selected allied health care providers for various periods subsequent to March 2014 to address post-concussion syndrome symptoms included the following therapies:

- Physiotherapy
- Trigger Point Therapy

3. Intake Interviews by Third Party Assessor – Participant F

Mary Leung, RN (retired), interviewed Participant F and recorded answers on the Client Documentation form.

Participant F, 7 February, 2016
Intake Interview Responses

Dominant Hand	*Ambidextrous*
Able to read?	Y
Able to work/study?	Y
When did you last pass out?	*25 years ago*
Able to view screens?	Y
Authorized to drive?	N
Do you have seizures?	N
Do you have a learning disability/ dyslexia/ADD/ADHD?	Y *Flipping letters*
Have you ever been diagnosed with depression, anxiety, or other psychiatric disorder? If yes, was this before any concussion?	N
Has anyone in your family ever been diagnosed with any of these problems?	N
Did you have headaches & migraines prior to any concussions? Details:	Y
Concussion History	
# concussions prior to this one:	*1 major concussion in 1990, 6 since 2007*
Date of concussion prior to this one:	See above
Were symptoms 100% resolved from the concussion prior to this one?	N
If yes, how long did recovery take?	*No complete recovery*
If no, what were the on-going symptoms?	
Were you able to work/study after the most recent concussion? If no, how long were you off?	Y *part time*
Date of most recent concussion:	*March 2014*
Describe how it happened & other injuries, if applicable:	*Hit by door*
Were you hospitalized?	N
Medical imaging of head? Results/Diagnosis: Area(s) of brain affected:	N
Other physical injuries?	Y *Left shoulder, head, neck*
Are you on medications? List.	N
Describe current therapies/treatments:	No current therapies. Previously: *Physio* *Acupuncture* (for teeth) *Trigger Point Therapy* *Tai Chi*

The assessor used the adapted SCAT3 symptom assessment form to record F's self-assessed symptom severity on a scale from 0 to 6, where 6 was severe.

At her Intake interview, Participant F indicated she had 23 of the symptoms of a possible 31 symptoms. The symptom severity score was calculated to be 89 out of a possible 186.
In March, Participant F indicated she had 20 symptoms. The symptom severity score was 60.
In April, Participant F indicated she had 21 symptoms. The symptom severity score was 42.5.
In June 2017 Participant F indicated she had 24 symptoms. The symptom severity score was 66.5.

Symptom (2016)	**7 February**	**5 March**	**16 April**	**26 June 2017**
Headache	0	3	0	
Neck pain	3	2	0.5	1.5
Pressure in head	3	2	1	2
Pain in *achiness all over/back*	4	3	0	3 *vacuumed yesterday*
Numbness/Tingling in right or left leg	3	1	0.5	3
Dizziness	2	0	1	1
Balance problems	2	1	1	1.5
Blurred vision				2 *acuity gone downhill in past 2 months, astigmatism worse*
<u>Vision Issues</u>				
Sensitivity to light	5	2	1	2 *lifetime issue*
Double vision or other issues	1	0	2	1
<u>Auditory Issues</u>				
Hearing impairment	0	2	2	2
Sensitivity to noise	2	2	2	3.5
Ringing in ears/tinnitus	4	4	3	4
Feeling “slowed down”	2	5	3	3
Feeling “in a fog”	4	5	2	3
“Don’t feel right”	2	5	2	2
Feeling restless	2	0	0	0
<u>Cognitive issues</u>				
Difficulty concentrating	6	2	3	4
Difficulty remembering	6	4	3	5 *sleep deprivation on on-going basis due to housing issues*
Forgetful	6	4	4.5	5
Confusion	6	0	1	3
Fatigue or low energy	5	5	3	4
Drowsiness	5	5	3	5
Difficulty falling asleep	0	0	0	0
Difficulty staying asleep	5	1	3	2
Easily annoyed or Irritable	5	2	1	2
Feeling nervous or anxious	6	0	0	2
Symptom Severity Score	**89**	**60**	**42.5**	**66.5**

Do the symptoms get worse with physical activity?	Y	Y	Y	Y

Do the symptoms get worse with mental activity?	Y	Y	N	N
Regarding ability to do physical activities, how well can you perform today?	Can walk	Can do mild exercise	Can walk	Can do vigorous exercise *10,000 steps/day*
Regarding ability to read on screens, how well can you perform today?	*3 hours*	*Hours*	*2+ hours*	*Can view all screens*
# hours you sleep per night?	*6*	*6*	*6*	*6*
# hours you sleep during the day?	*20 min nap*		*30 min nap*	*Catnaps. Works 5 days/week*

4. Initial Physical Assessment by Practitioner

4.1 Photos

Photos were not taken as there were no significant postural issues that would show up in before and after photos of a clothed body.

4.2 Practitioner Health History Interview on February 6, 2016 – First Session

Participant F reported to the practitioner that she possibly broke her tailbone 15 years ago. She reported a list of current physical issues that she associated with concussions and accidents over the years:

- Body aches/fibromyalgia
- Arthritis in knees, neck and left hip (meniscus torn in both knees previously)
- Right hip pain
- Numbness/tingling in right leg
- Cold extremities, especially feet
- Muscle spasms in calves and cramping in calves, feet and toes
- TMJ & teeth problems
- Tinnitus, worse in right ear
- High frequency hearing loss in right ear
- Intermittent double vision (right eye injured in 1990)
- Neck pain
- Right shoulder issue
- Lower to mid-back pain
- Breathing problems from second hand smoke. (Lungs were possibly weakened from 2010 pneumonia)
- Proprioception problems

- Migraines

During a physical assessment the practitioner determined Participant F had:

- compromised shoulder functionality. She could raise the "frozen" left arm laterally approximately 50 degrees and the right 80 degrees. Her scapulas were winged;
- tight right side neck muscles and average neck rotation: 60 degrees to left and right; and
- good postural alignment, with a slightly pronounced curve in the lumbar area that pushed her pelvis forward.

5. The Procedures

Session 1: BRM1, BRM2 (1-8), BRM3, Knee Procedure
Session 2: BRM1 (1-4), BRM2 (1-8ab), Teres Major, BRM3, UR/TMJ, Knee Procedure
Session 3: BRM1 (1-4), BRM2 (1-8ab), Teres Major, BRM3, UR/TMJ, North, Upper Trapezious (right)
Session 4: BRM1 (1-4), BRM2 (1-16ab), Teres Major, BRM3 + moves over skull muscles, UR/TMJ, Knee, Ankle
Break
Session 5: BRM1, BRM2 (1-16), Kidney, BRM3 + moves over skull, UR/TMJ
Session 6: BRM1, Prone Sacral, 5a7a Medially, BRM2 (1-16), Kidney, Pelvic, BRM3 + moves over skull, UR/TMJ
Session 7: BRM1, Prone Sacral, BRM2 (1-16ab), Teres Major, Teres Minor, Upper Trapezius, Kidney, Knee (15), BRM3 + moves over skull, UR/TMJ
Session 8: BRM1, Prone Sacral, BRM2 (1-16ab), Respiratory, Knee, BRM3 + moves over skull, UR/TMJ

6. Practitioner Observations During the Study

6.1 Sessions 1-5

Practitioner F generally scheduled her sessions after work, and several times had not eaten within five hours. She was given food prior to the session to ward off hypoglycemia.

She had a significant muscle knot in the right upper trapezius at the base of her neck, which was addressed starting in Session 3.

In Session 4 the practitioner checked leg lengths supine. Her right leg was approximately 3/4 inch longer than her left.

On March 12, the date of Session 5, she reported that pain in her legs when descending stairs had gone (the tight Achilles and lateral tendons in her calves having relaxed), but she still had pain in her right hip. The right side of the neck remained tight. Her tinnitus in the two weeks prior to the interim assessment had "gone through the roof." She reported a new UTI (a chronic issue).

6.2 Final Assessment Photos

Photos were not taken of Participant F.

6.3 Observations at the Final Assessment—April 16

On the day of the final third party assessment, Participant F reported that the incipient UTI had never developed into a full-blown infection, and she had not required antibiotics. The practitioner noted that the heat in one kidney was gone one week after the first use of Kidney Procedure.

Participant F's measured neck rotation at the end of the study was 45 deg left, 75 deg right—a 15 degree improvement on the left side of the neck, but tension on the right side of the neck had worsened by 15 degrees.

She could raise the "frozen" left arm laterally approximately 50 degrees (no improvement) and the right arm 100 degrees, approximately a 20 degree improvement from the start of the study.

Her jaw muscles had relaxed after eight TMJ Procedures, but a differential "clunk-clunk" remained. She did not wear her mouth guard during the study.

Her functional leg length discrepancy—left short by ¾ inch—temporarily resolved after activation of the left glute medius muscle.

7.0 Supplementary Questions at Third Party Assessments

7.1 Interim Assessment Questions & Participant F Responses—March 5

Q1. Comparing the previous week to before you had the first Bowen Therapy session, how much can you do each day **physically?**
X I can do about the same amount each day.

Q2. Comparing the previous week to before you had the first Bowen therapy session, how much can you do each day cognitively?

X I can do about the same amount each day. No change.

Q3. Since my concussion, I received diet counseling: NO. *Haven't received diet counseling but have read a lot about diet and attended lectures, etc.*

Q4. Since my concussion, I received recommendation for supplements:
X Yes.
Who recommended these supplements:

X pharmacist X *internet*

Q5. **Quality of Diet.** Since my concussion, I consider my diet to be:
X Average. I each nutritious food half the time.

Q6. **Frequency of Meals**. (A smoothie counts as a meal.) Since my concussion:
X I always eat three meals a day plus snacks.

Q7. **Emotional Response to Bowen Therapy.** Today this is how I feel about my health improvements (or lack thereof) since the first Bowen Session:
X Somewhat hopeful

Comments:
Extreme stress related to second hand smoke in my apartment and concerns over finances and ability to afford moving to a new location. Spending as little time in my apartment at night when the smoke is the worst has interfered with sleep and having to keep windows open and fans running has increased noise exposure. At the first assessment I was house-sitting so had a comfortable place to sleep.

7.2 Final Assessment Supplementary Questions & Participant F Responses—April 16

Participant's written comments are in italics.

Q1. Comparing the previous week to how you felt in January, 2016, how much can you do each day **physically**?
X I can do about the same amount each day.
X I can do more on occasional days. I have more energy <u>two</u> days after the session.

Q2. Comparing the previous week to January, how much can you do each day cognitively?
X I can do about the same amount each day. No change.

Q3. Emotional Response to Bowen Therapy. Today, this is how I feel about my health improvements (or lack thereof) after eight Bowen Therapy sessions:
X Somewhat hopeful/Neutral

Q4. Indicate which other therapies you had at any time during the period of this concussion study, and whether, in your opinion, they were of **no benefit**, **some benefit**, or a **great benefit** for reducing particular symptom(s):
N/A

Comments:
Stress with smoke at home. Life stresses – not concussion results.

8. Summary and Conclusions

8.1 Third Party Assessments

The results of the three independent assessments by Mary Leung, RN (retired) using the adapted SCAT3 symptom assessment were as follows:

Participant	Assessment 1 30 Jan 2016		Assessment 2 5 March 2016		Assessment 3* 16 April 2016		SSS Improve-ment
	# Symptoms	SSS	# Symptoms	SSS	# Symptoms	SSS	%
F	23	89	20	60	21	42.5	**52**

Total number of symptoms: max possible = **31**
Symptom Severity Score (SSS): max possible 31 x 6 = **186**
Percent improvement in SSS formula: (Original SSS – Final SSS) ÷ Original SSS

8.2 Practitioner Comments

Participant F's self-reported anxiety level dropped from 6 to 0 after eight sessions. By the end of the study she was noticeably less anxious, although her housing issues had not improved and she did not get consecutive good nights' sleep for much of the duration of the study.

Sensitivity to light markedly improved, from 5 to 1. The *Easily annoyed or Irritable* symptom dropped from 5 to 1, and *Confusion* from 6 to 1. Her cognitive function improved as well. *Difficulty concentrating* and *Difficulty remembering* improved by 50%.

Her UTI—a chronic issue that historically recurred often—resolved within one week of Kidney Procedure.

Participant F was active despite pain from chronic muscle tension. Her right side neck and leg muscle tension issues, in the Bowenwork practitioner's opinion, could be traced to a ¾ inch functional (not genetic) leg length discrepancy that potentially created a slight scoliosis of the spine (unconfirmed by X-ray). The associated neck tension contributed to jaw muscle TMJ and tinnitus.

In summary, Participant F made remarkable progress—a 52% improvement in her symptoms overall. Eight sessions of Bowen Therapy were insufficient to completely resolve her symptoms.

One Year Follow-up

Subsequent to the study she suffered a number of head impacts which triggered symptoms. These included a rough ride on the city bus in May 2016 and a hit on the back of her head a week later. In August 2016 she twisted her head, which triggered headaches, neck pain and dizziness. A week after that, she was hit in the ear by a door in the grocery store. In January 2017 she again hit her head.

Therapies since May 2016 included a BrainFit pilot program twice per week for eight weeks at the Ottawa Hospital rehab centre in January 2017. It included balance training, cardio on bike, cognitive puzzle-solving, muscle strengthening, etc. She separately had acupuncture once for her head. She works five days per week, and as of June 2017 continued to be the only study participant able to work.

Symptom (2016)	**30 January**	**5 March**	**16 April**	**26 June 2017**
Symptom Severity Score	**89**	**60**	**42.5**	**66.5**