

REFLEXOLOGY AFTER END-STAGE LIVER DISEASE AND LIVER TRANSPLANT

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Introduction

The Liver

Known to be the body's 'factory', the liver is a key organ for human functioning (1,2). In Chinese Medicine, the liver is key to a healthy "qi", which relates to a state of happiness versus anger, irritability, and depression (1). The liver is located in the upper right quadrant of the abdomen, above the gallbladder and below the diaphragm. After the skin, it is the second largest organ and largest internal organ of the body. The liver weighs approximately 3 lbs, 1.8kgs for men and 1.3 kgs for women, and stores about 13% of the body's blood supply (3,4).

The liver plays important roles in fighting infection, filtering toxins, producing and balancing sex hormones, storing energy, repairing cells, and aiding in the digestion by processing and synthesizing foods and producing bile (2,4). Malfunction of the liver can be due to multiple causes. The most prevalent etiologies of liver damage are Hepatitis B and C, but it can also be caused by "the metabolic syndrome" - a combination of diabetes type II, hyperlipidemia, hypertension, obesity, iron or copper overload, cirrhosis, fatty deposits, cancer, or genetic disorder (3,5).

Liver Transplant

Transplant surgery is a delicate surgery. Recipients are prescribed long lasting immune-suppressant medications since the body's natural reaction is to attack the new organ as an extraneous body. However, these medications can cause kidney damage, high blood pressure, increased body fats, insulin resistance, and bone thinning (with steroids). In addition, liver rejection can cause flu-like symptoms, fever, pain or swelling of the abdomen, nausea and vomiting, breathlessness, and itching. A common infection following transplantation is the cytomegalovirus (CMV) that presents with headaches, nausea, sore throat, fever, fatigue, and pain in the joints. Other risks after liver transplant include cancer, lymphomas, primary biliary cirrhosis (PBC), and risk of cardiovascular disease (6).

Literature Review

There were two research studies that used reflexology in hospital settings for patients with liver disease: Shioh-Luan et. al, showed significant changes in pain, anxiety, and decreased use of opioids in a sample of 61 patients after liver and gastric cancer surgery (7); and Kaur et. al, showed that patients had significant changes in heart rate, diastolic pressure and oxygen saturation, and observed changes in systolic pressure after six sessions of 'foot massage and reflexology' in a sample of 60 patients in ICU units, 25% of them in liver ICU (8). The latter research listed the protocol included "sweeping and rubbing, thumb walking, toe rotation, kneading and cupping" (8). In a systematic review and meta-analysis of 44 studies, researchers found reflexology had medium to large statistical effects on reducing fatigue, promoting sleep, and decreasing pain (9).

Research shows consensus in the importance of addressing the use of complementary and alternative medicines in patients with liver disease and hepatitis (11,12,13,14,15). Studies including herbal medicine use in patients with liver disease and hepatitis C have reported patients use herbal supplements to treat hepatitis C symptoms (i.e. to decrease fatigue, improve immune and gastrointestinal functions) (12, 15). However, results vary on the positive and negative effects of supplements (11). In addition, patients with liver disease have reported use of other complementary therapies such as: meditation (13,15); acupuncture (14,15); prayer (12,13); massage, aromatherapy, exercise, relaxation, wellness programs, group counseling (15); chiropractic, scratching, qigong, cupping, and incense ash (14). One study found that only 36% of 176 patients reported the use of alternative medicines to their doctor (14). Scientific literature on the efficacy of reflexology for clients with end-stage liver disease and liver transplant has not been addressed.

Objective

The objective of this case study was to explore the subjective effects of reflexology in a subject with approximately three and a half to four years post-liver transplant.

Health History

Subject

58 years old male who was diagnosed with end-stage liver disease and need for liver transplant approximately 3.5 to 4 years ago. Subject reported history of multiple kidney stones starting approximately 10 years ago and getting worse about four years ago, sometimes twice a week, twice a month, or once every other month; along with a noticeable decrease in energy and slowing down. About four years ago, subject started voiding blood and after a full blood

screen, subject was diagnosed with hepatitis C that had been dormant in his body. Subject is a veteran and reports getting hepatitis C infection thru air-jet injections in the 70's when he was in the army. Subject has led a healthy, active lifestyle prior to this illness, enjoyed playing volleyball, Frisbee, and repairing things. He reports, "I am starting to feel better but I am not back to what I used to be, I used to be very active". He reported he "used do a lot of strenuous stuff, was awake a lot of hours a day, had a big social life, and was constantly doing stuff", such as road trips, trips to the snow, exploring with his kids, but "I just don't do that anymore... I have a lot less energy".

End-stage liver disease

Subject reports, "As soon as I was diagnosed, my health did a rapid deterioration and I was screened to see if I was eligible for a liver transplant". He had extensive testing to qualify for a transplant including neurological testing, monitoring of blood cell counts, dental assessment. Subject reports he was "having all kinds of problems in between": low blood platelets, low red and white blood cell count, retaining water, getting bloated, and necessary injections to drain excess fluid from abdomen as well as dental surgery to rule out any potential tooth infection. Subject's health rapidly deteriorated and after one year and a half of testing and being on the waiting list for a transplant, subject reports, "They had sent me to hospital hospitality house to wait for a liver to become available but I was pretty unhealthy, and I think they were kind of giving up on finding me a liver". When he was discharged from the hospital, there was an available liver but it had some problems. Subject explains, "They said there was a liver but it had some problems. They briefly went over the reasons. It wasn't perfect for me, I can't really remember everything they said but the main thing was that it had problems, but it matched, it was a usable liver; mainly they said it was a 79 year-old liver and they don't like to do transplants if the liver is over 68 or 65 years old - I can't remember what they said, but it was a chance to get a liver and stay alive so of course I took it".

Liver transplant

Subject got a liver transplant in September of 2012. The surgery took 18 hours instead of eight and patient experienced complications. Two days after the transplant, patient was taken to Emergency Room for internal bleeding, and doctors found out he needed his colon removed. However, he was not able to undergo surgery at the time, and was in a medically induced coma for approximately 10 days. Post-op complications also included trouble walking, trouble thinking, fever, daily vomiting, continued closed monitoring and memory testing, and multiple re-hospitalizations. Subject reports his gallbladder was removed during the transplant, and recalls taking a lot of medication, including opioids and anti-rejection medicine, and having a lot of problems with vomiting bile. He was prescribed multiple anti-nausea medications that did not help, and was then prescribed Dronabinol (synthetic marijuana) to ameliorate the nausea.

However, he reports it “saps his energy” and tries to take it as needed only.

Life after the transplant

A normal day for the subject is getting up late. “I usually get up and do something...work on the pool, take the dogs for a walk or it just depends”. He also has continuous doctor appointments for blood-work, podiatry, primary care, and liver care, among others. The medications that he takes cause dehydration, and he says his body thinks he is hungry all the time due to low levels of energy. The subject was prescribed opioids for almost four years before and after the transplant, but stopped taking them approximately 10 months ago. Around the same time he was going through withdrawal from the opioids, the transplanted liver was found to be infected with CMV (cytomegalovirus), which the subject describes as a “killer virus”. He was prescribed anti-viral drugs and underwent chemotherapy for at least five weeks. At that time he was prescribed anti-depressants that he continues to take.

The anti-rejection medication was lowered about a year ago, but the levels of blood and white cells are maintained low. Patient reports, “with the lower count I am not getting the energy; I am tired all the time, I sleep a lot more, at least I am in bed a lot more than I should be. I am totally fatigued all the time and they are going to reduce my anti-rejection medicine again in about nine months I believe”. Subject explains with the lower energy from the anti-rejection medicine he does not do a lot of strenuous activity, and with moderate exertion he gets tired, such as when walking or running with the dogs.

Subject also complains of a continuous discomfort that sometimes escalates to pain, in the right upper abdomen, where he says, “the abdomen was ruptured prior to the transplant... which is very common with people that have liver problems. You get real bloated and something gives; some muscles give”. He describes his pain as always there, even when taking opioids, and he believes it will not heal right even with surgery, which he will be assessed for during this year. He describes the pain increases when getting up from lying down or sitting, or when turning his body during driving. Subject also reported that his kidney function fluctuates, and the right kidney is the one that always had the stones; and he sometimes gets nauseated. Subject describes always having had insomnia, and tried some sleep medications that did not work. However, his liver doctors closely monitor his medications and he does not take any over the counter medicine such as Tylenol or aspirin that can affect the liver.

Medications

Dronabinol, 5mg, as needed

Prograf, 1mg, twice a day

Omeprazol, 30mg, twice a day

Magnesium oxide 420, three times a day

Zoloft, 150mg, once a day
Mirtazapine, 15mg, once a day

Methods

Five reflexology sessions were scheduled with subject on Tuesday and Fridays at 4:30pm. Additionally, subject was given daily logs to record pain level, mood, fatigue, level of exercise, and quality of sleep (See Appendix A). Log variables were determined from literature review, initial interview with subject and subject's complaint of abdominal pain. A second log was used for the reflexology sessions, including pain level, mood, blood pressure, and pulse-before and after the session (See Appendix B).

Sessions were scheduled for an hour and 15 minutes and included the following protocol:

- Subjective reports and vital signs intake
- Sessions were given on a reflexology chair and excluded use of lotions, music, aromatherapy, and foot soak
- Relaxation techniques for opening and ending the session
- Techniques: thumb and finger walking (primary); press and roll, static and circular friction
- Full feet sessions emphasizing on areas that present with tissue abnormalities during session
- Subjective reports and vital signs intake

Results

Sleep Results

Subject needed reminders to record sleep duration therefore, data on table shows the approximate total hours of daily sleep. Sixteen of seventeen nights had recorded scores for quality of sleep. Out of the 16 nights recorded, 8 were scored as medium sleep, 4 were scored as above medium, 3 were poor sleep nights, and one was good sleep. Subject reported "feeling refreshed" and having good dreams the morning after first session, and "feeling rested" along with intermittent sleep and insomnia the morning after third session. On the other mornings after sessions, subject reported intermittent sleep and insomnia; restless night; and insomnia/restless night. Overall, 4 of 17 nights had positive descriptors, 9 out of 17 scored as insomnia, 4 of 17 scored as restless sleep, 4 of 17 scored as intermittent sleep, 2 of 17 were restful, one had "bad dreams", and one "no sleep". See Table 1.2 for all sleep results data.

Pain Results

Daily morning scores for pain were mostly scored as very mild – 10 of 17 scores were a 2, 2 of 17 were scores of 1.5, and one score of 1. A morning pain score

was missing for the third day of log recording and the other three scores were mild pain (2.5 and 3) and moderate pain (4). The score of 4 was the first score in the log for the morning before initiating the study. Pain location was the right upper abdomen in all occasions.

Afternoon pain scores were also recorded for the right upper abdomen as follows: one score of no pain the afternoon after session # 2 (from score of 2 in the morning); 2 scores of 1 and 6 scores of 2 (very mild pain); 3 scores of 3 and 2 scores of 2.5 (mild pain); 2 scores of 3.5 and one score of 4 (moderate pain). The score of 4 was the first score in the log and subject scored moderate pain level (4) before session and mild pain (3) after the session. The other two scores of moderate pain (3.5) were for the second and third day of the study. On the afternoon of sessions 3-5 respectively, pain went from 2.5 to 3, 2 to 1, and 1 to 2.

On day eight for session #3, subject complained of mild pain (1.5) in the back and mild pain in the right upper abdomen (3) that were scored as zero after the session; he reported "I usually don't have pain after the sessions". On day 9 of the diary log, subject reported going to bed with a sore back that was scored as moderate pain on day 10 and 11, then dissipated by day 12. The subject's activity on day of session 3 involved hooking up a trailer to truck and unloading it after a long drive.

Subject activities/exercise took place mostly in the afternoons and involved strenuous activities such as heavy lifting, repairing cars, unloading/loading truck, long drives, cleaning the pool; and other activities such as walking the dog, shopping, internet use, and playing chess. On session days, pain decreased from moderate (4) to mild (3) on session 1, mild to no pain on session 2, mild (3) to no pain on session 3, mild (2.5) to very mild (1) on session 4, and very mild (1) to no pain on session 5. Overall, subject reported not having pain when lying down on chair for sessions and feeling very good and relaxed after sessions. Table 1.3 shows all data for pain results.

Mood Results

Mood ratings were described as positive on 15 of 17 day entries and described as one or more of the following: 'calm', 'relaxed', and 'happy'; 'hopeful' was used in two occasions. On the day that lower back was hurting, subject also added 'frustrated' to the daily mood description. On the day he drove back home 125 miles, his mood descriptor was 'tired' and wrote "very tired" the day after this outing. The day of the fourth session when he had car trouble before and after session, he described his daily mood as "worried, stressed, frustrated, angry". Mood descriptions before and after sessions are shown in table 1.1 below and daily mood data recorded on Table 1.4.

Session	Mood before	Mood after
Session 1	Happy Calm Stressed Other: Tremors	Happy Calm Relaxed
Session 2	Calm Relaxed	Calmer More Relaxed Other: "I feel good"
Session 3	Calm Relaxed	Calm Relaxed Other: Very rested. " I feel good, I could fall asleep".
Session 4	Stressed Other: "shaky"	Calm Relaxed Somewhat stressed
Session 5	Somewhat energetic Happy Calm Relaxed	Calm Very Relaxed Other: Rested, "worry free", "I could fall asleep".

Fatigue Results

Daily fatigue scores were scored as mild on seven days, above mild on two days, moderate on three days and above moderate on two days. Moderate scores were reported on first five days and last day of study. On the first days of study, subject took long drives as passenger and driver, and worked on repairing a car and unloading truck. Last day of study subject reported "sore from bending over to repair chairs". On day seven, subject worked on unloading heavy loads and commented "exhausted" on diary log; on day 9 of third reflexology session, subject added 'relaxed' to the comments on diary; on day 10 he reported "restful day"; day 11 he had frustration with low back pain and scored fatigue as mild; day 12 he reported "lazy day" on diary and mild fatigue. Days with above mild fatigue, subject had worked on heavy lifting (day 6) and gardening (day 14). Daily fatigue scores are recorded on Table 1.4.

Vital Signs Results

Table 1.5 below describes vital signs before and after each session.

Sessions	Blood Pressure systolic/diastolic	Pulse	Respiration Rate (RR)	Comments
01/30/15 #1	Before: 120/90 After: 120/90 <i>No change</i>	Before: 60 After: 60 <i>No change</i>	Before: 16 After: 12 <i>Decreased (4)</i>	BP and pulse unchanged. Slower RR

02/03/15 #2	Before: 132/90 After: 128/82 <i>Decreased systolic (4) and diastolic (8) BP</i>	Before: 64 After: 58 <i>Decreased (6)</i>	Before: 12 After: 12 <i>No change</i>	Change in systolic and diastolic BP; pulse 6 points slower; respiration rate unchanged.
02/06/15 #3	Before: 145/90 After: 119/86 <i>Decreased systolic (26) and diastolic (4) BP</i>	Before: 70 After: 62 <i>Decreased (8)</i>	Before: 18 After: 14 <i>Decreased (4)</i>	Change in systolic and diastolic BP; pulse 8 points slower; Slower RR
02/10/15 #4	Before: 130/92 After: 125/98 <i>Decreased systolic (5) Increased diastolic (6)</i>	Before: 74 After: 62 <i>Decreased pulse (12)</i>	Before: 14 After: 12 <i>Decreased (2)</i>	Change in systolic and diastolic BP; pulse 12 points slower; Slower RR
02/13/15 #5	Before: 151/90 After: 138/90 <i>Decreased systolic (13) Diastolic unchanged</i>	Before: 76 After: 60 <i>Decreased pulse (16)</i>	Before: 18 After: 12 <i>Decreased (6)</i>	Change in systolic and BP; pulse 16 points slower; Slower RR

Sessions Results

Session #1

Subject complained of headache, tremors, and right upper abdomen pain before session; He said that according to the Dr., the headaches could be a side effect of the medications, and also complained of upset stomach.

Objective observations during session 1 included increased twitching when working on left big toe and digestive system on left foot; increased sensitivity on big toes but no pain, per subject's report and right IP joint had noticeable 'cracking' of the bone when rotating. Subject's breathing was calm and shallow, he kept his eyes closed and reported feeling great during session and said "that is so relaxing"; Therapist noticed a change in alpha brainwave level. After the session, pain decreased from moderate to mild, headache and tremors were gone. Subject reported he was surprised the headache was gone after the session and he said having no pain when lying on the chair. Respiration rate decreased after session.

Session #2

Subject referred feeling good and said he did not know if the reflexology had to do with him winning all four games of chess against brother, which had not happened in many years, because it is usually half win half loose. Reported not sleeping well last two nights. Objective observations included 'ruggae' music, alpha brainwave level changed, as subject did not notice end of session; there was no pain after session and subject reported he felt good. There were

decreased readings on blood pressure and heart rate and respiration rate was the same.

Session #3

Subjective report was "I did a lot of work today. My back hurts". There were noticeably more jerking and muscle contractions during this session; subject said, "I am very jumpy" during session. After session, subject reported his feet are usually like that at night although he had noticed some change since having the reflexology sessions, but not sure if it was from that. There was no pain in right upper abdomen after the session and there were decreased readings on all vital signs.

Session #4

Subject reported back pain and being worried about truck, which had broken down on the way to appointment. During session, subject relaxed, there were twitching movements on both feet. Subject's pain was decreased to very mild after the session and he reported, "almost passed out" after the session. There was decreased systolic blood pressure, decreased heart rate and respirations rate after session; and a slight increase in diastolic blood pressure.

Session #5

Subject reported, "I think I am a little more relaxed or content; I do leave a lot more relaxed then when I leave I get stressed again". During session subject was relaxed, had twitching movements on left foot more than right. Pain was reduced after session and subject reported, "That is so relaxing". There was decreased systolic blood pressure, unchanged diastolic reading, and decreased heart rate and respirations rate after session.

The table below (Table 1.6) describes the reflexes and systems that had more tension during the reflexology sessions. Overall, spine reflexes, neck and shoulder reflexes, liver and other digestive reflexes were tender on all sessions; kidney reflex points were congested on all but one session; endocrine glands were tender on sessions 2 thru 5, and tender reflexes were also noted on sessions for lung and heart. Also noted on all sessions were more stiffness on testes point (left ankle) and some adhesion on left groin lymph on left foot on session 1 and 5.

Abbreviations were used as follows: MS=Musculo-Skeletal System, Dig=Digestive System, Nerv=Nervous System; End=Endocrine System, CR=Cardio-Pulmonary System; Splex=Solar Plexus reflex, Sp=spine, Cerv=Cervical, Sac=Sacrum, LB=Low Back reflex, Sciat=Sciatic, Hd=Head, Adr=Adrenal Gland, Thym=Thymus, Sh=shoulder, Thor=Thoracic, Liv=Liver, Panc=Pancreas, Stom=Stomach, Gallb=Gallbladder, Smlnt=Small Intestine, TRC=Transverse Colon, DC=Descending Colon, SIF=Sigmoid Flexure Colon, HEP=Hepatic Flexure Colon, SPF=Splenic Flexure Colon, An/Rec=Anus/Rectum, App=Appendix, Kid=Kidney,

Z=Zone, Ref=Reflexes, DL=Diaphragm Line, WL= Waist Line, N/A=Not Applicable;

System	Session 1		Session 2		Session 3		Session 4		Session 5	
	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left
Nerv.	Sp C7 to thor. Hd. ref.	Sp C7 Hd. ref.	Sp Sac.	Sp C7	SPlex ref. LB ref. Hd. ref.	Sp Sac.	Sp cerv. Hd. ref.	Sp thor. Hd. ref.	Sp cerv.	N/A
End.	N/A	N/A	Adr. Panc. gland Thym gland	Adr. Panc. gland Z1-3	Adr. Panc. gland Thym gland	Adr. Panc. gland Spleen ref.	Adr. ref.	Panc. Thym ref. Spleen ref.	Adr. Panc. gland	Adr. Panc. gland Z1, 2
MS	Neck ref. Z1, 2, 3. Sh ref. Sh line all zones	Neck ref. Z1, 2 Sh ref.	Neck ref. Z1,4,5 Sh line all zones Sciat. nerve on PL	Sh ref. Sh line Z1,2,4,5	Neck ref. Z1,2,4 Sh ref. Sh line Z1-3	Sh ref. Sh line 1,2,4,5 Waist ref.	Neck ref. Z1 Sh ref.	Neck ref. Z1,2 Sh ref.	Neck ref. Z1,3 Sh ref.	Sh ref.
Dig.	App. TRC- Z1,2,3 Liv- Z1,5 near DL	DC SIF Liv- Z1 near DL Stom Z2 Panc.Z 2	HEP TRC- Z1, 2 Liv- Z1 near DL, Z3 Gallb. Stom ref. Panc. ref.	DC An/rec ref. Liv- Z1 near DL Stom ref. Panc.Z 1- 3	TRC- Z2 SmlntZ 4	DC SIF SPF Liv- Z1 below DL and above WL	TRC- Z2 Liv- Z1 near DL	TRC- Z1,2 An/rec ref. Liv- Z1 above WL	SmlntZ 2, 4 Liv- Z1	SmlntZ 4 Liv- Z1
Urinary	Kid. ref.	Kid. ref.	Kid. ref.	N/A	Kid.	N/A	N/A	N/A	Kid.	Kid. ref

	on WL and above Z2	Z2 above WL	Z2 on WL		ref.				ref.	
Cardio-Resp	Lung ref. Z2,3,4 DL- Z1	N/A	Lung ref. Z1,2 Heart ref.	N/A	Heart ref.	N/A	N/A	Lung ref. Z1,2	Lung Z4	Lung Z2-4

Results Tables

Table 1.2: Sleep Results

Sleep was measured by quality of sleep (restful, intermittent, insomnia, restless, other); duration of sleep; and scoring the quality of sleep (range 1 to 5; 1=very poor sleep, 2=poor sleep, 3=medium sleep, 4=good sleep, 5=very good sleep). Reports are for the night before date in all cases.

Daily Sleep Log	Sleep Quality/Score	Duration of Sleep
Friday 01/30/15 (report of Thursday)	Insomnia - 3	Fell asleep around 5:00am, woke up at 8:30am (3.5hrs); took another nap after getting home from running an errand, until 10:30am, approx. one more hour. Approx. total: 4.5hrs
Saturday 01/31/15	Other: "Woke up refreshed", "good dreams" - 3	Bed at 9:30pm, fell asleep about 4am, slept from 4 to 9am. Approx. total: 5hrs
Sunday 02/01/15	Other: "Bad dreams" No score recorded	Went to bed at 12pm, up until 4:30am, woke up at 9am (4.5); then slept on/off from 11 to 12:30pm (1.5) Approx. total: 5.5-6hrs
Monday 02/02/15	Other: No sleep - 2 "Very tired, no sleep till 3am"	Bed at 7pm but no sleep until 3am. Total not recorded
Tuesday 02/03/15	Insomnia - 3 Restless Other: "A lot of waking up then short sleep"	Stayed in bed till 3pm with intermittent sleep. Total not recorded

Wednesday 02/04/15	Intermittent Insomnia – 3	Went to sleep about 6am till 12pm Approx. total: 6hrs
Thursday 02/05/15	Intermittent Insomnia – 3.5	Went to bed at 11pm. Approx. total: 4hrs
Friday 02/06/15	Intermittent Insomnia – 3.5 Other: “Decent sleep”	Went to bed at midnight, “stayed up late”. Approx. total: 5hrs
Saturday 02/07/15	Insomnia – 3.5 Other: “Woke up rested”	“Fell asleep at 6am, stayed in bed until 12 or 1pm” Approx. total: 6.5hrs
Sunday 02/08/15	Restless – 3	Went to bed at 12 Approx. total: 6.5hrs
Monday 02/09/15	Restful Insomnia – 3 Other: “Feel good”	Bed at 4:30am, woke up at 8am, Doctor appt. at 9am Approx. total: 3.5hrs
Tuesday 02/10/15	Intermittent – 3	“Still up at 3am, awoke about 9am”, stayed in bed and slept on/off until 1pm Approx. total: 6hrs
Wednesday 02/11/15	Restless – 2 “tired all day”	“Up all night, couldn't sleep”. Total not recorded
Thursday 02/12/15	Restful - 3	Bed at 10pm. Slept 7:30-10:30am, then breakfast and rested until 12noon. Approx. total: 5hrs
Friday 02/13/15	Insomnia – 3.5	Slept 6 to 8am, then on/off until 12noon. Approx. total: 4.5hrs
Saturday 02/14/15	Restless Insomnia - 2	Didn't sleep until 7:30am, woke up at 9am, then on/off until 2pm. Approx. total: 5hrs
Sunday 02/15/15	Restful - 4	Fell asleep about 2am until 9am, then on/off until 11am. Approx. total: 7.5hrs

Table 1.3: Pain Results

Pain was measured with a daily score and location of pain in the morning, after exercise and/or activity, and before sleep. In addition, pain scores were recorded before and after sessions. Scores ranged from 0 to 10: 0=no pain, 1-2=very mild pain, 3 mild pain, 4-6=moderate pain, 7-8=severe pain, 9-10=very severe/unbearable pain.

Daily Pain Log	Pain location and score		Pain with exercise/activity Activity type	Pain location and score on session days
	AM	PM		
Friday 01/30/15	Right upper abdomen 4	Right upper abdomen 4	Right upper abdomen 4 Repair car Walk dogs	Right upper abdomen Before: 4 After: 3
Saturday 01/31/15	Right upper abdomen 2	Right upper abdomen 3.5	Right upper abdomen 3.5 Long drive (not the driver, approx. 125 miles)	N/A
Sunday 02/01/15	Not recorded	Right upper abdomen 3.5	Right upper abdomen 3 Driving (subject was not the driver)	N/A
Monday 02/02/15	Right upper abdomen 3	Right upper abdomen 3	Right upper abdomen 3 Long drive back (subject drove, approx. 125 miles)	N/A
Tuesday 02/03/15	Right upper abdomen 2	Right upper abdomen 0	Right upper abdomen 0 Long drive with dog; loaded treadmill, errands. Late walk with dog	Right upper abdomen Before: 2.5 After: 0
Wed 02/04/15	Right upper abdomen 2	Right upper abdomen 2.5	Right upper abdomen 2 Walk dog; pick up generator and mechanic supplies, internet.	N/A
Thursday 02/05/15	Right upper abdomen 2	Right upper abdomen 2.5	Right upper abdomen 2 Unload truck, assemble machine, internet. Played chess.	N/A
Friday 02/06/15	Right upper abdomen 2.5	Right upper abdomen 3	Hook up trailer/ unload; internet, banking, walk dog "stayed up late" 3	Right upper abdomen Before: 3 After: 0
Saturday 02/07/15	Right upper abdomen	Right upper abdomen	Walked the dog; grocery shopping.	N/A

	1.5	2	"Not much pain" Reported "sore back and back pain" at end of day on log 2	
Sunday 02/08/15	Right upper abdomen 2 Back pain 4	Right upper abdomen 2 Back pain 4	Long walk with the dog; worked on car. 2/4	N/A
Monday 02/09/15	Right upper abdomen 2 Back pain 3 "Back still hurts but getting better"	Right upper abdomen 2 Back pain 2	Cleaned pool, worked on car and went for a drive. 2/ 1.5	N/A
Tuesday 02/10/15	Right upper abdomen 2 "Back pain gone"	Right upper abdomen 1	Worked on car, walked dog. 3	Before: 2.5 right upper abdomen 1.5 back pain After: 1 on both
Wed 02/11/15	Right upper abdomen 2	Right upper abdomen 1	"no real exercise", watched TV; worked on pool, went to pool store. 1	N/A
Thursday 02/12/15	Right upper abdomen 2	Right upper abdomen 2	Walked dog, worked on car and truck, shopping, helped with gardening. 3	N/A "Feet jumpy"
Friday 02/13/15	Right upper abdomen 1	Right upper abdomen 2	Picked-up truck, walked dog, internet. 2	Right upper abdomen Before: 1 After: 0
Saturday 02/14/15	Right upper abdomen 2	Right upper abdomen 2	Run with dog, internet, play chess, shopping, went out to dinner. 2.5	N/A
Sunday	Right upper	Right upper	Repaired chairs, walked	N/A

02/15/15	abdomen 2	abdomen 2	dog, shopping. "A little sore from bending over". 4	
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Table 1.4: Mood and Fatigue Results

Mood was measured with daily descriptions of overall mood for the day- energetic, happy, calm, hopeful, relaxed, tired, sad/tearful,, worried, stressed, frustrated, angry, anxious, other. Before and after sessions mood scores were also recorded. Fatigue was measured with a 0-5 scale for general fatigue level during the day- 0=no fatigue, 1=very mild fatigue, 2=mild fatigue, 3=moderate fatigue, 4=severe fatigue, 5=very severe).

Daily log	Day Mood	Mood before session	Mood after session	Day Fatigue	Comments
Friday 01/30/15	Calm	Happy Calm Stressed Other: Tremors	Happy Calm Relaxed	3	After session: Headache is gone No tremors Less stressed
Saturday 01/31/15	Relaxed	N/A	N/A	3	Diary report: Played chess with brother and won four games in a row; usually he wins or it is 50/50
Sunday 02/01/15	Happy Calm Relaxed	N/A	N/A	3	
Monday 02/02/15	Tired	N/A	N/A	3.5	Diary report: "Very tired"
Tuesday 02/03/15	Happy Relaxed	Calm Relaxed	More Calm More Relaxed	3.5	After session: "I feel good" Diary report: tired
Wed 02/04/15	Relaxed	N/A	N/A	2.5	
Thursday 02/05/15	Happy Calm Relaxed	N/A	N/A	2	Diary report: "Exhausted"
Friday 02/06/15	Calm Hopeful	Calm Relaxed	Calm Relaxed Other: Very	2	After session: "I feel good, could fall asleep"

			rested		Diary report: relaxed
Saturday 02/07/15	Happy Calm	N/A	N/A	2	Diary report: "restful day"
Sunday 02/08/15	Happy Calm Frustrated (back pain)	N/A	N/A	2	
Monday 02/09/15	Happy Calm	N/A	N/A	2	Diary report: "lazy day"
Tuesday 02/10/15	Worried Stressed Frustrated Angry	Stressed Other: "shaky"	Calm Relaxed Somewhat stressed	2	Diary: wrote day mood ratings were due to car trouble.
Wed 02/11/15	Calm Relaxed	N/A	N/A	2	
Thursday 02/12/15	Happy Calm Relaxed	N/A	N/A	2.5	
Friday 02/13/15	Happy Calm Relaxed	Somewhat energetic Happy Calm Relaxed	Calm Relaxed Other: Rested "worry free"	2	After session: "I could fall asleep"
Saturday 02/14/15	Happy Calm	N/A	N/A	2	
Sunday 02/15/15	Calm Hopeful Relaxed	N/A	N/A	3	

Conclusion

The nature of this case study renders results that are only descriptive and subjective and no causality or correlation can be assumed. However, upon final interview, subject reported he felt very relaxed when getting home after sessions; he also said "it kind of helped my thinking" when referring to increased sharpness for playing chess in two opportunities – one with brother and one online match. Vital signs records and pain levels before and after sessions were mostly decreased. Sleep quality did not have noticeable changes, nor did fatigue or mood changes, but more studies are needed to determine statistical

significance of the effects of reflexology on these variables for differ populations.

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APPENDIX A DAILY LOG

Please record your daily reports as follows:

1. **Sleep:** description (restful, intermittent, insomnia, restless), duration, and scoring of quality of sleep (range 1 to 5; **1=very poor sleep, 2=poor sleep, 3=medium sleep, 4=good sleep, 5=very good sleep**).
2. **Pain:** location and scoring of pain after waking up, before sleep, and after activity/exercise. Pain score ranges 0 to 10 (**0=no pain, 1-2=very mild pain, 3 mild pain, 4-6=moderate pain, 7-8=severe pain, 9-10=very severe/unbearable pain**).
3. **Activities and exercise:** description of exercise activity (e.g., walking, jogging) and/or physical activity (e.g., repairs, lifting) and duration.
4. **Mood:** multiple choice of mood for most part of day (energetic, happy, calm, hopeful, relaxed, tired, sad/tearful,, worried, stressed, frustrated, angry, anxious, other)
5. **Fatigue:** Scoring of general fatigue level during the day (range 0 to 5; **0=no fatigue, 1=very mild fatigue, 2=mild fatigue, 3=moderate fatigue, 4=severe fatigue, 5=very severe**).
6. **Comments:** subjective comments or additions to daily log by subject.

Date	Sleep/ Rest Quality and duration	Sleep/ Rest Score (1-5)	Pain AM loc- score (0-10)	Pain PM loc- score (0-10)	Pain after exercis e loc- score (0-10)	Ex. type	Ex. dur.	Mood	Fatigu e level (0-5)	Commen s
1/30/15 to 2/11/15	Restful Intermitte nt Insomnia Restless Other:							Energetic Happy Calm Hopeful Relaxed Tired Sad/Tearfu l Worried Stressed Frustrated Angry Anxious Other:		

**APPENDIX B
REFLEXOLOGY SESSIONS LOG**

Reflexology sessions included recording of the following variables:

1. Blood Pressure before and after session
2. Pulse before and after session
3. Respiration rate before and after session
4. Pain: location and scoring of pain before and after session. Pain score ranges 0 to 10 (**0=no pain, 1-2=very mild pain, 3 mild pain, 4-6=moderate pain, 7-8=severe pain, 9-10=very severe/unbearable pain**)
5. Mood: multiple choice of mood before and after session (energetic, happy, calm, hopeful, relaxed, tired, sad/tearful,, worried, stressed, frustrated, angry, anxious, other)
7. Comments: subjective comments of subject before, during, after session

Date	BP	Pulse	Resp.	Pain loc-score before (0-10)	Pain PM loc-score after (0-10)	Mood before	Mood after	Comments
1	B: A:	B: A:	B: A:			Energetic Happy Calm Hopeful Relaxed Tired Sad/Tearful Worried Stressed Frustrated Angry Anxious Other:	Energetic Happy Calm Hopeful Relaxed Tired Sad/Tearful Worried Stressed Frustrated Angry Anxious Other:	