

# Introduction

- Pain is defined as an unpleasant sensory and emotional experience associated with actual or potential tissue damage (Melzack, 2010)
  - Acute pain is a normal response to trauma or surgery
  - Cancer-related pain refers to the pain experienced as a result of primary tumor growth
  - Chronic pain is a persistent pain that lasts weeks to years
- The effects of chronic pain on the patient significantly affects the patient's mood, personality and social relationships (Codeer, 1992)
- Chronic low-back pain (CLBP) results from a certain area of the body afflicted with extreme amounts of pain persisting as frequently as half of the days in the past six months before diagnosis
- CLBP is the second most common cause of disability among the elderly
- CLBP affects about 100 million adults and has an estimated annual cost of \$635 billion (Institute of Medicine, 2011)



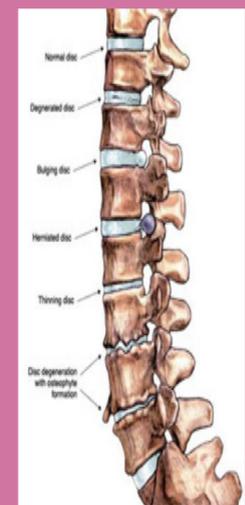
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# Review of Literature

- LBP negatively impacts the mental function in older adults (Weiner, 2006)
- Out of the approximate 17 million elderly persons that experience at least one episode of LBP in a full calendar year, more than 6 million of these individuals report suffering from a decline in their quality of life and life satisfaction
- An association was revealed between pain intensity and impaired quality of function in younger individuals aged 14-16
  - Preliminary evidence exists to support this relationship in older adults (Weiner, 2003)
- Depending on the severity of the initial pain and extensiveness of its persistence, different treatment methods are employed
- Medications play an important role in the management of CLBP, however the constant abuse of CLBP treatment medicines such as anti-inflammatory drugs, antidepressants, muscle relaxants and opioids is extremely detrimental (Bokarius, 2010)
- Patients should be carefully assessed before the start of long-term opioid therapy (Chaparro, 2015)
- Safer treatment interventions include tai chi, yoga and other forms of exercise
- Functional restoration (FR) has been defined as a "multimodal pain management program"
- Program employs a comprehensive cognitive assessment while undergoing the sports medicine physical approach to correct functional deficits (Chan, 2016)
- A study by Mayer, Gatchel and Evans initially evaluated the association between age and treatment outcomes of patients with chronic disabling spinal disorders undergoing FR (Mayer, 2001)
- Three particular aspects of FR are being applied
  - Myofascial Release Techniques (MFRT)
  - Neural Flossing (NF)
  - Proprioceptive Neuromuscular Facilitation (PNF)



<http://womanhealth.com/the-benefits-of-pnf-proprioceptive-neuromuscular>



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# Research Question and Hypothesis

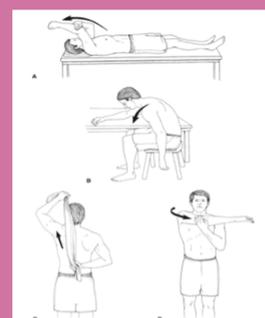
Purpose: Compare changes in pain and function achieved in a standard fitness program versus an individualized therapy program consisting of multi-dimensional exercises.

- H1: The application of an individualized multidimensional exercise therapy treatment will result in positive changes in physical function, walking pattern and brain processing as measured by subjective questionnaires.
- H0: The application of an individualized multidimensional exercise therapy treatment will not result in positive changes in physical function, walking pattern and brain processing as measured by subjective questionnaires.



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<http://www.spine-health.com/files/blog-images/lower-back-strain-ic.jpg>



[http://www.physio-pedia.com/Supraspinatus\\_tendonitis](http://www.physio-pedia.com/Supraspinatus_tendonitis)

# Discussion

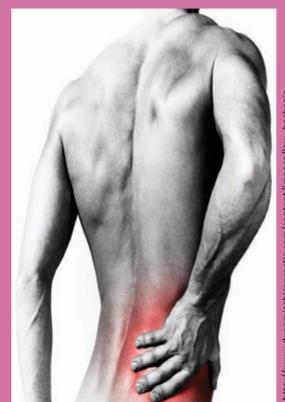
- This study was focused on investigating the effects of two different types of exercise interventions on chronic low-back pain by using biopsychosocial and pain perception evaluations
- Study hypothesis was supported
  - MET group's physical function improved significantly over the TET group's
- Post-test data indicated prominent differences among the PROMIS measures of fatigue and pain interference
- Studies investigating the efficacy of aspects of both MET and TET in the treatment of CLBP yield analogous results
- In a study conducted by Cherkin et al, the three trials designed to assess massage as a treatment for CLBP all produced positive results
- Furlan et al conducted a study that compared massage treatment with exercise as one of its control groups and found that patients who received massage treatment improved their physical function faster and more efficiently than the exercise group in terms of short-term function
- There might have been some potentially confounding factors that may or may not have played a role in influencing the findings
- Sources of possible bias
  - Selection process
  - Not properly representative of population in terms of education and income levels
- Study provided the first comprehensive biopsychosocial results in the scientific literature, using different outcome measures, in the under-studied elderly population with CLBP

# Conclusion

- The process of aging makes an individual more susceptible to falls and experiencing chronic low-back pain
- Because 8 out of 10 individuals experience an episode of LBP at some point in their lives, the necessity to increase options for treatment grow increasingly important
- The effects that come along with the aging process can catalyze disturbances in the balance systems of the elderly, affecting an individual's ability to control posture, putting him/her at a higher risk for falling.
- The results of this study yielded significant differences between the CLBP enduring elderly who underwent MET treatment or TET treatment.
- The MET group scored significantly lower on the PROMIS exam in the fatigue and pain interference aspects after treating their CLBP with massage in addition to other FR treatments, rather than exercise.
- No significant differences were found among groups regarding balance variables measured by the Neurocomm balance systems, though there were minor trends in conditions 4, 5 and 6 of the NeuroCom.



<http://www.dhcc.co.uk/wp-content/uploads/2014/04/Website-offer-image-with-legs.jpg>



[http://www.dynamicschiropractic.com/content/images/low\\_backpain](http://www.dynamicschiropractic.com/content/images/low_backpain)

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# Methods

## Pre and Post-Test Procedure

- PROMIS 29- psychosocial outcomes are measured through the 29 question form with seven subscales including physical function, anxiety, depression, fatigue, sleep disturbance, life satisfaction and pain interference
- Patient-Specific Function Scale- used to quantify patient specific activity limitation and measure function outcomes after interventions
- Neurocom Sensory Organization Test (SOT)- objectively identifies abnormalities in the participants use of the three sensory systems that contribute to postural control
- ProtoKinetics motion analysis system will be used to record full body motion using non invasive techniques with no sensors or special clothing required
- For both the MET both the MET and TET, the measurements will take place three times:
  - Pre-assessment done prior to beginning the randomly assigned MET or TET specific exercise program
  - Post assessment done at the end of the 4-week exercise intervention with MET or TET
  - 6 month exercise intervention follow up assessment that is done 6 months after the beginning of the MET or TET exercise interventions.

## Participants

- Participants will be recruited through the research center and the University
- Participants in the research center who reported chronic low-back pain (CLBP) were asked for participation in this study
- The existing data collected on the participants within the research center that will be used in the current low-back study is an indication of chronic low-back pain provided by a two-question inventory administered to participants under the currently existing IRB protocol.
- The participants with CLBP and the desire to participate in the study will then fill out a consent form informing of all risks, benefits, and aims associated with the current low-back study.
- The inclusion criteria are as follows:
  - Each participant is of 60 years of age or older
  - Is a client of the research center
  - Is willing to attend therapy sessions, complete the exercise program, in addition to pretest and post testing sessions.
- The exclusion criteria include males and females under 60 years old participating in the study, no physician approval for exercise, and not categorized as having CLBP according to the NIH definition



**Patient Specific Functional and Pain Scale**

Name: \_\_\_\_\_ DOB: \_\_\_\_\_  
 Provider Name: \_\_\_\_\_ Date: \_\_\_\_\_

**Patient Instructions:**  
 Please list and score at least 3 activities that you are having the most difficulty with, or are unable to perform, due to your chief problem.

**Patient Specific Activity Scoring Scale:**  
 0 = unable to perform activity 10 = Able to perform activity at same level as before injury or problem

Activity	0	1	2	3	4	5	6	7	8	9	10
Ex: walking up stairs	0	1	2	3	4	5	6	7	8	9	10
1.	0	1	2	3	4	5	6	7	8	9	10
2.	0	1	2	3	4	5	6	7	8	9	10
3.	0	1	2	3	4	5	6	7	8	9	10
4.	0	1	2	3	4	5	6	7	8	9	10
5.	0	1	2	3	4	5	6	7	8	9	10

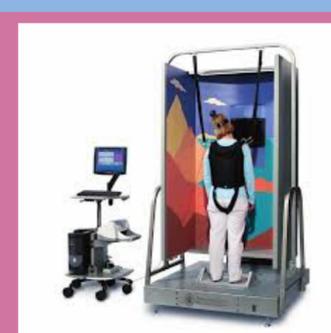
**Signatures:**  
 I understand that the information I have provided above is current and complete to the best of my knowledge.  
 Patient (age 18 or older): \_\_\_\_\_ Date: \_\_\_\_\_  
 Patient/Guardian (if under age 18): \_\_\_\_\_ Date: \_\_\_\_\_

Treatment	Valid	System	Frequency	Valid Percent	Cumulative Percent
Trowbridge's Treatment		Female	4	50	50
		Male	4	50	100
		Total	8	100	
		Female	5	62.5	62.5
		Male	3	37.5	100
		Total	8	100	

Table 1: Gender breakdown between groups

Treatment	N	Total
Trowbridge's Treatment	Valid	8
	Missing	0
	Mean age	71.125
Group Therapy	Valid	8
	Missing	0
	Mean age	76.625

Table 2: Age breakdown between groups



## Intervention Procedures

- Multidisciplinary Exercise Therapy (MET)
  - Subjects were assessed for hip and low-back range of motion, flexibility, muscle strength and motor control
  - 45 minute sessions, 2 times a week
  - Myofascial Release Techniques (MFRT)
  - Neural Flossing (NF)
  - Proprioceptive Neuromuscular Facilitation (PNF)
- Traditional Senior Exercise Therapy (TET)
  - Program administered within the CHLL
  - TET includes aerobic, strength and balance activities developed to reduce falls
  - This group intervention will be guided by an instructor
  - Exercises will include both seated and standing activities focusing on improving strength and increasing muscle
  - Typical class activities will include tasks of daily living such as
    - Chair stands
    - Ascending/descending stairs
    - Walking
    - Chair supported squats
    - Lightly seated aerobics

- Are you able to walk a block on flat ground?
  - Without any difficulty
  - With a little difficulty
  - With some difficulty
  - With much difficulty
  - Unable to do
- Does your health now limit you in doing strenuous activities such as backpacking, skiing, playing tennis, bicycling or jogging?
  - Not at all
  - Very little
  - Somewhat
  - Quite a lot
  - Cannot do
- Are you able to get in and out of bed?
  - Without any difficulty
  - With a little difficulty
  - With some difficulty
  - With much difficulty
  - Unable to do

## Results

Treatment	NeuroCom Measures	N	Minimum	Maximum	Mean	Std. Deviation
Trowbridge's Treatment	Composite	8	61	80	72.5	7.15142
	Somatic	8	91	99	95.375	2.6152
	Visual	8	63	94	82.625	11.28764
	Vestibular	8	48	77	63.75	10.02497
	Preference	8	93	105	98.625	4.20671
	Valid N (listwise)	8	-	-	-	-
Group Therapy	Composite	8	63	84	74.25	7.38241
	Somatic	8	71	97	91.5	8.60233
	Visual	8	84	97	91.375	4.30739
	Vestibular	8	45	86	70.75	11.90138
	Preference	8	83	111	98.125	9.09376
	Valid N (listwise)	8	-	-	-	-

Table 1a: NeuroCom measures before both MET and TET treatments were administered.

Treatment	Prokinetics Measures	N	Minimum	Maximum	Mean	Std. Deviation	
Trowbridge's Treatment	Pre_MeanIntegPressure	7	3.156	163.154	122.11914	56.818684	
	Pre_MeanStepLength	7	2.614	67.354	52.57	22.600058	
	Pre_MeanStrideWidth	7	3.005	10.328	6.11934	2.695903	
	Pre_MeanStepTime	7	0.431	2.08	0.72571	0.598933	
	Pre_MeanStrideVelocity	7	0.016	152.09	105.50814	48.729523	
	Pre_MeanGaitCycles	7	0.869	7.878	1.98443	2.600432	
	Pre_MeanStanceTime	7	0.031	0.781	0.56857	0.246526	
	Pre_MeanSwingTime	7	0.317	1.477	0.51257	0.426161	
	Pre_MeanTotalDsuppor	7	0.229	1.234	0.43257	0.355887	
	Pre_MeanVelocity	7	1.244	152.016	105.55343	48.243733	
	Valid N (listwise)	7	-	-	-	-	-
	Group Therapy	Pre_MeanIntegPressure	8	142.066	222.439	180.875	28.424584
		Pre_MeanStepLength	8	33.053	64.221	54.47687	10.071406
		Pre_MeanStrideWidth	8	2.643	12.873	8.01413	3.56642
Pre_MeanStepTime		8	0.431	0.713	0.55675	0.079388	
Pre_MeanStrideVelocity		8	54.817	139.274	101.22975	27.140835	
Pre_MeanGaitCycles		8	0.864	1.428	1.119	0.163588	
Pre_MeanStanceTime		8	0.572	0.957	0.755	0.123258	
Pre_MeanSwingTime		8	0.298	0.481	0.36988	0.052229	
Pre_MeanTotalDsuppor		8	0.268	0.599	0.38688	0.104664	
Pre_MeanVelocity		8	52.737	139.202	100.47125	27.236668	
Valid N (listwise)		8	-	-	-	-	-

Table 2a: ProKinetics measures MET and TET treatments were administered

Treatment	PROMIS Measures	N	Minimum	Maximum	Mean	Std. Deviation	
Trowbridge's Treatment	PreAnxiety/Fear	8	40	61	49.375	8.53459	
	PreDepression/Sadness	8	41	59	46.25	7.77817	
	PreFatigue	8	46	63	52	6.98979	
	PrePain Interference	8	42	68	56	7.6532	
	PrePhysical Function	8	40	57	46.125	7.16016	
	PreSleep Disturbance	8	44	66	50.375	7.44384	
	Valid N (listwise)	8	-	-	-	-	-
	Group Therapy	PreAnxiety/Fear	8	40	0	48	6.74007
		PreDepression/Sadness	8	41	49	44	4.14039
		PreFatigue	8	40	63	52.875	7.01911
PrePain Interference		8	42	65	57.5	7.4642	
PrePhysical Function		8	32	45	39.5	4.27618	
PreSleep Disturbance		8	41	66	48.375	7.90908	
Valid N (listwise)		8	-	-	-	-	-

Table 3a: PROMIS measures MET and TET treatments were administered

Treatment	NeuroCom Measures	N	Minimum	Maximum	Mean	Std. Deviation
Trowbridge's Treatment	Composite	8	62	80	72.625	6.58868
	Somatic	8	85	101	93.625	5.42316
	Visual	8	67	93	84.5	9.13392
	Vestibular	8	41	80	63.375	13.57453
	Preference	8	87	115	101.5	9.2582
	Valid N (listwise)	8	-	-	-	-
Group Therapy	Composite	7	63	81	73.4286	7.09124
	Somatic	7	71	100	91	9.34523
	Visual	7	85	96	90.8571	3.97612
	Vestibular	7	48	82	66.7143	11.0712
	Preference	7	88	103	95.2857	5.96418
	Valid N (listwise)	7	-	-	-	-

Table 1a: NeuroCom measures after MET and TET treatments were administered.

Treatment	Prokinetic Measures	N	Minimum	Maximum	Mean	Std. Deviation	
Trowbridge's Treatment	Post_MeanIntegPressure	7	0.408	152.944	117.43214	52.794855	
	Post_MeanStepLength	7	0.408	71.909	55.25557	24.700273	
	Post_MeanStrideWidth	7	2.638	143.312	31.189	50.955379	
	Post_MeanStepTime	7	0.11	0.565	0.44614	0.154586	
	Post_MeanStrideVelocity	7	10.607	152.09	112.58686	47.705424	
	Post_MeanGaitCycles	7	0.011	1.503	0.92957	0.454727	
	Post_MeanStanceTime	7	0.446	1.784	0.73143	0.47155	
	Post_MeanSwingTime	7	0.317	21.408	3.3671	7.956821	
	Post_MeanTotalDsuppor	7	0.228	10.902	1.81043	4.009268	
	Post_MeanVelocity	7	10.641	152.016	112.42143	47.630403	
	Valid N (listwise)	7	-	-	-	-	-
	Group Therapy	Post_MeanIntegPressure	7	5.901	222.439	128.86971	67.948889
		Post_MeanStepLength	7	4.19	70.613	48.18257	22.1298
		Post_MeanStrideWidth	7	1.547	10.58	6.503	3.432604
Post_MeanStepTime		7	0.446	1.784	0.73143	0.47155	
Post_MeanStrideVelocity		7	0.012	141.677	88.49486	47.517343	
Post_MeanGaitCycles		7	0.896	5.234	1.70071	1.566844	
Post_MeanStanceTime		7	0.025	0.957	0.64086	0.29589	
Post_MeanSwingTime		7	0.301	0.763	0.42814	0.157954	
Post_MeanTotalDsuppor		7	0.262	0.497	0.37414	0.084566	
Post_MeanVelocity		7	1.399	141.436	88.56743	47.045928	
Valid N (listwise)		7	-	-	-	-	-

Table 2b: ProKinetics measures after MET and TET treatments were administered

Treatment	PROMIS Measures	N	Minimum	Maximum	Mean	Std. Deviation	
Trowbridge's Treatment	PreAnxiety/Fear	8	40	63	50.75	7.90569	
	PreDepression/Sadness	8	41	54	47.375	5.52753	
	PreFatigue	8	34	57	48.75	7.72288	
	PrePain Interference	8	42	60	50.625	7.68928	
	PrePhysical Function	8	39	57	48.125	7.69856	
	PreSleep Disturbance	8	32	73	49	12.36354	
	Valid N (listwise)	8	-	-	-	-	-
	Group Therapy	PreAnxiety/Fear	7	40	56	48.5714	6.60447
		PreDepression/Sadness	7	41	57	46	6.65833
		PreFatigue	7	46	63	57.1429	6.12178
PrePain Interference		7	54	67	60.5714	4.92805	
PrePhysical Function		7	32	45	38.1429	4.94734	
PreSleep Disturbance		7	41	66	52.5714	9.0895	
Valid N (listwise)		7	-	-	-	-	-

Table 3b: PROMIS measures after MET and TET treatments were administered

A Treatment Outcome Study on the  
Efficacy of Two Therapy Interventions for  
Chronic Low-Back Pain in an Elderly  
Population