Introduction

• Core stabilization exercise is an important aspect for the rehabilitation of problems related to the spine and lower extremity.
• Yoga is frequently being used in the rehabilitation setting to strengthen and train the core.
• Limited data exist regarding the amount of muscle activation during yoga poses.
• EMG is a common tool used to quantify the relative amount of muscle activation during exercise.

Study Aim and Hypothesis

• The aim of this study was to determine the relative muscle activation of the rectus abdominis (RA), abdominal obliques (AO), lumbar extensors (LE), and gluteus maximus (GMX) muscles during four selected yoga poses.
• We hypothesized that there would be no difference in muscle activation between poses.

Subjects

• 30 total subjects (15 male, 15 female)

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>St. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
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</tr>
<tr>
<td>Height</td>
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</tr>
<tr>
<td>Mass</td>
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</table>

Methods

• Subjects performed 4 commonly prescribed yoga poses similar to core exercises prescribed for rehabilitation
• EMG activity was collected for the RA, AO, LE, and the GMX.
• EMG data were expressed as 100% of a maximum voluntary isometric contraction (MVIC)
• Separate 1-way ANOVA with repeated measures were used to determine differences in muscle amplitudes among exercises.
• The level of significance was established at 0.05 and adjusted using the sequentially-rejective Bonferroni correction.

Results

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Chair</th>
<th>Plank</th>
<th>Dog</th>
<th>Warrior</th>
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<tr>
<td>RA</td>
<td>30%</td>
<td>20%</td>
<td>15%</td>
<td>25%</td>
</tr>
<tr>
<td>AO</td>
<td>40%</td>
<td>35%</td>
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<tr>
<td>LE</td>
<td>50%</td>
<td>30%</td>
<td>20%</td>
<td>40%</td>
</tr>
<tr>
<td>GMX</td>
<td>60%</td>
<td>55%</td>
<td>50%</td>
<td>65%</td>
</tr>
</tbody>
</table>

Conclusion

Rectus Abdominis

• The plank pose could be used for endurance training of the RA which is good for low level core stability.

Abdominal Obliques

• The AO has a greater stabilizing effect than the RA during the plank and the dog poses.
• The plank pose could be used to strengthen the AO.

Lumbar Extensors

• Individuals with LE weakness may benefit from the chair for endurance effects.

Gluteus Maximus

• The selected yoga poses will not strengthen the GMX.

References

Core Muscle Activation during Yoga Poses in Untrained Individuals: Sex Differences

Lori Bolgla, PT, PhD, ATC, Trey Amodio, SPT, Jillian Estes, SPT, Alyssa Mullikin, SPT, Dylan Roberts, SPT
Department of Physical Therapy, Augusta University, Augusta, GA

Introduction

- Yoga, originating in India over 3,000 years ago, offers a holistic approach to health and wellness through physical postures, breathing techniques, and meditation.
- According to the same 2012 NIH survey, 78.4% of responders reported that they believed yoga would improve their general wellness or prevent disease.
- Surface EMG has been shown to be a noninvasive technique that can effectively measure muscle activation.
- Moderate EMG activity has been recommended for neuromuscular reeducation and endurance while high EMG activity has been recommended for strength gains.
- To our knowledge, only two studies have looked at core muscle activation during specific yoga poses and neither of these studies examined sex differences between the participants.
- There is not sufficient knowledge on differences in EMG activity during yoga poses in untrained individuals and differences that may be seen between sexes.
- The aim of the present study was to determine the average amount of core muscle activation in male and female novice yoga participants produced during four selected yoga poses.
- We hypothesized that there will be no differences in muscle activation patterns between poses or genders.
- This data will help guide clinicians in exercise prescription to more efficiently target muscles.

Subjects

<table>
<thead>
<tr>
<th></th>
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<th>Std Dev.</th>
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<td></td>
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<td>25.4</td>
<td>2.6</td>
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<tr>
<td>Height</td>
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<tr>
<td>Mass</td>
<td>Female</td>
<td>15</td>
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<td>8.7</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>15</td>
<td>81.2</td>
<td>9.0</td>
</tr>
</tbody>
</table>

Methods

- Subjects performed 4 commonly prescribed yoga poses similar to core exercises prescribed for rehabilitation
- EMG activity was collected for the rectus abdominis (RA); abdominal obliques (AO); lumbar extensors (LE); gluteus maximus (GMX); and gluteus medius (GM).
- EMG data were expressed as 100% of a maximum voluntary isometric contraction (MVIC)
- Separate mixed-model 2 (sex) X 4 (poses) analysis of variance with repeated measures were used to determine differences in muscle amplitudes among exercises.
- The level of significance was established at 0.05
- Post-hoc testing was conducted using the sequentially-rejective Bonferroni test

Results

Rectus Abdominis

- Females with RA weakness may benefit from the plank for improved endurance.
- Males with RA weakness will not benefit from any of the poses.

Abdominal Obliques

- Females with AO weakness may benefit from the plank for strengthening effects.
- Males with AO weakness may benefit from the plank for endurance effects.

Lumbar Extensors

- Males and females with LE weakness may benefit from the chair for endurance effects.

Gluteus Maximus

- Males and females with GMX weakness will not benefit from any of the poses.
- Subjects who need improved GMX strength will need more targeted GMX exercises.

References

Unsafe Driving in the Oldest Old: A Retrospective Cohort Study

Hannes Devos, PhD; Clayton Carroll, SPT; Austin Omwanghe, SPT; Margaret Smith, SPT; Mark Umberger, SPT
Augusta University

INTRODUCTION

• Determining whether an individual is fit to drive is critical in lowering accident rates and motor vehicle-related mortalities for both drivers and pedestrians.
• Driving fitness incorporates many traits, including binocular visual acuity, useful field of view, and function in the cognitive, motor, and psychological domains.
• There are declines in each of these areas even in healthy aging, as well as increased rates of pathologic systemic dysfunction and comorbidities1.

According to the United States Census, adults from the “Baby Boomer” generation have begun reaching 65 as of 2011, and the population above the age of 65 is expected to double from 43.1 million in 2012 to 83.7 million in 20501.

Very little research examines the “oldest old”, those adults aged 85 and above.

The purpose of this retrospective study is to provide rationale for examination of the oldest old based on findings in driving fitness involving older adults, dysfunction associated with chronological aging, and declines in various domains of performance.

METHODS

• Participant data were collected retrospectively from the Center for Evaluation of Fitness to Drive and Car Adaptations (CARA) patient databases, including all participants above the age of 55 from the period of January 2013 to December 2014.
• Upon admittance to CARA, all patients were given a medical questionnaire to be completed with their referring physician which included demographic information, driving, and clinical history.
• Participants were divided into four groups: middle-aged participants aged 55-64 (n=1386), young-old participants aged 65-74 (n=1013), old-old participants aged 75-84 (n=803), and oldest-old participants aged >85 (n=222).
• Each group was then divided into categories based on the participant’s primary medical condition (e.g., neurological), and further described by the subclass of their primary medical condition (e.g. stroke).
• Principal outcome measures used included those for driving safety: (i) physician’s fitness-to-drive recommendation, (ii) comprehensive fitness-to-drive decision, (iii) number of motor vehicle crashes, and (iv) number of traffic violations.

Clinical Variables

• The majority of patients in all four age groups were males ranging from 71% to 78%.
• The most common reason for CARA application was extension of driver’s license in all four age groups, representing about half of the patients in each group.
• The majority of patients had neurological conditions as their primary medical condition, which were 78% in middle-aged, 80% in young-old, 69% in old-old, and 53% in oldest-old.
• Within each group, about half of the patients had one or more comorbidities.

Driving-Related Outcome Measures

• We found significant differences in physician recommendation, comprehensive FTD decision, and MVCs within the past 5 years (p < 0.0001).
• Within physician recommendations, we found a significant difference when comparing the middle-aged and oldest-old groups (p < 0.008), but not for any other group comparisons.
• Within comprehensive FTD decisions, there were significant differences between the middle-aged and old-old groups, as well as the young-old and oldest-old groups (p = 0.008).
• Within MVCs within the past 5 years, there were significant differences between middle-aged and old-old groups, middle-aged and oldest-old groups, young-old and old-old groups, as well as young-old and oldest-old groups (p < 0.008).

There was no significant difference between groups when analyzing traffic violations within the past 5 years (p=0.8762).

RESULTS

Figure 1. Driving variables of groups 1 - 4

Table 1. Descriptive statistics of demographic and clinical characteristics of the total sample

<table>
<thead>
<tr>
<th>Variable</th>
<th>Middle-aged (55-64) (n=1386)</th>
<th>Young-old (65-74) (n=1013)</th>
<th>Old-old (75-84) (n=803)</th>
<th>Oldest-old (&gt;85) (n=222)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, y</td>
<td>59 (27-62) 69 (66-71) 79 (77-82) 87 (86-89)</td>
<td>960 (71) 780 (77) 630 (78) 174 (78)</td>
<td>1 (1-2) 1 (1-2) 1 (1-2) 1 (1-2)</td>
<td>1 (1-2) 1 (1-2) 1 (1-2) 1 (1-2)</td>
</tr>
<tr>
<td>Fail MVC</td>
<td>78% 78% 78% 78%</td>
<td>581 (58%) 677 (67%) 717 (72%) 803 (72%)</td>
<td>55 (55%) 55 (55%) 55 (55%) 55 (55%)</td>
<td>55 (55%) 55 (55%) 55 (55%) 55 (55%)</td>
</tr>
<tr>
<td>No MVC</td>
<td>22% 22% 22% 22%</td>
<td>419 (21%) 323 (32%) 283 (28%) 197 (19%)</td>
<td>45 (45%) 45 (45%) 45 (45%) 45 (45%)</td>
<td>45 (45%) 45 (45%) 45 (45%) 45 (45%)</td>
</tr>
<tr>
<td>Traffic violations</td>
<td>1 (1) 1 (1) 1 (1) 1 (1)</td>
<td>1 (1) 1 (1) 1 (1) 1 (1)</td>
<td>1 (1) 1 (1) 1 (1) 1 (1)</td>
<td>1 (1) 1 (1) 1 (1) 1 (1)</td>
</tr>
<tr>
<td>Physician recommendation</td>
<td>No MVC 22% 22% 22%</td>
<td>Yes MVC 78% 78% 78% 78%</td>
<td>Yes MVC 78% 78% 78% 78%</td>
<td>Yes MVC 78% 78% 78% 78%</td>
</tr>
<tr>
<td>Comprehensive FTD decision*</td>
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<td>Yes MVC 0% 0% 0% 0%</td>
<td>Yes MVC 0% 0% 0% 0%</td>
<td>Yes MVC 0% 0% 0% 0%</td>
</tr>
</tbody>
</table>

Table 2. Risk of unsafe driving across age groups

<table>
<thead>
<tr>
<th>Variable</th>
<th>Middle-aged (55-64) (n=1386)</th>
<th>Young-old (65-74) (n=1013)</th>
<th>Old-old (75-84) (n=803)</th>
<th>Oldest-old (&gt;85) (n=222)</th>
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</thead>
<tbody>
<tr>
<td>Physician recommendation</td>
<td>No MVC 100% 100% 100%</td>
<td>Yes MVC 0% 0% 0% 0%</td>
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<td>Fail MVC</td>
<td>78% 78% 78% 78%</td>
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<td>55 (55%) 55 (55%) 55 (55%) 55 (55%)</td>
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<td>No MVC</td>
<td>22% 22% 22% 22%</td>
<td>419 (21%) 323 (32%) 283 (28%) 197 (19%)</td>
<td>45 (45%) 45 (45%) 45 (45%) 45 (45%)</td>
<td>45 (45%) 45 (45%) 45 (45%) 45 (45%)</td>
</tr>
<tr>
<td>Traffic violations</td>
<td>1 (1) 1 (1) 1 (1) 1 (1)</td>
<td>1 (1) 1 (1) 1 (1) 1 (1)</td>
<td>1 (1) 1 (1) 1 (1) 1 (1)</td>
<td>1 (1) 1 (1) 1 (1) 1 (1)</td>
</tr>
</tbody>
</table>

CONCLUSIONS

• A comprehensive fitness-to-drive evaluation is a significantly more conservative measure than that of a physician recommendation alone.
• The number, and likely the risk of, of motor vehicle crashes within the past 5 years significantly increases with age.
• Traffic violations within the past 5 years does not appear to have any significant predictive value in determining driving fitness.
• Further research could explore the difference in prevalence of primary conditions and their impact on FTD decisions.

ACKNOWLEDGEMENTS
The Effects of Hippotherapy on Postural Alignment and Quality of Life in Children and Young Adults with Disabilities

Jennifer Chapman, SPT, Emilee Hart, SPT, Melissa Williams, SPT, Lori Bolgla, PT, Ph-D, ATC; Claudia Morin, MHE, HPCS, OTR/L

BACKGROUND

Hippotherapy has been used as a means of exercise since Ancient Greece, as early as 460 B.C. Since then it has been used as a treatment strategy for a variety of diagnoses including poliomyelitis, autism, cerebral palsy, Down syndrome, sensory integration disorders, and developmental delays. There is growing evidence to support the use of hippotherapy as an effective treatment strategy to address posture control problems in children with disabilities due to the somatosensory input from the horse’s natural movement. Additionally, quality of life (QOL) is a major aspect in children with disabilities and previous studies have suggested that hippotherapy improves QOL. With the growing interest in hippotherapy by therapists and/or patients and their families, it is necessary to examine the effectiveness of hippotherapy as an adjunct intervention.

PURPOSE

The purpose of this case series was to determine the effect of hippotherapy on postural alignment and quality of life in children and young adults with disabilities.

METHODS

TREATMENT STRATEGY

- 45-minute weekly treatment sessions for 10 consecutive sessions
- Sessions individualized and implemented by an NAHRA-certified occupational therapist for each participant
- Sample activities on the horse:
  ○ Reaching activities
  ○ Active ROM
  ○ Diagonal Patterns
- Emphasis placed on correct postural alignment throughout each treatment session

OUTCOME MEASURES

- Pediatric Quality of Life Inventory (PedQL™)
  ○ PedQL™ is a parent report questionnaire developed to examine aspects of the child’s physical, emotional, social, and school functioning over the prior month in order to determine quality of life.
- G.R.E.A.T. Postural Scale
  ○ Utilizes photos from lateral views of the horses to observe posture in five areas including cervical spine, shoulders/thoracic spine, pelvis/lumbar spine, hip angle, and knee flexion/heel orientation.
  ○ It is scored 0-4 with 0 being no abnormalities in postural control and 4 being the most severe

RESULTS

DISCUSSION

Results of this study suggested that hippotherapy as an adjunct therapy could lead to positive changes in a child’s posture and/or quality of life. Our findings also indicated that the benefits from hippotherapy may vary by diagnosis. Study limitations included the variability in a child’s behavior. Future investigations are needed to determine a patient cohort who may benefit more from hippotherapy.

Special thanks to Claudia Morin, MHE, HPCS, OTR/L, the children and their families, and the volunteers of Blue Ribbon Rider’s Inc. for their participation and involvement in the completion of these case analyses.
Dynamic Driving Simulation Compared to Visual Field Tests and Driving Performance in Individuals with Open-Angle Glaucoma

Linden Daiss, Katelyn Joyce, Mary Claire Lahaie, Kristie Leddon, and Dr. Hannes Devos, PhD
Department of Physical Therapy at Augusta University; Augusta, Georgia

Background
- More than 2.2 million United States citizens and 6.7 million people in the world currently have glaucoma.
- Open-angle glaucoma is chronic and causes a loss of visual field (VF), that starts in the periphery and moves centrally.
- There are many VF tests, but as of current there is not a specific screening tool to determine fitness to drive.
- A dynamic driving simulator test was created to compare to current screening tools to determine which would predict better on road driving performance.

Purpose
- Due to limitations of current methods used to determine fitness to drive in individuals with open-angle glaucoma, the aim of this study will be to compare the dynamic driving simulator test with the current methods used to determine fitness to drive.

Methods
- Each subject underwent various VF testing, dynamic driving simulator test, on road driving performance test and mini mental examination. VF tests are described below.
- The study consisted of three sessions, with the final session being the on road driving test performed in the city of Augusta, Georgia.

Control Group: Inclusion Criteria
- 20 Glaucoma
- 13 Control
- 33 Total

Subjects

Glucoma Group: Inclusion Criteria
- Open Angle Glaucoma
- Valid Drivers License
- Driven 500 miles in 4 years
- 50-80 years old
- Free of other neurological/ocular disease

Control Group: Inclusion Criteria
- Absence of visual, neurological, internal or psychiatric condition
- Valid Drivers License
- Driven 500 miles in 4 years
- 50-80 years old

Visual Field Assessments
- Humphrey VF Test: Considered the gold standard in the United States of America. Patient identifies blinking lights in the periphery.
- Keystone Vision Screener: Tests visual acuity, VF, eye coordination, depth perception, contrast sensitivity, and glare recovery.
- Useful Field of View (UFOV): Test consists of speed of processing, divided attention and selective attention.
- Dynavision: Evaluates visual awareness and response time.

Results
- Of the 33 original participants enrolled over the 14-month study, two dropped out due to motion sickness or discomfort from the driving simulator. The remaining 31 participants each completed 1.40 hours of driving simulator testing and 0.75 hours of on-road driving, as well as visual field assessments.
- The results of each of these aspects of the study was analyzed through paired t-test, Spearman, and Pearson correlations and assessed for accuracy and significant differences. Noteable values included Spearman correlations for glaucoma participants in Humphrey right median deviation, r = -0.58 and UFOV Processing Speed, r = -0.53, both indicating that the on-road test did not have significant differences in results. The Spearman value for Complex Reaction Time, r value of 0.57 for the glaucoma participants, compared with an r value of 0.10 for the control participants, indicates a significantly longer time taken for glaucoma patients in sum of seeing time average, movement time average, and brake time average, as well as a strong, positive correlation between the standard on-road driving test with the driving simulator test.

<table>
<thead>
<tr>
<th></th>
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<th>Glaucoma (r values)</th>
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<tbody>
<tr>
<td>Humphrey Right MD</td>
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<td>-0.58*</td>
</tr>
<tr>
<td>UFOV PS</td>
<td>-0.29</td>
<td>-0.53*</td>
</tr>
<tr>
<td>Complex Reaction</td>
<td>0.10</td>
<td>0.57**</td>
</tr>
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</table>

Comparison of Complex Reaction Times Between Glaucoma and Control Subjects

Discussion
- This study was performed on rather small samplings of subjects with glaucoma and without. This may have been what limited the significant findings, as there were only a few variables found to be significant between groups and the simulator and on-road driving tests. The strengths of this study include: each subject performed all driving tests and visual field tests, so each subject’s data was comparable to his/her own and the other subjects’ data; there was both a glaucoma and control group; all subjects were over the age of 50, making this study more specific and applicable to older adults. Later in life is also when the majority of Open-Angle Glaucoma tends to present itself.

Future research should be conducted to further explore the validity and accuracy of the Dynamic Driving Simulator Test, when compared to the on-road driving test (Triplot) and the most commonly used Humphrey VF Test. This study is only the beginning for determining if the Dynamic Driving Simulator Test is a better indicator of fitness to drive in those with glaucoma, and possibly other degenerative VF conditions.

Conclusion
In conclusion, evidence suggests that the newly developed driving simulator test is more predictive of on road driving performance, and thus fitness to drive in individuals with open-angle glaucoma. Therefore supporting that the driving simulator test would be more appropriate to use as a visual field test than the traditional tests commonly used today.
INTRODUCTION

- Parkinson's disease (PD) is a progressive movement disorder that impairs motor function through inhibiting dopamine production in the basal ganglia.
- In this process, many daily activities are affected including driving.
- One aspect of driving is visual search. It involves the ability to actively scan or search a visual field for a particular object.
- The visual search component of driving is important for identifying passing cars, traffic signs, and objects on the road.1,2
- Past studies have not shown a decrease in real-life driving safety but those with PD have been more likely to show safety errors and fail fitness-to-drive examinations.1,2

PURPOSE

- The aim of this study was to compare performance in a driving-related visual search tasks between individuals with PD and control subjects.
- A second aim was to determine the relationship between performance in other cognitive tasks and visual search in PD.

METHODS

- Dynamic Visual Search Task: Simulated a standardized 2-lane road, and required the patient to follow traffic laws while travelling at 45mph while identifying a billboard or car target. (Figure 1)
- Static Visual Search Task: Identify a road sign while staring at the center of a screen

RESULTS

- Control group significantly younger than PD patients; Results had to be adjusted for age (Figure 3)
- Significant findings between experimental and control groups for the following in Figure 4: TMT B (s), Stroop Test Color Condition score, and ROCF / 36. Significant findings between experimental control groups for the following in Figure 5: Correct response times target present (s), Correct response times target absent (s), Omissions when target present (s), and Omissions when target absent (s).
- Figure 6 depicts the tests showing correlations to visual search RT with the target present without inter-correlations between them. After regression analysis, ROCF (Figure 2) score accounted for the most variance in RT with an adjusted R² of 0.74.
- Figure 7 is demonstrating greater cognitive workloads in the PD subjects when compared to the healthy controls in the dynamic visual search task with the target present.

DISCUSSION

- The ICA results in Figure 7 indicate that PD patients may work harder to complete the same task.
- PD patients may not make more errors during visual search.
- Response time and cognitive workload are both increased in PD patients, which may affect driving safety.
- ROCF score may be a good indicator of efficient visual search.
- Limitations include small sample size for each group. Currently, more research is needed to further investigate how differences in visual search can have an affect on daily life and driving safety in those with PD.

ACKNOWLEDGEMENTS


REFERENCES


AUTHOR DISCLOSURES


ABBREVIATIONS

- MOCA: Montreal Cognitive Assessment
- LED: Levodopa Equivalent Dose
- UPDRS: Unified Parkinson’s Disease Rating Scale
- ROCKET: Real Life Outcome Clinical Test
- TMT: Trail Making Test part A
- ROCF: Rey Osterrieth Complex Figure
- ICA: Index of Cognitive Activity
- UFOV: Useful Field of View
- TMT B: Trail Making Test part B
- ABBREVIATIONS

Figure 1. STISIM driving simulation setup
Figure 2. Rey-Osterrieth Complex Figure
Figure 3. Demographic and clinical characteristics
Figure 4. Neuropsychological performances
Figure 5. Visual search performances
Figure 6. Spearman correlations to visual search RT (target present)
Figure 7. Correct detections (target present) Left ICA
A FITNESS BOOT CAMP WORKOUT GONE WRONG: A CASE REPORT OF PATELLOFEMORAL PAIN

MASON EARP, SPT
DEPARTMENT OF PHYSICAL THERAPY, AUGUSTA UNIVERSITY, AUGUSTA, GA

Introduction

Patellofemoral pain (PFP) and other nonspecific anterior knee pain is a common source of overuse injuries observed in a variety of patient populations. Due to the repetitive nature of certain activities such as running, evidence exists to suggest that female runners are twice as likely to develop PFP and other knee pathologies, such as iliotibial band friction syndrome, and tibial stress fractures, compared to male runners. Given the evidence for hip strengthening to reduce symptoms of PFP, and the utilization of manual therapy, it is hypothesized this combination will prove beneficial in the optimization of performance and pain reduction in a middle aged female preparing for her first half-marathon.

Methods

History

The patient was an active 43-year-old female who worked full-time from home as an information technologist. She spent a large portion of her time sitting at a computer, but made time for exercise on most days and was even preparing for her first half-marathon. Following a boot camp fitness class on 5/26/16, the patient experienced a significant amount of pain on her lateral patella and visited an orthopedic physician, who later referred her to a physical therapist. The patient’s chief complaints included pain to the lateral and deep aspects of the patella with activities such as jumping, running, lunging, and deep squatting. The pain hadn’t impacted her ability to attend boot camp workouts, but did reduce the maximal sustained intensity.

Examination

ROM: Within normal limits
Strength: 4-5 for L & R hip ABD, ADD, IR, & ER
Special Tests:
Negative – Ober’s, Thessaly, & Lateral Joint-Line Tenderness
Positive – Thomas & Modified Thomas Test
Gait Analysis: “Too many toes” sign, increased curvature through R Achilles tendon, R heel-strike cautiousness, decreased ankle dorsiflexion, and moderate knee valgus.

Evaluation

Based on the patient’s history and physical therapy examination, we diagnosed the patient with right PFP and concomitant right hip adductor strain inconsistent with referring MD’s diagnosis, further exacerbated by signs and symptoms consistent with LE kinematic dysfunction based on objective observations made throughout the patient’s examination.

Diagnosis

Medical: R Lateral Patellar Subluxation & R Hip Adductor Strain
Physical Therapy: Practice Pattern 4C (Impaired Muscle Performance) and Pattern 4D (Impaired Joint Mobility, Motor Function, Muscle Performance, and Range of Motion Associated with Connective Tissue Dysfunction).

Prognosis

According to the APTA Guide to Physical Therapist Practice, the estimated range of visits for someone in category 4C deviates from six to thirty visits per episode of care to demonstrate optimal muscle performance and the highest level of functioning.

Interventions

The patient in this case report was seen for two times per week for a total of twelve visits. The interventions were separated into three phases of treatment (Table 1), designed to further progress the patient to match her current level of functional ability. Tables 2 – 4 illustrate interventions consistent with the given phase.

Results/Outcomes

The NPRS, Lower Extremity Functional Scale, and Y-Balance Test were used to evaluate the progress of the patient. MMTs and the knee angle during a functional squat prior to pain were also assessed to determine improvements in strength and function. The patient’s ratings on the NPRS decreased from a 4/10 to 0/10 prior to treatment, reaching the MCID value; findings can be seen in Figure 1 below.

Discussion

The patient responded favorably to the therapeutic interventions, reaching clinical significance with the NPRS. The patient initially responded at a low-level of disability, as indicated by the LEFS outcome measure. A more sports-specific self-reported outcome measure would have likely produced clinically meaningful results. A MCID was unable to be compared on the Y-Balance Test due to not knowing the leg length post data collection. Additionally, there is difficulty in determining which particular intervention caused the most meaningful results to the patient’s improvement in function. The most that can be determined after further evaluation is the complete management was effective in reducing pain levels in a patient complaining of patellofemoral symptoms.

Conclusion

Although the patient did demonstrate overall improvements in each outcome measure chosen, only the NPRS reached clinical significance. Based on the design of the case report, it is difficult to reach a conclusion regarding which specific intervention(s) caused the improvements in function. It can be concluded, though, that functional improvements can occur in patients with patellofemoral pain with the selected interventions. More research is needed within this topic with a particular emphasis on integrating manual therapy and its therapeutic significance to improvements in overall function.

Figure 1

This poster design is adapted from: Tucker R. Chronic Ankle Instability Due to Repeated Eversion Ankle Sprains: A Case Report. This poster design is adapted from: Tucker R. Chronic Ankle Instability Due to Repeated Eversion Ankle Sprains: A Case Report. This poster design is adapted from: Tucker R. Chronic Ankle Instability Due to Repeated Eversion Ankle Sprains: A Case Report.
Effects of Niacin Supplementation on Symptoms of Patients with Parkinson’s disease

Kristen Fenstermaker, Stew Kremer, Erin McLure, Chase Pendley
Advisor: Dr. Raymond Chong, PhD

Introduction

Parkinson’s disease (PD) is a progressive neurological disorder that involves the degeneration of dopaminergic neurons in the substantia nigra of the basal ganglia. There are many theories regarding the pathogenesis of PD, and research shows that inflammation may play a fundamental role. Inflammation is initially beneficial for healing damaged tissue, but chronic inflammation can lead to the degeneration of neurons and ultimately motor and non-motor deficits.

The study at hand seeks to determine the relationship between niacin and neuroinflammation in patients with PD. Niacin is a water soluble vitamin evidenced and proposed to have many health benefits in the human body. One of those benefits is that it may have a significant role as an inhibitor of neurodegeneration in the substantia nigra, which could potentially lead to improvements in motor and non-motor symptoms commonly demonstrated in patients with PD.

Methods

Subjects
Average age = 62
Hoehn-Yahr (H&Y) Stage = 1-4
Mini-Mental > 23
No known allergies to niacin

Group 1
100 mg. Niacin

Group 2
250 mg. Niacin

Group 3
Placebo

Initial Testing
Quality of Life Questionnaire
Trail Making Test
Stroop Test
UPDRS III
Quiet Standing Sway Test
Brain Activity Monitoring
EEG Sleep Analysis

3 Month Double-Blinded, Placebo-Controlled, Semi-Pragmatic Trial

12 Month, Open-Labeled, Pragmatic Trial (250 mg. SR niacin)

Results

UPDRS III
Before
After
Placebo
100 mg
250 mg

Quality of Life Composite score
Before
After
Placebo
100 mg
250 mg

Postural Sway
Before
After
Niacin
Placebo
Mean A-P Dist, m
Niacin
Placebo
Mean M-L Dist, m

Depression
Geriatric Depression Scale, total points
Before
After
Placebo
100 mg
250 mg

Fatigue
Fatigue Severity Scale, total points
Before
After
Placebo
100 mg
250 mg

3 Month Follow Up: Mean body sway during 30 seconds of quiet stance with eyes open was trending towards improvements (smaller displacements while the placebo group was getting worse, *p = .0279 (antero-posterior, A-P plane) & *p = .0519 (medio-lateral, M-L plane). There was also an improvement in the UPDRS III scores for the 100 mg niacin group as compared to the placebo (increase by 4.5 points, from 22.1 ± 4 to 17.5 ± 3 points, p < .01). The primary symptom improvement was the bradykinesia component (from 3.5 ± 1 to 3.3 ± 1, p = .029).

Quality of life composite scores also saw an improvement in the two niacin groups, p < .0019.

12 Month Follow Up: Depression severity improved in all 3 groups by 7 points on average, from 11 to 4, p < 0.0001. Fatigue severity improved in all three group by 10 points on average, from 41 to 31, p < 0.0001.

Conclusion

The results of the study suggest that niacin has positive effects on both motor and non-motor symptoms (specifically postural sway, which is related to balance, overall quality of life, fatigue, UPDRS III scores, and depression) in patients with PD. The combination of carbidopa and levodopa is widely prescribed to PD patients to help with symptoms of PD, but it leaves PD patients with niacin deficiency. Niacin, however, is an over the counter supplement that can be easily obtained by people with PD. The chief adverse side effect is an acute flushing response that can be uncomfortable, but slow-release niacin has been developed to quell that effect in most subjects. While findings are promising, this study is open-labeled and a larger, long-term, double-blinded study should be conducted to further investigate the potentially beneficial ability of niacin to reduce or delay PD symptoms.

References
INTRODUCTION
• PD is a neurodegenerative disease of the nervous system, classified as a movement disorder, due to decreased production of dopamine. Loss of dopamine results in a series of movement impairments.1
• The four primary symptoms of PD are tremors, rigidity, bradykinesia, and postural instability1
• There are other non-motor symptoms that determine quality of life, including vision2
• Ocular motor function is critical to balance, spatial awareness, and ability to judge distance or shape of an object
• Due to motor and visual impairments, the ability to successfully complete ADLs is affected in the PD population3
• The effect of oculomotor function on functional and motor impairments has not been widely studied in individuals with Parkinson’s disease. A study found patients in the PD population with postural instability showed altered antisaccade latencies that correlated with function movement and duration of anticipatory postural adjustments before gait initiation4

PURPOSE
The purpose of this study is to assess how oculomotor deficits affect functional and motor impairments in PD.

METHODS
Subjects
17 subjects with idiopathic PD patients and 17 age-matched controls participated in the study

RESULTS
Between Groups
• There was a significant difference in performance UFoV - Part 1, UFoV- Part 3, MoCA, TMT- A reaction time, TMT-B reaction time, and Finger of Rey

UPDRS III
• UPDRS III was strongly related to B/V Color Vision, UfoV - cat, UfoV - part 1, UfoV - part 2, Visual Acuity, MoCA, TMT- B, and Figure of Rey
• UPDRS III was moderately related to age, UfoV - part 3, Hoehn & Yahr score, TMT- A, Figure of Rey, and Dot cancellation

DISCUSSION
• UfoV – Part 3 is a selection attention subtest of UfoV, used to predict mobility, walking ability, balance, and fall risk in patients with PD
• TUG consists of many selective attention tasks, including: following instructions, initiation of movements, ambulation, visualizing a turning point, turning, and controlling speed
• This suggests that addressing motor improvements is not enough in physical therapy. Physical therapists need to do cognitively loading task and selective attention tasks along with motor rehab to improve the functional mobility in patients with PD
• Threats to validity & limitations include the small sample size, method of recruitment of participants, and the difference in age between control and PD groups
• We recommend more research be done on this topic

References
1. Hoehn and Yahr, 1961
2. Black/Blue, cat, Brønnum, 2010

This poster design is adapted from: http://www.augusta.edu/pt/alliedhealth/ptresearchcourse/2016/2016-Conference/Posters/UPDRS-II-2016-Poster.pdf

Eye Catching Detectors of Motor and Functional Impairments in Parkinson’s Disease
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Management of Patellofemoral Pain in a Adolescent Female Multi-Sport Athlete: A Case Report

William Jackson, SPT
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Background/Introduction
Patellofemoral pain (PFP) is thought to be the most common overuse injury of the lower extremity, however, the exact etiology of the injury is still unknown. Different hypotheses have looked at the knee, proximal hip or distal foot, to determine which joint might be the primary causal agent. One of the most accepted hypotheses on the mechanism of injury is that patellar malalignment and/or abnormal patellar tracking might be the primary factors leading to the development of PFP. Excessive knee valgus has been found to occur when performing dynamic activities as a direct result of decreased strength of hip musculature, specifically hip abductors and external rotators. Weakness of the hip external rotators and abductors creates an internal rotation and adduction moment at knee and leads to increased compressive forces on the patellofemoral joint. The two muscles thought to be the most important to eccentric control of the hip are the gluteus maximus and gluteus medius, because their main functions are external rotation and abduction, respectively. Research has shown that hip training programs with the goal of reducing hip adduction and internal rotation show greater improvements in patient pain and function than standard programs that utilize quadriceps strengthening. However, there is minimal research done on this injury in teenagers. This case study aims to examine a hip focused approach for treatment of PFP in a teenage patient.

Methods

Case Description
History:
The patient was a 14-year old female referred to physical therapy for general anterior knee pain. There was no specific mechanism of injury, the patient stated that the pain grew stronger over the course of several weeks. The patient reported increased amounts of pain when playing soccer, volleyball and track, as well as other functional tasks. The patient reported that the pain had limited participation in sports and has set a goal to return to all sports activities with little to no pain.

Examination:
• Initial Outcome Measures:
  - Lower Extremity Functional Scale (LEFS): 54/80
  - Lower Extremity Active Range of Motion was normal in all directions for the hip, knee and ankle.
  - Manual Muscle Tests (MMT) showed 5/5 strength in all lower extremity muscles
  - NPRS: 5/10 with hip extension MMT, 8/10 with running, 7/10 with both squatting and jumping, and 4/10 with a single leg squat (SLS) on an 8” box.
  - Special Tests: Lachman’s (-), Anterior Drawer (-), Valgus Stress Test (-), McMurry’s (-)

Evaluation:
Upon completion of the examination, it was discovered that the patient had decreased dynamic strength on the affected side, as seen on completion of the SLS task. Special tests ruled out any ligamentous or meniscal injury, and the LEFS score, patient history and the pain ratings indicated an overuse injury.

Diagnosis:
• Medical: Left Patellofemoral Pain Syndrome
• Physical Therapy Practice Pattern 4D: Impaired joint mobility, motor function, muscle performance and range of motion associated with connective tissue dysfunction. The ICD-10 Codes are M22.2X2: Patellofemoral disorders, left knee and M25.562: Pain in the left knee.

Prognosis:
A review of the literature suggested that a patient with this condition and of this age should be seen 1-2 visits/wk for 6-8 weeks. This patient was seen a for a total five times over the course of 6 weeks with each visit lasting 45-60 minutes.

Interventions:
Treatment was progressed through three phases. The initial phase utilized static strengthening of the hip musculature with minor eccentric work. The second phase focused more on eccentric loading with light plyometrics. Phase III utilized strategies from the previous stages with increased loads, as well as the initiation of an aquatic treadmill program. Table 1. shows the treatment protocol performed.

Table 1. Treatment Protocol

| Intervention | Phase I | Theraband exercises, light eccentric
| Phase II | Increased load theraband and moderate eccentric, light plyometrics
| Phase III | Increased load theraband and moderate eccentric, moderate plyometrics, aquatic treadmill training

Results/Outcomes

The LEFS, FOTO and NPRS ratings were used to track the progress of the patient during the course of treatment. See Table 2. and Figure 1. After 6 weeks of treatment, the patient’s LEFS score increased from a 54/80 to a 78/80. On the FOTO, the patient rated only one task as causing “a little bit of pain” and nine tasks as causing “no difficulty”. The patients NPRS ratings went from 8/10 with running to 0/10 at discharge, 7/10 to 0/10 with squatting, 7/10 to 0/10 with jumping and 4/10 to 0/10 with the SLS task.

Table 2. Patient Progress at Initial, Reevaluation and Discharge

<table>
<thead>
<tr>
<th>LEFS</th>
<th>Initial</th>
<th>Reevaluation</th>
<th>Discharge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Running</td>
<td>54/80</td>
<td>68/80</td>
<td>78/80</td>
</tr>
<tr>
<td>Jumping</td>
<td>7/10</td>
<td>0/10</td>
<td>0/10</td>
</tr>
<tr>
<td>Squatting</td>
<td>7/10</td>
<td>0/10</td>
<td>0/10</td>
</tr>
<tr>
<td>SLS Task</td>
<td>4/10</td>
<td>0/10</td>
<td>0/10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NPRS</th>
<th>Initial</th>
<th>Reevaluation</th>
<th>Discharge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quite Difficult</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Moderate Difficulty</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Little Bit of Difficulty</td>
<td>3</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>No Difficulty</td>
<td>3</td>
<td>5</td>
<td>9</td>
</tr>
</tbody>
</table>

Conclusion
The patient responded favorably to all interventions throughout the treatment course. The patient experienced major improvements in pain throughout the 2-3 weeks of treatment with moderate improvements following that mark, potentially due to limits on improvement. Although it cannot be known which specific exercises provided the greatest benefit, static strengthening, eccentric loading, plyometrics or aquatic treadmill, the program as a whole proved to be successful in the management of this type of patient.

Discussion
While it can be shown that improvements occurred over the course of treatment, it cannot be proven, using this study, which exercises were the cause of those improvements. What can be shown, is that a hip focused approach to treating anterior knee pain is an effective treatment strategy and should be utilized when dealing with these patients. Dividing the treatment into three overlapping phases allowed for the patient to build strength in the major eccentric control muscles, making it possible to increase task difficulty while still maintaining tolerance to exercise. There are limits to this study in that it only focused on one person and that outcome measures were not administered consistently due to scheduling conflicts with the patient. This study does have merit in that it was able to show improvements in pain and functional movement scores by using specific interventions.
Shoulder pain is common in adults whether it is due to shoulder impingement, rotator cuff impairments or tears. Due to high mobility in order to allow individuals more movement, the shoulder joint sacrifices stability making it more susceptible to injury. When the shoulder joint is excessively overstressed or overloaded there is an increased risk for injury to the rotator cuff muscles as well as the joint capsule. The more commonly injured rotator cuff muscle is the supraspinatus which with overuse can not only lead to microtearing and muscle strain but also shoulder impingement due to the location through the subacromial space and insertion on the greater tubercle of the humerus. While there is research focused on interventions and outcomes for both supraspinatus tears and impingement, there are not many studies that look at how workers compensation can effect results of treatment and delay results.

Case Description:

**History:**
The patient is 49-year old left hand dominant female property adjuster for an insurance company who was referred to PT after 5 weeks from an incident that occurred during work. The patient began experiencing symptoms after taking a ladder out of the trunk, putting it on her shoulder and as she went to lean it against the house she felt a pop and her left shoulder began hurting the next day. The patient's chief complaint was pain in her anterior left shoulder with work activities as well as decreased strength and inability to reach overhead. The patient was unable to participate in daily job requirements due to lifting and reaching motion requirements as well as crawling and climbing a ladder secondary to partial supraspinatus tear and subdeltoid bursitis.

**Examination:**
- Left side AROM and PROM decreased in shoulder flexion, abduction external rotation and internal rotation
- NPRS: 4/10 with AROM and during activities
- quickDASH: 54.0 at initial eval

**Evaluation:**
Medical Diagnosis: Partial Supraspinatus tear and subdeltoid bursitis
Physical therapy practice pattern 4D: Impaired Joint Mobility, Motor Function, Muscle Performance, and Range of Motion Associated With Connective Tissue Dysfunction.
ICD-10: S43.402D

**Prognosis:**
This patient was seen 2-3x per week for 11 weeks for 60 minute sessions. There were 20 total visits for this patient.

**Table 1**

<table>
<thead>
<tr>
<th>INTERVENTION</th>
<th>FOCUS ON</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 1</td>
<td>Decreasing pain and increasing AROM and PROM for the shoulder</td>
</tr>
<tr>
<td>Phase 2</td>
<td>Eccentric and concentric exercises to strengthen the shoulder girdle as well as scapular stabilization</td>
</tr>
<tr>
<td>Phase 3</td>
<td>Began implementing functional return to work exercises along with progressed scapular stabilization exercises</td>
</tr>
</tbody>
</table>

Although the patient did show improvements from the interventions, it cannot be said what is the cause for each improvement. The quickDASH was administered when the DASH in full length would have given a better picture of impairments with more research supporting it. Due to Workers Compensation Insurance, we had some delays in treatment while waiting for approval for more visits which could have affected response to treatment. However, this case did show that incorporating eccentric and concentric exercises as well as stabilization exercises and then more functional tasks resulted in improvements.
A Case Study
Lacking 20 degrees
The patient responded favorably to the physical therapy.

Interventions:
- 5 weeks (1 X per week for 2 weeks, 2 X per week for 3 weeks)
- Rehabilitation techniques were performed for the right iliopsoas tendon as well as the left knee. See table 1 and table 2 for the focuses of each rehabilitation phase.

Conservative treatment has not been well studied in iliopsoas tendinopathy. However, conservative treatment with other tendinopathies, including patellar and Achilles tendinopathy, suggests eccentric strengthening of the tendon will reduce tendinosis symptoms.

Methods

Patient Information
- 63 year old male
- Occupation: Jeweler
- PT problem: Iliopsoas tendinopathy
- Past medical procedures:
  - 1.5 years status post left total knee arthroplasty
  - 1 year status post left total knee arthroplasty
- Symptoms: right anterior hip and groin pain, pain with passive right hip extension, pain with resisted hip flexion, pain with stationary cycling and walking at work
- Gait: Increased right hip flexion in right swing phase, decreased right step length, left hip drop during the left swing phase
- Key initial values:
  - Initial left knee range of motion: Lacking 20 degrees
  - Initial LEFS: 45/80, 43.75% impairment
  - Pain: 6/10 highest level
- Patient goals: Pain-free return to cycling, tennis, and walking

Table 1: Rehabilitation Phases for the Right Iliopsoas Tendon
<table>
<thead>
<tr>
<th>Phase</th>
<th>Activity Modification</th>
<th>Eccentric Iliopsoas Strengthening</th>
<th>Functional Return: Strengthening Iliopsoas Both Eccentrically and Concentrically Within Functional Patterns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase I</td>
<td>Activity modification: suspend morning cycling routine</td>
<td>Eccentric iliopsoas strengthening</td>
<td>Functional return: strengthening iliopsoas both eccentrically and concentrically within functional patterns</td>
</tr>
<tr>
<td>Phase II</td>
<td>Manual therapy, soft tissue mobilization and PNF stretching for left quadriceps, hamstrings, and gastrocnemius</td>
<td>Functional Return: continue manual therapy and add total knee extensions within ambulation and step ups and step downs</td>
<td></td>
</tr>
</tbody>
</table>

Results
- The main outcomes for this case study include changes in NPRS, LEFS, and left knee extension. See figures 1-3.
- NPRS: 6/10 to 0/10, (MCID is 2 points)
- LEFS: 45/80 (43.75% impairment) to 55/80 (31.25% impairment), (MCID is 9 points)
- Left knee extension: Lacking 20 degrees of extension to lacking 8 degrees of extension, (SE is 1.56 degrees)
- Gait: Normalized right hip flexion in right swing phase, increased right step length from initial evaluation, decreased left hip drop during the left swing phase from initial evaluation.

Discussion
- The patient responded favorably to the physical therapy treatment.
- Statistically significant changes were seen in the NPRS, LEFS, and left knee range of motion, indicating improvements in decreased right hip pain and increased bilateral lower extremity function.
- In addition, a gait analysis revealed a more normalized gait from pre-treatment to post-treatment further indicating an improvement in function.
- It is unclear if the patients right hip pain decreased from iliopsoas eccentric strength training, the reduction of left knee flexion contracture below 15 degrees, or a combination of both.
- Other limitations include a sample size of one and a limit of 5 weeks to conduct the case study.

Conclusion
- This case report provides low level evidence supporting the use of conservative treatments for iliopsoas tendinopathy such as eccentric iliopsoas strengthening as well as a reduction in contralateral knee flexion contracture.
- Future research is warranted to generalize these findings amongst a larger population sample as well as determine specific treatment strategies that may be beneficial for these patients.
Factors that Influence the Ability of a Teenager with Ataxic Cerebral Palsy to Drive: A Case Study

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INTRODUCTION
- 65 percent of individuals with a disability drive a car or other motor vehicle compared with 88 percent of nondisabled persons.
- Cerebral palsy (CP) is a group of disorders of the central nervous system characterized by abnormal control of movement or posture, present since early in life.
- Individuals with CP have weakness and motor deficiencies affecting hand-eye coordination, reaction time, visual perception and eye movement, proprioception, and postural control. The following characteristics are heavily relied on when driving.
- Ataxic CP is a result of damage to the cerebellum. Global involvement results in clumsiness, imprecision, or instability. Movements are disorganized and jerky. Individuals with ataxic CP have difficulty maintaining balance and appear unsteady and shaky.

PURPOSE
The purpose of this case study was to examine (1) the skills needed to safely drive, (2) how cerebral palsy affects the ability to drive, and (3) vehicle modifications to enable a 19-year-old teenager with ataxic cerebral palsy to drive.

METHODS
Design: Case Report
Subject:
- 19 year old African American female with ataxic CP
- No other significant past medical history
- GMFM-66 = 71.22
- GMFCS = mixed levels I and II
- Level I gross motor activities she is able to perform are running and jumping but speed, balance, and coordination are limited
- Level II gross motor activities she is limited in are walking long distances and balancing on uneven terrain, inclines, in crowded areas, confined spaces or when carrying objects
- Driver evaluation:
  - Comprehensive assessment of abilities that are necessary for safe and independent driving
  - Medical history, driving history, driver’s license status, physical functioning, vision and visual perception, cognition assessment, and driving performance assessment in a high fidelity driving simulator

RESULTS
- Range of motion of the neck and other major joints of the right and left sides of the body, and strength of all muscle groups of the right and left sides of the body were within limits that are necessary for safe driving
- Subject showed poor coordination in all extremities
- Subject’s far visual acuity and visual fields are within the levels of the state of Georgia requirement. Subject had difficulty with identifying red/green colored numbers, phoria (eye coordination), and visual depth perception.
- The outcome of cognitive assessment revealed moderate difficulties with visuospatial and psychomotor skills.

DISCUSSION
- Independent driving is often a concern for individuals with cerebral palsy. Little is known about the factors that influence one’s ability to drive with ataxic CP and furthermore the modifications and interventions beneficial to improving any deficiencies.
- The results suggest that there are deficiencies in coordination, difficulties with color perception, and moderate difficulties with visuospatial and psychomotor skills.
- Similar to prior research findings, the subject demonstrated fair coordination of the upper extremities, poor coordination of the lower extremities, and difficulty with eye coordination as a result of the disruption in her cerebellum, which is important for motor memory and detecting/reducing errors in motor activities.
- The subject’s difficulty in visual depth perception could be a result of decreased ability to accommodate the eyes secondary to cerebral palsy, as concluded from prior studies.
- The subject’s slower movements was a result of slow reaction time secondary to poor coordination.
- Different postural supports and alignments built into the car seats may aid in controlling direction-specific movements in the upper and lower extremities while driving, as well as the addition of hand controls.

CONCLUSION
- This study provides evidence that teenagers with ataxic cerebral palsy have physical, visual, and cognitive deficits that would greatly affect their driving capabilities. As a result of these findings, the subject will benefit from a driving rehabilitation program to enable her to train using modifications to the car including postural support and hand controls as well as physical therapy interventions focused on improving postural control, reaction time, upper and lower extremity coordination, and balance. Further research should be performed in the subject with a larger sample size on various types of CP so the results can be more generalized to an entire population.
Multimodal Treatment Approach for Chronic Cervical Radiculopathy: A Case Report

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INTRODUCTION

Cervical Radiculopathy is defined as neck pain with symptoms radiating out of the neck into the upper extremity, including pain, numbness, tingling, and sensation loss (Cleland, Whitman, Fritz, & Palmer, 2005). Cervical radiculopathy may result from numerous anatomical causes including degeneration of an intervertebral disc, leading to compression on the cervical nerve root, cervical spondylolisthesis, or painful connective and osseous tissues (Childs, et al., 2008). Numerous isolated physical therapy treatment approaches currently exist to address cervical radiculopathy including manual and mechanical traction, modalities, strengthening and stabilization therapeutic exercise, stretching, manual therapy, and home exercise programs. However, case series and prospective cohort studies have suggested that outcomes may be improved by incorporating multiple types of interventions, or a multimodal approach. Much of the current research regarding multimodal approaches examines acute cervical radiculopathy, indicating that further research remains to be conducted regarding the effects of this treatment strategy on chronic symptoms. Therefore, this case report will focus on the use of a specific multimodal approach for the management of chronic neck and shoulder pain resulting from cervical radiculopathy, including intermittent mechanical cervical traction, cervical stabilization, MDT centralization, thoracic mobilization, and postural re-education.

CASE DESCRIPTION

History
- 58 year old right hand dominant male
- Referred for evaluation and treatment of cervical radiculopathy and mild degeneration of unspecified cervical intervertebral discs
- Chronic history of neck pain following an unspecified neck injury 25 years prior that worsened 10-12 weeks ago prior to evaluation
- Prior concern: “nagging” pain in right shoulder and neck pain.
- Prior treatment: physical therapy including cervical traction and analgesics and muscle relaxers

Examination
- Forward head/rounded shoulders posture
- Localized pain to R shoulder/scapula not reproduced with palpation
- UE ROM WFL bilaterally
- UE strength testing 5/5 bilaterally, except R shoulder abduction (4/5 with pain)
- Decreased light touch sensation at R C6 dermatome
- Cervical AROM WNL but painful at end-range
- NDI 26%
- PSFS: 4.67 (Sleeping, Driving, Working)
- Increased pain with PA glides at C5-C7
- Reduction in neck pain with physical activity

Special Tests
<table>
<thead>
<tr>
<th>Special Test</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cervical Compression Test</td>
<td>+</td>
</tr>
<tr>
<td>Cervical Distraction Test</td>
<td>+</td>
</tr>
<tr>
<td>Shoulder Abduction Maneuver</td>
<td>- (Bilaterally)</td>
</tr>
</tbody>
</table>

Diagnosis
- Medical: cervical radiculopathy
- Physical Therapy: practice pattern 4F: Impaired Joint Mobility, Motor Function, Muscle Performance, Range of Motion, and Reflex Integrity Associated with Spinal Disorders

Prognosis
The APTA predicts that patients classified under this practice pattern will achieve their physical therapy goals and return to optimal function within 1-6 months through 8-24 physical therapy visits, based on patient presentation. Due to the patient’s age, chronicity of symptoms, and dominant upper extremity as the affected side, this patient’s plan of care was set at 2 visits per week for 6-8 weeks.

Interventions
- Phase I: Pain reduction, postural improvement, centralization of symptoms
  - Postural strengthening and stretching, scapular strengthening, intermittent mechanical traction, IFES
  - Phase II: Strengthening within cervical extension directional preference
  - Added spinal extension mobilizations: self (Visits 4-8) and manual (Visits 9-11)

OUTCOMES

Self Report Outcome Measures
- NDI 32%
- PSFS: 6.33

CONCLUSION

Due to the single subject design of this study, limited literature regarding this approach for chronic symptoms, and collection of data during only a portion of this patient’s plan of care, more research is needed to determine the most effective treatment strategy for chronic cervical radiculopathy and to generalize these results to a larger patient population.

This poster design is adapted from
Management of Subacromial Impingement Syndrome Through a Manual Approach in an Older Adult: A Case Report

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Department of Physical Therapy, Augusta University, Augusta, GA

INTRODUCTION

Subacromial impingement syndrome (SIS) accounts for 40% of shoulder disorders and is the most common cause of shoulder pain. SIS has been defined as compression of the rotator cuff and subacromial bursa between the humerus and coracacromial arch. The presentation of symptoms can vary from minor inflammation of the rotator cuff tendons to significant degeneration of the tendon. The initial goal of PT is reducing pain and achieving full pain free ROM if possible. One technique to include in the rehab process of treating SIS may be manual therapy to help restore ROM and function to the shoulder. A few examples of manual therapy for SIS found in the literature include mobilization with movement and joint mobilization. This patient case will help present potential evidence-based treatment methods that can be used to treat SIS in the older adult (>70 years old). This is an area where there is a high prevalence of SIS but little evidence found in the literature.

CASE DESCRIPTION

History:
A 75-year-old, right hand dominant, female was referred for outpatient PT after experiencing bilateral (BL) shoulder pain of insidious onset. The patient reported the symptoms began after an increase in activity at home with no specific mechanism of injury. Her previous physical therapy did not include the use of manual techniques and was not clinically effective in managing her symptoms. The patient’s chief complaint was consistent, diffuse pain in both shoulders, which increased with overhead activities and during the night. Her main goal was to reduce BL shoulder pain in order to resume daily activities without pain or limitation.

Examination:

- Range of Motion in Bilateral UE
  - Active Flexion: 130
  - Passive Flexion: 170
  - Internal Rotation: 45
  - External Rotation 80

Manual muscle testing was performed for the following joint motions bilaterally: shoulder flexion, shoulder internal and external rotation (0 and 90 degrees of abduction), elbow flexion and elbow extension. The patient scored a 4+5 for all of these motions bilaterally.

Evaluation:

Based on the patient’s history, physical therapy examination, and special test findings, we diagnosed the patient with BL rotator cuff tendinitis with probable subacromial impingement syndrome.

Diagnosis:

- Medical: Bilateral Shoulder Tendonopathy
- Physical Therapy: Pattern 4D: Impaired Joint Mobility, Motor Function, Muscle Performance, and Range of Motion Associated with Connective Tissue Dysfunction
- ICD 10 Codes: S46.011D and S46.012D, which are strain of muscle(s) and tendon(s) of the rotator cuff of right and left shoulder respectively.

Prognosis:

The APTA guide suggests the number of visits for practice pattern 4D to be 3 to 36 visits. Within this time frame, the patient is expected to achieve anticipated goals and functional expectations. After a review of the literature, the projected time for the treatment of SIS with manual therapy is suggested to be approximately 1-2 visits/wk. for 6 weeks. Therefore, the average for a patient with SIS would be between 6 and 12 visits.

Interventions:

The treatment plan was divided into two phases:
1. Initial Exercise and 2. Exercise + Manual Therapy.

During the Initial Exercise phase, all exercises were aimed at improving posture, strength and shoulder stabilization. Progression to phase 2 occurred at visit 3 once she demonstrated the ability to perform the original exercises correctly and felt comfortable beginning manual therapy. The Exercise + Manual Therapy phase included the original exercises used in Phase 1 but added manual interventions. The primary manual therapy technique used for this patient was mobilization with movement in which the therapist utilized an accessory posterior-lateral glide on the humeral head combined with active shoulder flexion by the patient. Scapular mobilization was also a manual technique that was utilized in the treatment program aiming to improve scapular kinematics and allow the shoulder complex to move in proper planes. Because this patient presented with BL shoulder pain with similar etiology, the treatment protocol was performed on both shoulders.

RESULTS/OUTCOMES

The DASH questionnaire, pain-free scapion ROM and the NPRS were all used to record outcomes for this patient. Her DASH questionnaire improved from 48 on the initial visit to 19 on discharge. Her pain-free scapion ROM improved from an initial measure of 80° bilaterally to 100° on the left and 125° on the right. This is a measure of pain-free ROM. It should be noted that the patient’s overall AROM increased as well. The NPRS score was rated at best, present and worst in the past week and then also at present. There was a significant change in the NPRS score at present over the course of treatment. Both of these scores meet the MCID of 2 for this measure with changes of 4 points and 3 points respectively.

DISCUSSION

The patient responded well to the manual therapy techniques and demonstrated clinically important changes. She also did not experience an exacerbation of symptoms. With this success, it should be noted that this research demonstrates a need for more research on SIS in older individuals as well as manual therapy in this population. The limitations of this study include the use of two self report measures in the NPRS and DASH questionnaire. Also, this report is not an experimental design that can evaluate cause for improvement. This report aimed solely to provide an example of an older patient who appears to benefit from the use of manual therapy techniques.

CONCLUSION

This case report provides preliminary, low-level evidence that the use of manual therapy on an older adult (>70 years old) may be beneficial for improving shoulder pain and function. Further research is needed in this demographic with larger populations and the use of a randomized control trial design.
Introduction
Chronic low back pain (LBP) is the second leading cause of physician visits and the third most common reason for surgery in the US. Disc herniation, soft tissue injury, poor and slumped posture, and muscle weakness have all been suggested to cause LBP. Weakness of the trunk stabilizing muscles has shown to be one of the more common factors in causing LBP. Many studies have suggested the effectiveness of core strengthening for LBP. However, these studies have neglected to look at the effects of core strengthening in the elderly population. It has also been suggested that spinal dysfunction can cause LBP. Most spinal dysfunction is caused by hypomobility of a particular vertebral segment. Oftentimes, hypomobility of the lumbar spine is the most significant cause of LBP. It has been observed that hypomobility of the lumbar spine could be associated with hypomobility of the thoracic spine. Since lumbar hypomobility can be associated with thoracic hypomobility, it could be argued that manual mobilization of the thoracic spine could be beneficial for patients with LBP. As mentioned, there have been many studies that reported core stabilization exercises provide stabilization by strengthening the lumbar muscles of patients with LBP; but few studies have looked at LBP treatment with thoracic mobilization. Even Fewer have looked at this when the elderly population variable is added. The purpose of this case study is to observe a patient’s response to a regimen of core strengthening exercises coupled with thoracic mobilization.

Methods
Design: Case Report
Case Description
History:
• 64-year-old female who currently works as a professor at a local college
• Spends day a her desk grading papers and reaching into undesirable positions to write on her whiteboard
• On-and-off LBP for nine years
• Has seen orthopedists, a chiropractor, masseuse, pelvic floor specialist and yoga instructors with mild, temporary relief
• Aggravating factors include standing from her chair, long walks with her dog, bending over desks to help students, and long walks. PMH: None

Examination:
Table 1: Active Range of Motion

Table 2: Strength

Table 3: Special Tests

Evaluation
• As evidenced by the aforementioned subjective pain aggravating factors, objective exam findings, the patient appears to have symptoms consistent with her medical diagnosis of LBP.
• These findings suggest if it may be due to weak trunk stabilizing muscles and thoracic hypomobility.

Diagnosis
Medical: Low Back Pain
Physical therapy:
• Primary: Practice Pattern 4D: Impaired Joint Mobility, Motor Function, Muscle Performance, and Range of Motion Associated With Connective Tissue Dysfunction.
• Secondary: LBP due to hypomobile thoracic spine and deconditioned core.

Prognosis
• APTA Guide the Physical Therapy Practice: visits for Pattern 4D is 8-24 visits.
• Studies suggest that the patient could see the desired results in just 10 visits.
• To be seen once per week for up to 10 weeks based on the reviewed evidence.

Interventions
• Was seen once per week over 7 weeks with 2 cancelations due to conflicts at work.
• Strengthening exercise, stretching exercises and manual therapy techniques.
• Phase 1: focused on teaching the patient how to effectively contract her trunk stabilizing muscles without making her flex or extend her back and on improving thoracic spine mobility.
• Phase 2: added functional aspects to Phase 1 to apply to activities at work and home.
• Criterion for moving to Phase 2 was a NPRS rating of less than 2/10 with the supine exercises.
• Expected to take 3-4 visits, patient met the criterion at the second visit.
• Phase 3 began at the third visit and lasted the remainder of visits. Tables 4 and 5 show interventions during each phase.

Results/Outcomes
• NPRS, Active Lumbar Range of Motion and Oswestry Disability Index used.
• All three showed significant improvements.
• NPRS improved from a 7/10 with movement and 4/10 at rest to 1/10 and 0/10 respectively. These findings can be found in Figure 2 below.

Table 4: Phase 1

Table 5: Phase 2

Discussion
The purpose of this case study was to examine the effects that thoracic spine mobilization coupled with lumbar stabilization exercises on LBP. The patient saw significant improvements in her pain as well as her ability to perform her duties at work. The patient quickly progressed from Phase 1 to Phase 2 after only 2 visits. The patient saw improvements in NPRS, ODI and AROM.

Conclusion
This case report provides a specific physical therapy treatment regimen used to treat a patient who suffered from LBP. Based on how the patient presented, she was treated using core strengthening exercises along with thoracic spine mobilization techniques. The findings of this report support the fact that elderly patients with LBP may benefit from a plan of care that includes both thoracic mobilization and lumbar stabilization exercises. There is limited research to support the claim that these two treatment strategies, when combined, can be effective for treating LBP. It should be noted that the results of this case report are specific to one patient and may not be generalizable to all patients with LBP. Therefore, more research needs to be conducted on patients with similar presentations to the patient in this study.