Core Muscle Activation During Yoga Poses In Untrained Individuals

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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.

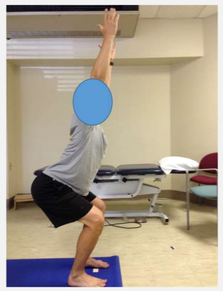
Subjects

- 30 total subjects (15 male, 15 female)

	Mean	St. Deviation
Age	24.7	2.1
Height	174.1	8.6
Mass	71.6	13.0

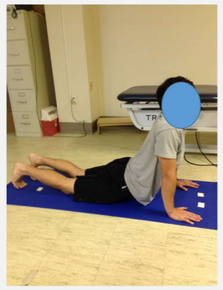
Methods

- 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.

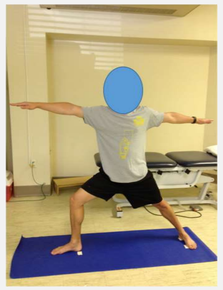


Chair Pose

High Plank Pose

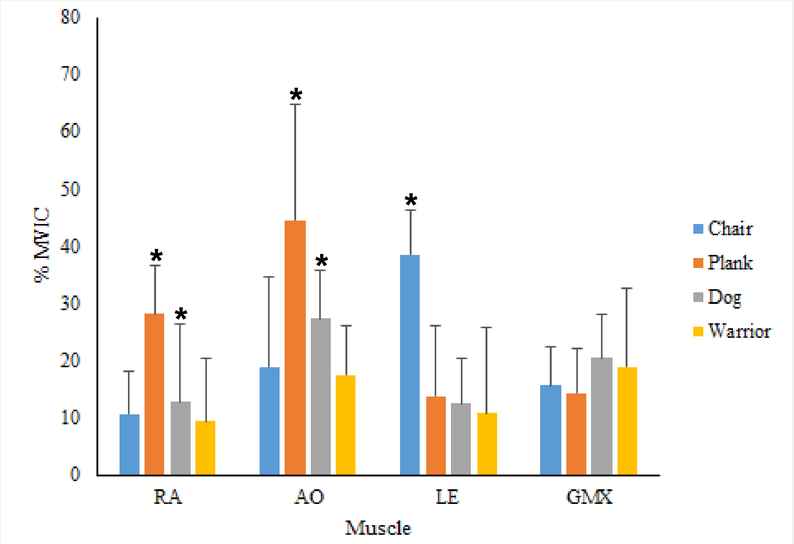


Upward Facing Dog Pose



Warrior II Pose

Results



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

Cramer H, et al. *Am J Prev Med,* 2016;*50(2):230-235.*
Ni M., et al. *Complement Ther Med*, 2014. 22(2): 235-243.
Ni, M., et al . *Complement Ther Med*, 2014. 22(4): 662-669.
Reiman, M.P., et al. *Physiother Theory Pract*, 2012. 28(4): 257-68.

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

AUGUSTA UNIVERSITY

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Introduction

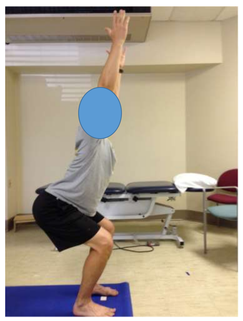
- Yoga, originating in India over 3,000 years ago, offers a holistic approach to health and wellness through physical postures, breathing techniques, and meditation.
- According to the same 2012 NIHS survey, 78.4% of responders reported that they believed yoga would improve their general wellness or prevent disease.
- Surface EMG has be 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

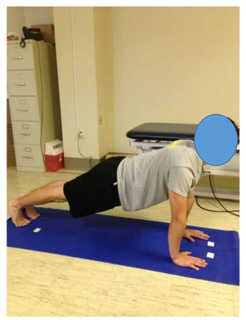
	Sex	N	Mean	Std Dev.
Age	Female	15	24.0	1.3
	Male	15	25.4	2.6
Height	Female	15	168.7	6.1
	Male	15	179.5	7.2
Mass	Female	15	62.1	8.7
	Male	15	81.2	9.0

Methods

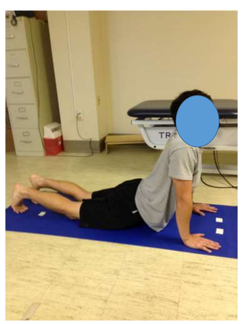
- Subjects performed 4 commonly prescribed yoga poses similar to core exercises prescribed for rehabilitation
- EMG activity was collected for the rectus abdominis (RA); abdominal obliques (AO); lumbar extensors (LE); gluteus maximus (GMX); and gluteus medius (GM).
- EMG data were expressed as 100% of 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



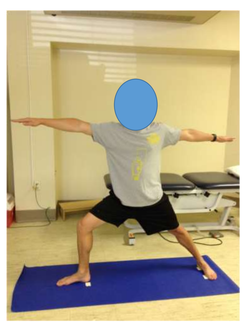
Chair Pose



High Plank Pose

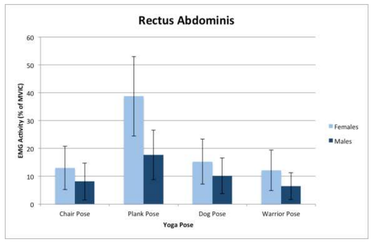


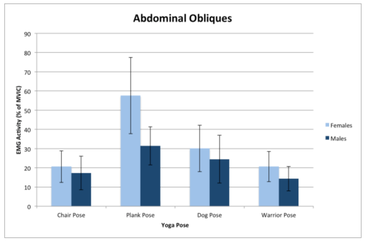
Upward Facing Dog Pose

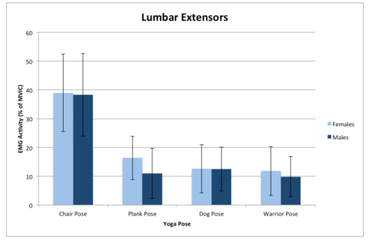


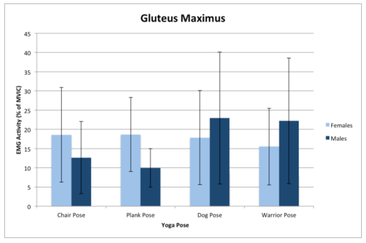
Warrior II Pose

Results









Introduction

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

Cramer H, et al. *Am J Prev Med,* 2016;*50(2):230-235.*
Ni M., et al. *Complement Ther Med*, 2014. 22(2): 235-243.
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Unsafe Driving in the Oldest Old: A Retrospective Cohort Study

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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 pathological systemic dysfunction and comorbidities[1].
- 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 2050[1].
- 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=804), and oldest-old participants aged >85 (n=224).
- 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.

RESULTS

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 ($p=0.8762$).

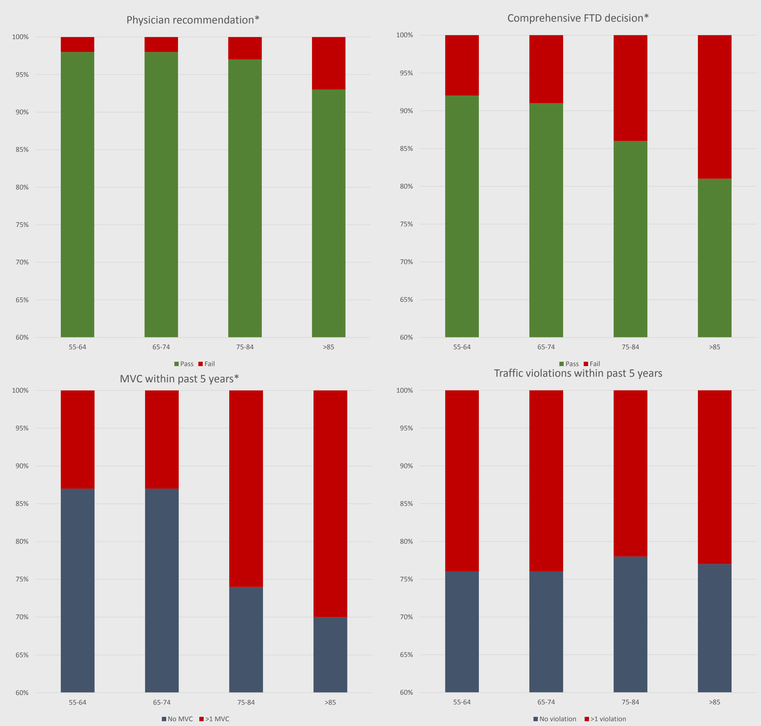

Figure 1. Driving variables of groups 1 - 4

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

Variable	Middle-aged (55-64) (n=1386)	Young-old (65-74) (n=1013)	Old-old (75-84) (n=803)	Oldest-old (>85) (n=223)
Age, y	59 (57-62)	69 (66-71)	79 (77-82)	87 (86-89)
Sex, male, n	980 (71)	780 (77)	630 (78)	174 (78)
Previous CARA visits, n	1 (1-2)	1 (1-2)	1 (1-2)	1 (1-2)
Reason for application, n				
Change in medical condition	461 (39)	297 (35)	198 (29)	47 (25)
Extension of driver's license	552 (46)	432 (50)	279 (42)	100 (53)
New driver's license	18 (2)	14 (2)	17 (3)	1 (1)
Mandatory referral	160 (13)	114 (13)	178 (26)	41 (22)
Primary medical condition, n				
Neurological	1078 (78)	811 (80)	553 (69)	119 (53)
Psychiatric	40 (3)	12 (1)	16 (2)	9 (4)
Musculoskeletal	162 (12)	97 (10)	73 (9)	20 (9)
Visual	14 (1)	7 (1)	33 (4)	20 (9)
Vestibular or hearing	1 (0)	2 (0)	2 (0)	3 (1)
Cardio or pulmonary	34 (2)	32 (3)	90 (11)	42 (19)
Liver or renal	6 (0)	3 (0)	7 (1)	1 (0)
Sleep	8 (1)	4(0)	4 (0)	2 (1)
Diabetes	34 (2)	37 (4)	23 (3)	6 (3)
Substance abuse	7 (1)	8 (1)	2 (0)	1 (0)
Comorbidities, n				
No comorbidity	762 (55)	486 (48)	349 (43)	108 (48)
1+ comorbidity	624 (45)	527 (52)	454 (57)	115 (52)

Table 2. Risk of unsafe driving across age groups

Variable	Middle-aged (55-64) (n=1386)	Young-old (65-74) (n=1013)	Old-old (75-84) (n=803)	Oldest-old (>85) (n=223)	P-Value Kruskal Wallis	Post-hoc Mann Whitney
Physician Recommendation					<0.0001	1-4
Pass	1243 (98)	925 (98)	677 (97)	172 (93)		
Fail	21 (2)	16 (2)	24 (3)	13 (7%)		
Comprehensive FTD Decision					<0.0001	1-3, 1-4, 2-3, 2-4
Pass	1275 (92)	922 (91)	693 (86)	180 (81)		
Fail	111 (8)	91 (9)	110 (14)	43 (19)		
MVC Past 5 Years					<0.0001	1-3, 1-4, 2-3, 2-4
No MVC	858 (87)	604 (87)	425 (74)	109 (70)		
1+ MVC	130 (13)	91 (13)	151 (26)	46 (30)		
Traffic Violations Past 5 Years					0.8762	N/A
No traffic violation	754 (76)	560 (76)	448 (78)	119 (77)		
1+ traffic violation	235 (24)	174 (24)	127 (22)	35 (23)		

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.

REFERENCES

1. Ortman JM, Velkoff VA, Hogan H. An Aging Nation: The Older Population in the United States. 2014. Accessed March 21, 2016, 2016.
2. Henderson S, Gagnon S, Collin C, Tabone R, Stinchcombe A. Near peripheral motion contrast threshold predicts older drivers' simulator performance. *Accident; analysis and prevention.* 2013;50:103-109.
3. Ott BR, Papandonatos GD, Davis JD, Barco PP. Naturalistic validation of an on-road driving test of older drivers. *Human factors.* 2012;54(4):663-674.
4. Hollis AM, Duncanson H, Kapust LR, Xi PM, O'Connor MG. Validity of the mini-mental state examination and the montreal cognitive assessment in the prediction of driving test outcome. *Journal of the American Geriatrics Society.* 2015;63(5):988-992.
5. Jones Ross RW, Cordazzo ST, Scialfa CT. Predicting on-road driving performance and safety in healthy older adults. *Journal of safety research.* 2014;51:73-80.
6. Vaucher P, Herzig D, Cardoso I, Herzog MH, Mangin P, Favrat B. The trail making test as a screening instrument for driving performance in older drivers; a translational research. *BMC geriatrics.* 2014;14:123.
7. Papa M, Boccardi V, Prestano R, et al. Comorbidities and crash involvement among younger and older drivers. *PloS one.* 2014;9(4):e94564.
8. Broberg T, Dukic Willstrand T. Safe mobility for elderly drivers--considerations based on expert and self-assessment. *Accident; analysis and prevention.* 2014;66:104-113.
9. Hoggarth PA, Innes CR, Dalrymple-Alford JC, Jones RD. Predicting on-road assessment pass and fail outcomes in older drivers with cognitive impairment using a battery of computerized sensory-motor and cognitive tests. *Journal of the American Geriatrics Society.* 2013;61(12):2192-2198.
10. Manning KJ, Davis JD, Papandonatos GD, Ott BR. Clock drawing as a screen for impaired driving in aging and dementia: is it worth the time? *Archives of clinical neuropsychology : the official journal of the National Academy of Neuropsychologists.* 2014;29(1):1-6.
11. Classen S, Wang Y, Crizzle AM, Winter SM, Lanford DN. Predicting older driver on-road performance by means of the useful field of view and trail making test part B. *The American journal of occupational therapy : official publication of the American Occupational Therapy Association.* 2013;67(5):574-582.
12. Aksan N, Dawson JD, Emerson JL, et al. Naturalistic distraction and driving safety in older drivers. *Human factors.* 2013;55(4):841-853.
13. Dobbs BM, Shergill SS. How effective is the Trail Making Test (Parts A and B) in identifying cognitively impaired drivers? *Age and ageing.* 2013;42(5):577-581.
14. Ott BR, Davis JD, Papandonatos GD, et al. Assessment of driving-related skills prediction of unsafe driving in older adults in the office setting. *Journal of the American Geriatrics Society.* 2013;61(7):1164-1169.
15. Rapoport MJ, Naglie G, Weegar K, et al. The relationship between cognitive performance, perceptions of driving comfort and abilities, and self-reported driving restrictions among healthy older drivers. *Accident; analysis and prevention.* 2013;61:288-295.
16. Reimer B, Donmez B, Lavalliere M, Mehler B, Coughlin JF, Teasdale N. Impact of age and cognitive demand on lane choice and changing under actual highway conditions. *Accident; analysis and prevention.* 2013;52:125-132.
17. Classen S, Wang Y, Winter SM, Velozo CA, Lanford DN, Bedard M. Concurrent criterion validity of the safe driving behavior measure: a predictor of on-road driving outcomes. *The American journal of occupational therapy : official publication of the American Occupational Therapy Association.* 2013;67(1):108-116.
18. Classen S, Wang Y, Crizzle AM, Winter SM, Lanford DN. Gender differences among older drivers in a comprehensive driving evaluation. *Accident; analysis and prevention.* 2013;61:146-152.
19. Wood JM, Horswill MS, Lacherez PF, Anstey KJ. Evaluation of screening tests for predicting older driver performance and safety assessed by an on-road test. *Accident; analysis and prevention.* 2013;50:1161-1168.
20. Crizzle AM, Classen S, Bedard M, Lanford D, Winter S. MMSE as a predictor of on-road driving performance in community dwelling older drivers. *Accident; analysis and prevention.* 2012;49:287-292.
21. Ferreira IS, Simoes MR, Maroco J. The Addenbrooke's Cognitive Examination Revised as a potential screening test for elderly drivers. *Accident; analysis and prevention.* 2012;49:278-286.
22. Wood JM, Lacherez PF, Anstey KJ. Not all older adults have insight into their driving abilities: evidence from an on-road assessment and implications for policy. *The journals of gerontology. Series A, Biological sciences and medical sciences.* 2013;68(5):559-566.
23. Emerson JL, Johnson AM, Dawson JD, Uc EY, Anderson SW, Rizzo M. Predictors of driving outcomes in advancing age. *Psychology and aging.* 2012;27(3):550-559.
24. Aksan N, Anderson SW, Dawson JD, Johnson AM, Uc EY, Rizzo M. Cognitive functioning predicts driver safety on road tests 1 and 2 years later. *Journal of the American Geriatrics Society.* 2012;60(1):99-105.
25. Selander H, Bolin I, Falkmer T. Does automatic transmission improve driving behavior in older drivers? *Gerontology.* 2012;58(2):181-187.
26. Bedard M, Riendeau J, Weaver B, Clarkson A. Roadwise Review has limited congruence with actual driving performance of aging drivers. *Accident; analysis and prevention.* 2011;43(6):2209-2214.
27. Adrian J, Postal V, Moessinger M, Rascle N, Charles A. Personality traits and executive functions related to on-road driving performance among older drivers. *Accident; analysis and prevention.* 2011;43(5):1652-1659.
28. Anstey KJ, Wood J. Chronological age and age-related cognitive deficits are associated with an increase in multiple types of driving errors in late life. *Neuropsychology.* 2011;25(5):613-621.
29. Krishnasamy C, Unsworth CA. Normative data, preliminary inter-rater reliability and predictive validity of the Drive Home Maze Test. *Clinical rehabilitation.* 2011;25(1):88-95.
30. Lombardi DA, Horrey WJ, Courtney TK. Age-related differences in fatal intersection crashes in the United States. *Accident Analysis and Prevention. 2016;99:20-29.*

ACKNOWLEDGEMENTS

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

AUGUSTA UNIVERSITY

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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.

PARTICIPANTS

Participant 1
- 4 y/o male
- Autistic Spectrum
- Speech delay & decreased attention

Participant 2
- 7 y/o male
- Autistic Spectrum
- ADHD

Participant 3
- 21 y/o male
- Down Syndrome

Participant 4
- 26 y/o female
- Down Syndrome

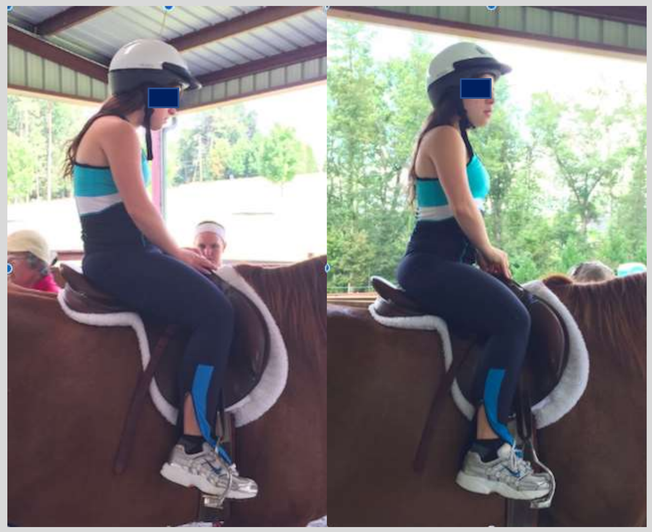
METHODS

TREATMENT STRATEGY

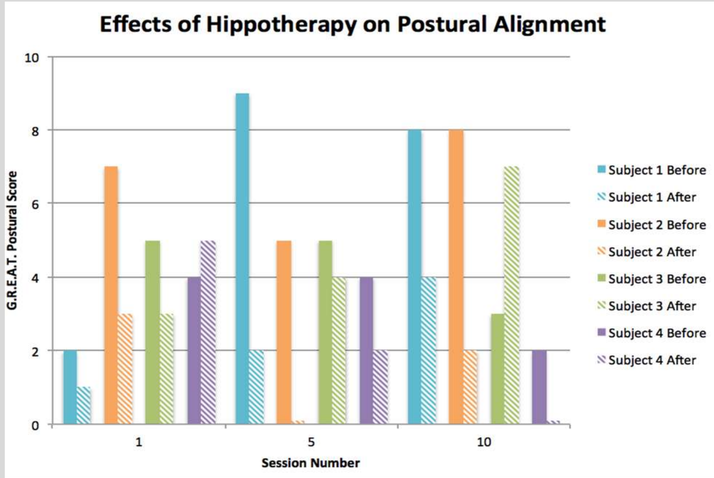
- 45-minute weekly treatment sessions for 10 consecutive sessions
- Sessions individualized and implemented by an NAHRA-certified occupational therapist for each participant
- Sample activities on the horse:
  - Reaching activities
  - Active ROM
  - Diagonal Patterns
- Emphasis placed on correct postural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

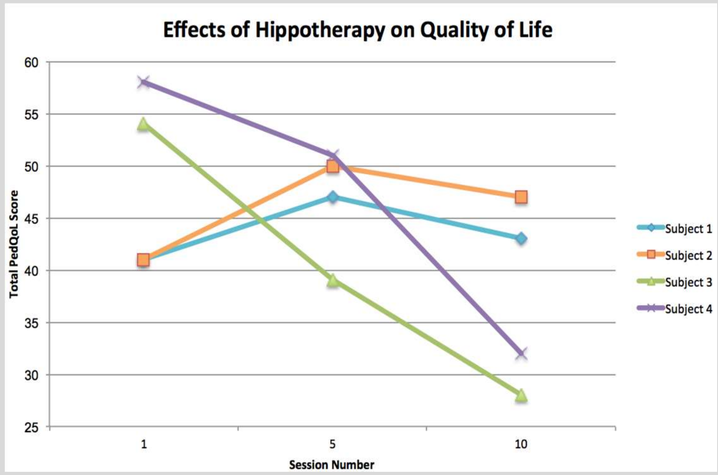
OUTCOME MEASURES

- 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

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Background

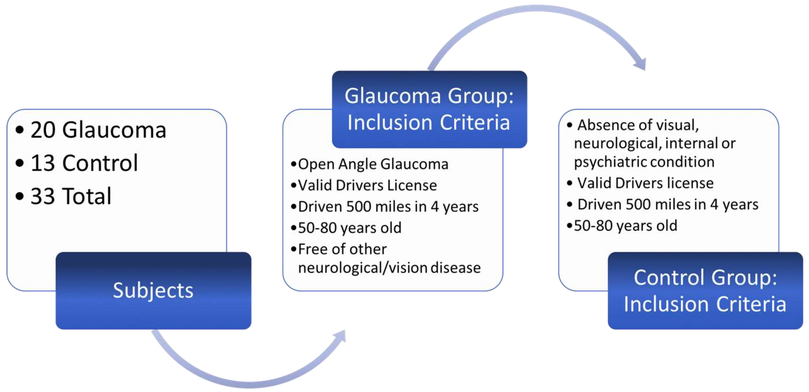
- More than 2.2 million United States citizens and 6.7 million people in the world currently have glaucoma.
- Open-angle glaucoma is chronic and causes a loss of visual field (VF), that starts in the periphery and moves centrally.
- There are many VF tests, but as of current there is not a specific screening 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

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.



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

This poster design is adapted from "Allgood M, Pilcher M, Stout A, Threeths J, Cortez-Cooper M. Alter-G Training Following a Total Knee Replacement" located at http://www.augusta.edu/alliedhealth/pt/researchcourse/documents/2016posters.pdf.

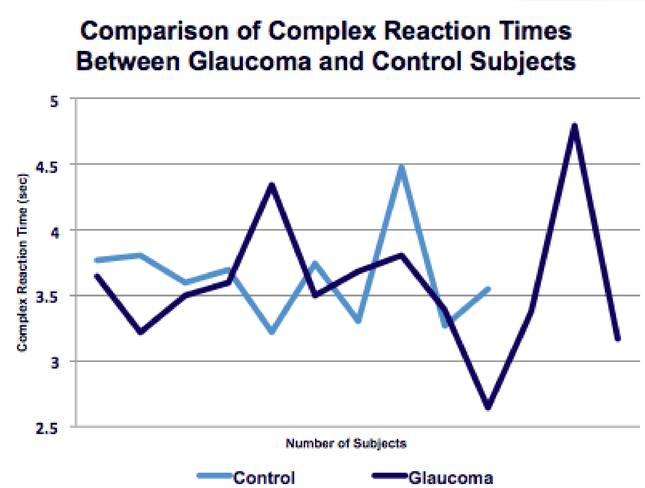
Results

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.

	Control (r values)	Glaucoma (r values)
Humphrey Right MD	-0.40	-0.58*
UFOV PS	-0.29	-0.53*
Complex Reaction Time	0.10	0.57**

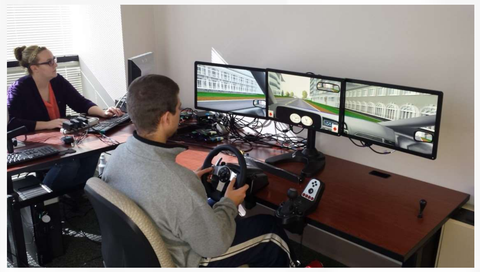
* = glaucoma group significantly correlates with variable; ** = Triptot (on road driving test significantly correlates with complex reaction time (CRT)



Methods Continued

Dynamic Driving Simulator:

- Computer system used for the driving simulation was M100WS of STISIM Drive. Three computer screens provided a 100˚ horizontal and 20˚ vertical field of view (FOV). (Seen below)
- During the simulated drive, symbols were projected throughout the VF (114 in total). Subjects were to press a button when one appeared
- Each simulation scenario (4 in total) lasted 18-20 minutes, depicting day-to-day city/rural driving events (maneuvering traffic, changing lanes, changing speed).
- An eye tracker was used with each subject, measuring eye and gaze movements
- The simulator was performance-based, including the VF simulation and eye tracking



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/or 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 (Triptot) and the most commonly used Humphrey VF Test. This study is only the beginning for determining if the Dynamic Driving Simlator 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.

Visual Search in Parkinson's Disease

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INTRODUCTION

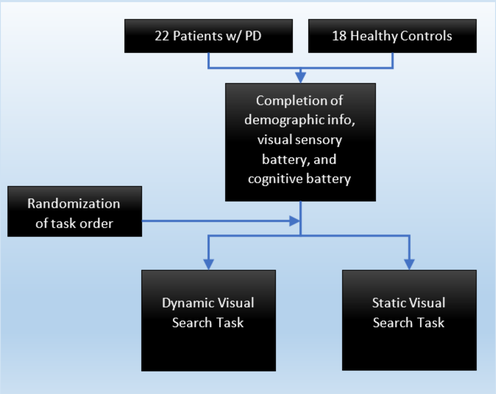
- Parkinson's disease (PD) is a progressive movement disorder that impairs motor function through inhibiting dopamine production in the basal ganglia.
- In this process, many daily activities are affected including driving.
- One aspect of driving is visual search. It involves the ability to actively 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]
- 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



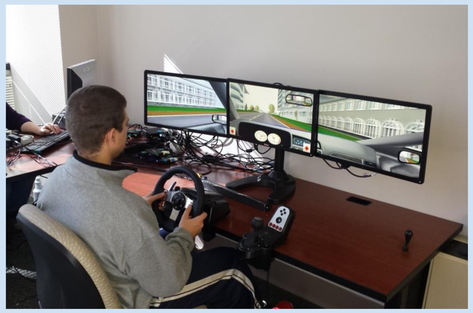


Figure 1. STISIM driving simulation setup[3]

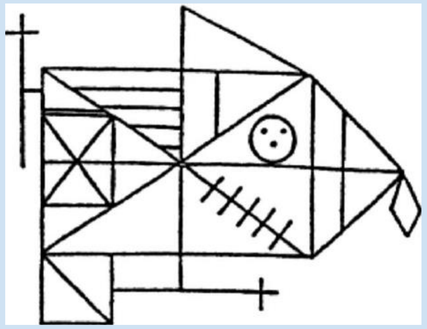


Figure 2. Rey-Osterrieth Complex Figure[4]

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 R^2 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.

Variable	Controls N = 15	PD patients N = 20	Statistical test, P value
Age, years	**61 ± 11**	**69 ± 8**	**t student, 0.025**
Sex (male), %	47	80	Fisher, 0.07
Education, years	15 (13 – 20)	17 (16 – 18)	W, 0.49
MOCA score (0-30)	**29 (27 – 30)**	**26 (20 – 27.5)**	**W, 0.001**
Disease duration, years	NA	5 (2 – 7)	NA
LED, mg/day	NA	340 (250 – 733)	NA
Hoehn and Yahr stage (on)	NA	2 (2 – 3)	NA
UPDRS motor (on)	NA	31 (19.5 – 38.5)	NA

Figure 3. Demographic and clinical characteristics

Variable	Controls N = 15	PD patients N = 20	Statistical test, P value adjusted for age
UFOV speed of processing, ms	17 (17 – 17)	20 (17- 70)	Chi², 0.07
UFOV divided attention, ms.	47 (23 – 130)	176 (50 – 500)	Chi², 0.18
UFOV selective attention, ms.	187 (133 – 227)	354 (169 – 500)	Chi², 0.14
TMT A, s.	30 (21 – 37)	45 (32 – 63)	Chi², 0.11
TMT B, s.	**71 (53- 80)**	**128 (80 – 177)**	**Chi², 0.03**
Stroop test color condition, score	**69 (62 – 87)**	**54 (40 - 64)**	**ANOVA, 0.02**
Stroop test word condition, score	96 (82 - 100)	77 (56 – 100)	ANOVA, 0.39
Stroop test color-word condition, score	39 (33 – 44)	29 (16 - 38)	ANOVA, 0.10
Dot Cancellation times, seconds	405 (350 – 589)	587 (451 – 883)	Chi², 0.12
Dot Cancellation errors	4 (3 – 9)	7 (2 – 15)	Chi², 0.68
ROCF /36	**36 (34 – 36)**	**31 (25 – 35)**	**Chi², 0.03**

Figure 4. Neuropsychological performances

Variable	Controls N = 15	PD patients N = 20	Statistical test, P value adjusted for age
Accuracy, %	90 ± 7	87 ± 10	ANOVA, 0.918
Correct response times, s.	**7 ± 1**	**9 ± 2**	**ANOVA, 0.001**
Target present			
Correct response times, s.	**5 ± 1**	**7 ± 2**	**ANOVA, 0.004**
Target absent			
Correct response times, s.	9 ± 2	10 ± 2	ANOVA, 0.142
Correct responses, n	38 (34 – 40)	35.5 (28 – 38)	Chi², 0.221
False alarms[a], n	0 (0 - 1)	0 (0 - 1)	Chi², 0.283
No detections[b], n	3 (1 – 6)	3 (2 – 5)	Chi², 0.987
Omissions when target present, n	**0 (0 – 0)**	**0 (0 – 2)**	**Chi², 0.040**
Omissions when target absent, n	**0 (0 – 1)**	**1 (0 – 5)**	**Chi², 0.009**

Figure 5. Visual search performances

Variable	MOCA	UFOV Part 2	Stroop Interference	ROCF Score	Time – Dot Cancellation Test	Errors – Dot Cancellation Test	RT – TMT part A	RT – TMT part B	RT – Prosaccade
PD Patients	-.676 (0.001)	.601 (0.005)	-.666 (0.005)	**-.759 (0.0001)**	.569 (0.042)	.837 (0.000004)	.576 (0.008)	.673 (0.002)	-.525 (0.044)

Figure 6. Spearman correlations to visual search RT (target present)

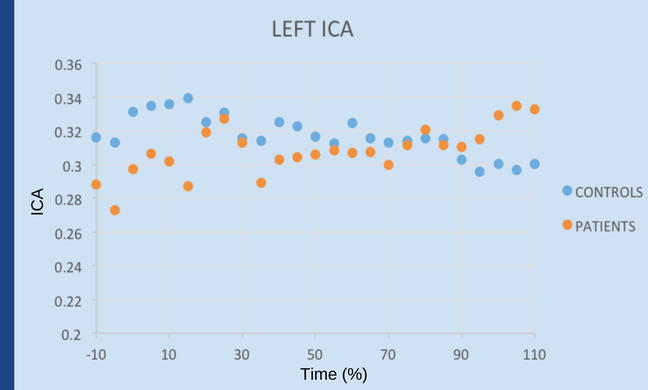


Figure 7. Correct detections (target present) Left ICA

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.

REFERENCES

1. Devos, H., Vandenberghe, W., Tant, M., Akinwuntan, A. E., De Weerdt, W., Nieuwboer, A., & Uc, E. Y. (2013). Driving and off-road impairments underlying failure on road testing in Parkinson's disease. *Movement Disorders, 28*(14),1949-1956. doi:10.1002/mds.25701
2. Uc EY, Rizzo M, Johnson AM et al. Real-life driving outcomes in Parkinson disease. Neurology 2011;76:1894–1902
3. Augusta University Simulator Lab [Digital image]. (n.d.). Retrieved June 20, 2017, from http://www.augusta.edu/alliedhealth/pt/bio/lab/drivingsimulatorlab.php
4. Morgan, C. A., 3rd, Doran, A., Steffian, G., Hazlett, G., & Southwick, S. M. (2006). Stress-induced deficits in working memory and visuo-constructive abilities in Special Operations soldiers. *Biol Psychiatry, 60*(7), 722-729. doi:10.1016/j.biopsych.2006.04.021

ACKNOWLEDGEMENTS
This poster design is adapted from "Hagler H, Patton M, Cortez-Cooper M, Akinwuntan A, Devos H. "Driving Training in Individuals with Relapsing-Remitting Multiple Sclerosis: An Ongoing Study" located at http://www.augusta.edu/alliedhealth/pt/researchcourse/documents/2016posters.pdf.

ABBREVIATIONS
MOCA, Montreal Cognitive Assessment
LED, Levodopa Equivalent Dose
On, on medication
UPDRS, Unified Parkinson Disease Rating Scale
UFOV, Useful Field of View
TMT A, Trail Making Test part A
TMT B, Trail Making Test part B
ROCF, Rey-Osterrieth Complex Figure
RT, Response Time
ICA, Index of Cognitive Activity

A FITNESS BOOT CAMP WORKOUT GONE WRONG: A CASE REPORT OF PATELLOFEMORAL PAIN

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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.

	Concept
Phase One	Concept and Basic Strengthening
Phase Two	Introduction to Functional Weight-Bearing Exercises
Phase Three	Plyometric/Agility-Focused Intervention

Table 1

Selected Interventions for Phase One
Hip Flexor Stretch
Calf Stretch
Sup. Hamstring Stretch
Reverse Clamshell
T-Band Ankle Inversion
Bridging with TA Set
MT: Patellar Joint Mobs

Table 2

Selected Interventions for Phase Two
Wall Squats
Ball Toss on Trampoline
Lateral Squat Walks
Standing Hip ABD
Monster Walks
MT: Patellar Joint Mobs & PNF HR-CR

Table 3

Selected Interventions for Phase Three
Forward Lunges onto BOSU
Plank with Knee Drives
Squat Jumps
Fast Feet Toe Taps
Treadmill Jogging
MT: PNF HR-CR

Table 4

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.

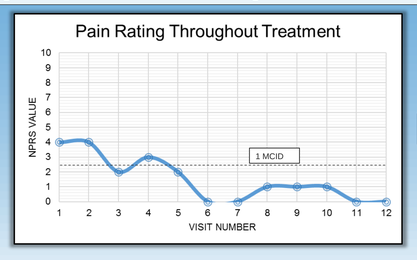

Figure 1

YBT: The patient demonstrated an improvement of all three directions past the unaffected extremity by 17%, 35%, and 25% for anterior, posterolateral, and posteromedial, respectively; a visual representation can be seen in Figure 2 below.
MMT: Significant findings have been reported in Table 5 below.
LEFS: The patient progressed from a score of 65/80 initially to 71/80 by the twelfth visit, not reaching the 9-point MCID value.
Functional Squat: The patient reported only reaching 87° of knee flexion prior to pain, initially. By the twelfth visit, 110° was reached prior to experiencing discomfort.

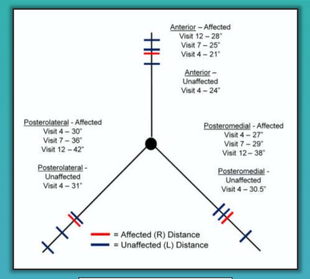

Figure 2

		Visit 1		Visit 7		Visit 12	
		R	L	R	L	R	L
Knee	Flexion	4	4+	4+	4+	4+	4+
	Extension	5	5	N/A	N/A	N/A	N/A
Hip	Flexion	4	4+	4+	4+	4+	4+
	Extension	4	4-	4+	4+	4+	4+
	Abduction	4-	4-	4+	4+	5	5
	Adduction	4-	4-	4	4	4+	4+
	Internal Rotation	4-	4-	4+	4	4+	4+
	External Rotation	4-	4-	4	4	4	4

Table 5

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.

This poster design is adapted from:
1. "Tucker N. Chronic Ankle Instability Due to Repeated Eversion Ankle Sprains: A Case Report"
2. "Suttles J, Hasson S. The Use of McKenzie Therapy in Conjunction with Bilateral LE Stretching/Strengthening Exercises as a Treatment of Low Back and Lumbo-Pelvic Pain with Radiculopathy: A Case Report"

Effects of Niacin Supplementation on Symptoms of Patients with Parkinson's disease

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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

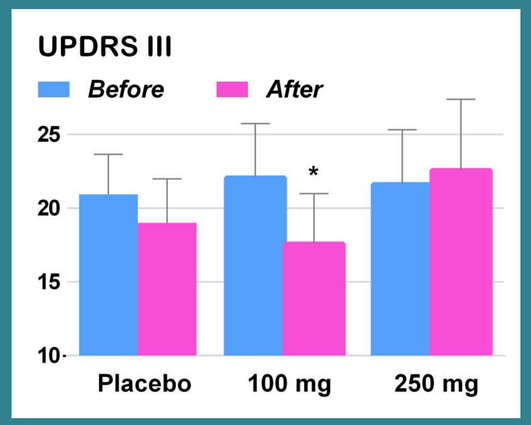
Group 3
Placebo

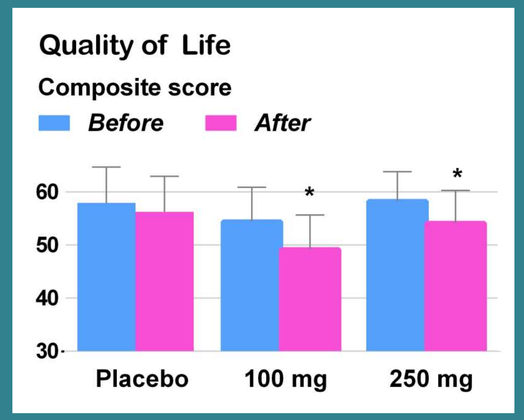
Initial Testing
Quality of Life Questionnaire
Trail Making Test
Stroop Test
UPDRS III
Quiet Standing Sway Test
Brain Activity Monitoring
EEG Sleep Analysis

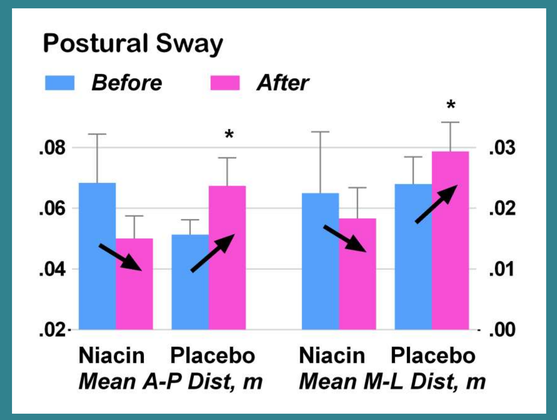
3 Month Double-Blinded, Placebo-Controlled, Semi-Pragmatic Trial

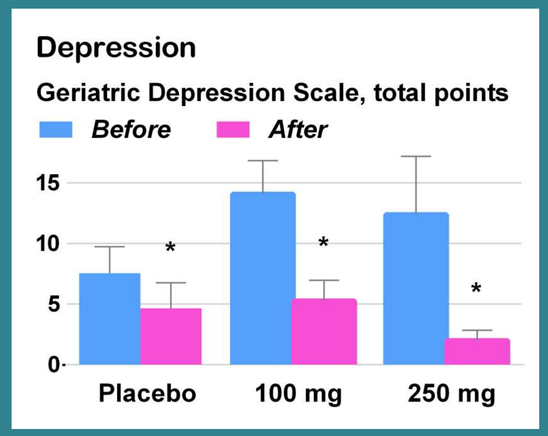
12 Month, Open-Labeled, Pragmatic Trial (250 mg. SR niacin)

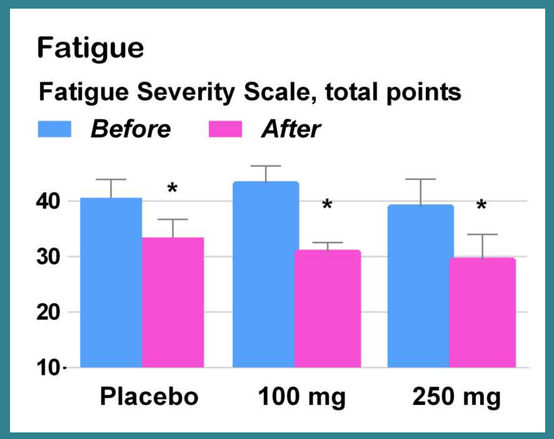
Results











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
Gao, H.-M., Liu, B., Zhang, W., & Hong, J.-S. (2003). Novel anti-inflammatory therapy for Parkinson's disease. *Trends in Pharmacological Sciences, 24*(8), 395-401.
Qian, L., & Flood, P. M. (2008). Microglial cells and Parkinson's disease. *Immunologic Research, 41*(3), 155-164. 2

Eye Catching Detectors of Motor and Functional Impairments in Parkinson's Disease

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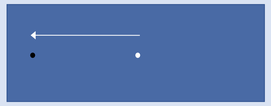
INTRODUCTION

- 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 instability[1]
- There are other non-motor symptoms that determine quality of life, including vision[2]
- Vision deficits include defects in eye movements, pupillary function, and ability to judge distance or shape of an object[2]
- Due to motor and visual impairments, the ability to successfully complete ADLs is affected in the PD population[3]
- The effect of oculomotor function on functional and motor impairments has not been widely studied in individuals with Parkinson's. One 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 initiation[4]

Prosaccade Task



Antisaccade Task

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 – and sex - matched controls participated in the study

Variable	PD (mean ± SD)	Controls (mean ± SD)
Age (years)	69.19 ± 8.75	60.29 ± 10.72
Gender	13 M / 4 F	8 M / 9F
Education (years)	16.86 ± 2.98	16.07 ± 3.63
UPDRS II	8.94 ± 7.26	N/A
UPDRS III	28.82 ±13.44	N/A
Hoehn and Yahr	2.31 ± .95	N/A

METHODS CONTINUED

Procedures

Tests performed by the participants were in randomized order:

Motor/Functional	Cognitive	Visual
TUG	MoCA	Keystone Vision Screener
UPDRS II	TMT - A	Prosaccade Task
UPDRS III	TMT - B	Antisaccade Task
Neck ROM	Stroop Color-Word	
Reaction Time Test	Dot Cancellation	
	Figure of Rey	
	UFoV	

Statistical Analysis

- Differences in clinical and demographic data and performance in visual, cognitive and motor tasks were examined using two tailed t-test
- Correlations between oculomotor, visual, and cognitive functions with UPDRS II, UPDRS III and TUG were calculated
- Linear regression analysis with TUG as the dependent variable and all visual, cognitive, and functional variables and the independent variables was ran to determine most predictive variable(s) of TUG performance

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, Stroop and Figure of Rey

	PD	Control	p-value
UFoV - Part 1	39.23 ± 34.05	17.66 ± 3.95	0.01*
UFoV - Part 3	285.43 ± 147.64	189.52 ± 122.39	0.05*
MoCA	25.18 ± 4.10	28.41 ± 1.66	0.01*
TMT - A	44.23 ± 23.52	29.93 ± 11.72	0.03*
TMT - B	124.59 ± 84.73	71.86 ± 26.18	0.03*
Stroop	24.44 ± 15.90	38.65 ± 8.48	0.00*
Figure of Rey	30.25 ± 7.82	34.47 ± 2.23	0.04*

UPDRS III

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

	H_Y	B/V Color Vision	UFoV (cat)	UFoV - Part 1	UFoV - Part 2	UFoV - Part 3	Visual Acuity	Contrast	MoCA	TMT-A	TMT-B	Figure of Rey	Dot Cancellation
r	.557	-.612	.657	.796	.600	.574	.794	.634	-.678	.575	.907	-.519	.537
p	.025	.012	.006	.000	.014	.020	.000	.011	.003	.020	.000	.039	.010

RESULTS CONTINUED

UPDRS II

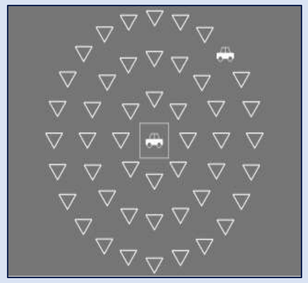
- UPDRS II was strongly related to UPDRS III, UFoV – cat, UFoV - Part 1, UFoV - Part 2, UFoV - Part 3, Visual Acuity, MoCA, TMT – B, Figure of Rey, and Dot-Cancellation

	UPDRS III	UFoV - cat	UFoV – Part 1	UFoV – Part 2	UFoV – Part 3	Visual Acuity	MoCA	TMT-B	Figure of Rey	Dot Cancellation
r	.733	.696	.764	.641	.614	.656	-.758	.754	-.641	.625
p	.001	.003	.001	.008	.011	.006	.000	.003	.007	.010

TUG

- ANOVA multivariate regression analysis of the correlations indicated that of all visual, cognitive, and functional variables, Useful Field Of View - Part 3 was the most significant predictor of TUG performance ($R^2 = 0.553$, $F = 6.18$, $p = .035$)

UFOV – Part 3



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. NINDS. (2014). Parkinson's Disease: Hope Through Research 2016.
2. Armstrong, R. A. (2011). Visual symptoms in Parkinson's disease. *Parkinsons Dis*, 908306.
3. Goodman, C. C., & Fuller, K. S. (2009). *Pathology: Implications for the Physical Therapist* (3rd ed.): Saunders, Elsevier Inc.
4. Ewenczyk, C., Mesmoudi, S., Callea C., Welter, M.L., Gaymard, B., Demain, A., et al. (2017). Antisaccades in Parkinson disease: a new marker of postural control? *J Neurol*, 88(9), 853-861.

Acknowledgements

This poster design is adapted from:

1. "Hagler H, Patton M, Cortez-Cooper M, Akinwuntan A, Devos H. Driving Training in Individuals with Relapsing-Remitting Multiple Sclerosis: An Ongoing Study." located at http://www.augusta.edu/alliedhealth/pt/researchcourse/research5.php
2. "Blackwell J, Cebul M, Hickman M, Smith M, Foley M. The Effects of a Community Based, Multimodal Exercise Program on Sleep Quality in Breast Cancer Survivors." located at http://www.augusta.edu/alliedhealth/pt/researchcourse/research5.php

Abbreviations

PD = Parkinson's Disease, ADL = Activity of Daily Living, UPDRS = Unified Parkinson's Disease Rating Scale, PIGD = Postural Instability and Gait Disorder, TUG = Timed Up and Go, RT = Reaction Time, ROM = Range of Motion, MoCA = Montreal Cognitive Assessment, TMT-A = Trail Making Test A, TMT – B = Trail Making Test B, UFoV = Useful Field of View, B/V = Blue/Violet, H_Y = Hoehn and Yahr

Management of Patellofemoral Pain in a Adolescent Female Multi-Sport Athlete: A Case Report

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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 eccentrics
Phase II	Increased load theraband and moderate eccentrics, light plyometrics
Phase III	Increased load theraband and moderate eccentrics, moderate plyometrics, aquatic treadmill training

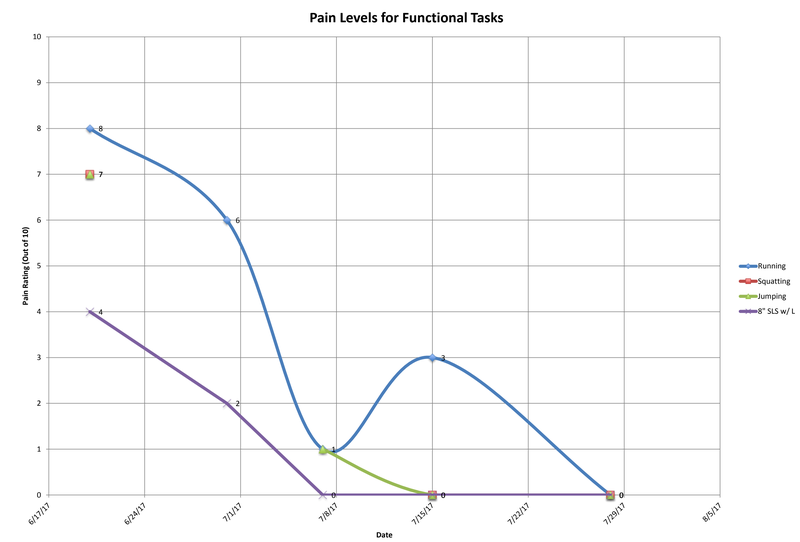
Results/ Outcomes

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

	Initial			Reevaluation			Discharge					
LEFS	54/80			68/80			78/80					
	Running			Jumping			Squatting			SLS Task		
NPRS	8/10	1/10	0/10	7/10	1/10	0/10	7/10	-	0/10	4/10	0/10	0/10
	Quite Difficult			Moderate Difficulty			Little Bit of Difficulty			No Difficulty		
FOTO	2	0	0	2	1	0	3	4	1	3	5	9

Figure 1. Pain Levels for Functional Tasks During Treatment



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.

PARTIAL SUPRASPINATUS TEAR WITH IMPINGEMENT FOR WORKMAN'S COMP PATIENT: A CASE REPORT

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MEGAN LEFTWICH, SPT

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Introduction

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.

Methods

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.

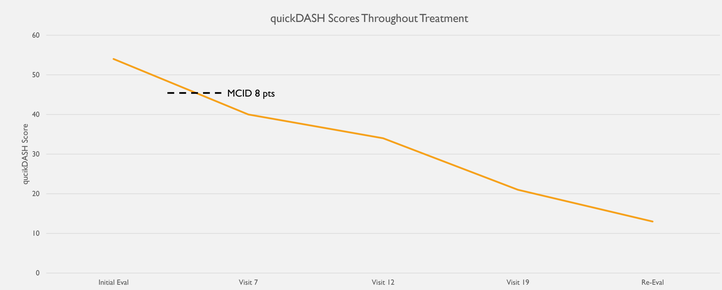
ICD-10: S43.402D

Prognosis:

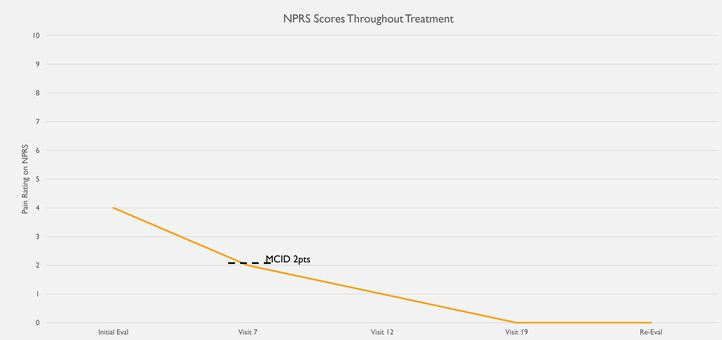
This patient was seen 2-3x per week for 11 weeks for 60 minute sessions. There were 20 total visits for this patient.

TABLE 1	
INTERVENTION	FOCUS ON
Phase 1	Decreasing pain and increasing AROM and PROM for the shoulder
Phase 2	Eccentric and concentric exercises to strengthen the shoulder girdle as well as scapular stabilization
Phase 3	Began implementing functional return to work exercises along with progressed scapular stabilization exercises

Results



The quickDASH and NPRS were administered at the initial evaluation and at each progress note throughout the treatment. Range of motion was also assessed and measured at each of these points.



Conclusion

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.

This poster is adapted from "Tucker N. Chronic Ankle Instability Due to Repeated Eversion Ankle Sprains: A Case Report " located at http://www.augusta.edu/alliedhealth/pt/researchcourse/documents/2016posters.pdf

The Conservative Treatment of Iliopsoas Tendinopathy After a Total Hip Arthroplasty in the Presence of a Contralateral Total Knee Arthroplasty- A Case Study

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Introduction

- Tendinopathy is a general term that describes any chronic injury to any tendon in the body and is thought to be a result of increased mechanical stress placed on the tendon.
- Tendinosis, the most likely form of tendinopathy, is defined as the degeneration of the collagen in the tendon as a result of repetitive microtrauma.
- General clinical signs and symptoms include pain with palpation to the tendon, pain with loading of the tendon, and pain at the insertion site of the tendon.
- Some case studies have linked total hip arthroplasty (THA), in particular the anterior THA approach, to iliopsoas tendinopathy. After a THA there may be a build-up of scar tissue around the iliopsoas tendon potentially leading to iliopsoas tendinopathy.
- Iliopsoas tendinosis signs and symptoms include pain at the groin with activity and palpation, pain with resisted hip flexion, and pain with end range hip extension.
- Knee flexion contractures can result in gait abnormalities in the contralateral limb. Gait compensations on the contralateral side may begin once the knee flexion contracture exceeds 15 degrees and include excessive hip flexion on the contralateral side. Thus, the contralateral iliopsoas tendon may be overworked in this scenario.
- 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 right total hip 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 Extension
  - ***Initial LEFS:*** 45/80, 43.75% impairment
  - ***Pain:*** 6/10 highest level
- **Patient goals:** Pain-free return to cycling, tennis, and walking

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.

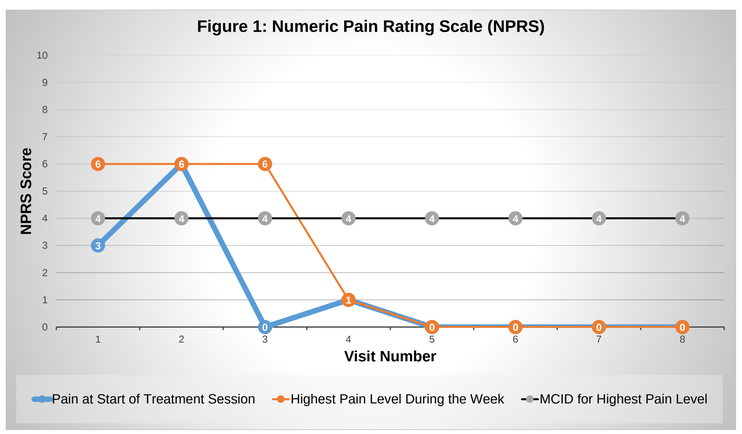
Table 1: Rehabilitation Phases for the Right Iliopsoas Tendon	
Phase I	Activity modification: suspend morning cycling routine
Phase II	Eccentric iliopsoas strengthening
Phase III	Functional return: strengthening iliopsoas both eccentrically and concentrically within functional patterns

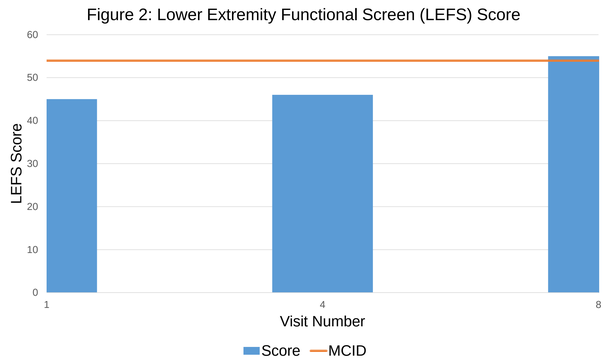
Table 2: Rehabilitation Phases for the Left Knee	
Phase I	Manual therapy: soft tissue mobilization and PNF stretching for left quadriceps, hamstrings, and gastrocnemius
Phase II	Functional Return: continue manual therapy and add total knee extensions within ambulation and step ups and step downs

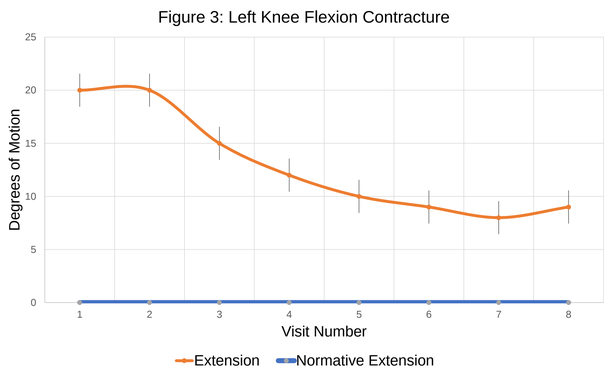
Results

- 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 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

Visual Assessment Results

Assessment	Result
Right eye acuity far vision	20/25
Left eye acuity far vision	20/30
Binocular acuity far vision	20/25
Right eye acuity near vision	20/25
Left eye acuity near vision	20/30
Binocular acuity near vision	20/25
Right side peripheral vision	85degrees
Left side peripheral vision	85degrees

*State of Georgia Licensing Requirement is an absolute visual acuity minimum of 20/60 in either eye or both eyes with or without correction and minimum visual field of 140 0both eyes.

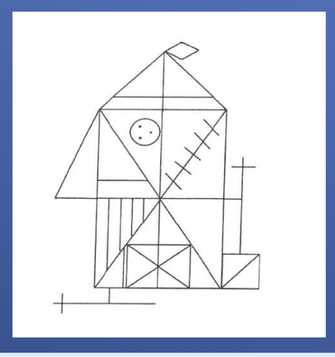
Cognitive Assessment

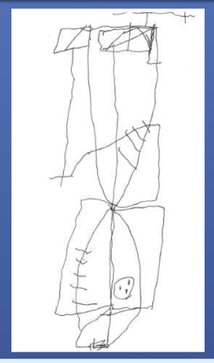
Assessment	Score	Norm Value
Mini-Mental State Examination	25/30*	29/30 *based on age and education level*[1]
Rey Osterreith Complex Figure	12/36	N/A
Trail Making Test A	59 seconds	23 seconds
Tail Making Test B	160 seconds	49 seconds
Montreal Cognitive Assessment (MoCA)	24/30ǂ	24.46 *based on age and education level*[2]

*Patient lost 3 points to orientation, 1 point to language, and 1 point to visuospatial.
ǂ Patient lost 2 points to visuospatial, 1 point to attention, 1 point to fluency, 1 point to abstraction and 1 point to recall.

Useful Field of View Test	
Processing Speed	17 milliseconds*
Divided Attention	17 milliseconds ǂ
Selective Attention	54 milliseconds √

* Suggestive of normal central vision loss and/or speed of processing visual information
ǂ Suggestive of normal divided attention ability
√ Suggestive of normal selective attention ability





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- This poster design is adapted from: J. Tankersley, M. Hale, A. Sadow. Intervention for Motor Impairment in a Child with Autism Spectrum Disorder: A Case Report. Department of Physical Therapy, Augusta University and Children's Hospital of Georgia, Augusta, GA. 2014.

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 spondylosis, 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
- Primary 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

Special Test	Results
Cervical Compression Test	+
Cervical Distraction Test	+
Shoulder Abduction Maneuver	- (Bilaterally)

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.

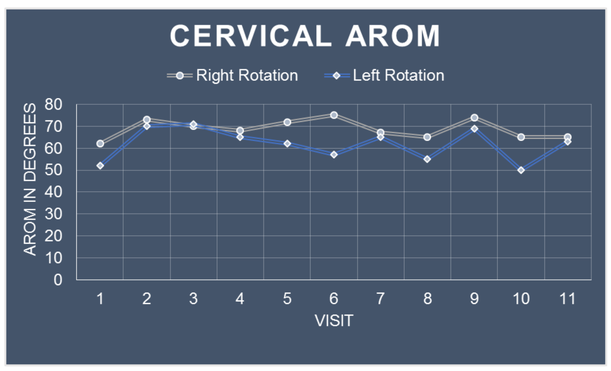
Interventions

- 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)

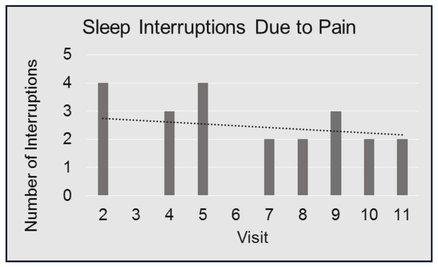
OUTCOMES

Self Report Outcome Measures

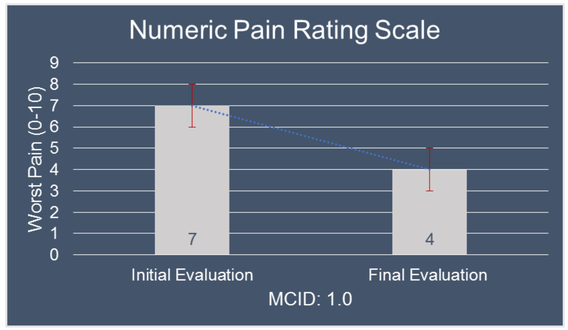
- NDI 32%
- PSFS: 6.33



Manual Muscle Test	Initial Evaluation (Visit 1)	Final Evaluation (Visit 11)
Myotome	Right UE	Right UE
C5-6: Shoulder Abduction	4/5 with pain	5/5 pain-free



*Sleep interruptions defined as number of nightly awakenings with neck pain that prevents return to sleep in a timeframe typical to the patient.



DISCUSSION

- Final Evaluation conducted at 11th visit after 6 weeks of treatment

Significant Improvements:

- Increased pain free bilateral cervical rotation AROM
- Restoration of pain-free right shoulder abduction strength
- Centralization of radicular symptoms from his right shoulder
- 50% reduction in sleep interruptions secondary to neck pain
- Decrease in reports of worst pain from 7/10 to 4/10

Remaining Limitations:

- No clinically significant improvement in NDI or PSFS
- Chronicity of symptoms may contribute to slow progress
- Additional improvements possible as plan of care extended beyond final

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

1. "Parker, S. Scapular Dyskinesia in a Collegiate Swimming Athlete: A Case Report" located at http://www.augusta.edu/alliedhealth/pt/researchcourse/documents/2016posters.pdf
2. "Galpin, K. Quadriceps Flexibility, A Major Component to Patellofemoral Pain: A Case Report" located at dhttp://www.augusta.edu/alliedhealth/pt/researchcourse/

Management of Subacromial Impingement Syndrome Through a Manual Approach in an Older Adult: A Case Report

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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 coracoacromial 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*

Special Test	Left	Right
Hawkins-Kennedy	(+)	(+)
Neer's	(+)	(+)
Empty Can	(+)	(+)
Painful Arc	(+)	(+)
Speed's	(-)	(-)
Drop Arm	(-)	(-)

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 tendonitis 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 in 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.

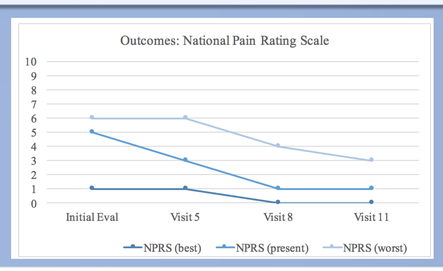
Interventions:

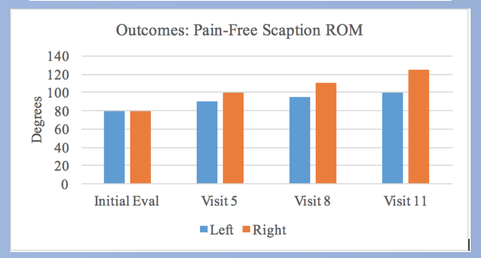
The treatment plan was divided into two phases:

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 scaption 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 scaption ROM improved from an initial measure of 80º bilaterally to 100º on the left and 125º 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.

This poster is adapted from 1) "Turcker N. Chronic Ankle Instability Due to Repeated Eversion Ankle Sprains: A Case Report " located at http://www.augusta.edu/alliedhealth/pt/research.php

Management of Chronic LBP in an Elderly Female Patient: A Case Report

Trey Wimmer, SPT and Scott Hasson EdD, PT, FASCM, FAPTA

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 hypermobility of a particular vertebral segment. Oftentimes, hypermobility of the lumbar spine is the most significant cause of LBP. It has been observed that hypermobility of the lumbar spine could be associated with hypomobility of the thoracic spine. Since lumbar hypermobility 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

	Degrees	Pain Scale (0-10)
Flexion	60 w/ aberrant motion	8/10
Extension	<5 with pain	10/10
R Side bending	WNL	6/10; no effect on pain
L Side bending	WNL	6/10; no effect on pain
L Rotation	WNL	6/10; no effect on pain
R Rotation	WNL	6/10; no effect on pain

Table 2- Strength

	Right	Left
Hip Flexors	3+/5 w pain	4/5
Gluteus Maximus	4/5 with pain	4/5
Hip Internal Rotation	4/5	4/5
Hip External Rotation	4/5	4/5

Table 3- Special Tests

	Right	Left
Anterior Gap Test	Negative	
Posterior Shear	Negative	
Sacral Compression	Negative	
FABER	Negative	Negative
FADIR	Negative	Negative
FAIR	Negative	Negative
Straight Leg Raise	Negative	Negative

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 that 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.

Table 4- Phase 1

Manual Thoracic Spine Mobilizations	CPA, Grade III-IV
Thoracic Spine Self Mobilization with ½ foam roll	3 x 5 with 10 second hold
Supine TA activation	3 x 10 with 5 second hold
Supine TA Activation with Alternating SL March	3 x 10 with 5 second hold
Supine TA Activation with Alternating SLR	3 x 10 with 5 second hold
Seated Scapular Retraction	3 x 10 with 10 second hold
Standing Rows with Thera-Band	3 x 10 with 5 second hold
Wall Press Ups	3 x 10 with 5 second hold

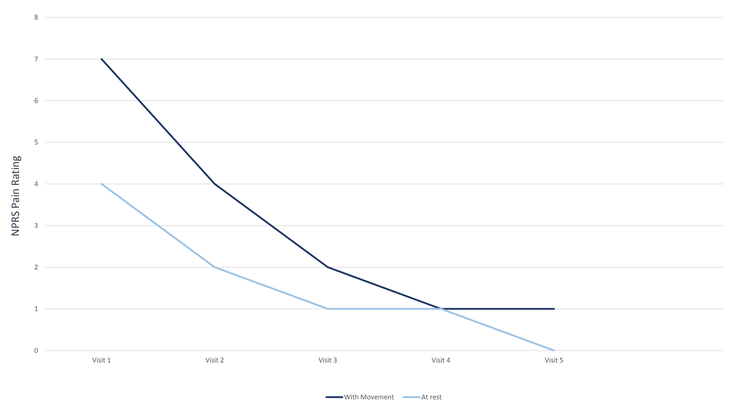
Table 5: Phase 2

Manual Thoracic Spine Mobilizations	CPA, Grade III-IV
Manual Thoracic Spine Mobilizations with Thoracic Extension	CPA, Grade III-IV
Thoracic Spine Self Mobilization with ½ foam roll	2 x 10 with 5 second hold
Standing TA Activation with Reach on Wall	3 x 10 with 5 second hold
Standing TA Activation with Alternating SL March	3 x 10 with 5 second hold
Standing Retraction/Rows with Thera-Band	3 x 10 with 5 second hold
Quadruped Arm/Leg Lifts (Bird Dogs)	3 x 10 with 5 sec hold
Standing Wall Climbs	3 x 10 with 5 second hold
Wall Angels	3 x 10
Prone Press Ups	3 x 10 with 5 second hold

Results/ Outcomes

- NPRS, Active Lumbar Rang 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.

Figure 1- NPRS Throughout Treatment



- Lumbar flexion improved from 60 degrees with aberrant motion and an 8/10 on the NPRS to 115 degrees with no aberrant motion and no pain.
- Lumbar extension increased from less than 5 degrees and 10/10 pain to 15 degrees and 1/10 pain. The ODI scores decreased from 46% to 12%. Figures 2 and 3 show these findings.
- Images 1 and 2 show lumbar flexion and extension, respectively, upon last visit

Figure 2- ODI Self-Reported Scores

Figure 3- Lumbar AROM Changes

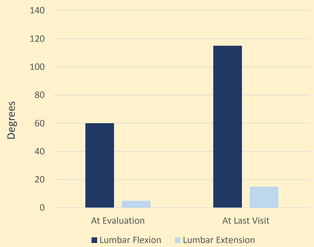


Image 1- Lumbar Flexion

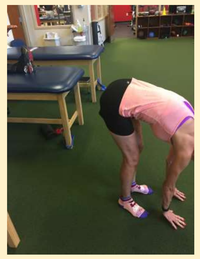


Image 2- Lumbar Extension

Limitations

- Limited number of visits
- Possibility of catastrophizing
- Lack of functional outcome measures
- Small sample size

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.