The Role of Occupational Therapy in a Multidisciplinary Concussion Clinic: Persistent Post-Concussion Symptoms

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ATSU Doctoral Capstone

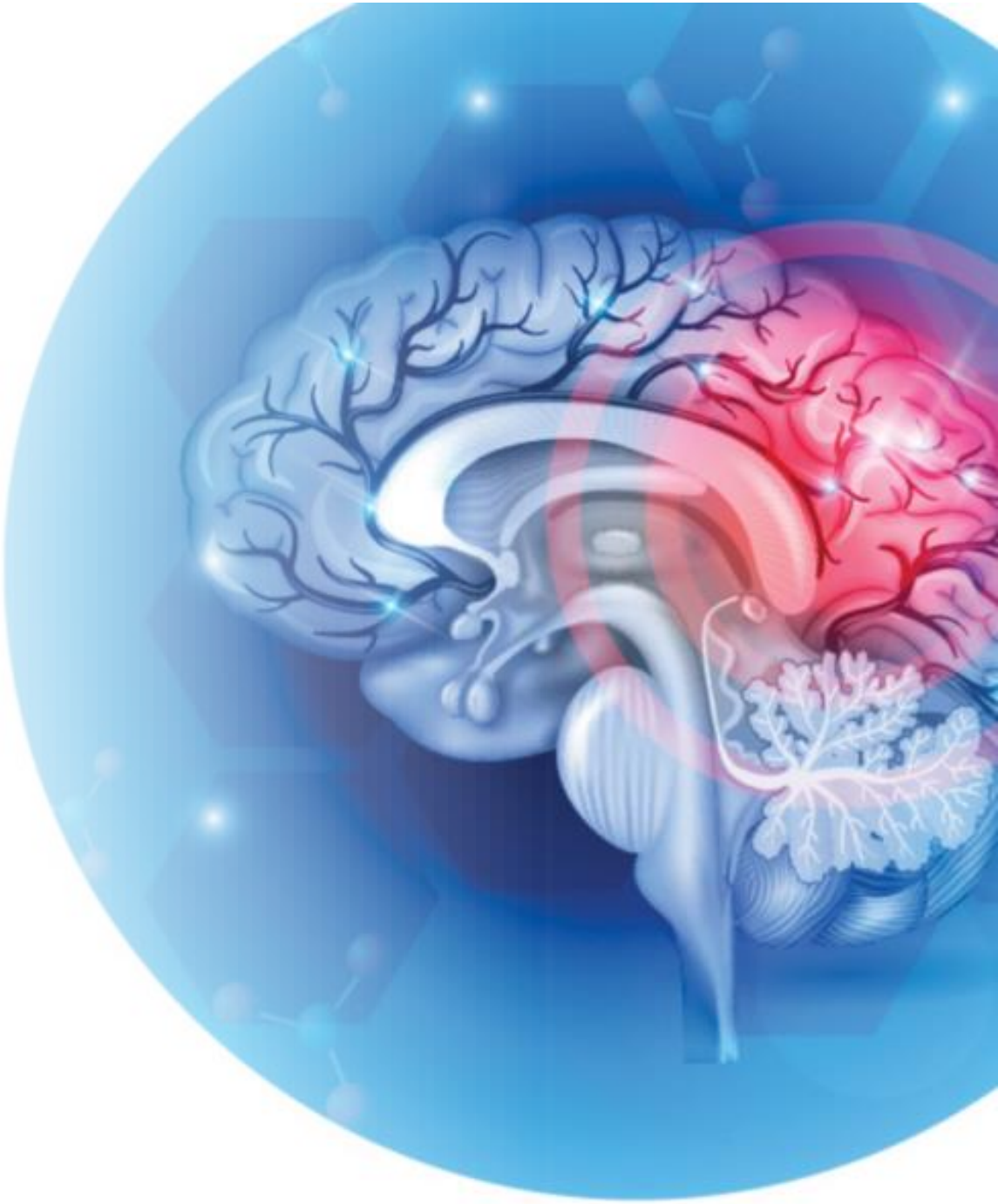
WHO? WHAT? WHERE? WHY?

Program Objectives

- To investigate the significance of cognitive rehabilitation in treating individuals with persistent post-concussion symptoms (PPCS) at the UCLA Steve Tisch BrainSPORT Program
- To analyze the multidisciplinary relationship between occupational therapists, neurologists, neuropsychologists and dieticians at the UCLA Steve Tisch BrainSPORT Program
- To expand the role of occupational therapy in treating post-concussion symptoms for individuals ages 18+ at UCLA Steve Tisch BrainSPORT Program

Background Information

- “A mild traumatic brain injury (mTBI) caused by a bump, blow or jolt to the head or by a hit to the body which causes the head and brain to rapidly move back and forth, resulting in chemical changes”
- Estimated 1.6 - 3.8 million concussions are reported in the United States per year due to sports and recreational activities
- Prevalent etiology: sports related accidents, motor vehicle accidents, falls, military injury and domestic violence
- Concussion recovery management
  - Complete rest VS Graded return to activity



(CDC, n.d.; Brogolio et al., 2014; Cogan et al., 2019;Harmon et al., 2018; Marshall et al., 2015; Smirl et al., 2019; Sveen et al., 2010

Concussion Symptoms

Headache Pressure Neck pain Nausea or vomiting Dizziness Blurred vision Balance Sensitivity to light Sensitivity to noise Fatigue or low energy “Don’t feel right”
Feeling slowed down Feeling in a fog Difficulty remembering Difficulty Concentrating Confusion
More emotional Irritability Sadness Nervous or anxious
Trouble falling asleep

Persistent Post-Concussion Symptoms (PPCS)

- Majority of patients who sustain a concussion recover within 10 days
- 15-20% prolonged recovery longer than 10 days or suffer from persistent-post concussion symptoms
- DSM-5: persistent post- concussive symptoms (PPCS) have persisting symptoms 3 months after the precipitating concussion event.
- Most include at least 3 of the following: *headache, fatigue, dizziness, irritability, sleep disturbances, reduced concentration, sensitivity to light & noises, impaired memory, and decline in processing speed and concentration* 3 months after TBI
- Differences in saccadic eye movements, smooth pursuits and eye tracking has been shown for individuals with PPCS
- Cognitive dysfunctions include mental/cognitive fatigue, attention/concentration, memory, processing speed, language and communication, and executive function issues

(Brogolio et al., 2014; CAOT, n.d.; Cogan et al., 2014 & 2019; Harris et al., 2019 ;Patricios et al., 2015; Smirl et al., 2019; Finn et al., 2015)

Long-Term Effects

- Long term effects on one's mental health and cognitive function
- Changes in mood and personality, a loss of sense of self

"Fatigue or Low Energy"

"Nervous or Anxious"

"Dizziness"

"Difficulty in Concentration or Memory"

"Just Don't Feel Right"

(Brogolio et al., 2014; Guskiewicz et al., 2005; Harmon et al., 2018; McAllister et al., 2017; Smirl et al., 2019).

Occupational Therapy in Concussion Clinics

- Finn (2019) identified that 40.6% of the author's respondents (n=153) currently receive referrals for concussion treatment and 59.4% do not currently receive referrals for concussion treatment
- Visual rehabilitation, cognitive rehabilitation, vestibular rehabilitation, return to occupation (work, school, play, exercise, sport, driving), psychoeducation, non-pharmacological pain management, mental health concerns, sleep hygiene, sensory sensitivities and exercise intolerance
- Studies show a majority of the occupational therapy participants receive referrals specifically for visual skill training, cognitive skill retraining and return to occupation
- Visual rehabilitation → Saccadic eye movement, smooth eye pursuits and eye tracking
- Cognitive rehabilitation → Assessment, evaluation and rehabilitation (memory, attention and executive functioning)
- Graded return to activity

(Acord-Vira et al., 2018; Cogan et al., 2019; Cogan et al., 2014; Finn et al., 2019; (Harris et al., 2019); Reed et al., 201; Sveen et al., 2010; Tan-Rapues, 2018).

- UCLA's outpatient concussion clinic provides a comprehensive and multidisciplinary approach to the evaluation and management of concussions
- Mission statement: "*make leading discoveries through research, provide forward-thinking diagnosis and treatment, and transfer our knowledge of sports related concussion and brain health to the broader community*"
- Multidisciplinary team: neurologists, neuropsychologists, occupational therapists, and dieticians who "work closely together, in real-time, to evaluate patients and athletes and provide a comprehensive treatment plan and monitoring"
- Strives to be the forefront of concussion/TBI research, education and prevention

Advanced Practice Skills

- Telemedicine skills
- Ramp testing
- Interdisciplinary relationship
- Oral presentation skills
- Additional research training
- TBI and pharmacology education
- Co-treats with other specialties
- Documentation & reimbursement

Types of Interventions

- Cognitive Rehabilitation
- Executive functioning strategies
- Mental Health
- Symptom management
- Exercise protocol
- Work reintegration
- Lifestyle management
- Remedial interventions
- Compensatory interventions
- Co-treats: CBT Exercise, Dietician

Research Question

Are patients with increased cognitive symptoms secondary to a concussion more likely to be referred to occupational therapy when compared to those with less cognitive symptoms?

Research Details

Hypothesis

- Patients with increased reported cognitive symptoms after a concussive event are more likely to be referred to occupational therapy versus those with less cognitive symptoms

Secondary Hypothesis

- Patients with overall more reported concussion symptoms are more likely to be referred to occupational therapy than those with less reported concussion symptoms

Independent Variables

- Concussion Symptoms
- Concussion Diagnosis
- Graded Symptom Checklist
- SAC

Outcome Measure

- Occupational Therapy Referral
- Project Design
  - Retrospective Chart Analysis

Inclusion & Exclusion Criteria

Inclusion Criteria

18 years and older

Traumatic Brain Injury Referral : TBI Diagnosis

Graded Symptom Checklist (GSC)

Standardized Assessment of Concussion (SAC)

Seen at BrainSPORT July 2020— December 2020

Exclusion Criteria

Younger than 18 years old

Missing GSC and SAC

Participants

- 91 Patients
- 48 Female | 43 Male
- Ages 18- 89 years old
- Average age of 37. 1 years old
- 46 patients with a prior concussion

Methods

- Retrospective chart analysis of the 91 patient charts with a suspicion of a concussion, or TBI, at BrainSPORT
- Identified all consented adults who met the inclusion criteria and were seen in the clinic by a neurologist between July 2020 – December 2020
- Identified patients were added to an Excel spreadsheet in a HIPAA Compliant BOX folder
- Patients deidentified and coded
- Each patient's neurological evaluation were analyzed and coded
- Deidentified patients were categorized into two groups: OT & Non- OT group
- Final spreadsheet identified specific information relevant to research question
- Categorized all symptoms in GSC into somatic, emotional, cognitive, and sleep categories
- Took average summary scores for each category for the two groups

Neurological Evaluation Examination Information

- Demographics: date of service, age, gender, marital status, employment status, date of injury, injury location, days since injury
- Loss of consciousness, amnesia, presence of seizure, sport-related concussion, neck pain, prior concussion or other TBI history, recovery period of prior TBI
- Other medical history, past treatment
- Graded Symptom Checklist (GSC)
- Standardized Assessment of Concussion (SAC)
- CT/MRI results
- Concussion injury characteristics
- Referral to occupational therapy

GSC

Headache	
Pressure in head	Difficulty concentrating
Neck pain	Difficulty remembering
Nausea or vomiting	Fatigue or low energy
Dizziness	Confusion
Blurred vision	Drowsiness
Balance Problems	Trouble falling asleep
Sensitivity to light	More emotional
Sensitivity to noise	Irritability
Feeling slowed down	Sadness
Feeling like “in a fog”	Nervous or anxious
“Don’t feel right”	Total Score (max:132)

0: None, 1-2: Mild, 3-4: Moderate, 5-6: Severe

SAC

ORIENTATION — Score: _____ / 5

What month is it?	0		1	
What is the date?	0		1	
What day of the week is it?	0		1	
What year is it?	0		1	
What time of day is it? (*w/in 1 hour*)	0		1	

IMMEDIATE MEMORY — Score: _____ / 15

Form A	Form B	Form C	Form D
Elbow	Candle	Baby	Monkey
Apple	Paper	Monkey	Penny
Carpet	Sugar	Perfume	Blanket
Saddle	Sandwich	Sunset	Lemon
Bubble	Wagon	Iron	Insect

	Trial 1		Trail 2		Trail 3	
Word 1	0	1	0	1	0	1
Word 2	0	1	0	1	0	1
Word 3	0	1	0	1	0	1
Word 4	0	1	0	1	0	1
Word 5	0	1	0	1	0	1

NEUROLOGIC SCREENING

Loss of Consciousness: *(occurrance, duration)*

Retrograde Amnesia

Antegrade Amnesia

Strength

Sensation

Coordination

CONCENTRATION: *Digits Backwards* — Score: _____ / 5

Form A			
4-9-3	6-2-9	0	1
3-8-1-4	3-2-7-9	0	1
6-2-9-7-1	1-5-2-8-5	0	1
7-1-8-4-6-2	5-3-9-1-4-8	0	1
Form B			
5-2-6	4-1-5	0	1
1-7-9-5	4-9-6-8	0	1
4-8-5-2-7	6-1-8-4-3	0	1
8-3-1-9-6-4	7-2-4-8-6-5	0	1
Form C			
1-4-2	6-5-8	0	1
1-8-3-1	3-4-8-1	0	1
4-9-1-5-3	6-8-2-5-1	0	1
3-7-6-5-1-9	9-2-6-5-1-4	0	1

Months in Reverse Order

Dec_Nov_Oct_Sept_Aug_ Jul_Jun_May_Apr_Mar_Feb_Jan

0 1

DELAYED RECALL — Score: _____ / 5

Word 1	0	1
Word 2	0	1
Word 3	0	1
Word 4	0	1
Word 5	0	1

SCORE TOTALS

Orientation	= ____ /	5
Immediate Memory	= ____ /	15
Concentration	= ____ /	5
Delayed Recall	= ____ /	5

Overall Score

/ 30

Somatic/Physical	Headache Pressure Neck pain Nausea or vomiting Dizziness Blurred vision Balance Sensitivity to light Sensitivity to noise Fatigue or low energy “Don’t feel right”
Cognitive	Feeling slowed down Feeling in a fog Difficulty remembering Difficulty Concentrating Confusion
Emotional	More emotional Irritability Sadness Nervous or anxious
Sleep	Trouble falling asleep

Symptom Checklist Categories

Results
Demographics

	Referred to OT (n=23)	Not Referred to OT (n=68)	Significance
Age, Mean (SD)	33.43 (16.970)	38.09 (16.530)	NS, *P= 0.170*
Time Since Injury in Days, Mean (SD)	1020.90(1674.144)	833.17(1613.019)	NS, *P= 0.873*
Sex, Female/Male	14(60.9%) / 9(39.1%)	34/34 (50%)	NS, *P=0.367*
Number of Participants with Prior Concussions, Total	16 (69.6%)	30 9 (44.1%)	*P= 0.035***
Number of Participants with Other Comorbidities, Total	Headache= 9 Psychiatric Hx (anxiety/depression) = 16 Other Psychiatric Hx= 8 Learning Problems= 4 ADHD= 4 Sleep= 8 Other relevant medical Hx= 5	Headache= 25 Psychiatric Hx (anxiety/depression) = 30 Other psychiatric Hx= 14 Learning Problems= 7 ADHD= 6 Sleep= 20 Other relevant medical Hx= 24	

Results

Comparison of GSC Scores and SAC Scores

NS, in all groups

	Referred to OT (n=23)	Not Referred to OT (n=68)	Total Participants (n=91)
Summary Scores of GSCSomatic Symptoms Reported, Mean (SD)	20.52 (12.58)	18.78 (18.26)	19.22 (16.96)
Summary Scores of GSCCognitive Symptoms Reported, Mean (SD)	15.42 (7.237)	11.87 (8.878)	12.82 (8.568)
Summary Scores of GSCSleep Symptoms Reported, Mean (SD)	1.61 (1.85)	1.68 (2.11)	1.66 (2.04)
Summary Scores of GSCEmotional Symptoms Reported, Mean (SD)	9.63 (7.159)	10.71 (7.365)	10.42 (7.276)
Summary Scores of Total GSCSymptoms Reported, Mean (SD)	51.84 (19.687)	49.33 (49.33)	50.00 (28.860)
Summary Total SAC Scores, Mean (SD)	14.09 (13.99)	8.34 (12.77)	9.79 (13.25)

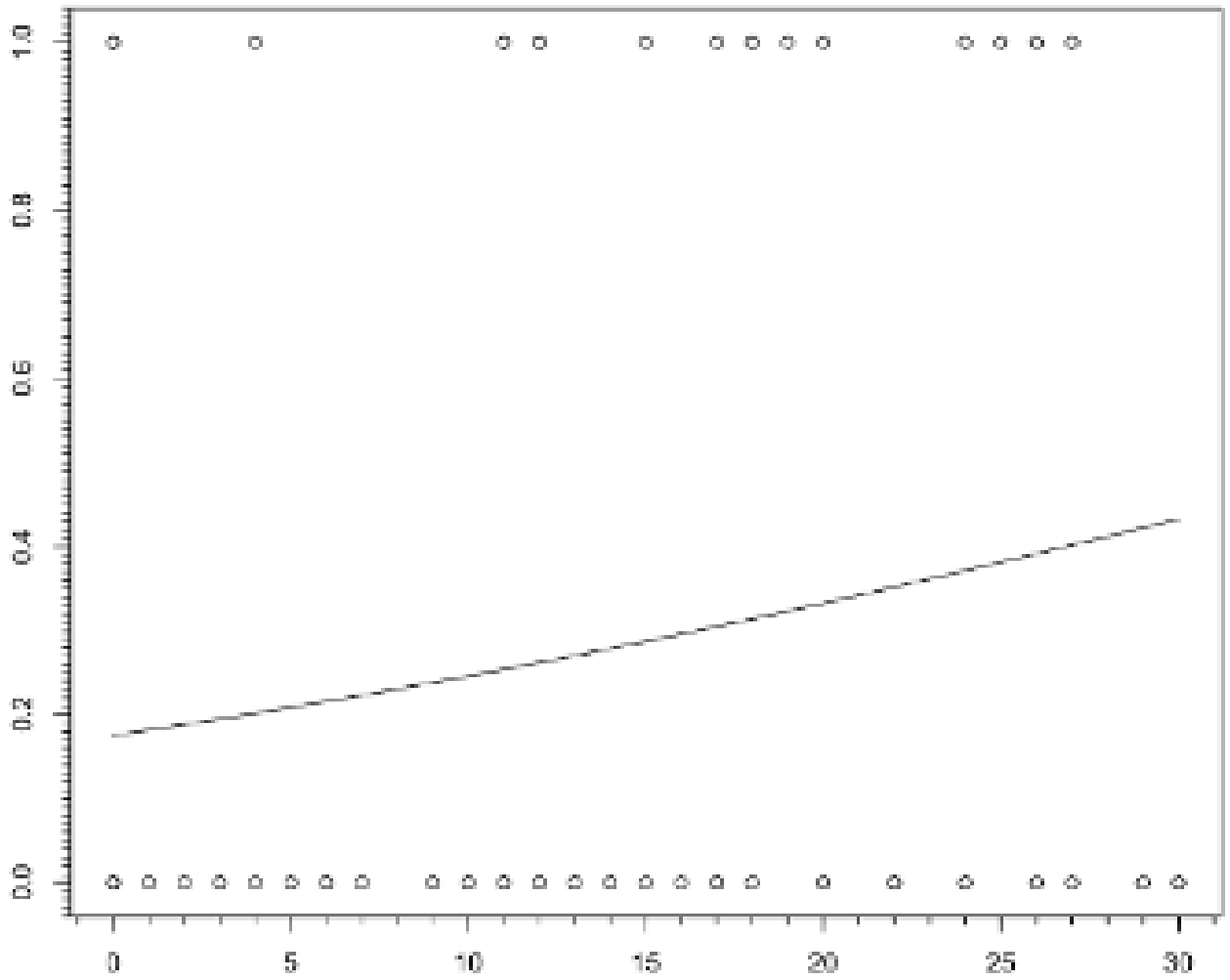
Results

Binary Logistic Regression: GSC Scores x OT Referral

	Estimate	Standard Error	*z*	*p*
Summary Scores of GSCSomatic Symptoms Reported	-0.039	0.37	-1/045	0.300
Summary Scores of GSCCognitive Symptoms Reported	0.132	0.057	2.320	0.020*
Summary Scores of GSCSleep Symptoms Reported	-0.008	0.175	-0.045	0.964
Summary Scores of GSCEmotional Symptoms Reported	-0.041	0.061	-0.672	0.502
Summary Scores of GSCTotal Symptoms Reported	-0.002	0.0138	-0.121	0.904

Results

Logistic Curve of Summary Scores of Cognitive Symptoms Reported



Discussion

- Patients who were referred to OT reported higher GSC scores (subjective) and higher SAC scores (objective)
  - Although the values were not significantly different, analysis shows, on average, those referred to OT are experiencing increased persistent-post concussion symptoms
- Poor prediction of OT referral based on reported symptoms
  - Comorbidities
- Increase symptom load burden resulting in difficulty with participation in daily occupations
- Addition of occupational therapy practice to multidisciplinary concussion clinics
- More frequent occupational therapy appointments
- Occupational therapists provide a variety of intervention approaches to ensure a comprehensive graded return to activity for the individual post-concussion
- The holistic and unique training of an occupational therapist provides quality patient-centered care for the extensive issues with PPCS

Implications for Occupational Therapy Practice in Concussion Clinics

- Multidisciplinary clinic: therapeutic strategies and activity modification through graded return activity
- Address physical, emotional, cognitive and sleep concerns
- Symptom management with return to desired activity
  - Work, school, sport/exercise
  - Remedial and compensatory interventions
- Exercise protocols
- Mental health interventions
- Vestibular therapy
- Visual-ocular rehabilitation
- Cognitive rehabilitation
  - Education
- Lifestyle management

Limitations & Future Studies

- Small-biased sample from one multidisciplinary clinic
- Target population limiting N
- Multiple physicians understanding/referral of OT
- COVID-19
- Future studies

Conclusion

- Investigates the relationship between increased symptom burden in persistent-post concussion symptoms, specifically cognitive symptoms, and role of occupational therapy in a multidisciplinary clinic
- Data analysis demonstrated increased concussion symptoms for the patients referred to OT
- Addition of rehabilitation specialists in a multidisciplinary clinic
- Occupational therapist role

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