Efficacy of Vodder Manual Lymphatic Drainage of the Head and Neck on Adolescents with Post-Concussion Symptoms

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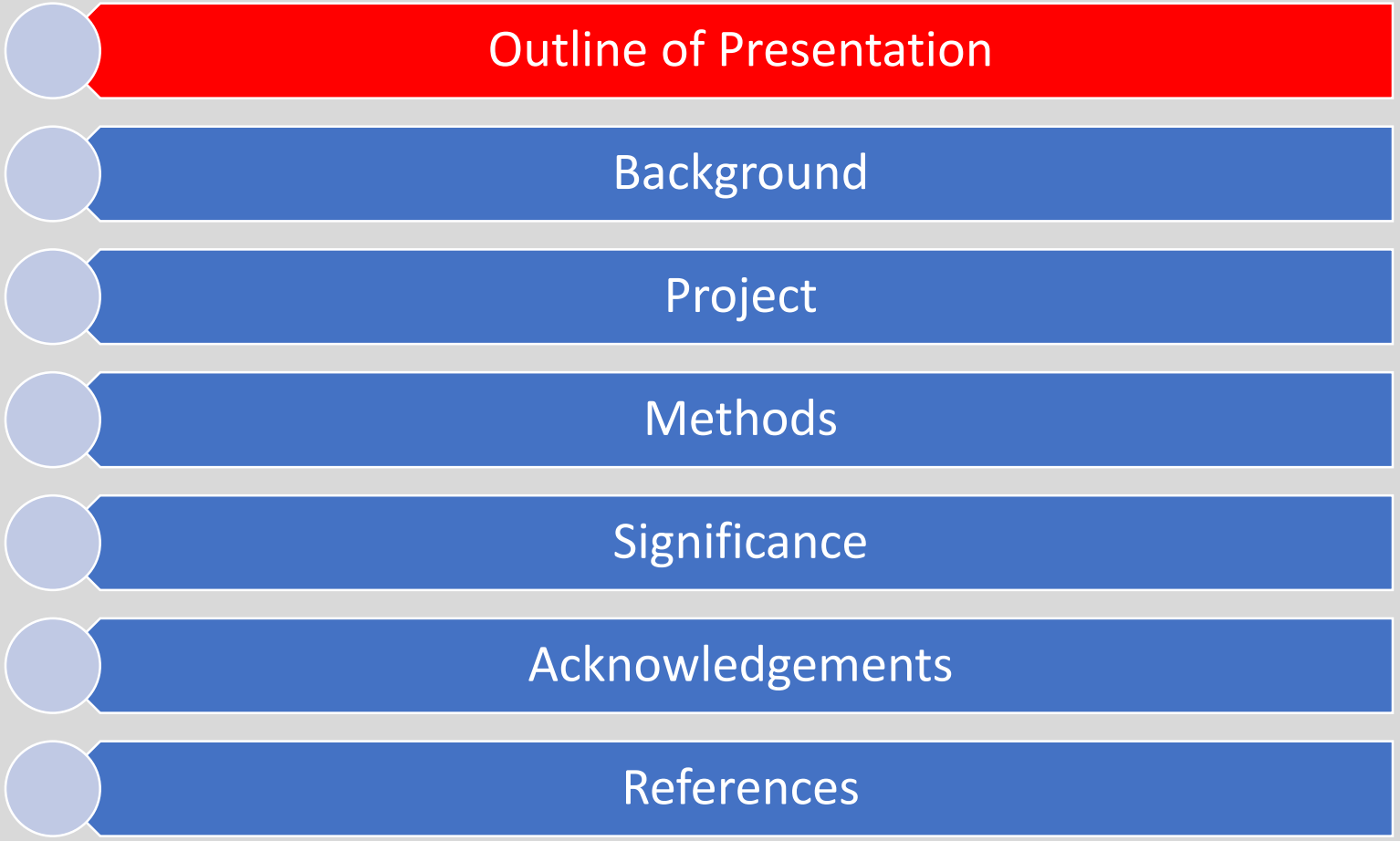
Committee:

Department: Dr. Robert Kilgour, Dr. Geoffrey Dover

External: Dr. Anna Towers

Outline of Presentation



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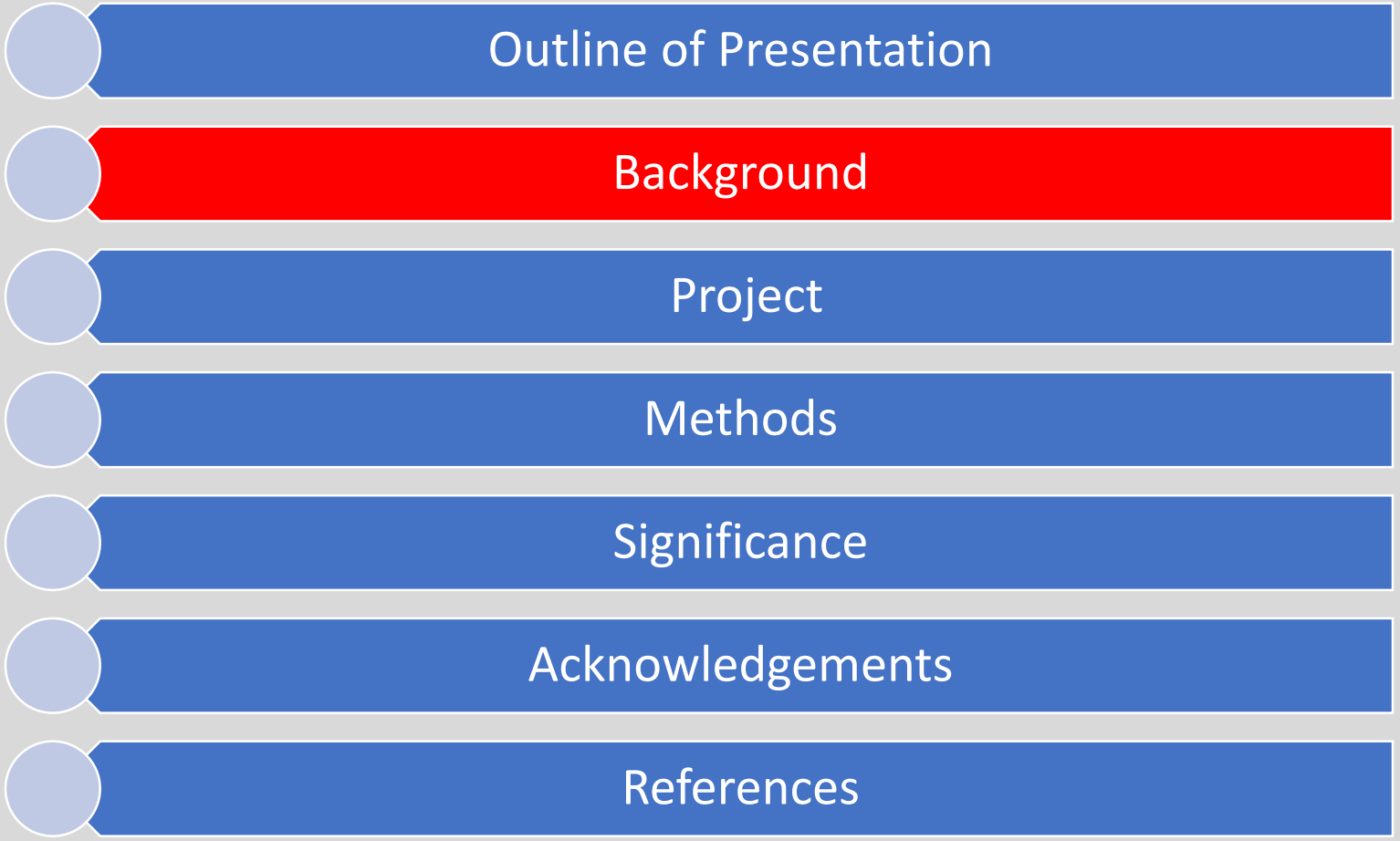
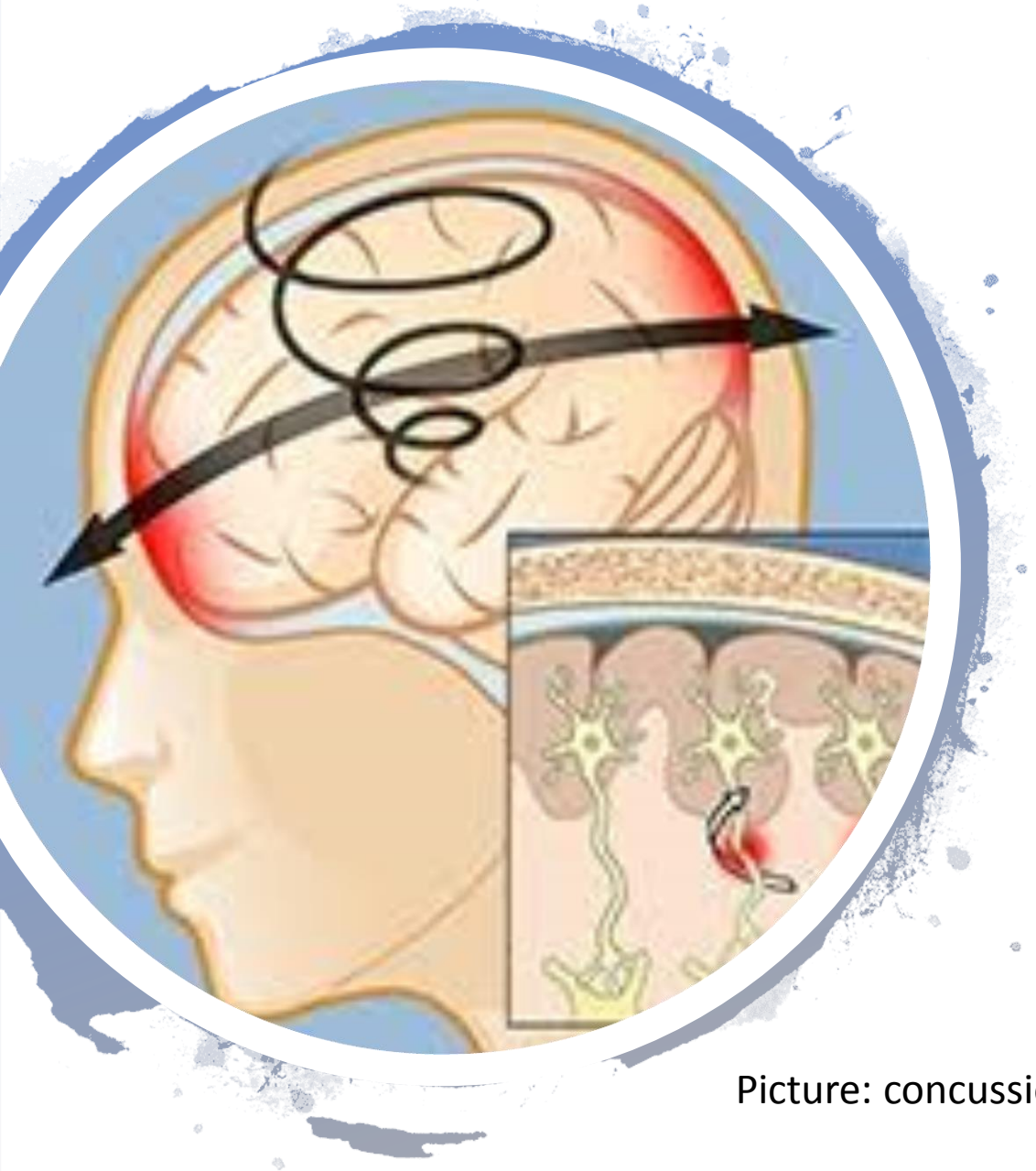




What is a concussion?

Mild Traumatic Brain Injury

Jagoda A. et al. 2008. *Annal of Emergency Medecine*

Picture: concussionweillcornell.org

Most Common Symptoms

S.H.A.D.E

S is for Sensitivity or Skill Changes

- Sensitivity to Light
- Sensitivity to Noise

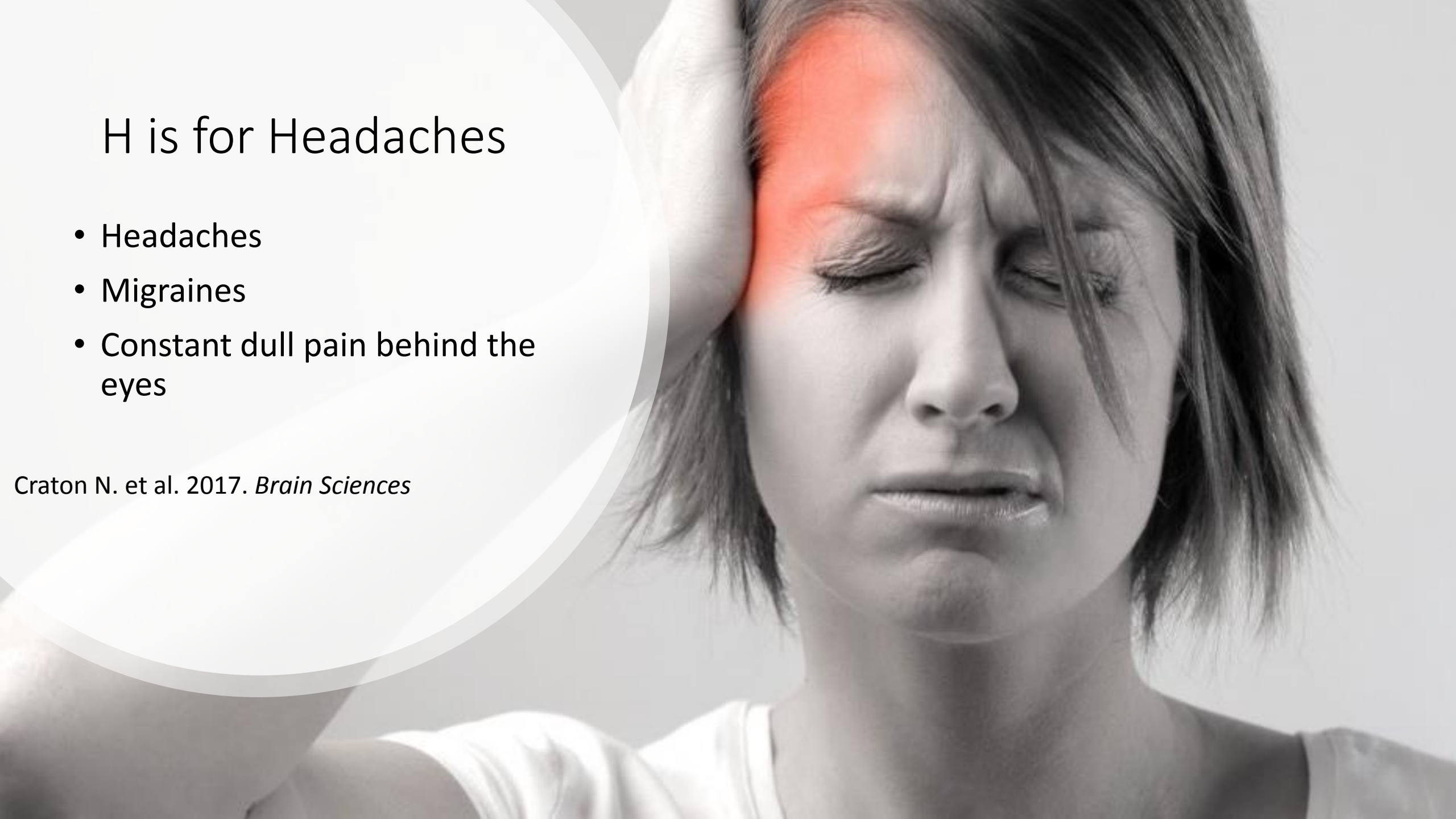
- Fine Motor Skill Dysfunction
- Cognitive dysfunction
- Balance Issues

Craton N. et al. 2017. *Brain Sciences*

H is for Headaches

- Headaches
- Migraines
- Constant dull pain behind the eyes

Craton N. et al. 2017. *Brain Sciences*



A is for Attitude

- Anxiety
- Depression
- Easily Angered
- Change in Motivation
- Mood Swings

Craton N. et al. 2017. *Brain Sciences*

D is for Diet Changes

- Stomach aches
- Nausea
- Vomiting
- Lack of Hunger
- Crave sugary foods

Craton N. et al. 2017. *Brain Sciences*

E is for Eye Changes or Energy Changes

- Blurred vision
- Double Vision
- Eyes Sensitive to light
- Vestibular dysfunction

- Easily Fatigued
- Changes to Sleep patterns (sleep too much or insomnia)

Craton N. et al. 2017. *Brain Sciences*

Long-term effects

- Post-Concussion Syndrome
  - Barlow KM.. et al. 2010. *Pediatrics*
- CTE (chronic traumatic encephalopathy)
- ALS
- Parkinson’s
  - Thomsen Gm et al. 2016. *Journal of Trauma and Acute Care Surgery*
- Punch drunk syndrome (dementia puglistica)
  - Hay J et al. 2016. *Mechanisms of Disease Vol 11*

Post-Concussion Syndrome

29.3% of concussion-related ER visits result in post-concussion syndrome

58.5% of concussions symptomatic at 1 month

If still symptomatic at 100 days, 40% chance of staying symptomatic

Babcock L. et al. 2013 *JAMA Pediatrics*

Barlow KM. et al. 2010 *Pediatrics*

Current Treatments

- Graded Exercise
- Manual Therapy
- Visual Exercises
  - Grabowski et al. 2016. *Physical Therapy in Sport*
- Neuropsychological Evaluations and Rehabilitation
  - Prince c. 2017. *Brain Science*

- There is a need for better rehabilitation

- Despite following approved treatment protocols, changes in brain still detected post medical clearance.

Churchill NW. et al. 2017 *Scientific Reports*

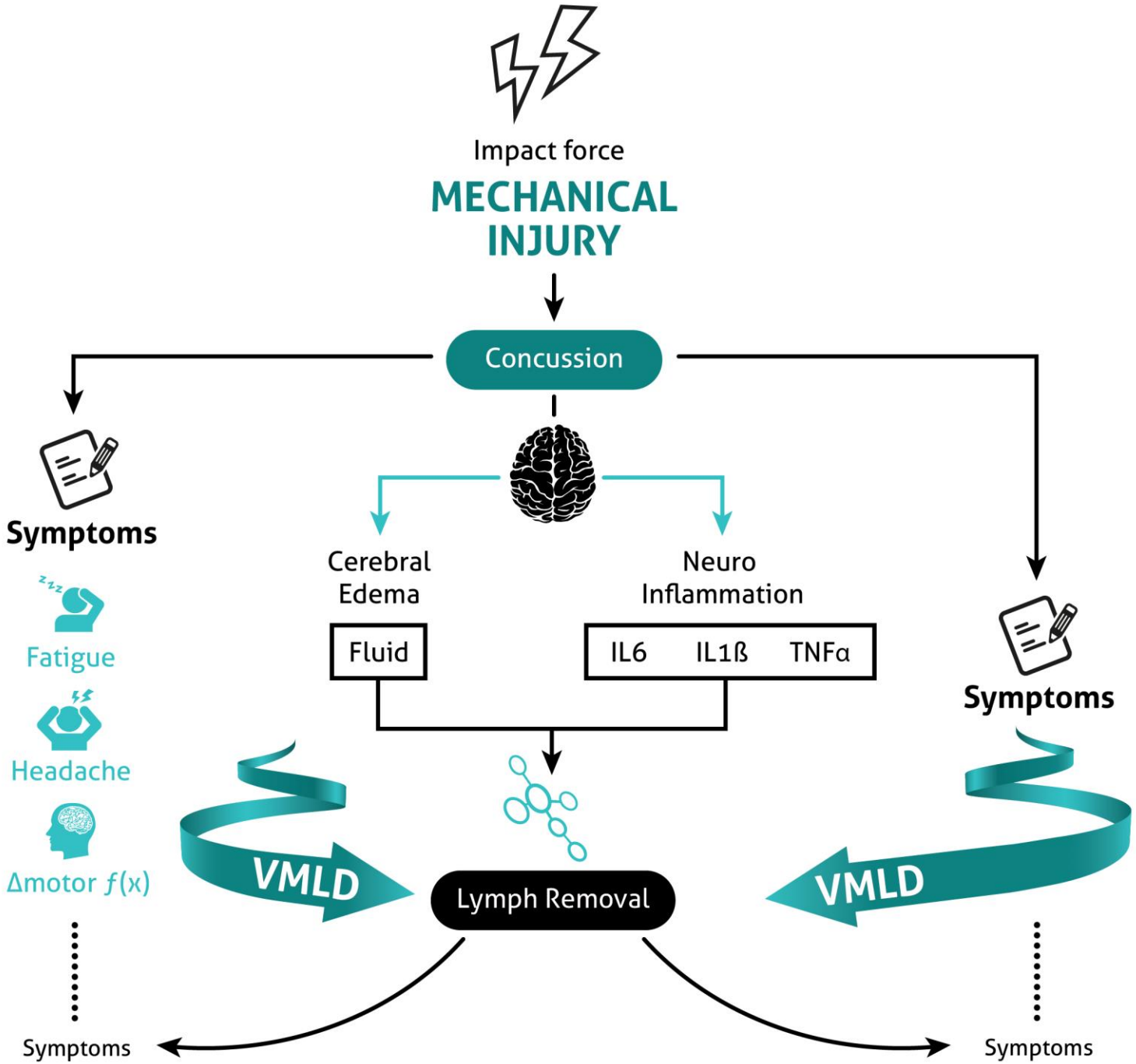
Neuro-Inflammatory Markers

- Post_Concussion Syndrome Should be Post-Inflammatory Syndrome

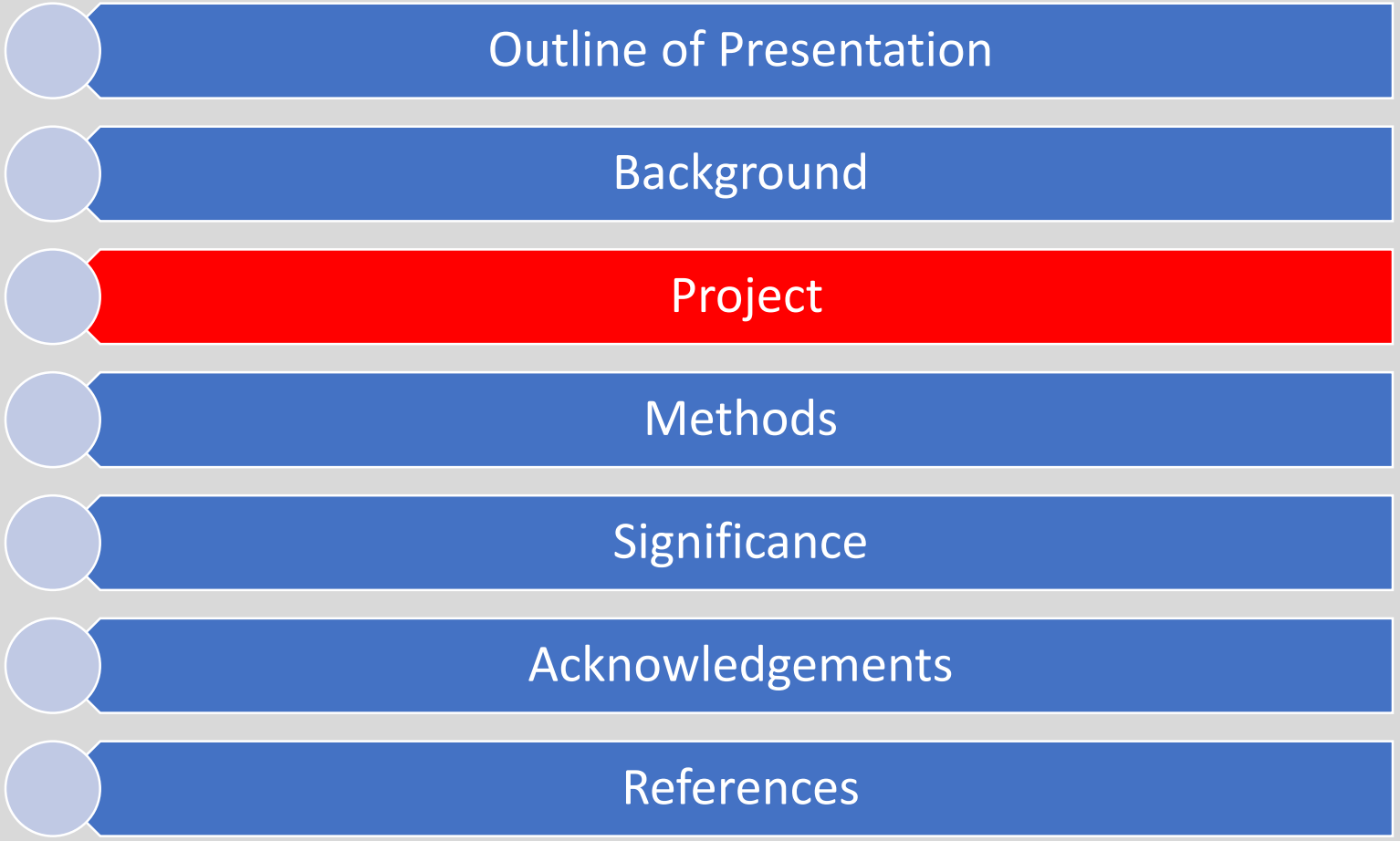
- Increase in cytokines IL-β, IL-6, TNFα, and IFN-γ

Rathbone ATL. et al. 2015 *Brain Behaviour and Immunity*

Possible Mechanism

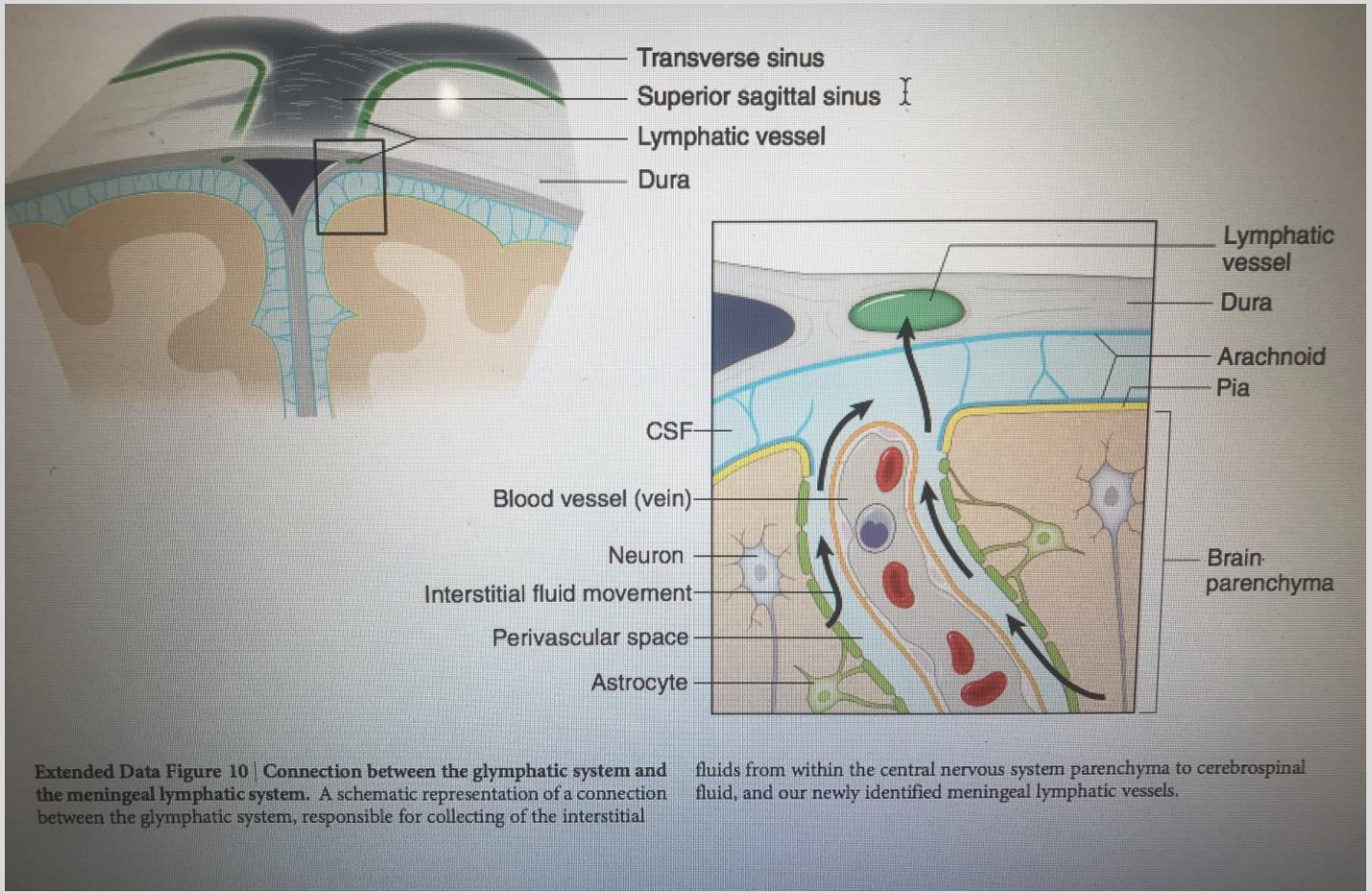


Outline of Presentation



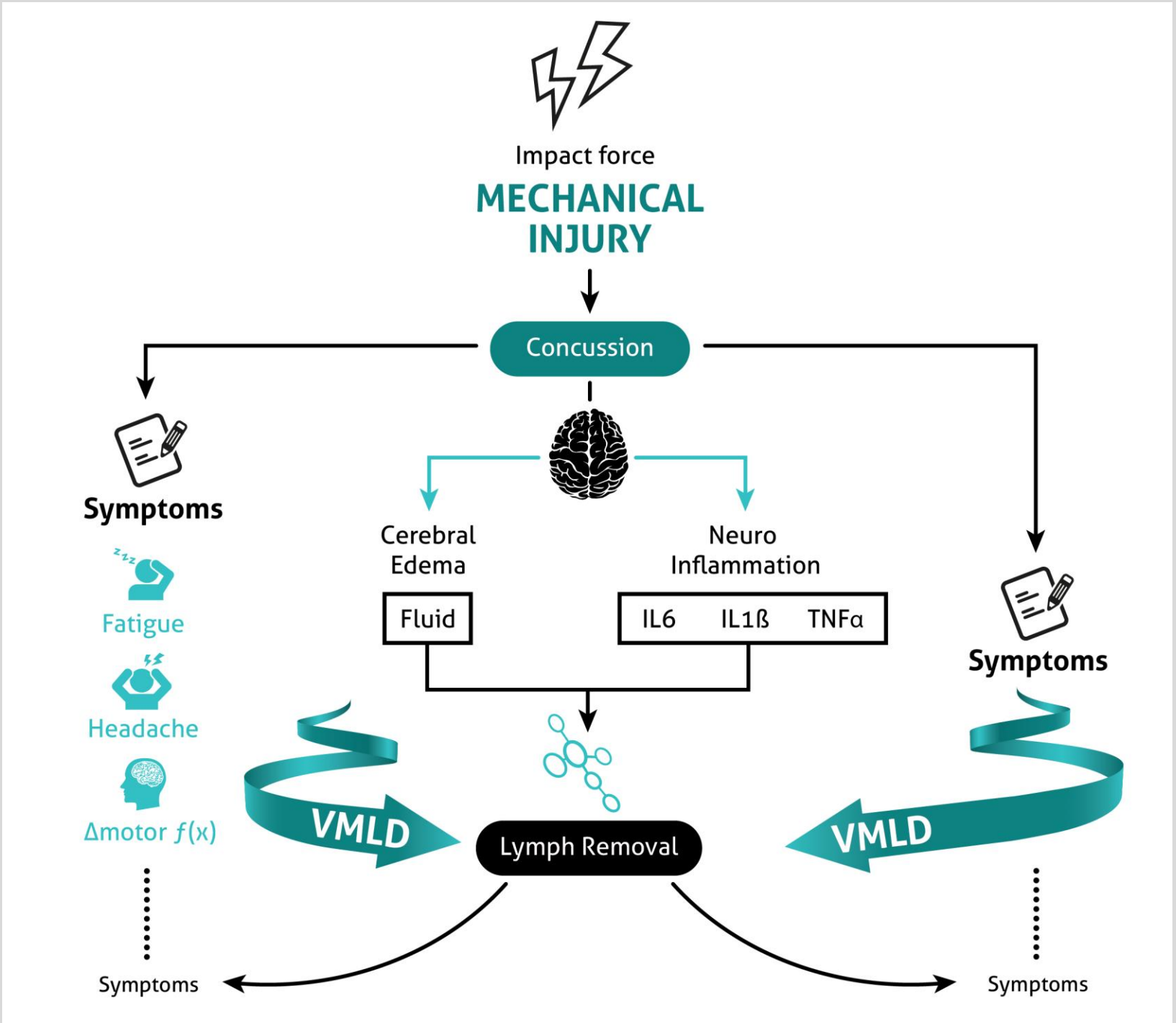
Lymphatics and the brain

- Discovery of lymph vessels around cranium.
  - Földi M et al. 1966. *Acta Anat*.
- Mapping of meningeal and sinus lymphatics in 2015
- Louveu et al. 2015. *Nature*

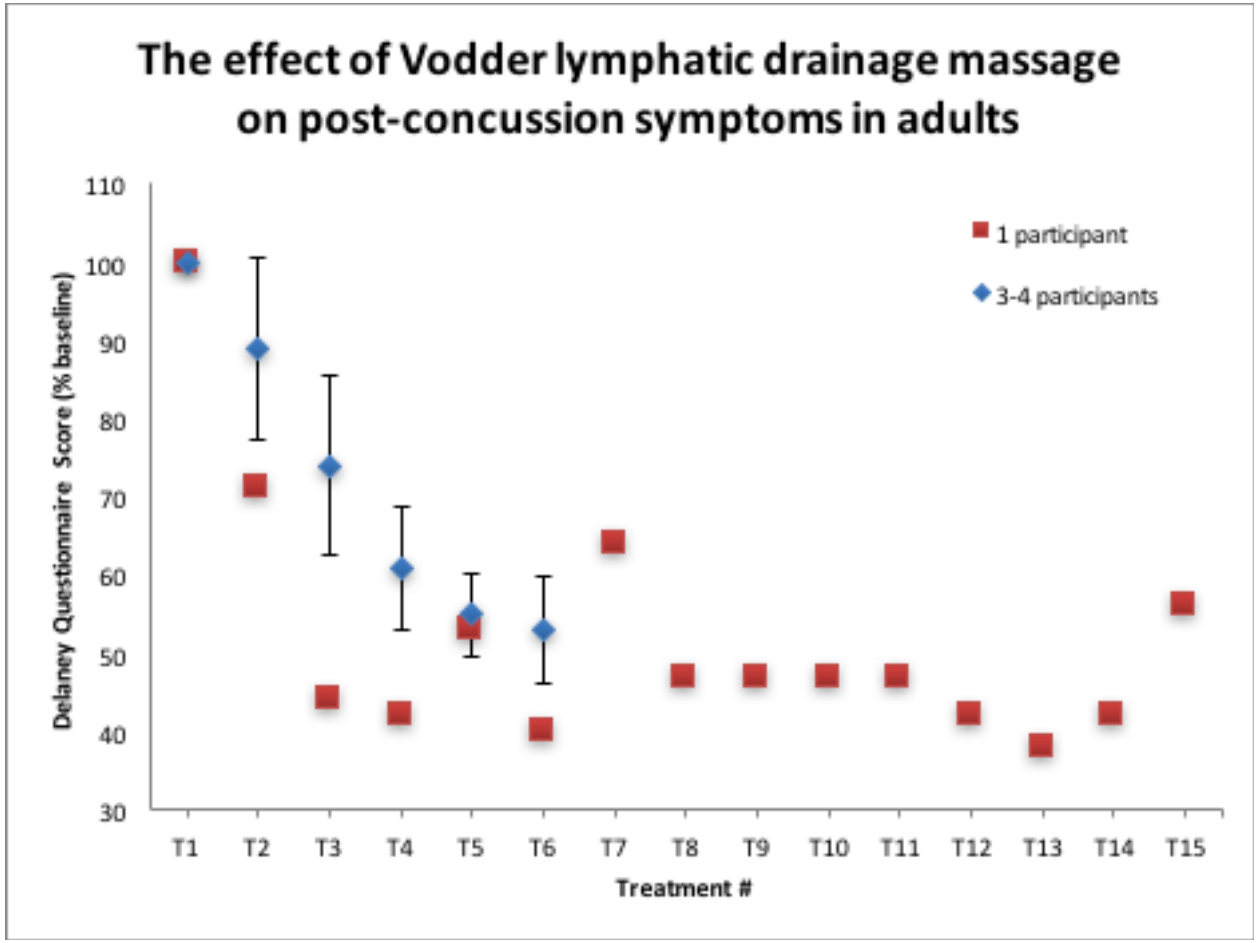


Extended Data Figure 10 | Connection between the glymphatic system and the meningeal lymphatic system. A schematic representation of a connection between the glymphatic system, responsible for collecting of the interstitial fluids from within the central nervous system parenchyma to cerebrospinal fluid, and our newly identified meningeal lymphatic vessels.

Possible Mechanism



Preliminary Data



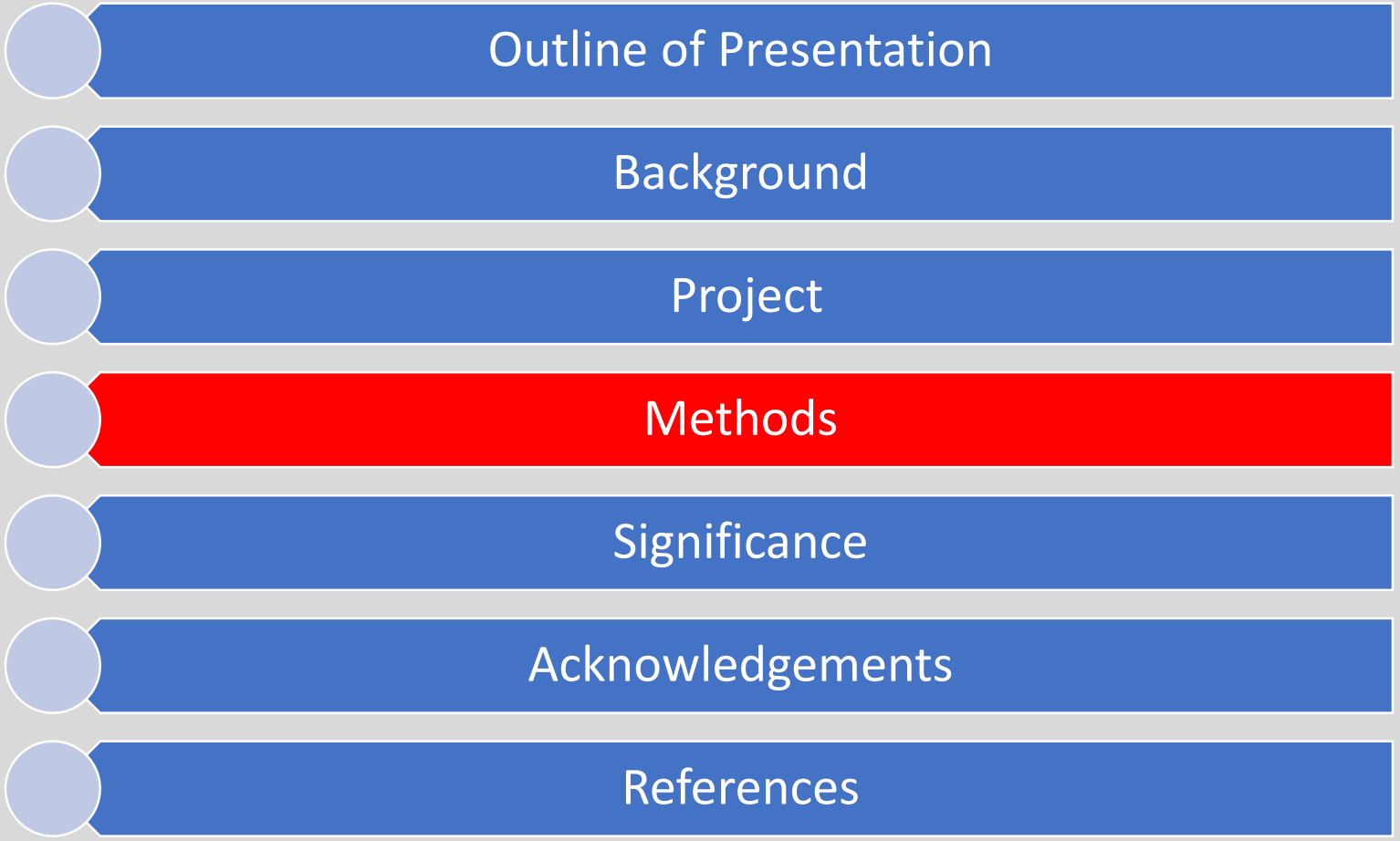
Research Objectives

- To assess the effectiveness of a standardized Vodder Manual Lymphatic Drainage (VMLD) massage therapy protocol in adolescents 13-18 years old with post-concussion symptoms on Rivermead Questionnaire and SCAT5 memory and cognitive test scores.
- To compare these findings with the “touch” control group.

Hypothesis

- VMLD protocol of 15 treatments will significantly decrease post-concussion symptoms according to Rivermead and SCAT5 memory and cognitive questionnaire scores.
- The touch control group will show minimal symptom improvement according to Rivermead and SCAT5 memory and cognitive questionnaire scores.
- Improvements in symptoms will be significantly greater in the VMLD group than “touch” control group.

Outline of Presentation

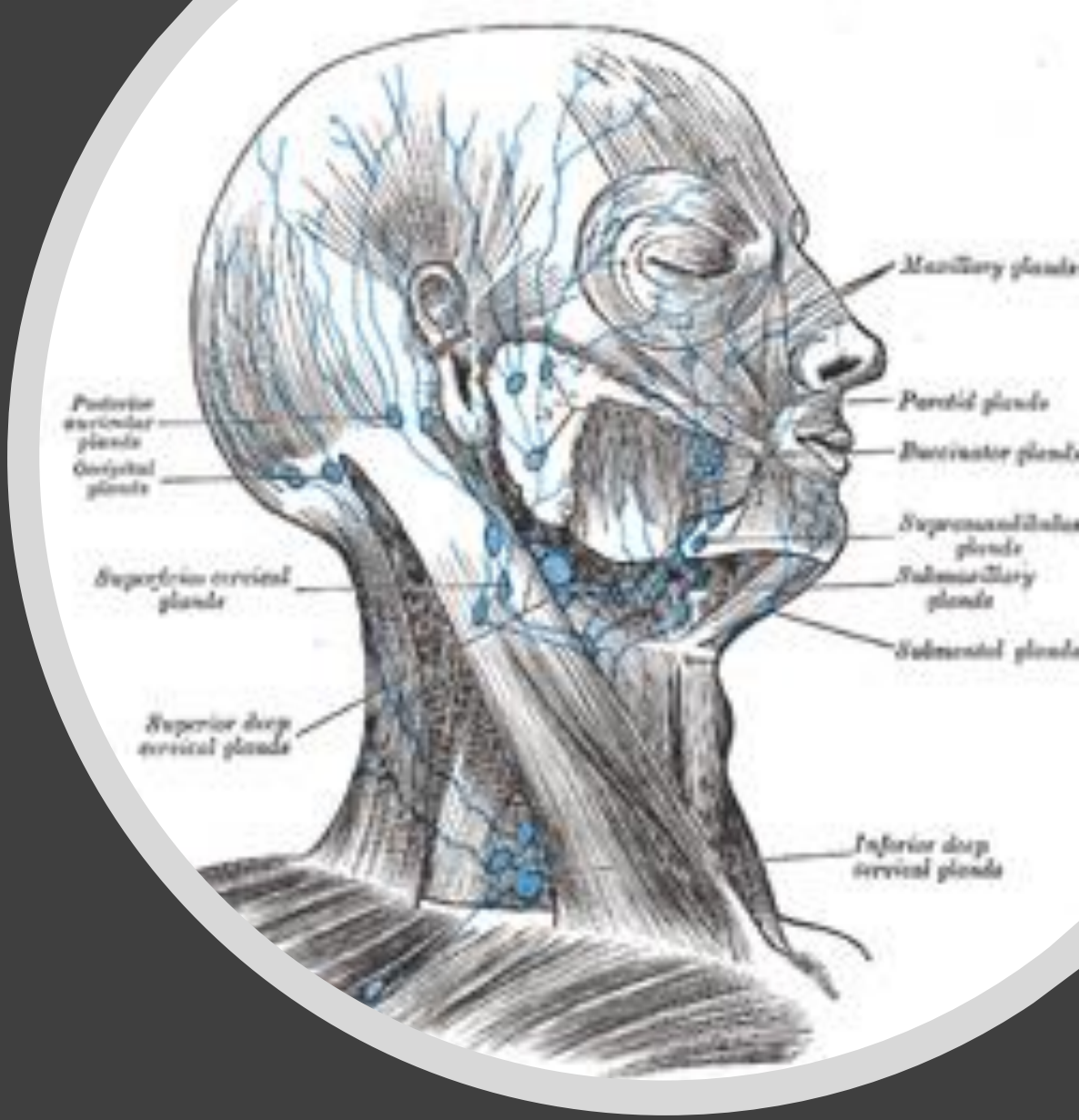


Methods

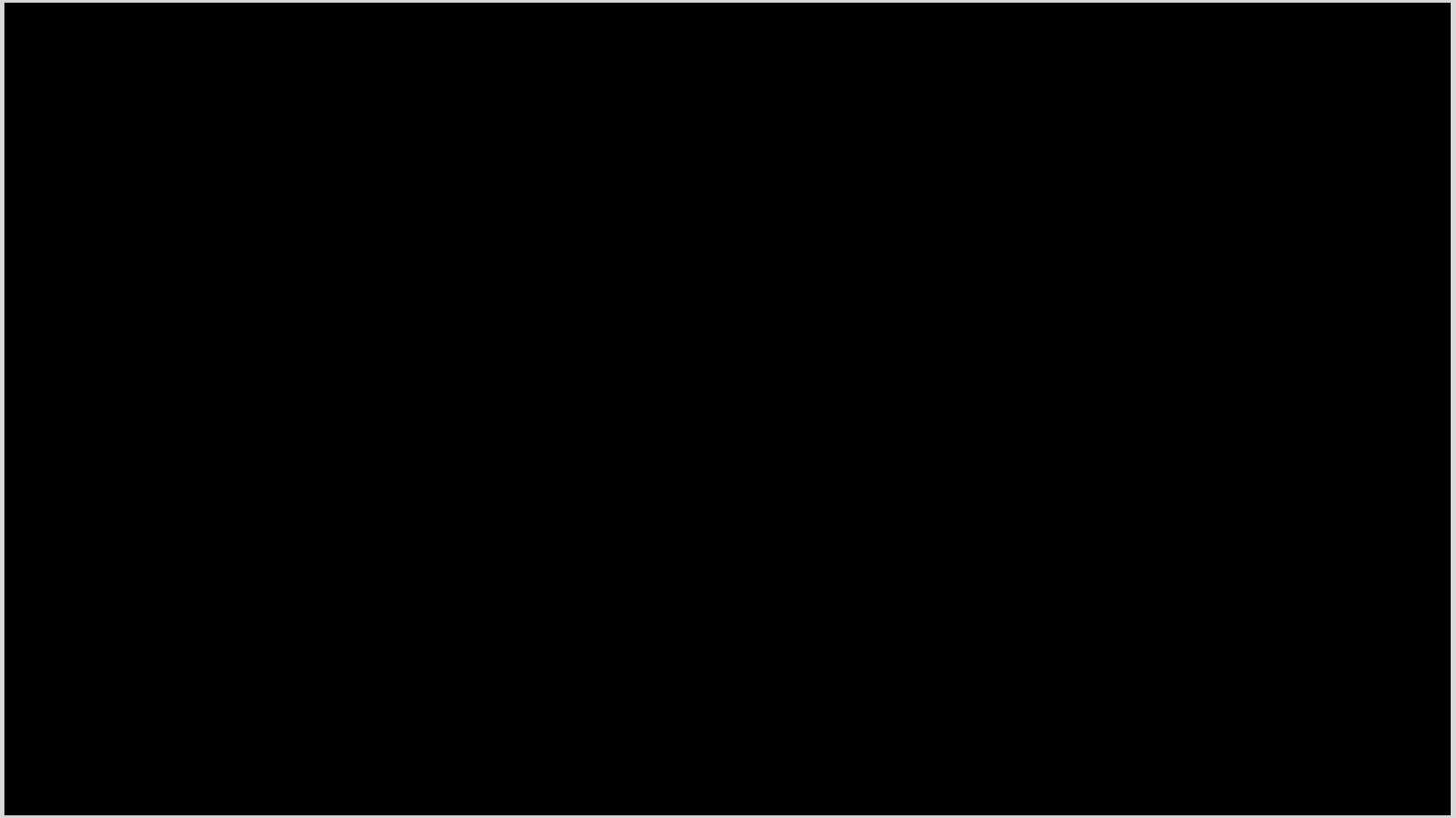
- Comparing VMLD to a touch-control group

Treatment Group

- Vodder Lymphatic Drainage
  - Cranium
  - Face
  - Special Techniques
  - Intra-Oral Technique



Touch Treatment



Methods - Participants

- N=20
- N=10 VMLD group N=10 Control group
- Adolescents 13-18 years old
- Post-Concussion Syndrome

Methods - Treatment

- 15 treatments
- 60 minute appointments
- 3 – 5 times a week

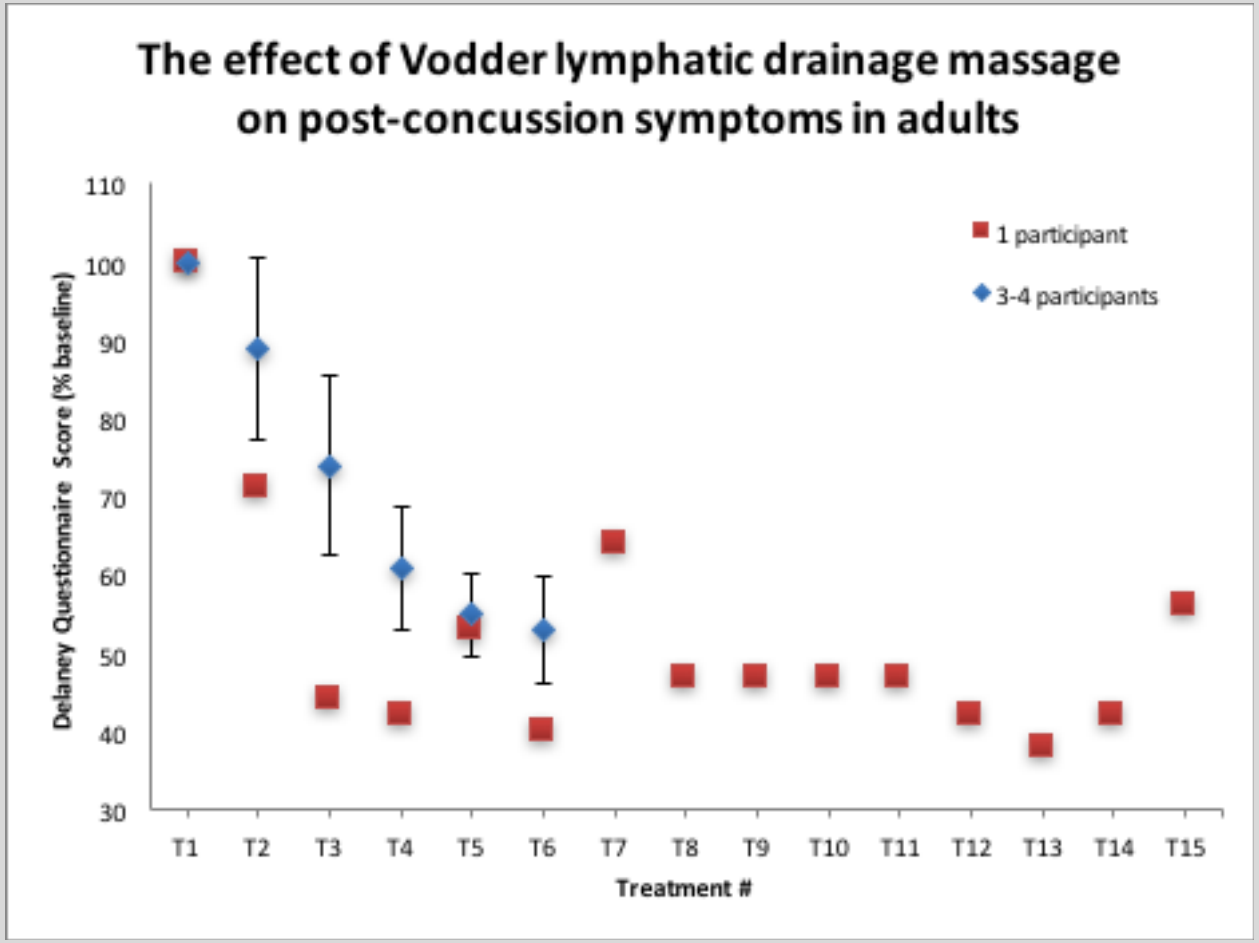
Methods - Testing

Rivermead Questionnaire and cognitive and memory test from the SCAT5 Questionnaire on appointments 1, 7 and 15

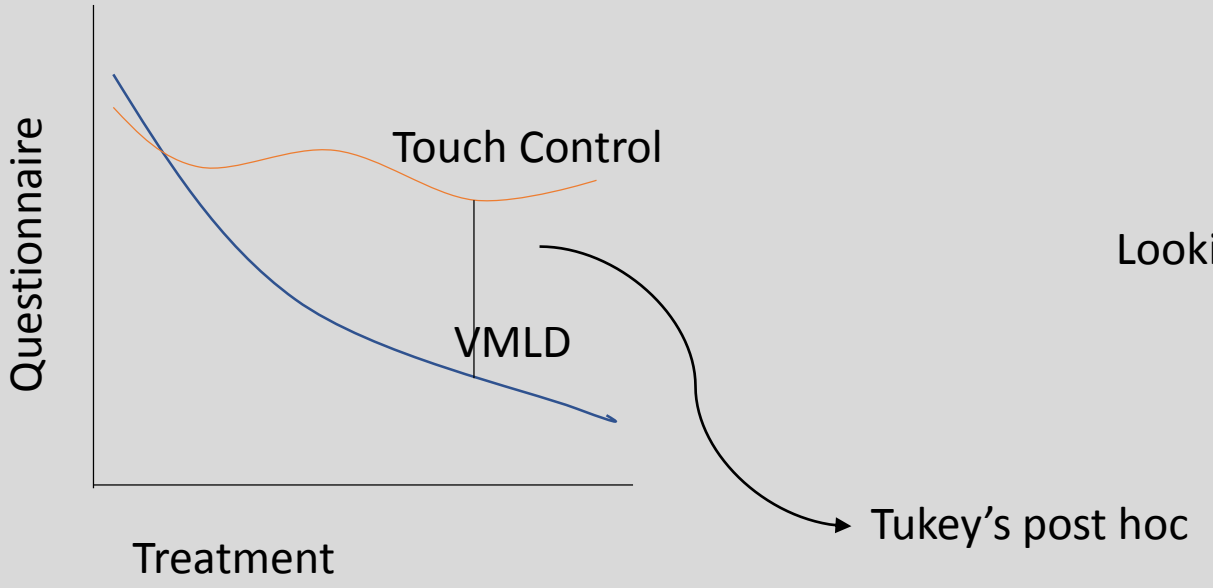
Tx	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Rivermead	X						X								X
Quest.	X						X								X

Rivermead Post-Concussion Questionnaire
Questions: Memory recall (short-term and long-term and cognitive tests from SCAT5)

Preliminary Data

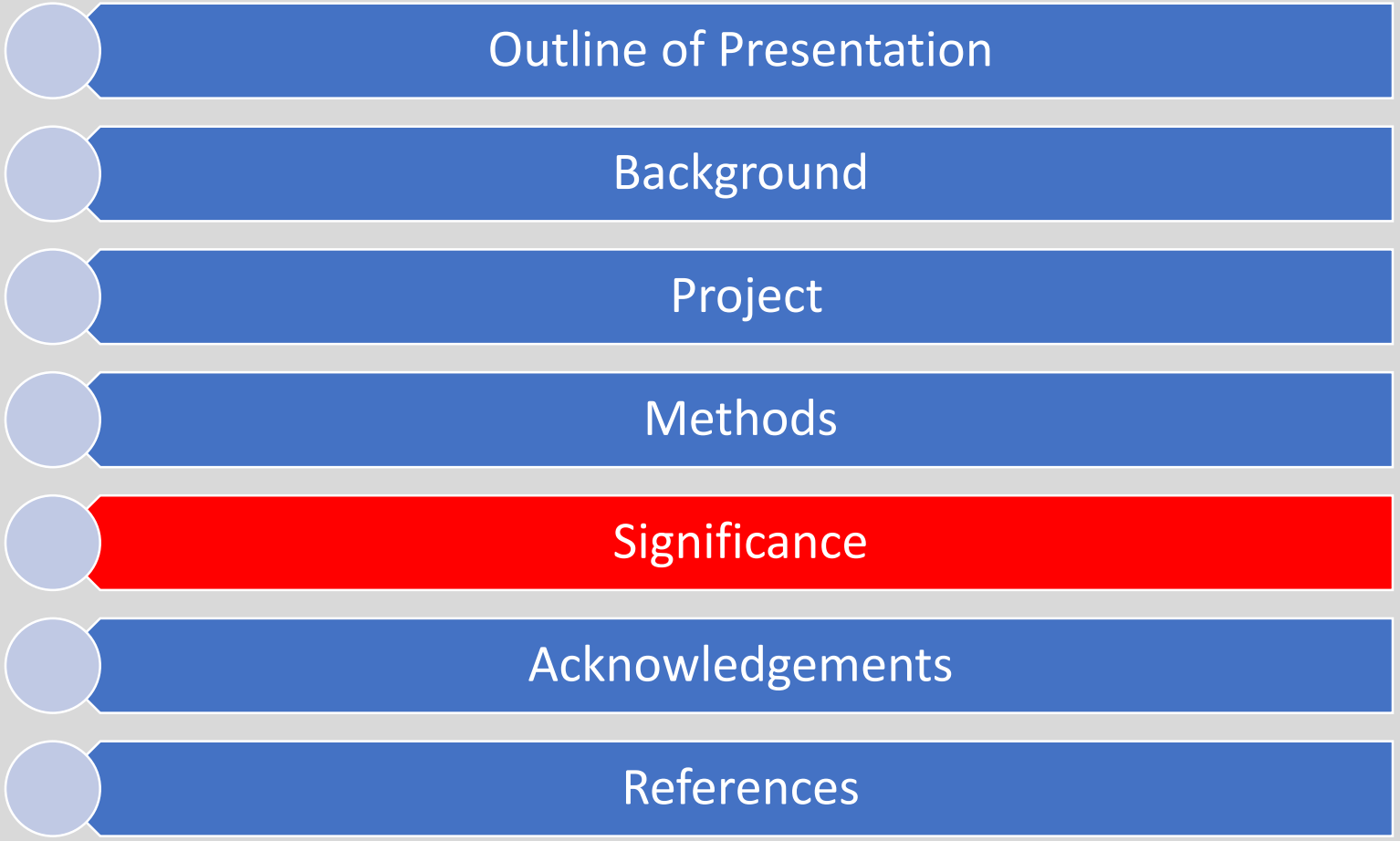


Anticipated Outcome



Looking for an interaction between the two

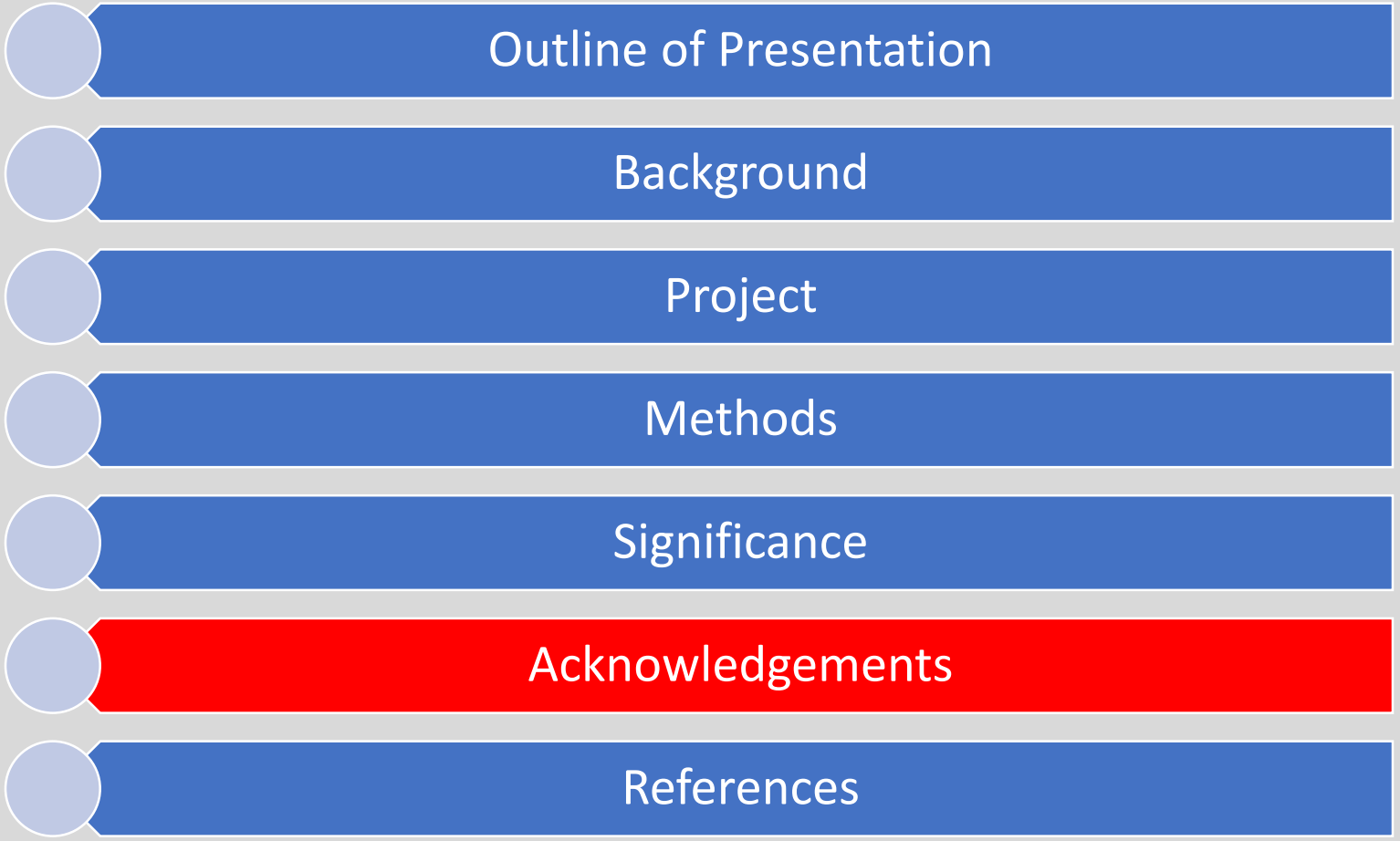
Outline of Presentation



Significance

- May be an important asset in the rehabilitation of concussions
- Unsure if inflammatory markers and tau proteins will be affected with VMLD

Outline of Presentation



Acknowledgements

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- Committee Members: Dr. Anna Towers, Dr. Geoffrey Dover

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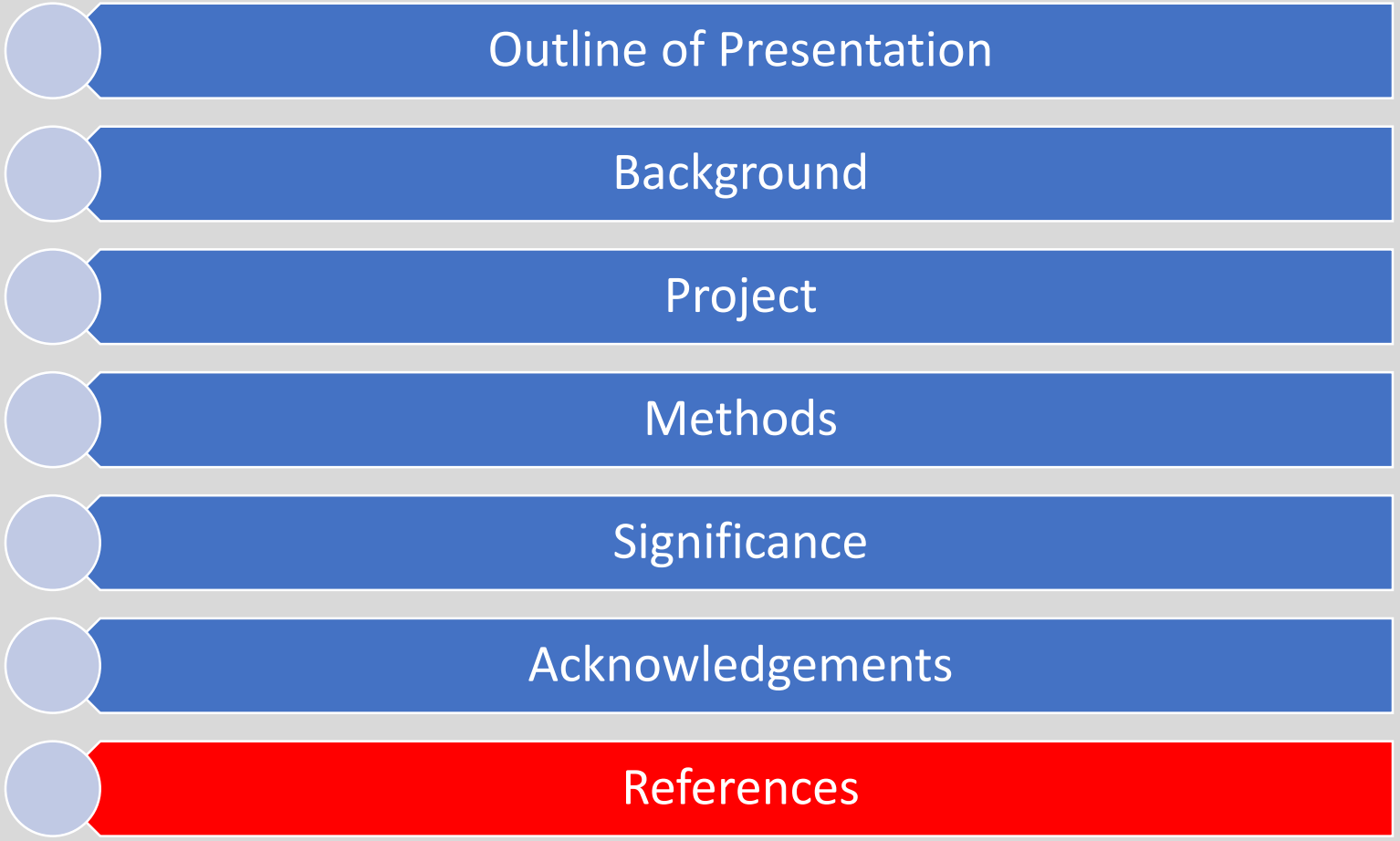

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Questions?

Rivermead Questionnaire

RIVERMEAD SYMPTOM CHECKLIST

Name: **Date:**

We would like to know whether, at the present, you suffer from any of the symptoms we list below. Because many of these symptoms occur normally, we would like you to compare yourself as you are now compared with how you were before the accident.

For each, will you please circle the number closest to your answer

KEY

0 Not experienced at all
1 Was a problem but no more
2 A mild problem
3 A moderate problem
4 A severe problem

Compared with before the accident, do you now suffer from (please circle):

Headaches	0	1	2	3	4
Feelings of dizziness	0	1	2	3	4
Nausea and/or vomiting	0	1	2	3	4
Sensitivity to noise, easily upset by noise	0	1	2	3	4
Poor sleep	0	1	2	3	4
Tiring more easily, fatigue	0	1	2	3	4
Being irritable, easily angered	0	1	2	3	4
Feeling depressed or tearful	0	1	2	3	4
Feeling frustrated or impatient	0	1	2	3	4
Forgetfulness, poor memory	0	1	2	3	4
Poor concentration	0	1	2	3	4
Taking longer to think	0	1	2	3	4
Blurred vision	0	1	2	3	4
Upset by bright light	0	1	2	3	4
Double vision	0	1	2	3	4
Restlessness	0	1	2	3	4

Are you having any other difficulties?

Please describe and rate them as above

1 _____	0	1	2	3	4
2 _____	0	1	2	3	4

SCAT5

3

STEP 3: COGNITIVE SCREENING

Standardised Assessment of Concussion (SAC)[4]

ORIENTATION

What month is it?	0	1
What is the date today?	0	1
What is the day of the week?	0	1
What year is it?	0	1
What time is it right now? (within 1 hour)	0	1
Orientation score		of 5

IMMEDIATE MEMORY

The Immediate Memory component can be completed using the traditional 5-word per trial list or optionally using 10-words per trial to minimise any ceiling effect. All 3 trials must be administered irrespective of the number correct on the first trial. Administer at the rate of one word per second.

Please choose EITHER the 5 or 10 word list groups and circle the specific word list chosen for this test.

I am going to test your memory. I will read you a list of words and when I am done, repeat back as many words as you can remember, in any order. For Trials 2 & 3: I am going to repeat the same list again. Repeat back as many words as you can remember in any order, even if you said the word before.

List	Alternate 5 word lists					Score (of 5) Trial 1	Trial 2	Trial 3
A	Finger	Penny	Blanket	Lemon	Insect			
B	Candle	Paper	Sugar	Sandwich	Wagon			
C	Baby	Monkey	Perfume	Sunset	Iron			
D	Elbow	Apple	Carpet	Saddle	Bubble			
E	Jacket	Arrow	Pepper	Cotton	Movie			
F	Dollar	Honey	Mirror	Saddle	Anchor			
					Immediate Memory Score			of 15
					Time that last trial was completed			

List	Alternate 10 word lists					Score (of 10) Trial 1	Trial 2	Trial 3
G	Finger Candle	Penny Paper	Blanket Sugar	Lemon Sandwich	Insect Wagon			
H	Baby Elbow	Monkey Apple	Perfume Carpet	Sunset Saddle	Iron Bubble			
I	Jacket Dollar	Arrow Honey	Pepper Mirror	Cotton Saddle	Movie Anchor			
					Immediate Memory Score			of 30
					Time that last trial was completed			

Name: _____

DOB: _____

Address: _____

ID number: _____

Examiner: _____

Date: _____

CONCENTRATION

DIGITS BACKWARDS

Please circle the Digit list chosen (A, B, C, D, E, F). Administer at the rate of one digit per second reading DOWN the selected column.

I am going to read a string of numbers and when I am done, you repeat them back to me in reverse order of how I read them to you. For example, if I say 7-1-9, you would say 9-1-7.

Concentration Number Lists (circle one)

List A	List B	List C			
4-9-3	5-2-6	1-4-2	Y	N	0
6-2-9	4-1-5	6-5-8	Y	N	1
3-8-1-4	1-7-9-5	6-8-3-1	Y	N	0
3-2-7-9	4-9-6-8	3-4-8-1	Y	N	1
6-2-9-7-1	4-8-5-2-7	4-9-1-5-3	Y	N	0
1-5-2-8-6	6-1-8-4-3	6-8-2-5-1	Y	N	1
7-1-8-4-6-2	8-3-1-9-6-4	3-7-6-5-1-9	Y	N	0
5-3-9-1-4-8	7-2-4-8-5-6	9-2-6-5-1-4	Y	N	1
List D	**List E**	**List F**			
7-8-2	3-8-2	2-7-1	Y	N	0
9-2-6	5-1-8	4-7-9	Y	N	1
4-1-8-3	2-7-9-3	1-6-8-3	Y	N	0
9-7-2-3	2-1-6-9	3-9-2-4	Y	N	1
1-7-9-2-6	4-1-8-6-9	2-4-7-5-8	Y	N	0
4-1-7-5-2	9-4-1-7-5	8-3-9-6-4	Y	N	1
2-6-4-8-1-7	6-9-7-3-8-2	5-8-6-2-4-9	Y	N	0
8-4-1-9-3-5	4-2-7-9-3-8	3-1-7-8-2-6	Y	N	1
		Digits Score:			of 4

MONTHS IN REVERSE ORDER

Now tell me the months of the year in reverse order. Start with the last month and go backward. So you'll say December, November. Go ahead.

Dec - Nov - Oct - Sept - Aug - Jul - Jun - May - Apr - Mar - Feb - Jan 0 1

Months Score of 1

Concentration Total Score (Digits + Months) of 5

4

STEP 4: NEUROLOGICAL SCREEN

See the instruction sheet (page 7) for details of test administration and scoring of the tests.

Can the patient read aloud (e.g. symptom check-list) and follow instructions without difficulty?	Y	N
Does the patient have a full range of pain-free PASSIVE cervical spine movement?	Y	N
Without moving their head or neck, can the patient look side-to-side and up-and-down without double vision?	Y	N
Can the patient perform the finger nose coordination test normally?	Y	N
Can the patient perform tandem gait normally?	Y	N

BALANCE EXAMINATION

Modified Balance Error Scoring System (mBESS) testing[5]

Which foot was tested (i.e. which is the non-dominant foot) ☐ Left ☐ Right

Testing surface (hard floor, field, etc.) _____

Footwear (shoes, barefoot, braces, tape, etc.) _____

Condition	Errors
Double leg stance	of 10
Single leg stance (non-dominant foot)	of 10
Tandem stance (non-dominant foot at the back)	of 10
Total Errors	of 30

Name: _____

DOB: _____

Address: _____

ID number: _____

Examiner: _____

Date: _____

5

STEP 5: DELAYED RECALL:

The delayed recall should be performed after 5 minutes have elapsed since the end of the Immediate Recall section. Score 1 pt. for each correct response.

Do you remember that list of words I read a few times earlier? Tell me as many words from the list as you can remember in any order.

Time Started _____

Please record each word correctly recalled. Total score equals number of words recalled.

_____

_____

_____

Total number of words recalled accurately: of 5 or of 10

6

STEP 6: DECISION

Domain	Date & time of assessment:		
Symptom number (of 22)			
Symptom severity score (of 132)			
Orientation (of 5)			
Immediate memory	of 15 of 30	of 15 of 30	of 15 of 30
Concentration (of 5)			
Neuro exam	Normal Abnormal	Normal Abnormal	Normal Abnormal
Balance errors (of 30)			
Delayed Recall	of 5 of 10	of 5 of 10	of 5 of 10

Date and time of injury: _____

If the athlete is known to you prior to their injury, are they different from their usual self?
☐ **Yes** ☐ **No** ☐ **Unsure** ☐ **Not Applicable**
(If different, describe why in the clinical notes section)

Concussion Diagnosed?
☐ **Yes** ☐ **No** ☐ **Unsure** ☐ **Not Applicable**

If re-testing, has the athlete improved?
☐ **Yes** ☐ **No** ☐ **Unsure** ☐ **Not Applicable**

I am a physician or licensed healthcare professional and I have personally administered or supervised the administration of this SCAT5.

Signature: _____

Name: _____

Title: _____

Registration number (if applicable): _____

Date: _____

SCORING ON THE SCAT5 SHOULD NOT BE USED AS A STAND-ALONE METHOD TO DIAGNOSE CONCUSSION, MEASURE RECOVERY OR MAKE DECISIONS ABOUT AN ATHLETE'S READINESS TO RETURN TO COMPETITION AFTER CONCUSSION.