

“Neuro Visual Training”, Merging Brain Training with Vision Training to Prevent Injuries and Accelerate Rehabilitation”

Visual Reaction Time: Testing, Training and Thinking.

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Learning Objectives

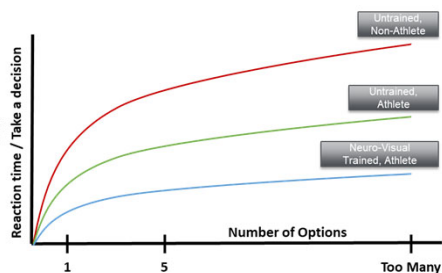
- The student will be able to define visual reaction time.
- The student will be able to list methods to test reaction time.
- The student will be able list training methods to improve reaction time.
- The student will be able to define central and peripheral reaction time.
- We need to train the brain and body to think and react quickly and correctly.

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Hick's Principle

➤ Hick's Principle and Speed of Decision Making in Sports Vision Training

➤ Hick's principle predicts that the time and effort it takes to make a decision increases with the number of options.



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Hick's Principle

➤ In essence: “Seeing and thinking” more may mean MORE TO PROCESS, MORE DECISIONS TO MAKE

➤ Therefore it is imperative to do brain training and eye training to improve reaction times.

➤ Neuro-Visual Training for multiple sports can provide the athlete and their brain with additional information

➤ May correlate to added performance options

➤ The added options can be associated with a slowing of performance via Hick's principle

➤ We need to train the brain and body to think and react. Not all reactions and reaction times have the same cognitive load.

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Hick's Principle

➤ In our practice, during the later stages of training, we often tell the athlete that they are best served by trusting their instincts following successful training and to **NOT** think too much about options.

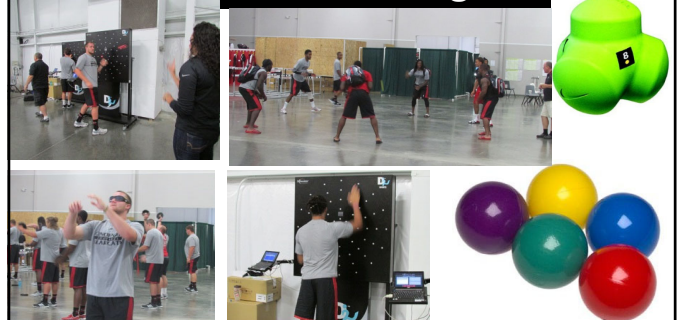
➤ Encouragement helps to encourage rapid processing of the athlete and improve the speed of performance.

➤ Thinking and practicing thinking is done during training and practices. Performance should be filled with using instincts and rapid reflexes.

➤ **ASSUMPTION:** Training was sufficient to improve ‘brain muscle memory’ speed and performance.

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Vision Training




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Reaction Time Testing - Dynavision

- We use the dynavision to measure central reaction time and Peripheral visual field reaction time.
- Peripheral visual field reaction time is 45 degrees off center – left and right.
- Both use the dynavision reaction test; 1 button option.

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Reaction Testing with Dynavision



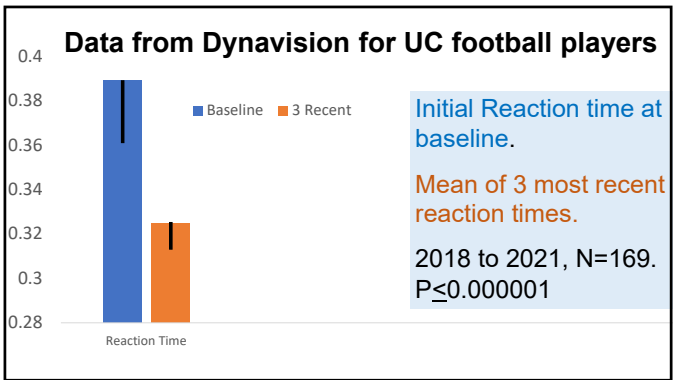
A CASE SERIES.

Visual reaction times were assessed using the Dynavision D2 light board (Westchester Ohio). Central and Peripheral vision is tested on the light board. Measured central visual reaction time compared to the visual reaction time in the periphery ($\approx 45^\circ$ off center)

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Peripheral Vision Reaction Time

<p>Control Subjects. 0.3 second reaction time with 16% peripheral slowing.</p>	<p>Vision Trained. 16% FASTER reaction time with only a 6% peripheral vision slowing.</p>	<p>Post Concussion. 20% SLOWER second reaction time with 36% peripheral slowing.</p>
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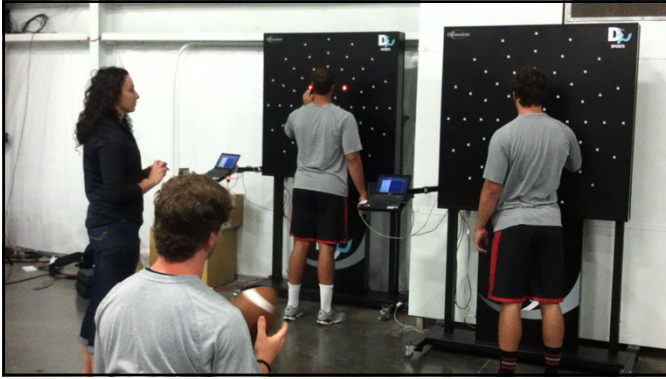
Training reaction time is great. Training peripheral vision reaction time is next level in that you get more and faster information about the field of play. The result, we believe, is better play and safer play.

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Sequential Processing

- In many sports a person must perform an action, decide based on sensory (Visual) input and react. **The concept here is sequential processing.** Consider a linebacker on a football team who has a primary responsibility and a secondary responsibility based on the read of the play. That decision tree involves sequential processing.
- If you do a reaction test (we use the dynavision light board) and get a person to a standard reproducible reaction test AND then add an additional task to be done quickly after the reaction sequence, the first task slows down.
- Consider ways to train and improve sequential processing when dealing with athletes.

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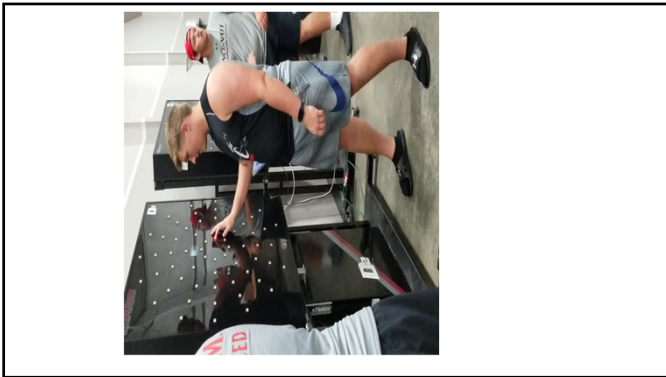


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Sequential processing video

- Establish the reaction time.
- Have a second task added to the end of the reaction time task.
- Typically people slow ~20% from their typical performance by adding a task to be completed after the reaction test.
- Thinking about the second task slows the first task. Often people will do the first task worse. In the case of the dynavision a person may miss buttons.
- THINK ABOUT THINGS THAT IMPACT SPORTS REACTION TIME; Hick Principle, Stress, Body Awareness .

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Strobe Glasses For Reaction time and Performance Enhancement

- Strobe glasses can be used as part of a performance enhancement paradigm
- Brands:
 - Nike Sparq (manufacture discontinued but can be found on line)
 - Synaptec (knock off from nike sparq)
 - Vima Revs (Comes in sports and tactical types)
 - Japan Labs (not designed for sports)
 - Xpand (one speed)
- Be safely aware when adding strobes. Ask about seizure disorder. Minimize risk of injury. Progress difficulty as the athlete gains proficiency

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Strobe Glasses – Performance Enhancement



➤ The simplest concept for the use of strobe glasses is to add them to a standard training regimen as a means of progressing the exercise



➤ For example if you have someone doing pitch and catch or marsden ball exercise, and they have become proficient at it; add the strobes. Start with a fast speed with the task (marsden ball) and slow the strobe frequency as the person gets more proficient

➤ Strobe glasses address the third pillar of NVT: brain processing and speed of processing

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Strobe Glasses – Performance Enhancement

➤ Overarching Concept with Strobe Glasses & Sports Performance Enhancement:

- Establish proficiency with the drill
- Start with fast frequency strobes sandwiched between normal activities
- Ensure a safe environment for the athlete to benefit from the strobes
- End with normal drill and assess the athletes' perception of benefits post strobes
- As post use perceived benefit diminishes (and performance improves) consider slowing the strobe frequency

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Strobe Glasses – Biological Principles

Fast Frequency (5-10Hz):

- Tend to be easier to use for athletes
- Tend to have fast on/off washout of benefits
- Provide the perception that things are slowing down
- **Improves reaction times.**
- **NOTE:** Training at frequencies higher than 10Hz have increased seizure risk, and frequencies higher than 50Hz have minimal benefits

Slow Frequency (<5Hz):

- Tend to be harder to use for athletes
- Tend to take longer to see benefits
- Benefits seem to (we believe) last longer
- Improves eye discipline, processing of interpretive visual information
 - filling in gaps

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Strobe Glasses – Duty Cycles

- Square Waves
 - the on/off cycles

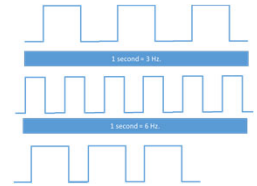
- Frequency
 - Cycles per second

- Types of Duty Cycles:
 - Two Eyes
 - One Eye Only
 - Alternating Eyes

- Duty Cycles
 - Time on vs time off

- To the right are two 50/50 cycles

- The bottom is a 75% duty cycle



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Strobes – Examples for Sports Performance

➤ Baseball - **Batter:**

- Consider using the strobes in the batting cage. Ensure the batter will not be hit (pitching machine or competent pitcher). Consider 4 or 5 pitches without strobes, 10 - 12 pitches with strobes and 4 or 5 pitches without. Or a similar ratio 1:2:1

➤ Football – **Quarterback:**

- Consider 7 on 7 drill. Have quarterback take 2 or 3 reps without strobes, 8 to 10 with strobes, followed by 3 or 4 without. 1:3:1 ratio

➤ Ice Hockey – **Goalie:**

- Consider 1 or 2 minutes usual practice, 10 to 12 minutes with strobes, followed by 1 to 3 minutes without. 2:5:2 ratio

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Marsden Balls

- **Function:** improve processing of visual info when objects are coming at you.

- Need to react and process information with the ball in the air.

- Multiple colors provide advanced processing, calling colors, and designating specific tasks per color caught.

- Shapes & alphanumeric increases complexity of the visual processing.

- AKA Squarkle.



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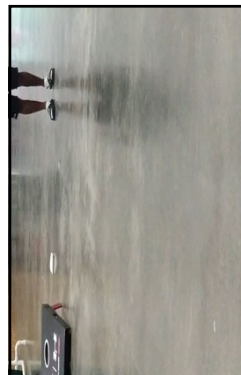
Image of Vector Ball.



- The vector ball flashes red, blue or green when bounced.
- We often ask athletes to catch the ball based on the color flashed; Red=Right, Green=Left and Blue=Both.
- Right now, they are not in stock – apparently the delayed shipment is stuck on a ship off the coast of California.

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Vector Ball Video with Strobe Glasses



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Wacky Ball:

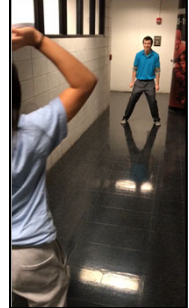
Reaction Training

- Function: An asymmetric ball, that bounces in relatively unpredictable ways and addresses training associated with eye discipline and speed of processing
- It can be used as part of a primary solo drill (one person bouncing against a wall) or in competition

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Wacky Ball – Functionality



- With certain aspects of life and post mTBI recovery, one must be disciplined to **NOT** react at certain times, and react only when appropriate. Frontal Lobe Training.
 - The reaction trainer can achieve a facet of such training when applied appropriately
- Instructions:
 - Have the patient stay in sports like stance until the bounce
 - React **ONLY** to the bounce and catch the ball
 - Don't over anticipate, wait for the bounce
 - Throw the ball in the air back to me
 - Bounce the ball about 4 – 5 feet in front of the patient
 - Mixing speeds (sometimes fast, sometimes slow)

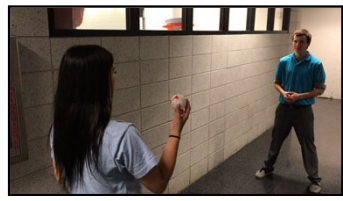
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Box of Marsden Balls



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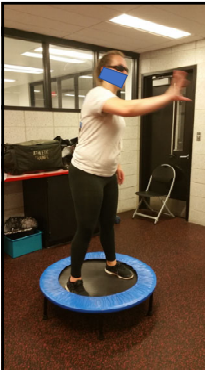
Marsden Balls – Functionality



- Types:
 - Pitch & Catch
 - Pitch & Hit (Bunting or Baton Contact Drills)
 - Baton matches color of balls
 - Can have 4 color ball suspended from a string and hit baton to the color
 - Roll & Kick (Soccer Drills)
- Progressions:
 - Include task with Pinhole Glasses, Strobe Glasses, or Colored Glasses

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SQUARKLE



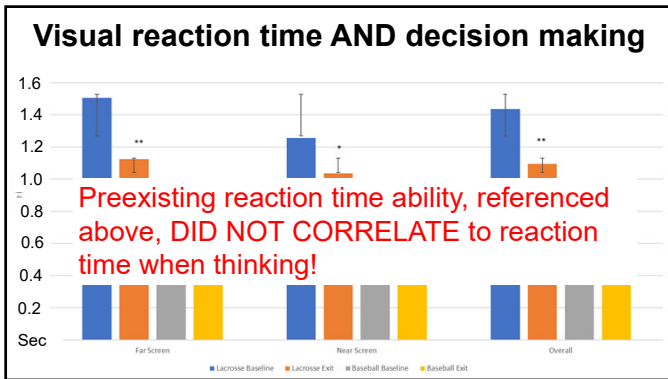
- Following a logical progression this post TBI patient is on a minitramp, wearing strobe glasses and having balls thrown at her.
- The balls have red, blue or green shapes on them. The shapes are; squares, circles or triangles.
- She catches; red=right, green=left, blue=both hands.
- IN THE AIR she calls the shape.
- At some point every patient will call a square and circle simultaneously; giving us SQUARKLE.

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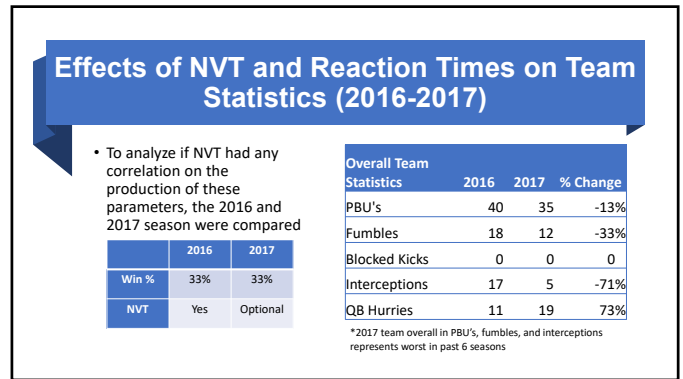
Rhythmic Stabilization

- Rhythmic stabilization is a relatively established method of perturbing the core of the body or the limbs while the subject is doing a task.
- The subject must adjust from the perturbation to continue the task.
- A simple example is to have the subject lay on his/her back, hold a weight straight up.
- We'll call this the starting position.
- A therapist will push and pull the arm and the subject must adjust to bring the arm and weight to the starting position.
- The subject must react to the perturbation and process the adjustments. **These are visual and motor adjustments.**

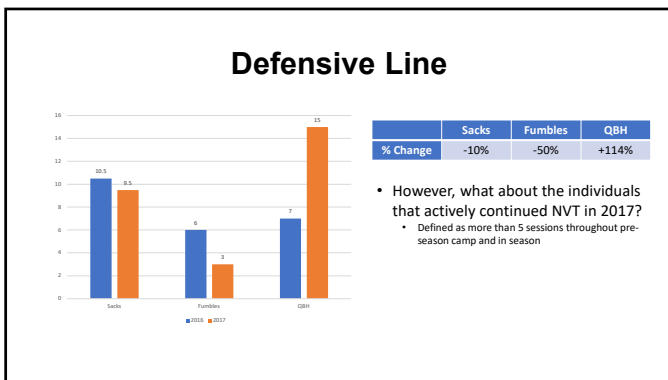
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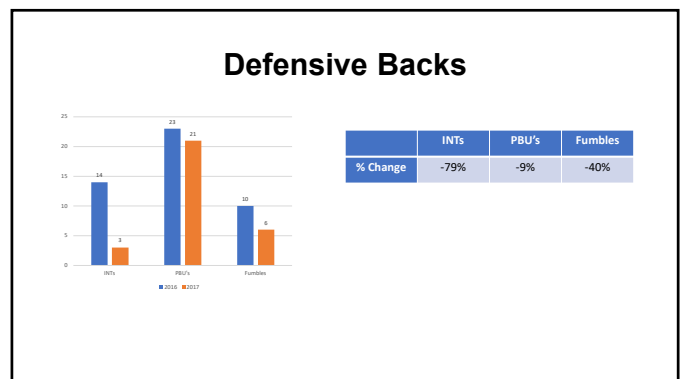


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Conclusion

- Avoid underappreciating the significance of reaction visual times for sports performance enhancement.
- Not all reaction time tests are created equal.
- Speed of brain processing counts.

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**Neurovisual training to decrease concussion in College Sports.
Neurovisual rehab to accelerate return to play in College Sports.**

Joseph F. Clark, Ph.D.

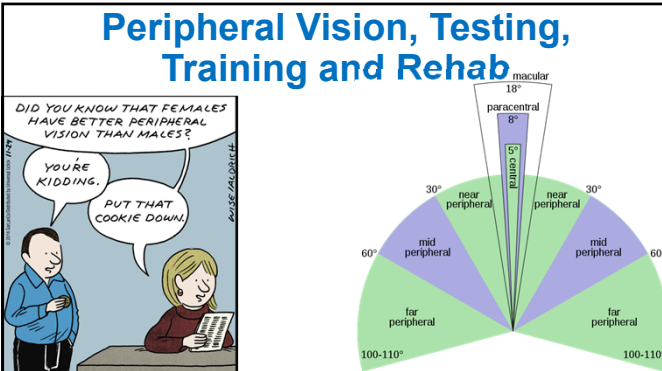
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Injury prevention and Performance Enhancement Video



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Peripheral Vision, Testing, Training and Rehab



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UC Concussion Numbers

Why are we doing this?

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University of Cincinnati Concussion in Football

- Data from 2006 to 2020 for the UC football team. This covers the full calendar year; as opposed to the season.
- Mean concussion per year without vision training: 9.0 ± 1.6 .
- Mean concussions per year with vision training: 2.3 ± 1.4 .
- Mean return to play in days (2014 to 2020): $*8.07 \pm 2.6$
- Significant difference in concussions = 0.000004.
- We have 12 years of vision training data and concussion incidence rates, plus 5 years of no vision training data. The data do not appear to be influenced by 5 different coaches.
- This is from a study from 2014 to 2020.

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Do we want to go into some pitfalls of NVT?

- Yes, but we need to be cognizant of the source and the implications.
- To follow are some common misconceptions concerning NVT.
- The take home message will be; all NVT is not created equal.



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Does Visual Performance Influence Head Impact Severity Among High School Football Athletes?

OBJECTIVE: To compare the odds of sustaining moderate and severe head impacts, rather than mild, between high school football players with high and low visual performance.

DESIGN: Prospective quasi-experimental.

SETTING: Clinical Research Center/On-field.

PARTICIPANTS: Thirty-seven high school varsity football players.

INTERVENTIONS: athletes completed the new (2012) Sensory Station visual assessment before the season. Head impact biomechanics were captured at all practices and games using the Head Impact Telemetry System.

MAIN RESULTS: Each player was classified as either a high or low performer using a median split for each of the following visual performance measures: visual acuity, contrast sensitivity, depth perception, near-to-far quickness, target capture, perception span, eye-hand coordination, gaito jio, and reaction time. We computed the odds of sustaining moderate and severe head impacts against the reference odds of sustaining mild head impacts across groups of high and low performers for each of the visual performance measures.

RESULTS: Players with better near-to-far quickness had increased odds of sustaining moderate (odds ratios (ORs) 1.27, 95% confidence intervals (CIs) 1.04-1.55) and severe head impacts (ORs 1.45, 95% CI 1.05-2.01) as measured by Head Impact Technology severity profile.

CONCLUSIONS: Better visual performance did not reduce the odds of sustaining higher magnitude head impacts. Visual performance may play less of a role than expected for protecting against higher magnitude head impacts among high school football players. Further research is needed to determine whether visual performance influences concussion risk.

CLINICAL RELEVANCE: Based on our results, we do not recommend using visual training programs at the high school level for the purpose of reducing the odds of sustaining higher magnitude head impacts.

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CONCLUSIONS: Better visual performance did not reduce the odds of sustaining higher magnitude head impacts. Visual performance may play less of a role than expected for protecting against higher magnitude head impacts among high school football players. Further research is needed to determine whether visual performance influences concussion risk.

CLINICAL RELEVANCE: Based on our results, we do not recommend using visual training programs at the high school level for the purpose of reducing the odds of sustaining higher magnitude head impacts.

This is quoted from the afore referenced study. The claim that vision training does not reduce concussion risk. We have a problem in sports vision and sports TBI.

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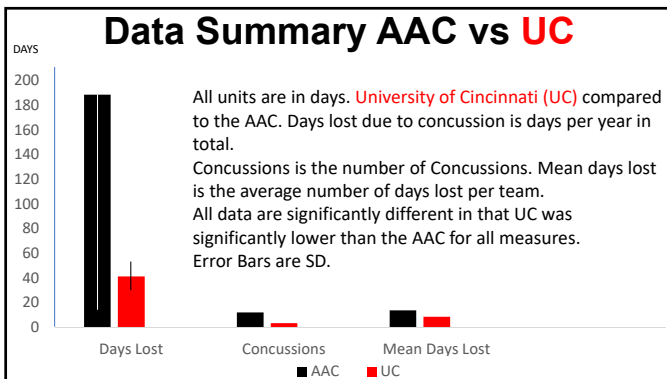
Near Point of Convergence taught at an Athletic Training conference.

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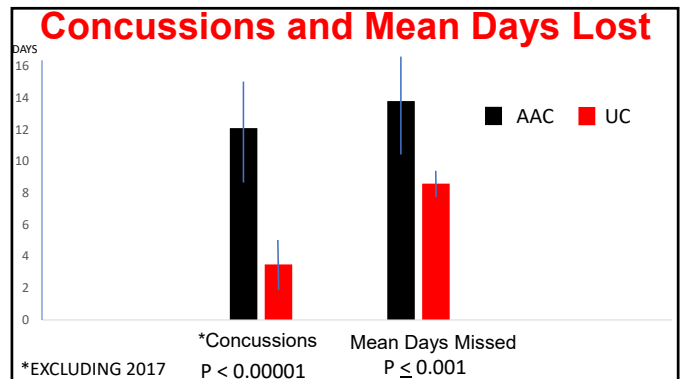
AAC Study, Demographics of data

- No unique identifiers collected, no PHI, no change in standard of care.
- The University of Cincinnati is the only school to report doing vision training for concussion prevention.
- Our research question is, does NVT impact the concussion profile for the University of Cincinnati football team compared to the AAC?

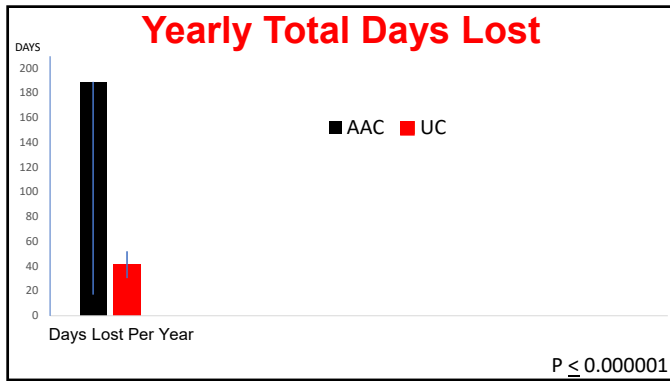
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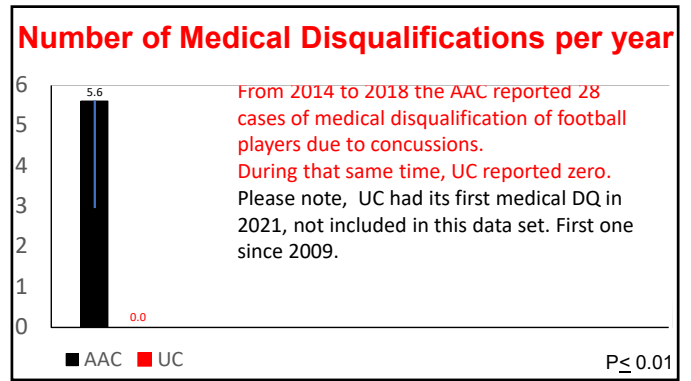
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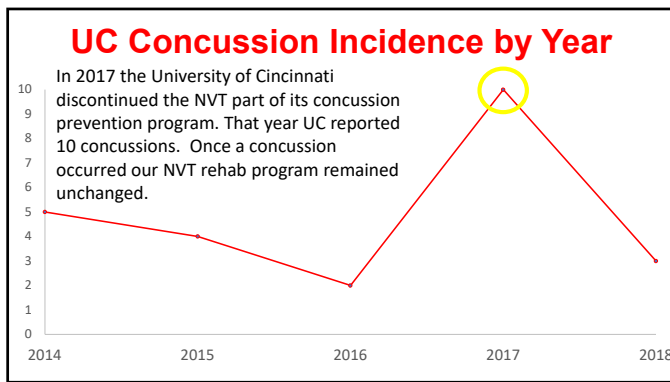
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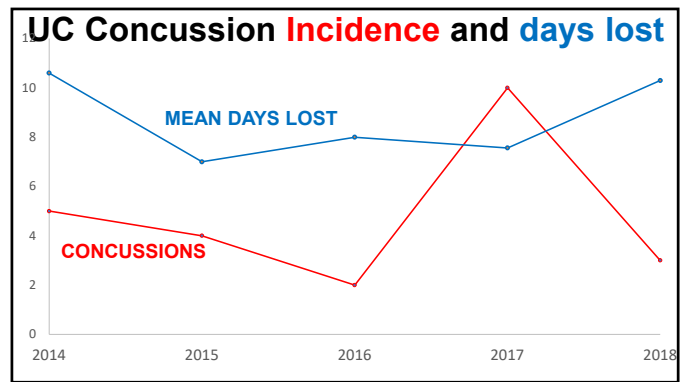
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Days lost for football concussions.

- UC's duration to Return to Play (RTP) was consistently lower than the AAC (faster RTP). Note, the rehab always contains a full vision exam, neuro exam and vision training as rehab as needed. Done by an OD and myself.
- The RTP duration in the year without vision training pre-season was not changed (2017).
- We conclude from this that prior exposure to vision training did not change RTP length, and that the vision training may play a part in the accelerated RTP.

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Hart Chart Peripheral Vision Testing / Training

- Use the hart charts, but do not do the saccadic eye movement.
- Use peripherals to read the alpha numeric.
- Can also be used to train color peripheral fields as needed.

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N	U	J	W	R	X	7	C	K	Y
U	Y	4	M	A	P	O	X	Z	Q
X	M	T	I	G	A	H	F	D	B
L	E	A	M	R	D	W	T	X	1
P	5	K	I	X	R	8	W	C	W
I	G	2	P	W	A	7	C	K	Y
T	D	9	M	K	P	O	X	Z	Q
F	R	4	C	X	7	1	9	X	F
C	O	X	Z	B	N	C	O	E	P
J	H	C	2	H	G	J	5	T	I

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N	U	J	W	R	X	7	C	K	Y
U	Y	4	M	A	P	O	X	Z	Q
X	M	T	I	G	A	H	F	D	B
L	E	A	M	R	D	W	T	X	1
P	5	K	I	X	R	8	W	C	W
I	G	2	P	W	A	7	C	K	Y
T	D	9	M	K	P	O	X	Z	Q
F	R	4	C	X	7	1	9	X	F
C	O	X	Z	B	N	C	O	E	P
J	H	C	2	H	G	J	5	T	I

20

N	U	J	W	R	X	7	C	K	Y
U	Y	4	M	A	P	O	X	Z	Q
X	M	T	I	G	A	H	F	D	B
L	E	A	M	R	D	W	T	X	1
P	5	K	I	X	R	8	W	C	W
I	G	2	P	W	A	7	C	K	Y
T	D	9	M	K	P	O	X	Z	Q
F	R	4	C	X	7	1	9	X	F
C	O	X	Z	B	N	C	O	E	P
J	H	C	2	H	G	J	5	T	I

21

N	U	J	W	R	X	7	C	K	Y
U	Y	4	M	A	P	O	X	Z	Q
X	M	T	I	G	A	H	F	D	B
L	E	A	M	R	D	W	T	X	1
P	5	K	I	X	R	8	W	C	W
I	G	2	P	W	A	7	C	K	Y
T	D	9	M	K	P	O	X	Z	Q
F	R	4	C	X	7	1	9	X	F
C	O	X	Z	B	N	C	O	E	P
J	H	C	2	H	G	J	5	T	I

22

N	U	J	W	R	X	7	C	K	Y
U	Y	4	M	A	P	O	X	Z	Q
X	M	T	I	G	A	H	F	D	B
L	E	A	M	R	D	W	T	X	1
P	5	K	I	X	R	8	W	C	W
I	G	2	P	W	A	7	C	K	Y
T	D	9	M	K	P	O	X	Z	Q
F	R	4	C	X	7	1	9	X	F
C	O	X	Z	B	N	C	O	E	P
J	H	C	2	H	G	J	5	T	I

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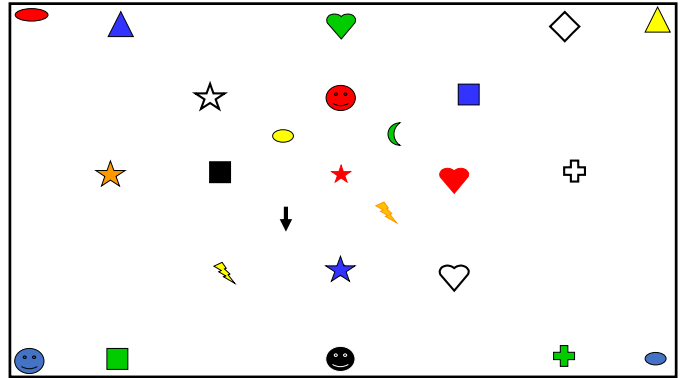
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U	Y	4	M	A	P	O	X	Z	Q
X	M	T	I	G	A	H	F	D	B
L	E	A	M	R	D	W	T	X	1
P	5	K	I	X	R	8	W	C	W
I	G	2	P	W	A	7	C	K	Y
T	D	9	M	K	P	O	X	Z	Q
F	R	4	C	X	7	1	9	X	F
C	O	X	Z	B	N	C	O	E	P
J	H	C	2	H	G	J	5	T	I

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When to do Hart Chart Peripheral Vision Testing / Training

- When doing our advanced baseline.
- When directed by a CL2 or CL3.
- When peripheral vision deficiency is suspected.
- When peripheral vision asymmetry is suspected.
- Post TBI.

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How To; Peripheral Cards

- Cut a hole in the center of the card. About 3 mm diameter.
- Have the subject close or cover one eye. Look at the uncovered eye through the hole.
- With the card about 14 inches from the subject have them call out the shape and color by using just their peripherals.
- Typically I have them start from the top, going up, and continue clockwise or counter clock wise.
- Do each eye, one at a time.
- Record how long it takes to complete and number of misses.

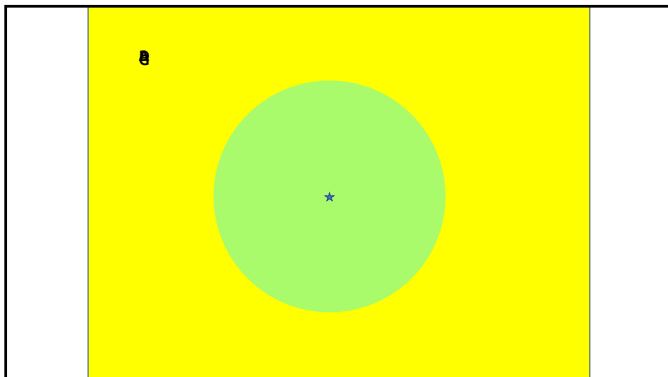
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Batons

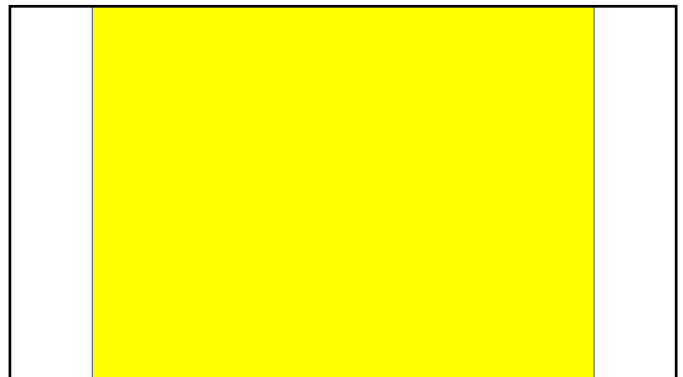
- We use multiple types of Batons.
- The 3 color batons are often used doing Call color and catch on color.
 - This can be done with the multi color as well as part of a progression.
- The multi color can also be used as a partner with Marsden Balls.
- We progress from single baton pitch, call color and catch to two batons pitch, call color and catch. This is often done by keeping eyes up on the thrower or other fixation target.
- Good for peripherals.
- Pillars eye discipline and cognitive.



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Dynavision – Demonstrations

Quarterbacks:
 ➤ Blind Side Drill
 ➤ With Flashcards



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N	Q	J	R	E	I	W	T	N	Y
Y	D	Q	A	Z	C	M	W	P	R
3	J	6	W	5	J	I	G	2	V
R	X	I	G	2	J	F	S	C	B
G	2	T	D	9	M	L	A	R	G
M	D	F	R	4	D	S	H	M	K
E	X	7	P	O	B	F	X	Z	Q
5	C	W	C	X	7	1	9	X	F
C	O	X	Z	B	N	C	O	E	P
J	H	C	2	H	G	J	5	T	I

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U	P	I	P	M	C	Z	E	B	L
Y	M	T	S	A	H	F	3	R	V
D	N	C	I	G	2	X	M	D	B
Q	F	B	D	9	M	W	Z	X	L
B	2	K	R	4	D	P	5	C	W
N	9	Q	P	O	B	7	C	K	Y
U	G	7	M	X	P	D	X	2	Q
8	P	W	5	K	7	1	9	Y	F
D	A	H	Z	B	N	T	O	I	P
5	V	C	2	H	G	J	Y	E	G

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Some Saccadic Eye Movement Assessment Methods; Hart Charts

Other saccadic eye movement methods.
 King Divic,
 Hart Eye Charts,
 Finger Saccades,
 Wolff Wands,
 Anti Saccades,
 Some need baselines.
 Some are free and others charge a fee.

B	3	Z	P	M	C	Z	E	B	L
2	W	T	S	A	H	F	3	R	V
F	C	Q	J	D	W	T	N	C	4
5	U	Q	L	R	8	W	P	K	Y
V	Q	2	I	K	I	G	2	D	B
O	P	A	T	X	U	6	E	X	1
U	C	G	M	W	P	O	X	Z	Q
8	B	K	D	B	7	1	9	X	F
F	A	Q	Z	D	N	C	O	E	P
U	V	C	2	H	G	J	H	L	U

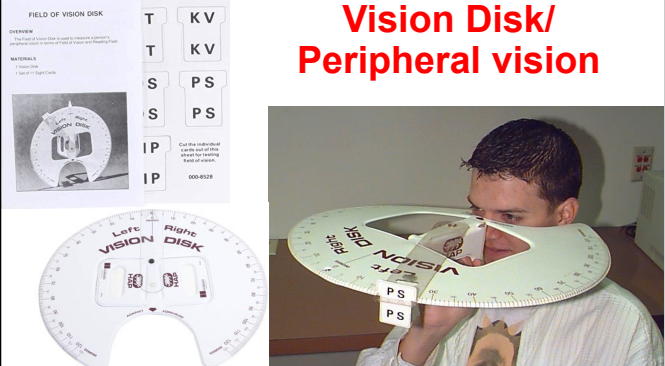
34

TESTING PERIPHERAL VISION

- You can purchase a specific device (s) to do this or do it your self.
- With a protractor, some cards or a cheap device you can get pretty good information on peripheral vision.
- I like TWO numbers typically for horizontal peripheral vision.
 - 1 movement; confrontation of visual fields.
 - 2 color; when they start to recognize things like color in the periphery. (not for color blind people).

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Vision Disk/ Peripheral vision



FIELD OF VISION DISK

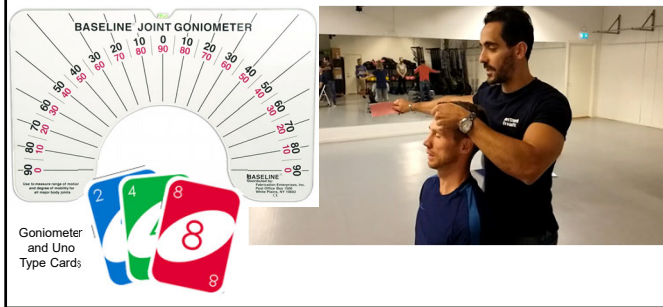
OVERVIEW
 The Field of Vision Disk is used to measure peripheral vision.

MATERIALS
 1 Protractor
 1 Card (see figure below)

Cut the individual cards out and use them for testing. Field of vision.
 600-8128

36

Low Tech Determination of Peripheral Vision



37

Data Collection Table for Peripheral Vision Assessment

	RED	Yellow	Green	Blue
Right Eye				
Left Eye				

- Fill in the table with the responses from left and right eye.
- Two numbers per cell; movement, followed by color.
- I have had patients 'lose' peripheral color vision post TBI and see recovery with therapy.

38

Stroop

- Stroop was talked about in CL2.
- We are expanding the utility of Stroop for post TBI rehab.
- Memory, multi tasking, trigger words.

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RED	BLUE	GREEN	BLACK	GOLD	BLUE	GREEN
BLACK	RED	ORANGE	YELLOW	BLACK	GREEN	YELLOW
GOLD	ORANGE	YELLOW	PINK	BLUE	BLACK	RED
PINK	BLACK	ORANGE	RED	YELLOW	BLUE	GREEN
PURPLE	ORANGE	GREEN	PURPLE	ORANGE	PINK	RED
BLUE	PINK	PURPLE	GREEN	YELLOW	YELLOW	BLACK
RED	GREEN	BLUE	GOLD	YELLOW	ORANGE	BLACK
PINK	YELLOW	GREEN	RED	BLACK	ORANGE	BLUE

40

CAT	BOOK	LEMON	GRASS	HELP	DOOR	WINDOW	GARDEN
DOG	WALK	CARD	ACID	BORN	BEST	BONE	FIT
FISH	FREE	FOOD	GIRL	GIFT	FAIR	MUST	NOSE
ONTO	OVER	PART	PAST	MALE	MAKE	SONG	SICK
STAR	SNOW	STEP	SENT	EPIC	FOAM	DREW	SICK
TEAM	BOLD	BARN	ZERO	WISE	ATOM	BAIT	FATE
SALE	CAPS	AVID	BELL	WASH	YOGA	LACE	NETS
SPOT	EVIL	MAMA	MICE	OBEY	LEAP	JETS	KISS

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GREEN	PINK	GOLD	PARIS	ORANGE	ROME	GOLD	RED
GOLD	BERN	GREEN	RED	SOFIA	ORANGE	PINK	YELLOW
BLACK	GREEN	PINK	ORANGE	PURPLE	RED	PURPLE	PRAGUE
VIENNA	YELLOW	ORANGE	PURPLE	YELLOW	DUBLIN	OSLO	PINK
BLUE	ORANGE	BERLIN	RED	GREEN	YELLOW	YELLOW	GOLD
YELLOW	LONDON	PURPLE	BLUE	RED	PURPLE	ORANGE	BLACK
PURPLE	BLUE	BLACK	YELLOW	PINK	ORANGE	GREEN	BLACK
ANKARA	PINK	GREEN	ORANGE	PINK	ATHENS	BLUE	TALLINN

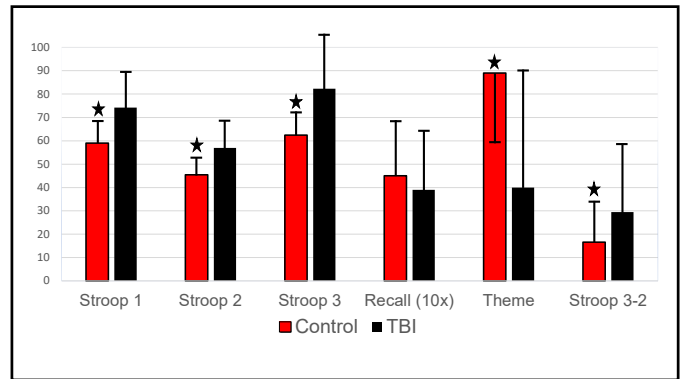
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Stroop Test: Normative Data and Diagnostic Validation.

	Stroop 1	Stroop 2	Stroop 3	Recall	Stroop 3 - Stroop 2	Theme Correct
Normative	58.0 ± 11.8	45.0 ± 7.2	61.4 ± 11.5	4.5 ± 1.8	16.4 ± 3.8	91% ± 29
Concussion Patient	74.1 ± 25.0	57.0 ± 15.8	82.3 ± 24.7	3.9 ± 2.4	33.0 ± 30.9	40% ± 52
T-Test	0.0003	0.0003	0.000001	0.66	0.00022	0.00051

Stroop units = seconds, recall = x/10.

43



44

Sensitivity and Specificity Percentages

	+ mTBI	- mTBI
Test positive	100%	3.03%
Test negative	0	96.97%

The Stroop test appears to be 100% sensitive and 96.97% specific for showing an abnormal result in mTBI patients.
N = 127 control, N = 10 patients.

45

- ### Memory and Stroop
- In the control group they recalled the theme of the memory component 90% of the time. The mTBI group recalled the theme 40% of the time.
 - The differences were statistically significant. P = 0.00053.
 - 90 ± 29 (N=99) vs 43 ± 51 (N=9) P = 0.00053.
 - Of consideration here is perhaps the memory component aids in separating the TBI patient's abilities from the control.

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- ### Conclusion – vision training
- Why?
 - Performance Enhancement
 - Injury prevention
 - Rehabilitation
 - How to train?
 - Lots of ways.
 - Dynavision, Hart Charts, Batons, Pinhole Peripheral cards
 - THANK YOU FOR YOUR TIME
 - ANY QUESTIONS?

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Supplement Panels that can be considered post TBI

Joseph F. Clark, Ph.D.

1

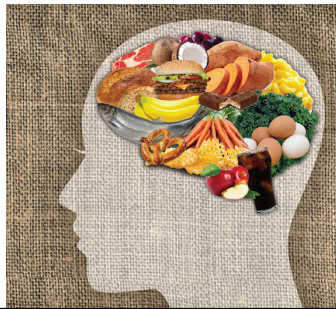
Disclosures

- Dr. Clark is the chief scientific officer for a company that markets some of the compounds discussed here.
 - I will not be talking about the company or their patented products.

2

Nutrition and supplements

- Good hydration. Drink whatever (non alcohol) but add to that 3 quarts of water per day.
- Good nutrition. Consider 3 metabolic food groups: Fats, Carbs and Proteins.
- Supplement panels:
 - Creatine, Mg, beta-hydroxybuterate. (Energy)
 - SAM-E, Phosphatidylcholine, Tryptophan. (Neurotransmitter)



3

Some general supplement facts

- No supplement is needed in 100% of the population.
- No person is deficient in 100% of the possible supplements.
- Supplement studies of compounds found in the body (like discussed here) are deficient in about 50% of individuals.
- Even dietary supplements of compounds that are often found in the diet can result in side effects or contraindications.
 - Sometimes those are hard to find, I'll discuss them when I can.

4

Moving forward

- I'll be talking about two groups of supplements that some believe can be helpful for treating some post TBI deficiencies.
- We'll talk about the individual supplements and those same as a panel.
- All are well researched and easily available from multiple reputable sources.

5

Please consider two common post TBI sequelae

- Feeling slow. Brain fog. Needing more sleep. Slowed speech. Slow processing.
- Or.
- Irritable. Sensory overload. Photophobia. Phonophobia. Dysautonomia. Agitated.
- While these sets of sequelae can overlap, they are somewhat distinct.
- If you will entertain that the first one is associated with low energy and the other one may be a neurotransmitter imbalance, we can consider dietary supplements to address them.

6

Things that suggest the use of Supplements in Panel 1.

- Brain Fog. Feeling Slow. Feeling behind. Low energy. Needing / wanting more sleep. Slow speech. Perception of slowed speech. Poor reaction time.
- Complaints or observations of low energy. Slow brain processing and / or poor Speech. Note, Speech requires a large and dynamic energy demand.

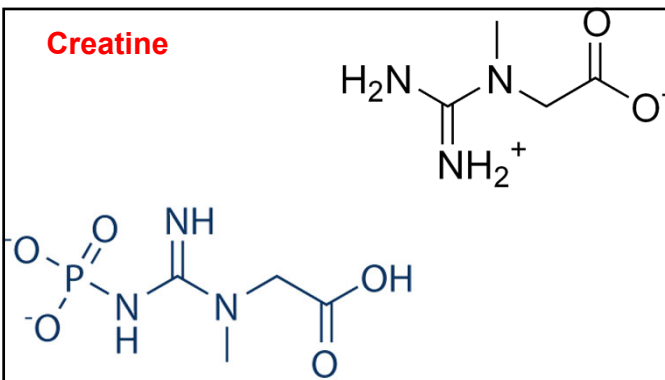
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For Low Energy Supplements in Panel 1.

- Individually and / or in combination.
- Creatine.
- Magnesium.
- Beta Hydroxybutyrate.
- Are supplements that can benefit brain energy metabolism.

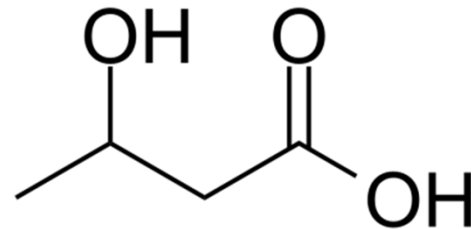
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Creatine



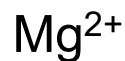
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Beta – hydroxybutyrate



10

Magnesium



11

3 compounds can be used to Aid in Brain Energy Metabolism.

- ✓ Creatine (Cr).
↗ ~5 g/day
 - ✓ Beta-Hydroxybutyrate (BHB).
↗ ~2.5 g/day
 - ✓ Magnesium (Mg).
↗ ~2.5 g/day
- Split into two doses taken in the morning and the evening.

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Supplement panel 1 side effects

- Can be a stool softener.
- Can lead to water retention.
- Can lead to increased muscle mass if exercising.
- Can lower blood pressure.
- Stomach Upset.
- Note, creatine does NOT cause kidney failure.

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Neuro Transmitter Supplements in Panel 2

14

Supplements that can help a Neurotransmitter Deficiency.

- If a neurotransmitter deficiency is suspected, consider a supplement or panel of supplements designed to help normalize neurotransmitter metabolism.
- Need to characterize Neurotransmitter Dysfunction.
- Consider asking the Sensory Overload questions.
 - Going to an outdoor event.
 - Driving in the car with 2 radio stations playing.

15

The Autonomic Nervous System(s)

- There is the ANS and within the ANS is the SNS and the PNS.
- Dysautonomia is common post TBI, it is somewhat a catch all because multiple aspects of the autonomic nervous system can go awry post TBI.
- The supplement panel has supplement precursors to several neurotransmitters.

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Dysautonomia. Tests and QnA

- Exercise intolerance.
- Thermal regulation. Sweat Assessment.
- Dive Reflex.
- Cold immersion. Cold Pressor Test.
- SNS and PNS – arousal and orgasm.
- Fountain Square and Driving with dual radio channels.
- POTS

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Sensory Overload

- Neurotransmitters possibly involved in sensory overload;
 - egixjplspri0
 - wivsxrn0
 - rsvhvirepr0
 - hsteg mi0
 - lwaeg mi0

18

3 compounds can be used as neurotransmitter precursors.

- ✓ Phosphatidylcholine (PC).
 - ✓ ~2g/day
- ✓ S-adenosylmethionine (SAM-E).
 - ✓ ~0.5 g/day
- ✓ Tryptophan (Tr).
 - ✓ ~1g/day

Split into two doses taken in the morning and the evening.

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Contraindications

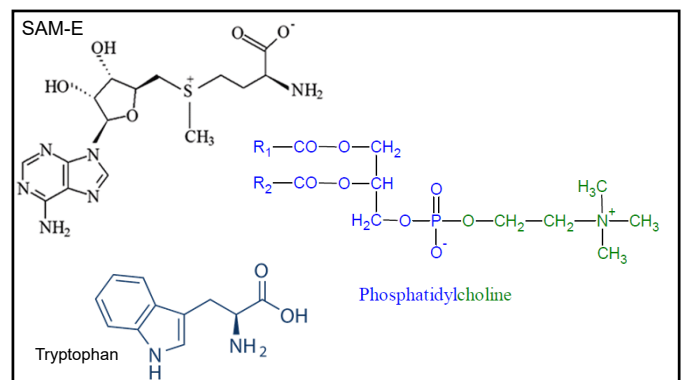
- Medications impacting the SNS, ANS, and or PNS.
- Liver dysfunction.
- Difficulty digesting and / or absorbing fats.

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Panel 2 Supplements' Side Effects

- Change in Dreams.
- Change in sleep patterns.
- Change in appetite.

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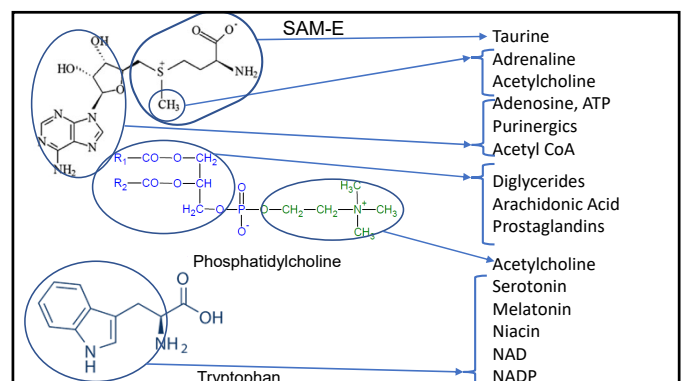


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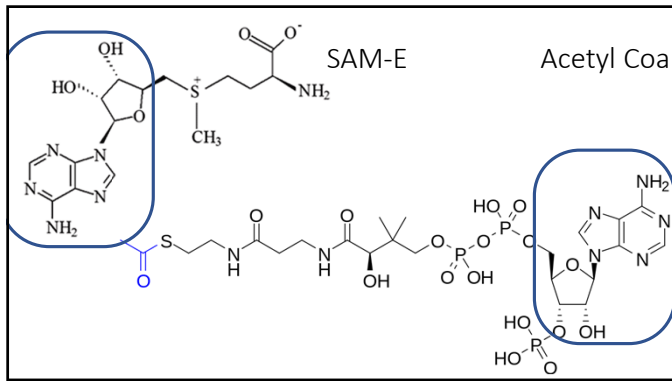
Attribution of the Supplements.

Phosphatidylcholine	Tryptophan	SAM-E
Acetyl Choline	Serotonin	Adrenaline
Arachidonic Acid	Melatonin	Purinergerics
Diglycerides (↑ NT release)	Niacin	Acetylcholine
Prostaglandins	NAD	Adenosine, ATP
	NADP	Taurine
		Acetyl CoA

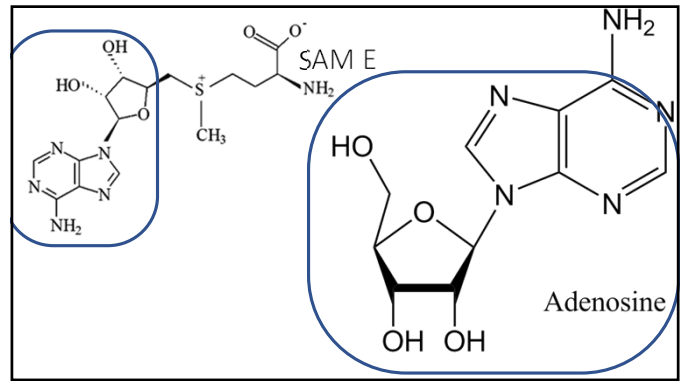
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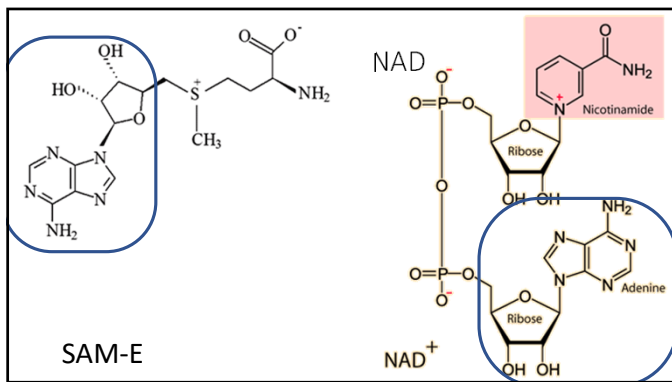
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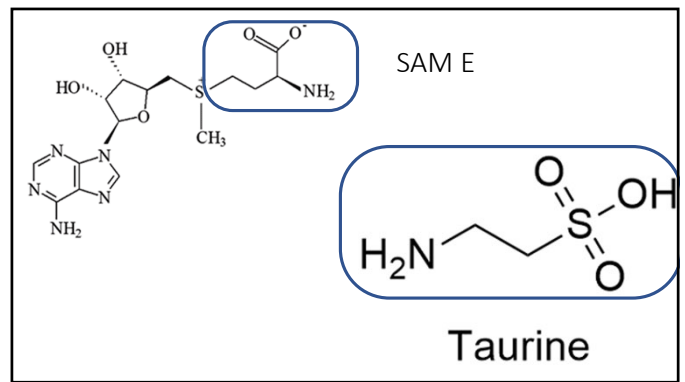
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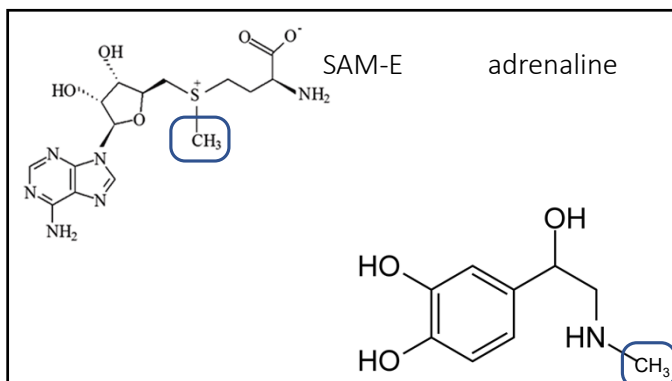
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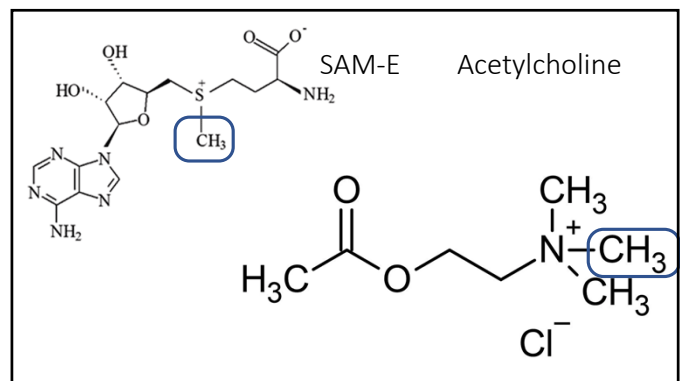
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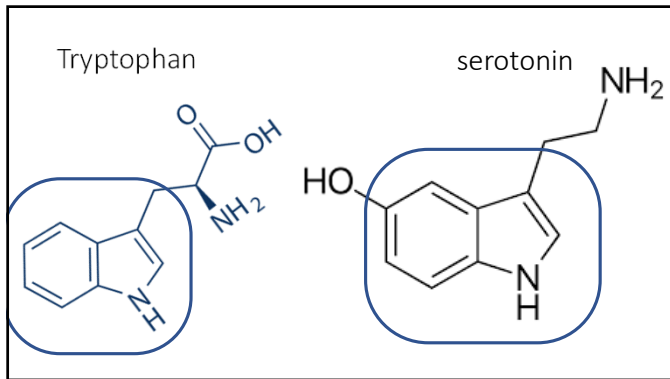
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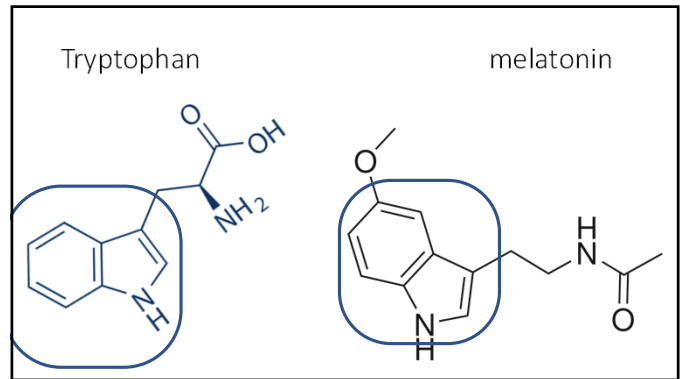
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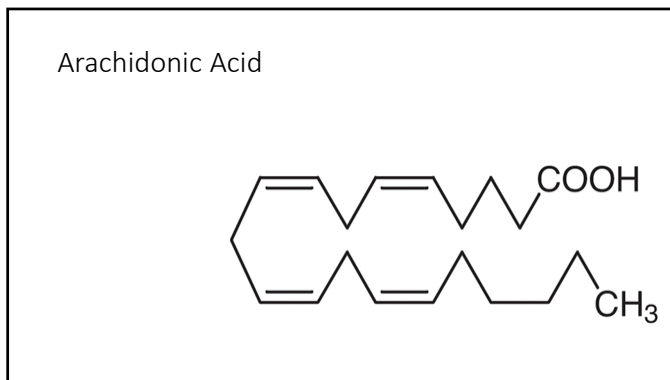
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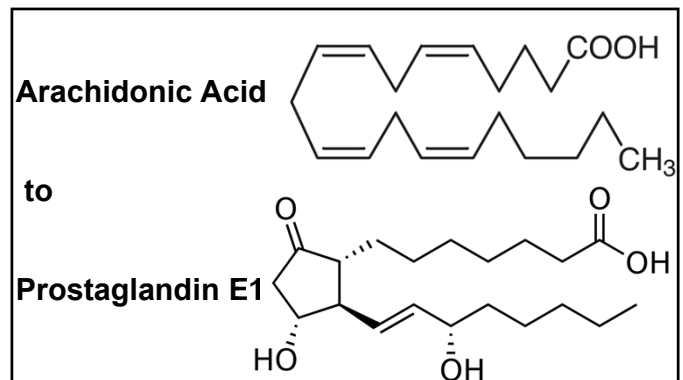
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32



33



34

Last stages of finalizing a study.

- The military is working on finalizing a protocol to use these two panels post TBI.
- They will characterize energy or neurotransmitter dysfunction and randomize those subjects into control or the corresponding supplement panel.
- Subsequent treatments will be unchanged.
- Inclusion and exclusion criteria still being discussed.
- Endpoints as presented below.

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Endpoints we are looking at

- Less brain fog.
- Improved cognitive abilities.
- Fewer word finding difficulties.
- Improved rehab – less fatigue or disengaging during rehab.
- Improved Saccades.
- Improved near far.
- Improved word recall.
- Decreased phorias.
- Quality of Life survey and Symptom Survey.

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When to recommend Either Supplement Panel.

Panel 1

- Low Energy.
- Feeling slow.
- Slow reaction time.
- Difficult to recall information.
- Slow speech, word finding difficulty.

Panel 2

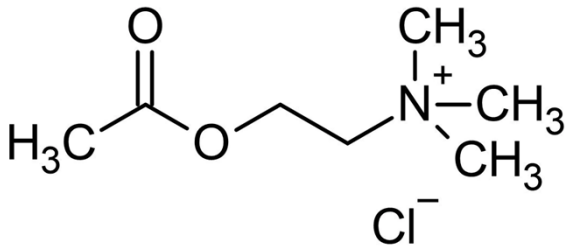
- Neurotransmitter deficient.
- Dysautonomia.
- Change in dreams or sleep
- Thermal regulation.
- POTS.
- Vertigo.

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Thank you – Any Questions.

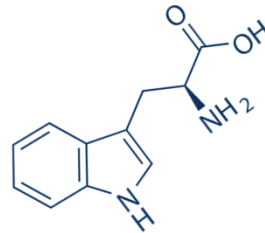
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Acetyl Choline



39

Tryptophan



40

niacin

