Language of the Discipline

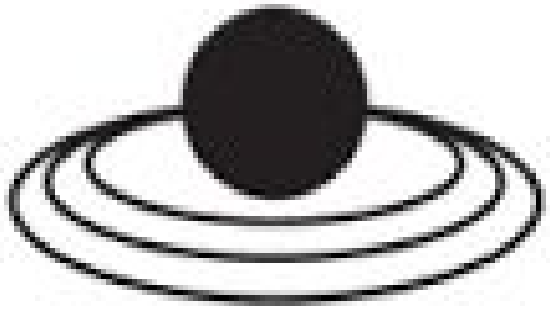
- **Adrenaline**- a condition where the blood pressure/pump rate goes up by a rapid amount
- **Mental Chronometry**- works like the part of your brain that memorizes things in at a short term only
- **Motor Skill**- the ability to perform complex muscle and nerve acts that produce movement
- **Motor Control**- the process in which humans and animals use their brain/cognition to activate and coordinate the muscles and limbs involved in the action of a motor skill
- **Muscle Memory-** a form of procedural memory that involves consolidating a specific motor task into memory through repetition
- **Hand-Eye Coordination-** the coordinated control of eye movement with hand movement

Driving Question:

How does the structure and chemistry of the brain impact an individual's

physical and mental athleticism?

Impact

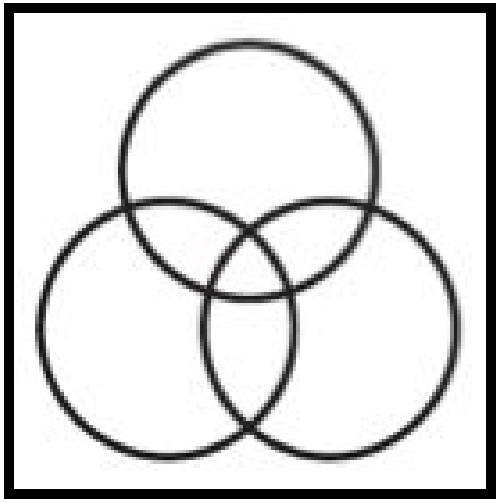


The impact that the structure of the brain has on athletes, is that it will get them in the positive mindset pre-game, during the game, and even after the game. This would be getting the adrenaline flowing and believing that you will win the competition, no matter the difficulty of the opposition. After the change in mindset, it will most likely remain the same way for the rest of his or her life and in order to become a better athlete, they must apply their positive views on sports.

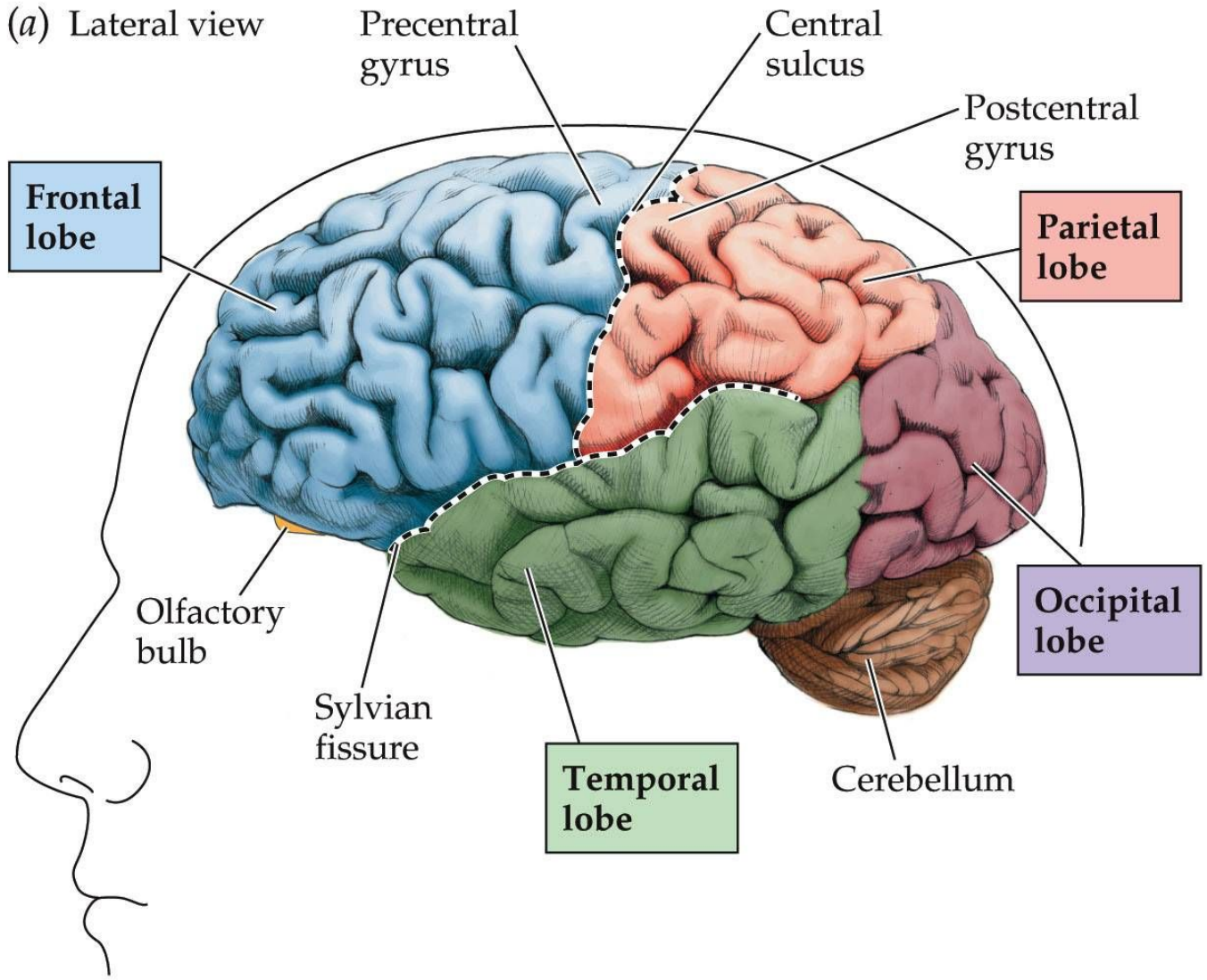
Structures have parts that interrelate.

The brain' s structure has an impact on athletes, by allowing one or more parts

of the brain to do a certain job in the sport. Of course the entirety of the brain's parts interrelate to perform that action. For example, the temporal lobe is commonly used for getting adrenaline or as some people call it, "the flow" or "the zone." It connects to the sport by making you perform at higher level than you think you can. After our interview with Dr. David Raichlen, we found that most often athletes will engage in training methods that relate to improving reaction times and processing speeds which both have to do with "mental chronometry" in parts of the brain, mainly the frontal lobe. According to an article written by Sukel Kayt, it mentions and also agrees with the idea that athletes have to be in the correct mindset in order to activate "the zone." Being able to think with this "correct" mindset helps determine the way each part of the brain will function or interrelate together and in the end how well a person is able to perform a certain motor skill.



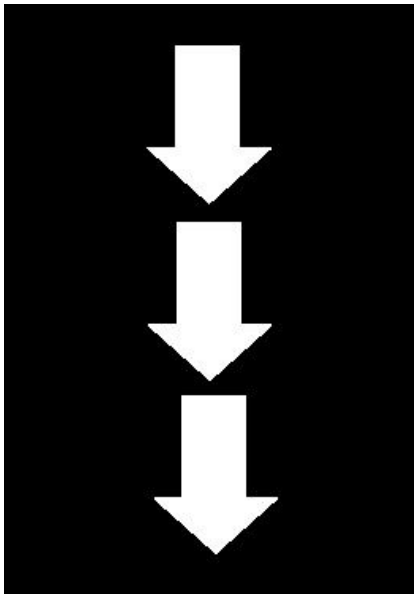
Context



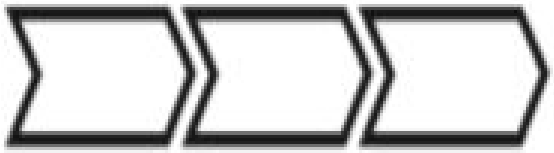
***Biological Psychology 6e*, Figure 2.12 (Part 1)**

This diagram helps visualize the different sections of the brain and the way they are structured together.

In structures, parts support and are supported by other parts.	The structure of the brain has to have parts that support each other, like a checks and balances system. One part of the brain has to "check" the other in order for another one to work properly, each part is needed and dependent on one another. An athlete needs to keep a positive mindset in order for the body or brain to function properly while playing any sport. For instance, runners' brains depend more on a connection with areas in planning and attention or "executive functions" as Dr. David Raichlen explained to us. It is not only limited to sports, essentially everyday you need to do something yourself to send signals to your brain to work and to make sure your nervous system is functioning. Carolyn Gregoire, a writer who focuses on the brain-training tactics of olympic athletes states in her work that "you don't have to be vying for a gold medal to benefit from training your brain" this helps clarify that not

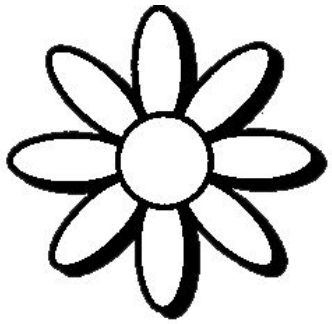
	only keeping a positive outlook on situations helps an individual's inner workings of the brain but results in positive outcomes in the person's life outside of sports thanks to the contributions made by both the physical and mental structures of the brain.  Contribution

Structures may be combined to form larger structures.	You can't change the physical shape of your brain. The only possible ways would be things like a head injury or some kind of illness in the brain. You could, however, overtime through a process of training cause your brain to become stronger and adapt to your mindset in this case a positive and athletic one. Our interview with Dr. David Raichlen helped clarify that structural changes in the brain can happen. It can be improved by using a variety of concentration training methods. These structural changes mainly occur in the motor control structures of the brain which contribute to overall "hand-eye coordination." In the article *"Sport Psychology,"* it is stated that, "many strategies and procedures are used by sport psychology proficiency to

	address problems faced by athletes and sports participants". One of these skills used to enhance performance and implant the habit of goal setting is imagery or "muscle memory," which helps the athlete develop concentration and self-confidence in the actions they self-consciously take while performing. 

A structure is no stronger than its weakest component.

The mental structure of the brain is not stronger overall than the physical actions in sports. Each "half" of the sport has its weaknesses. For instance, emotions can have a major impact on the mindset of an athlete which lead to the athlete failing to concentrate on performing certain actions. Furthermore, trauma to the head such as a concussion can cause the brain to stop communicating with the nervous system overall. Emotions also play a key role in non-verbal communications and how they are executed during a game. Edward G. Wertheim states in *"Non-Verbal Communications"* that "repetition (in gestures) can repeat the message the person is making verbally" which connects with the component in the brain known as imagery/muscle memory. The tactic of using imagery to mentally prepare oneself isn't any weaker or stronger than emotions felt while performing.



Details

Student-led Research - We interviewed an expert in the field.		
Person Interviewed:	**Occupation:**	**Contact Information:**
Dr. David Raichlen	Associate Professor at the University of Arizona, who studies runner's brains and how physical activity impacts both the organ system and brain structure	Email: raichlen@email.arizona.edu Office Phone: 520-626-4543

Our interview:

How does the structure of the brain impact an athlete's ability to be good at playing a sport?

Well, this is a complicated question. I would say that it depends on the sport. There are structural changes that can occur and improve performance as it relates mainly to motor control. So, for example, enhanced structure or connectivity in motor areas can improve things like hand-eye coordination.

Is the brain structure and mental ability incorporated in training athletes to improve in their sport?

There is some evidence that brain training in sport specific methods can improve performance. There are techniques that people have tried, especially as it relates to improving reaction times and processing speed.

How is the structure of the brain responsible for an athlete's competitive mindset or physical abilities?

I don' t have a good answer for this one. What I can say, from our research, is that highly competitive endurance athletes (like cross country runners) appear to have brains with stronger connections between areas responsible for things like planning and attention (what we call executive functions). These strengthen connections may reflect increased reliance on these cognitive functions during running.

What we learned:

What we learned, was that there is no straight answer to whether or not the structure of the brain

can be changed or not. Also, we know from our interview, that people have a higher intensity rate in their sport that have executive functions which makes them more persistent in their sport.

REFERENCES PAGE

Use APA formatting for this. https://owl.english.purdue.edu/owl/resource/560/01/

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“What it Takes to Be an Olympic Athlete” Murphy, Shane Date N/A Sport Psychologist

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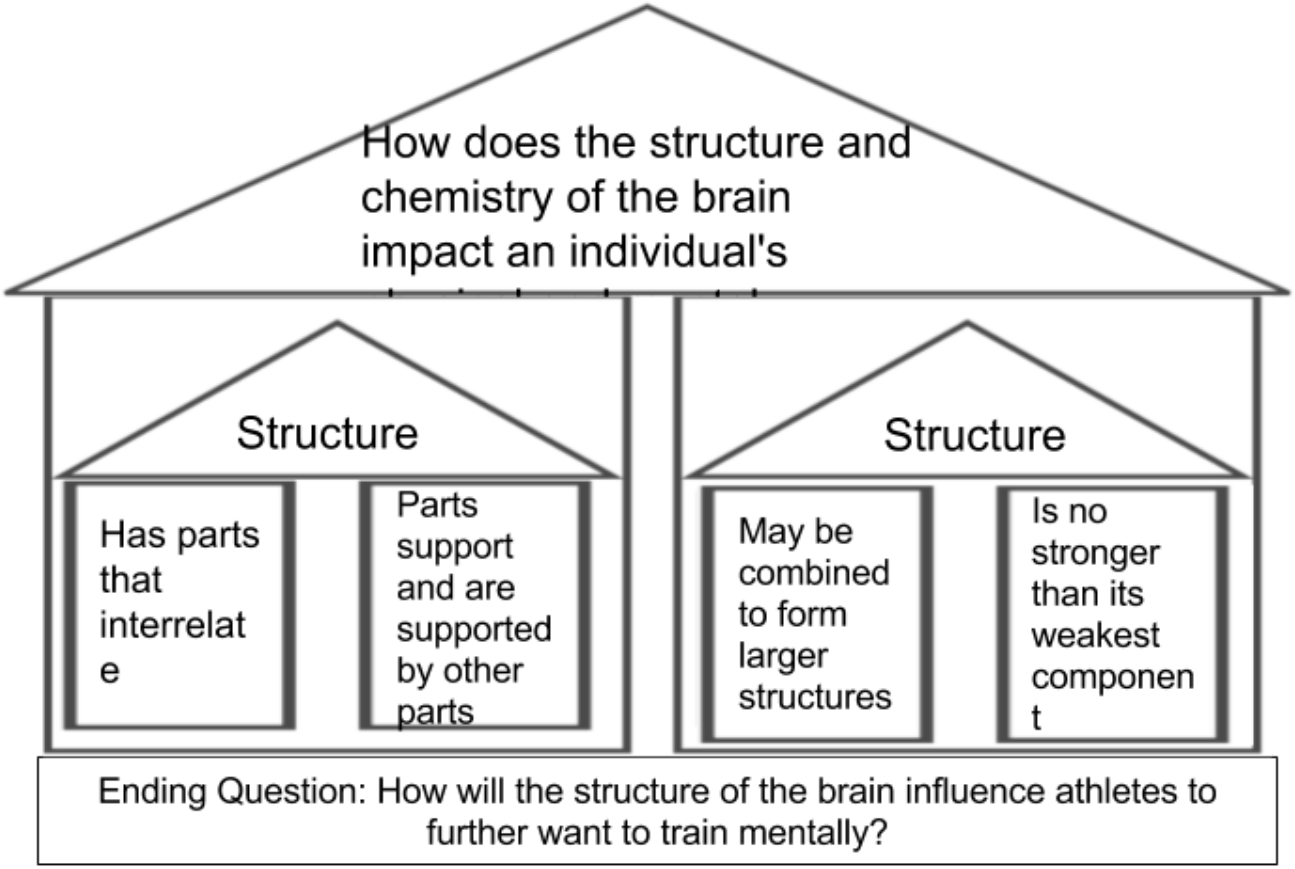
“The Nine Mental Skills of Successful Athletes” Jack J. Lesyk Ph.D. Date N/A`

REALLY BIG IDEA CHART



BOARD TAG

Back label - Please fill this out and glue it to the back of your trifold board when you turn it in on May 8th in Room 310 (the media room) or Room 308 (Ms. Park's classroom).

GLUE THIS "BOARD TAG" ON THE BACK OF YOUR BOARD!

<table>
<tr><td colspan="2">Driving Question:
How does the structure and chemistry of the brain impact an individual's physical and mental athleticism?</td></tr>
<tr><td colspan="2">Names of student researchers:
Jesse Munoz
Andrea Herrera</td></tr>
<tr><td>Grade level: 8th</td><td>Mentor teacher:
Ms. Park</td></tr>
<tr><td colspan="2">Special notes about handling and or placement or presentation space needed:
We won't be needing to much space when we present on Symposium night. It'll mainly be the both of us speaking equally and going more in depth about our driving question, as well as giving our own thoughts and opinions on the subject or in this case the question.</td></tr>
</table>

ENDING QUESTION

Please write down the ending question in the box below. Refer to pages 93-98. You might also want to include the icon for "Unanswered questions" here too.

Ending question - Where do I fit in?

How could I study the brain in the future to research how surgical changes can potentially impact an athlete's abilities?