Beyond the Body: How the Brain Gets Involved in Sport

You may be wondering to yourself: "What possible benefit can I get by understanding how brain chemistry relates to sport?" It matters more than you might think. A better understanding of brain chemistry may actually lead to improved outcomes for your athletes, from strategies to engage them more in practice to a better understanding of how certain mood-altering prescribed medications should be taken into account when helping an athlete thrive on the team.

Here, Michele LaBotz, TrueSport Expert and sports medicine physician, explains the basics of brain chemistry that may change the way you coach your athletes.

The Brain is The Boss

“As a coach, it's important to understand that there's a lot more going on in the body than just our legs moving and how our muscles work during exercise,” says LaBotz. Understanding brain chemistry can help you be a more effective coach when you realize how much small shifts in brain chemistry can impact athletes’ actions and motivations.

"The brain is the boss of the rest of the body," says LaBotz. "If the brain isn't optimized and working well, the rest of the body isn't going to be either."

Physical Activity Changes the Brain

"Physical activity and exercise have direct and indirect impacts on the way our brain chemistry works," she says. That's why you often hear that exercise is one of the best prescriptions for people suffering from anxiety or depression, or more colloquially, when we're upset or angry, we're told to 'walk it off.' The walk really can help!

"Dopamine, serotonin, endorphins, and endocannabinoids all directly play into mood, fatigue, performance, and even pain to a degree," says LaBotz. While you can't directly regulate your athlete's brain chemistry, you can better understand and harness it. You can also better understand how medications that affect brain chemistry may impact your athlete.

A quick overview of some key brain chemistry components that affect young athletes:

- Dopamine: Dopamine is associated with the reward and pleasure parts of the brain and can promote motivation. Dopamine is released during physical activity, as well as when something pleasurable happens, whether it’s winning a game or receiving a friendly text message. Many medications prescribed for attention deficit disorder/ADHD increase dopamine levels in the brain.
- Serotonin: Serotonin is also increased during physical activity. Serotonin appears to play a significant role in helping with anxiety and depression, and many medications prescribed for these conditions increase serotonin levels in the brain. This chemical carries messages from the brain to the rest of the body, and it also plays a role in sleep, digestion, and many other important bodily functions.

- Endorphins and endocannabinoids: Endorphins and endocannabinoids are released during exercise and are associated with reductions in pain and perceived exertion (i.e., makes things feel easier). The euphoria that some athletes experience during exercise, also known as the “runner’s high,” was previously attributed to endorphins, but are now believed to be produced by endocannabinoids.
- Cortisol: Cortisol is important for a variety of functions in athletes, and exercise and nutrition are key regulators of its production. However, elevated levels of cortisol are associated with muscle breakdown and poor recovery.
- Brain-derived neurotrophic factor: This protein plays a major role in the brain's ability to learn and make new connections. It's associated with growth and development, and it increases the brain's ability to grow and change.

Practical Application of Brain Chemistry for Coaches

1. **Increase dopamine by focusing on fun**

Dopamine is the brain's pleasure-sensing hormone, and with it comes motivation. If you can make early warmup drills fun at practice, your team can get an early dopamine surge, increasing motivation for the rest of the practice, even when it gets hard. "Any time you can make training more fun, that will increase dopamine," says LaBotz. Finding chances for athletes to feel small wins throughout training and practice can enhance dopamine release, resulting in improved motivation and effort. You don’t need to save the rewards for competition.

2. **Increase dopamine by increasing athlete autonomy**

"Dopamine levels are more responsive when activity is voluntary, or when somebody's doing something that they want to do, rather than something that they don't want to do," says LaBotz. "Forced exercise does not appear to exert that same effect on dopamine levels." To increase the likelihood of dopamine release, try giving your athletes several acceptable options, such as a choice of conditioning methods, like running, rowing, or cycling.

3. **Feeling “hangry” is real**

Feeling “hangry” (the combination of “hungry” and “anger”), is a very real phenomenon and is in part due to brain chemistry and the brain's need for fuel. "The brain relies on glycogen stores for energy, the same as the muscles in your legs," says LaBotz. "The brain is a huge energy suck. Young people's brains aren't as good at tapping into the body's glycogen stores, so kids are much more reliant on making sure they are eating enough carbohydrates for energy before exercise." Encouraging athletes to “fuel up” beforehand benefits both physical and mental function during training.

4. **Recognize the importance of brain-derived neurotrophic factor**

Brain-derived neurotrophic factor is important for long-term athlete development. "Exercise promotes chemicals that allow brain cells to talk to each other. And brain-derived neurotrophic factor affects the actual structure of the brain, improving the ability to develop," LaBotz says. "We know that the whole principle of athletic development is that we should start with

developing a variety of basic skills, and then build efficiency, performance, and more specialized skills off of that. Brain-derived neurotrophic factor plays a role in that."

5. **Athletes get stress from many different directions**

You may not measure your athlete's cortisol, but you can keep an eye on their stress levels. LaBotz notes that "Cortisol levels rise when stress levels rise—whether it's sport-related stress from high levels of training or stress from home or school situations—cortisol levels are driven up. Poor nutrition and low calorie intake are other forms of stress that increase cortisol. Heightened cortisol is going to reduce an athlete's ability to recover from training or injury, or to experience gains from training." Recognizing the additive effects of stress from different sources on athlete health and performance and assuring adequate recovery during periods of high stress is key.

6. **Brain chemistry shifts in response to overtraining**

The physical reasons to avoid overtraining are obvious, but the brain can also be in danger if an athlete is doing too much. "Often, overtraining syndrome looks like depression, and depression is believed to be associated with overtraining syndrome," says LaBotz. "A lot of times, people with overtraining syndrome get put on depression medication to alleviate those symptoms." Monitoring athlete mental well-being during periods of increased training may help you adjust training and recovery periods to assure continued optimal performance.

7. **Every athlete is unique**

Remember, every athlete's brain chemistry is going to be different. For instance, some people are capable of getting the flood of feel-good hormones known as the "runner's high," while others can run for miles without ever getting that feeling. In addition, many young athletes may be on some type of medication to change their brain chemistry and may or may not feel comfortable sharing that with you. A 2019 survey found that 10% of boys and 7% of girls used some form of medication for their mental health, but multiple reports state that these numbers have gone up significantly through the pandemic era.

Takeaway

A better understanding of brain chemistry can give you more insight into how your athletes respond to coaching and competition. Understanding how the body responds to dopamine, endorphins, serotonin, cortisol, endocannabinoids, and brain-derived neurotrophic factors can help you tailor your practice plans, conditioning schedules, and communication to best motivate and protect your athletes.

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About TrueSport

TrueSport®, a movement powered by the experience and values of the U.S. Anti-Doping Agency, champions the positive values and life lessons learned through youth sport. Backed by U.S. Congressional mandate, TrueSport inspires athletes, coaches, parents, and administrators to change the culture of youth sport through active engagement and thoughtful curriculum based on cornerstone lessons of sportsmanship, character-building, and clean and healthy performance, while also creating leaders across communities through sport.

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