

# VERSUS

CASE STUDY | CARLOS QUENTIN



This post-hoc data analysis has been conducted to evaluate the use of Performance Brain Training™ among elite athletes for the purpose of improving mental functioning and therefore sport performance. It is the first step in the process of systematically demonstrating efficacy of the neurofeedback process and protocols designed by Neuro Management LLC. A brief review of five elite athletes that participated in brain training is provided below. This report details the comparison of pre and post-training assessments highlighting changes in brain function and awareness that promote enhanced performance in their respective sports.

Although these outcomes are positive, particularly from the athletes' perspectives, future analyses of pre-post comparisons should utilize data collected in a more controlled fashion. As is apparent from this report, the number of protocols for various athletes has not been consistent and the choice of protocol has been based less on pre-defined criteria and more on subjective and varying case-specific rationale. With more frequent reviews of the data, pre-defined criteria can be developed; which allow SenseLabs to be more consistent in the application of neurofeedback.

## Brief Summary

Carlos Quentin reported significant improvements in his ability to focus, manage anxiety, recover from the demands of competition, as well as an overall higher quality of sleep. His data support primarily his focus improvements, but it is likely that an overall shift in his cortical activation balanced his energy management and allowed him to relax in his downtime.

## Legend

Throughout this report you will find each athlete summarized in the following fashion:

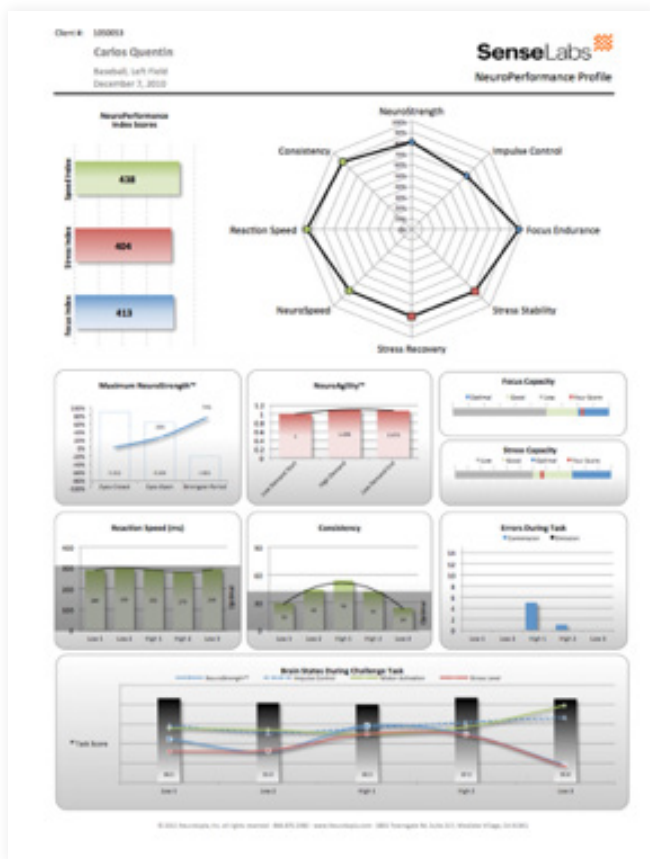
1. Athlete demographic information explained.
2. Brain Training regimen, dates and number of sessions reported.
3. Pre and Post NeuroPerformance Profiles (NPP) are displayed.
4. Comparison data charted for each construct of the NPP, where blue trend lines are the pre training evaluation scores and red trend lines are the post evaluation scores. Scores that increase in the post condition are "generally better" scores.
5. Pre and Post comparison bar charts for the Focus Capacity and Stress Capacity scores are displayed. Again the blue bar is the pre training evaluation and the red bar is the post training evaluation. In the Focus Capacity metric a decrease is a positive change indicating a reduction in the slow wave/fast wave ratio values. In the Stress Capacity metric an increase is a positive change indicating an increased alpha wave/fast wave ratio.
6. Supporting physiological evidence for the changes occurred. Statistically significant changes ( $p < .05$ ) in cortical current source density are illustrated in three-dimensional space using the exact Low Resolution Electromagnetic brain Tomography (eLORETA) solution.
7. Athlete self-report data are presented. Each athlete was interviewed and asked the same questions. The interview was summarized with key points highlighted. Full interviews were digitally recorded and athlete permissions were obtained for participation in this exploration and the use of their comments, name, and image. Those areas colored with the lightest teal blue color are set for statistically significant decreases in the reported frequency band and those with yellow color are set for statistically significant increases in the reported frequency band.
8. A summary narrative is the conclusion for each athlete where interpretive statements and conclusions are drawn.

Carlos Quentin, born on August 28, 1982, is a MLB outfielder for the San Diego Padres. He started his MLB career in 2003 and was selected as an All-Star in 2008 and 2011.

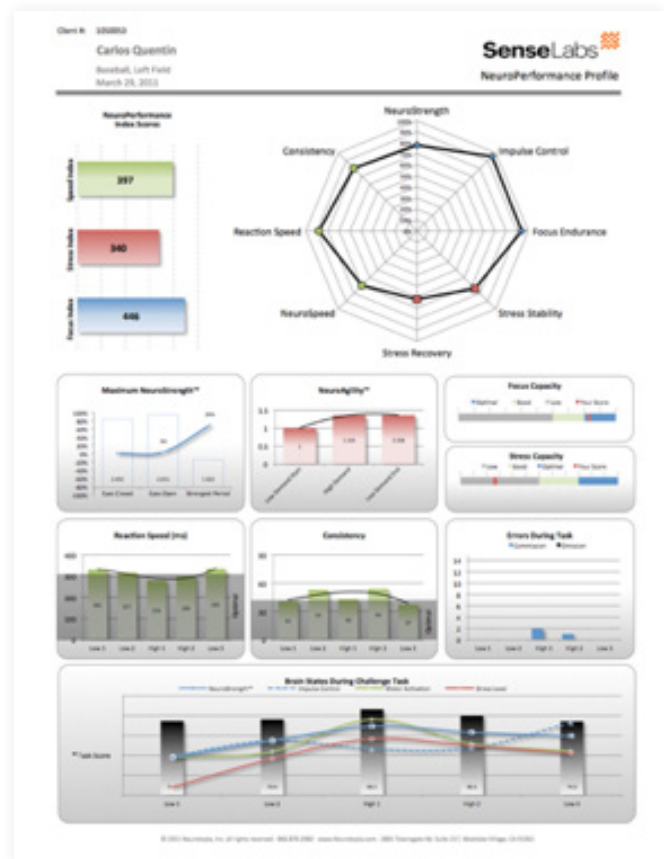
## Training Sessions

Quentin logged 39 Stress Recovery 2 sessions in August 2011. He also logged 11 Reaction Speed Protocol 3 sessions and 12 Stress Recover protocol sessions between January and February 2012.

### Pre-Assessment December 7, 2010



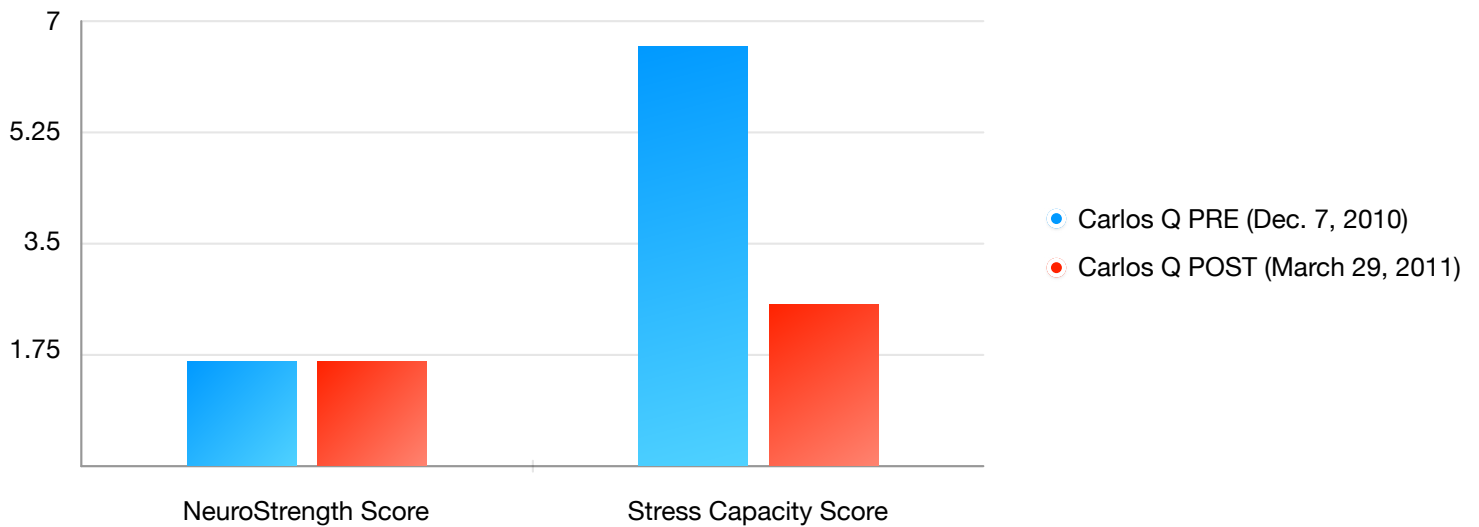
### Post-Assessment March 29, 2011



### Carlos Quentin Pre-Post Comparison of 9 Constructs:

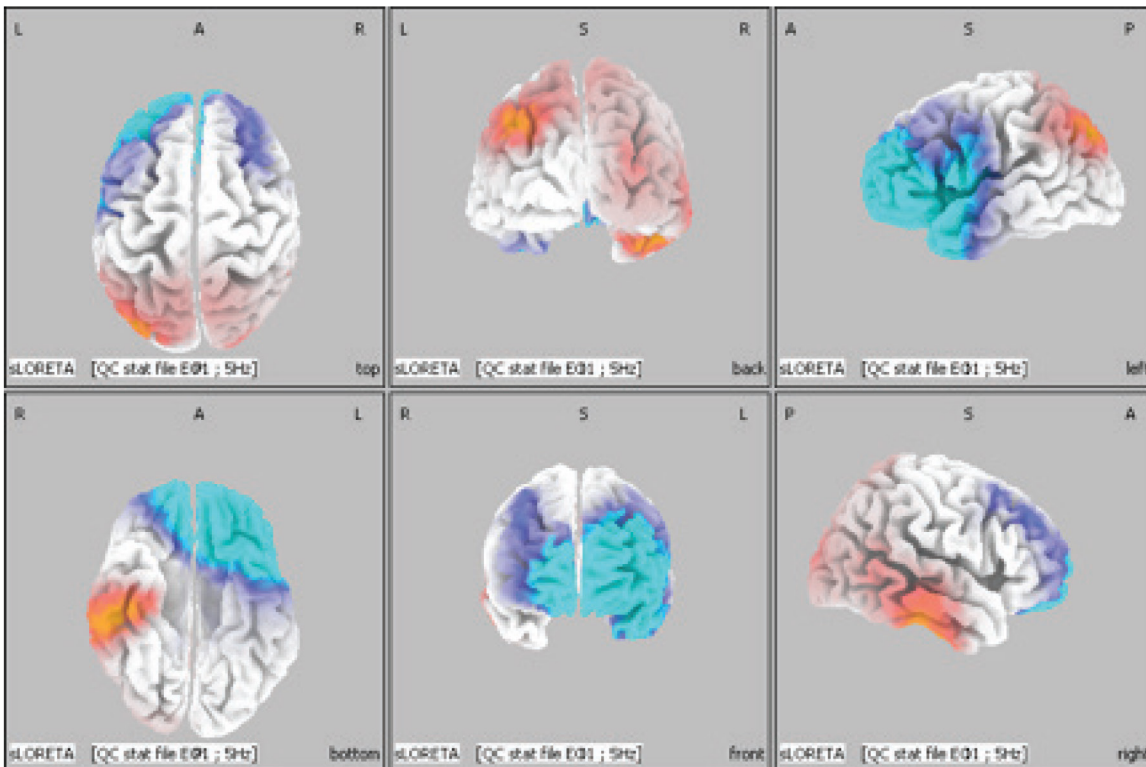
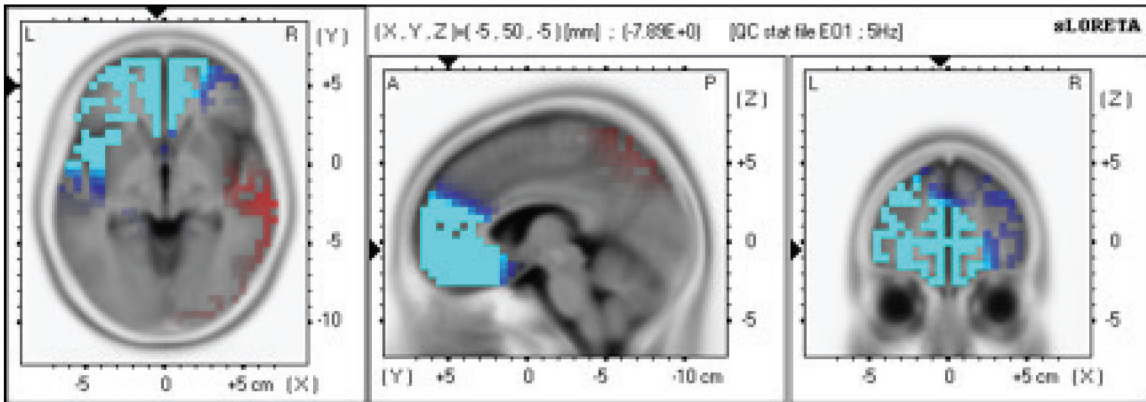


### Carlos Quentin Pre-Post Comparison of Focus and Stress Capacity Scores:



Physiological support for athlete self reports continued:

Eyes Open Beta 2

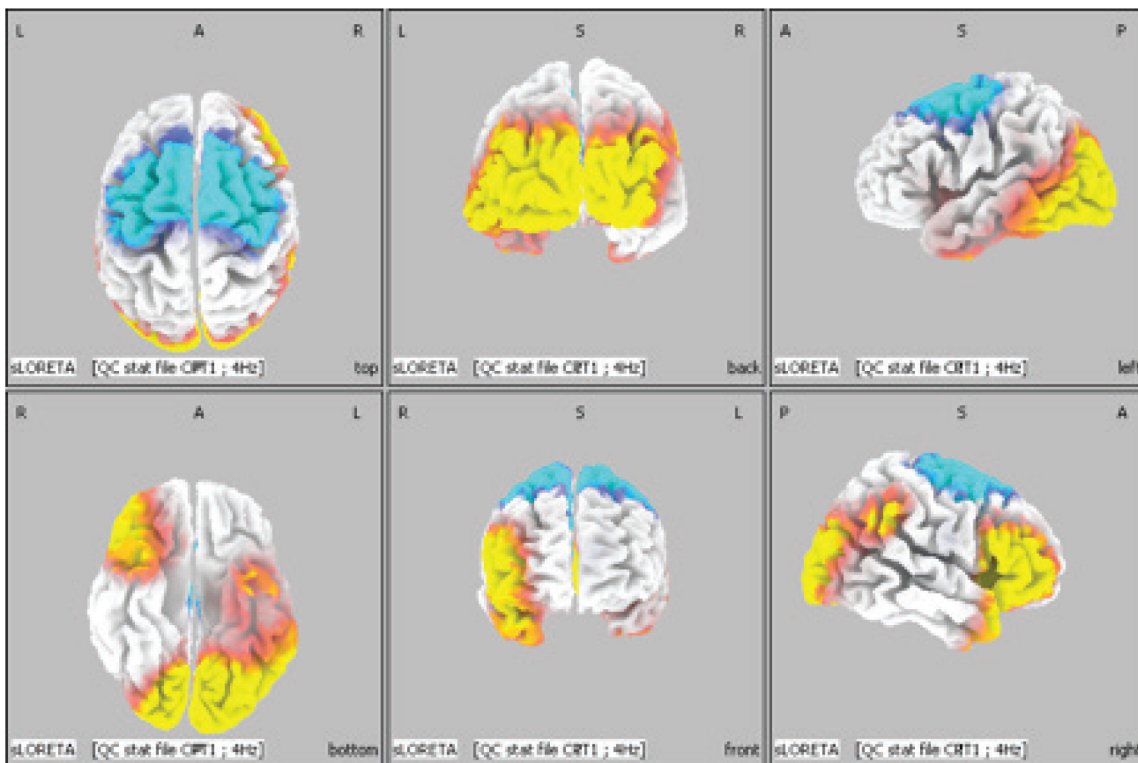
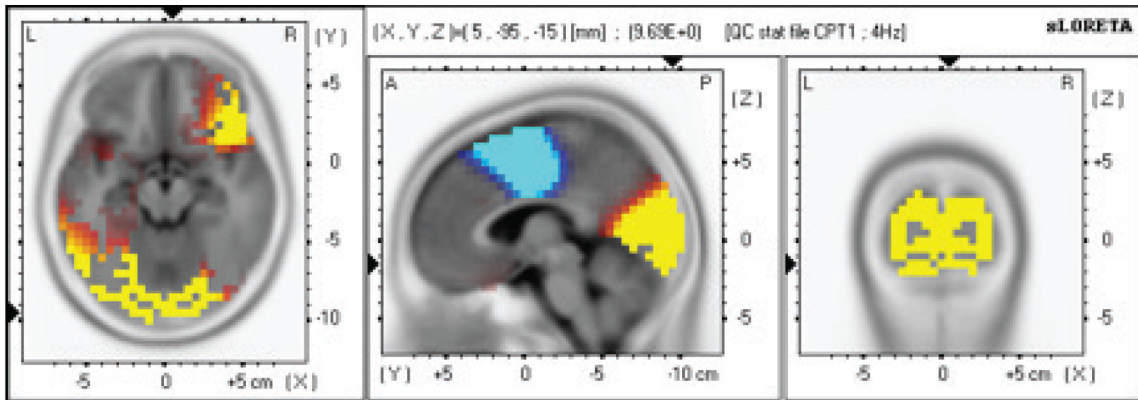


DECREASES

INCREASES

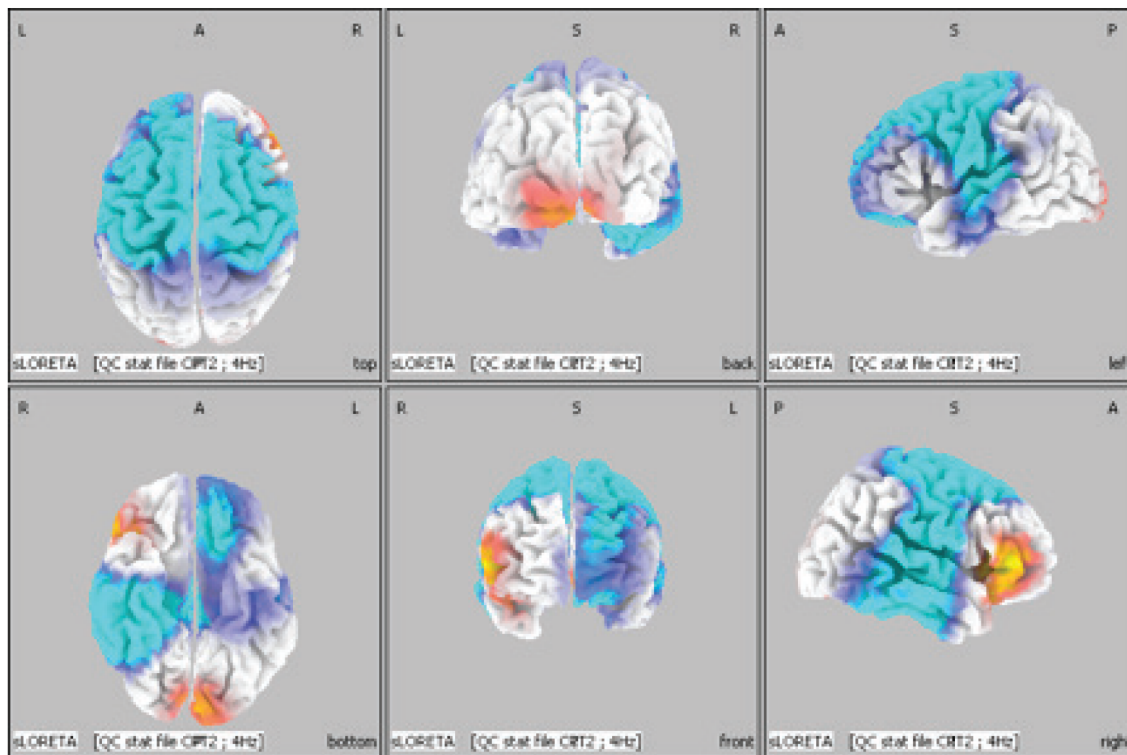
Physiological support for athlete self reports

CPT1 Beta 1



## Physiological support for athlete self reports

### CPT1 Beta 2



Throughout his experience with Performance Brain Training™ Quentin has been a strong advocate for how effectively the training has improved his baseball performance. From the beginning he reported:

*“As an athlete, you’re always looking for tools to make adjustments that make you more successful. One of our biggest challenges is making the mental adjustments that improve performance. This training gives athletes the tool they need, and want, to do just that.”*

He also reported that prior to doing training he was augmenting his focus abilities with Ritalin, probably a common tactic by athletes in all sports at the professional level, he said:

*“Prior to doing this training, I was using Ritalin to improve my focus endurance. One of the biggest things that has helped me from this training, was getting me off that medication. I didn’t realize how negatively the medication affected me until I was able to get off it – diet, health, and my emotional state. Not only has this training given me a tool to improve my focus endurance, it has allowed me to get rid of a crutch. Now I’m able to eat better, feel better, and improve my health overall... so my health, and emotional state have been dramatically improved.”*

Now after training, Carlos says he has the ability to:

*“... focus on several tasks, but also focus intensely on a single task when I need to.”*

Beyond the improvements in focus, Quentin reported:

*“This training allowed me to turn off my mind after being stimulated from performance. It has allowed for better sleep, deeper sleep, and better dream states... It has increased the quality of my sleep tremendously... and [to] properly recover for the next game. This has been such a huge help in regenerating my mental energy for the next day, because I always had issues with that.”*

In addition to mental recovery from stress, Quentin pointed out that he has:

*“had an extensive injury history, but I have continued to play at a fairly high level. It’s hard to quantify the training’s contribution to that continued performance, but I definitely know it has helped me.”*

Just like some of the other athletes reviewed here, Quentin made positive comments about his newfound awareness and the role that it plays in his performance:

*“After this training, I started to become more aware of my body and my coordination. I became able to do things that I wasn’t used to doing – I attribute it to a greater mental awareness, and a greater awareness of things around me.”*

Quentin also said the training has been a:

*“useful tool to alleviate anxiety before performance,”*

something that would benefit any athlete. Finally, when asked if he would recommend this training to other athletes Quentin replied:

*“Guys think about their swing, their performance, and just playing better. Professional athletes want to do everything they can to improve, they’re very proactive, and I would definitely recommend this to my teammates.”*



Quentin demonstrated significant shifts in the cortical electrical activity that correspond with his reported improvements and these shifts are far more illustrative than the changes in his NPP. Interestingly, there was a very focal effect where he was able to decrease the faster activity across the central motor strip and specifically the Anterior Cingulate Gyrus (see CPT1 Beta1 image above). These effects will contribute to a decreased rumination and increased fluidity in cognitive switching. This is impressive because the most important factor in contributing to his mental performance was his increased ability to let things go and move on from errors. Quentin is one of the examples of an over aroused cortex contributing to decreased attention and distractibility. Typically the converse is true for individuals with these symptoms. This is particularly relevant because Ritalin will increase cortical excitation which was the exact opposite of what Carlos needed in order to be better focused and thus his negative reactions to the medication.

Quentin improved most strongly in the focus index, especially impulse control shown both in the construct score as well as the errors (i.e., decreased errors) during the CPT. Training appeared to make Quentin more cortically engaged, which has worked well for him in his baseball performance given his self reported experience following training. Quentin maintained positive scores on most constructs following training, only losing ground slightly in the Stress Capacity Score (Stress Recovery in the spider graph) as a result of his increased cortical arousal.