

Cognitive Soccer Diploma Course

Module #1

Developing a player's ability to process key information rapidly, decide upon an appropriate action, execute the action, and then evaluate the outcome of the action in-order to make future decisions based upon the success or failure of the action as it relates to an overall strategy, is just one part of cognitive development in sports. Today's modern soccer player must be able to make ultra fast intelligent decisions under pressure, while possessing the ability to successfully execute on those decisions with high-level technical skill. Top players are able to sort through, instantly organize and chunk essential information together, while discarding all non-essential information. The high-level player rarely gets stuck in the decision making process, while the lower level player will frequently get stuck. Often the lower level player will fail because somewhere in the decision making process they fail to process data quickly enough, focus on the wrong cues, don't possess the correct skill for the situation or they simply do not have the technique to execute the required skill, even if they made the right decision. It is no coincidence that top-level players possess higher

intelligence levels and are better problem solvers on and off the field than lower-level players. Today's scientific data is making a convincing case that becoming a high level elite player has far more to do with your brain than your body. I can't stress enough the importance of developing thinking players who are also excellent overall learners, problem solvers and information processors, compared to just physically fit players.

However, the million-dollar question is, what exactly is the best way to develop players who have a high soccer IQ, excellent technique, tactical intelligence, emotional control, large attention capacity, superior focus and also make excellent teammates? Why do some clubs produce many players with superior soccer intelligence, while other clubs fail to produce any at all? Why do certain clubs produce high-level players year after year while others struggle to produce just one? Look at the size of the United States; the number of youth players and the amount of leagues in America, yet the United States still has still never produced a world class striker. Why? How does a tiny country like the Netherlands or Belgium develop so many world class pro's? These are the types of questions this course will attempt to answer from a cognitive soccer coaching perspective, the

information in the course is based upon scientific research done by neuroscientists, clinical psychologists, sports psychologists, high level coaches, fitness experts, sleep experts and many more qualified professionals. Very simply, the course is based on scientific findings from a wide variety of experts in many different fields, along with my own 25+ years of coaching experience; I combine the science and coaching experience together to make up the cognitive soccer methodology and course.

One important concept the course stresses is that soccer should not be taught with a separation between the body and mind. I repeat, Coaches should educate and train the players mind and body together as one; it is not realistic to consistently train the two separately. This is not to say technical training should not be done separately at times, it certainly can, there is some value to rote training methods if done in the right context, but technique ultimately must be used in game realistic situations that requires the brain to use strategy. Top players understand that in order to play the game using strategy, they must be focused at all times, attentive and constantly problem-solving, both with and without the ball for the entire 90 minutes, regardless of the situation. The famous player Johan Cruyff said, "The average time a player

spends on the ball in one game is about 3 minutes, so its what you do for the other 87 minutes off the ball that determines how good you are". Any lapse in concentration during the 90 minutes will reduce the player's effectiveness and weaken the team, it is not good enough to only focus for the 3 minutes the player is on the ball, it is imperative that concentration levels stay high for all 90 minutes. Players must have the ability to stick to the task and stay concentrated, regardless of the environment, game situation or any other external uncontrollable factors. A major benefit of cognitive soccer training is that it develops the player's ability to focus and concentrate for a full 90 minutes. Cognitive soccer training constantly works on problem-solving, decision-making and building attention capacities; this mandates that every player stay focused and attentive or else the entire practice will break down.

As a coach there is no magic drill or exercise that will instantly create the next soccer super-star, but over the long term a highly skilled coach can produce top quality players, if the players are willing to put in the required time. However, there is a big difference between having a curriculum loaded with all kinds of content, compared to having a methodology that the coach fully understands and implements. Coaches

who are well versed in a high quality developmental methodology have the ability and knowledge to adapt trainings and make necessary changes to improve student learning, while a curriculum or drill book coach will not have that same skill set and central developmental philosophy. An example of this is when we look at poor performing students, these students are not automatically less intelligent, the main problem is that lower performing students often get stuck processing the information they are given, if the information was presented in a different way, those same students may learn very quickly. Being able to adapt content and deliver it in different ways is a skill that top coaches and educators have; this is often where the drill book coaches will fail. Coaches should always use a variety of ways to deliver content, presenting the information in the best possible way for each individual student, by doing this it allows for the greatest chance of deep learning to occur. Presenting content in different ways does not have to be overly complicated, it may just be playing on a different surface like the beach, or using a variable bounce soccer ball, or adding various constraints to the training. Becoming a “Master Coach” is not something that can be accomplished overnight. Top coaches have worked at their craft for a long time in order to gain the skills necessary to

become great teachers. Want to become a great cognitive coach? It’s all about having a methodology that allows you to deliver quality content in a way that the players can process the information and apply it in many different and unique settings, with enough freedom to find their own solutions, while learning from their mistakes without a coach telling them what to do every five seconds. A skilled cognitive soccer instructor will help develop players that will become efficient learners and in turn, confident problem solvers and excellent players.

Before you start the course please remember these five important cognitive coaching guidelines. First, soccer is a team sport and every member must be a humble hard working member of the team. When the team trains it depends on the focus of all individuals to make the group better. Exercises will break down if all the players are not working together, just like the real game. Second, autonomous learning, minimally invasive learning or player centered learning are all very similar important modern coaching concepts; the old school model where the coach is the dictator that yells and talks down to players is finished, we are smarter people than that now. The modern coach is a facilitator of quality information using many different methods that stimulate player learning; the modern

coach is a true leader and respected mentor to the players. Good coaches guide players in the process of becoming better; they don't rely on screaming, yelling or making sarcastic comments to their players. The third important factor in cognitive soccer development is the importance of teaching a cognitive centered lifestyle outside of soccer. This means developing well-rounded individuals who continually develop their brains off the field by taking part in activities like playing music, reading books, focusing on academics, writing poetry, programming computers, learning art, asking philosophical important questions, meditating, practicing mindfulness and making an effort to learn about other cultures. These are just a few things that will not only increase the brains plasticity and ability to learn, it will help your players become well-rounded individuals. Fourth, ethics, respect & sportsmanship must be taught and seen as an important part of the curriculum. There is no room in sport for "me, me me" or "lack of respect for any human being". Players should be asking, "what can I do to make the team better", instead of "what can I do to start". Unfortunately, we are living in a world that you hear "what can I do to start" more and more compared to "what can I do to help the team". The good news is the coach can create the environment, so "team

first"! Lastly, players & coaches should look at the learning environment (training ground) as a place to be excited and feel empowered to learn and teach in. Learning and getting better should be a passion shared by all. Players should not feel scared or embarrassed about failure, they should feel comfortable taking chances, learning, creating and asking questions, regardless of the outcome! Cognitive soccer development and coaching is really a holistic and scientific methodology for soccer, learning and life. If we can produce great soccer players, that's awesome, but if we can produce great soccer players and great people together than it's a total success. Enjoy the course and feel free to get back to me with all your questions. I am sure you will have a lot, because the information in the course will challenge many of the conventional coaching methods most of us have been exposed to growing up.

After the successful completion of the course, the "Cognitive Soccer Instructors Diploma" will be awarded. Also, be sure to check out my Youtube channel under "Marcus DiBernardo", it has over 250+ trainings. Feel free to email me any questions or comments at coachdibernardo@gmail.com

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Soccer: Cognitive Development 101

“There are only so many ways we can continue to get bigger, quicker, faster and stronger. The future of sport isn’t in the physical dimension; it is in the brain.”

Before getting into how the brain works while playing soccer, it is important to grasp a general understanding of cognitive development and the human brain. The definition of cognition dates back to the 15th century meaning “thinking and awareness”. Cognition is essentially the “processing of information”. This includes things like calculating, reasoning, problem solving and decision-making. The processes of cognition are handled in the brain. Fields like neuropsychology, neuroscience and cognitive science study these processes in detail. When I mention developing a player’s cognitive soccer ability, I literally mean developing the player’s ability to make better and quicker decisions, utilizing and recognizing important information while discarding the irrelevant information, gaining the ability to chunk & organize information together instantly in order to make split second decisions, having the ability to consistently judge space and time correctly on the field, being able read and couple together cues

and patterns to anticipate and problem solve on the field, while creating an overall more intelligent athlete and person. Players who possess high level cognitive abilities also tend to have better emotional control, better memories and longer attention spans. The end result of team cognitive training will be a higher performing group on many levels. The players will understand that successful teams must work together for 90 minutes, having each player fulfilling their individual duties with no lapses in concentration; cognitively trained teams will also be excellent problem solvers who can adjust tactics quickly, finding solutions in real time, displaying emotional control and sportsmanship are also traits of cognitively trained teams. Individually players will see the benefits of cognitive training with an increased ability to concentrate, learn, focus, recognize patterns, anticipate actions and problem solve, not just on the field but in other areas outside of soccer as well. Cognitive training improves an individual’s mental bandwidth or their ability to learn and concentrate on multiple things. A human’s conscious mind is able to handle a maximum of four tasks at one time; which can still prove to be very challenging. The pre-frontal cortex is the area of the brain that is responsible for dealing with multiple tasks. The problem is that the pre-frontal cortex is not

equipped to handle multiple tasks efficiently; however the subconscious mind can handle multiple tasks much more efficiently. This is why player's that get distracted easily by things like bad calls or hard fouls are at a severe disadvantage; they end up losing their ability to focus on what matters, which is the game in the present moment, instead they place their attention on what they can't control, taking up room in their limited conscious mind and pre-frontal cortex, which only serves to derail their focus and attention even further, leaving no room in the pre-frontal cortex to deal with the present game. Players who have trained in a cognitive soccer environment will possess a greater ability to focus on what matters, which are the things within their control; they have the ability to maintain their attention over 90 minutes, they are constantly solving problems on the field and ultimately will perform better. Even at the youngest ages it is important to start working on the player's cognitive abilities; remember that much of a person's core beliefs, outlook about life, social ability and self-esteem are programmed from birth to 6 years old. This is even more of a reason to empower your players early on using cognitive soccer coaching methods.

Have you ever had to explain the rules of an exercise three or four times because players didn't get it or just a few got it and a few were lost? That is a strong indication the players are not processing information efficiently for a number of reasons. Most likely the delivery system being used isn't working or the players are not well trained cognitively. One way to get players focused right from the beginning of training is to start by performing exercises that primarily focus on building attention capacities and the ability to focus. It is fine to do an activity that isn't your typical soccer related warm up to open the training session, as long as it challenges the brain, works the teams coordination and requires focus and attention. As training progresses and the players are showing progress, build the complexity in all of the training, but keep the information focused and to the point. The more the players are engaged in training that challenges the brain, the more their overall cognitive abilities will increase.

Another important concept in the course is the value of unique soccer experiences, the more different and unique experiences a player has, the more chance they will adapt and develop different and valuable skills that they otherwise would have not developed.

Research supports the idea of unique learning environments by proving that when a person is exposed to different learning environments and tasks, there is a clear transfer of intelligence that occurs from one environment to another. Example, unique dribbling touches that are learned playing beach soccer can be instantly transferred to a regular 11v11 game on grass; it also means that a person who increases their cognitive abilities in one area, will be able to transfer those cognitive abilities to other areas. An example of this would be a soccer player who is asked to play basketball or hockey, the soccer player would likely pick-up the games quickly, because the basic ideas and tactics of the games are so closely related. There would be a strong crossover of experience, soccer to basketball or hockey, this helps the player adapt easily in these similar types of games. A recent study in Germany determined that, a large percentage of the top German professional soccer players all played a variety of sports growing up, not purely focusing on just soccer. In addition to unique experiences, I strongly recommend implementing an overall cognitive development structure for your players; they will literally become better all-around learners across the board, which parents and teachers will be pleased to hear. Later in the course we will discuss specific training methods,

but the idea of the transferring of intelligence points towards the benefits of placing players in many different types of training environments, which require problem solving and creative solutions in order to be successful. However, don't neglect off the field cognitive development, the more the brain can be challenged when not playing soccer, the better overall learner the person will become. In an article written by Torbjörn Vestberg, a prominent neuroscientist from Sweden, he concludes that elite soccer players ages 12-19 perform better on executive brain function tests compared to the norm, therefore predicting that success in soccer may correlate with higher executive brain function abilities. All the research re-enforces the importance of having a cognitive curriculum that includes a variety of different activities, which are designed to increase brain plasticity, along with pre-planned downtime, which is called settling time by neuroscientists. Neuroscience tells us that optimal learning happens when people have time to relax and process information they have received, so don't think every second of the day must be busy! Even during the actual soccer training session, it is fine to build in a few minutes for the players to process what they have learned. Giving time to process information during the day is needed but the most important time

for the brain is the nighttime, during sleep is when the brain organizes and encodes the day's information, hard wiring the information for long-term use. Without a proper night's rest, the information received during the day will not be properly processed and retained, this indicates that sleep is a major factor in the brain's ability to learn and problem solve, this is a topic we examine in detail later in the course.

In order to fully understand the concept of transferring intelligence, we need to look at the make-up of intelligence. Intelligence is defined in two separate ways, crystallized intelligence and fluid intelligence. Crystallized intelligence is the ability to use information, skills and knowledge to score well on standardized tests. This type of knowledge represents your lifetime of cerebral knowledge. Games like Jeopardy or Trivial Pursuit test a person's crystallized intelligence. Crystallized intelligence will not help players on the soccer field in terms of decision-making and problem solving. However, the second type of intelligence called Fluid Intelligence, will help players in their soccer developmental and decision-making processes. Fluid intelligence is the ability to think logically, learn new skills and then use the

knowledge gained as a platform to solve nonrelated new problems or learn new skills. The fact that fluid intelligence can be transferred and used in other related and unrelated tasks is a major breakthrough. The other positive factor with fluid intelligence is that it can be trained and increased. The more you train your fluid intelligence the more progress and overall cognitive development increases. Increasing fluid intelligence literally makes people smarter in all areas of their lives. When humans are actively training their brain and learning, they are creating new synaptic connections, these connections build on each other, creating increased neural activity and more connections. As this happens, learning is happening. The term neural plasticity refers to the number of connections between the neurons in the brain. An increase in plasticity will enhance a person's ability to learn and retain knowledge. When new things are learned, electrical impulses travel from the neuron over a gap, which is called a synapse to other neurons. When learning something new, the first couple of times crossing the synapses are hard but with repetition, the impulses start to cruise easily over them, committing them to memory. Cognitive soccer training combined with a cognitive centered lifestyle will increase fluid intelligence levels. Increasing fluid intelligence is like hard wiring a person's brain for

success by building efficient neurological pathways. Elite soccer players are proven to be some of the best problem solvers, both on and off the field. High-level soccer players even test in the top percentiles on written tests that have nothing to do with soccer compared to non-elite players and the general public. A study in Europe recently showed top goal scorers were better problem solvers than most of their teammates. Another study showed players with higher attention spans and better memories score more goals and play for higher division teams. These facts indicate that soccer is much more of a cognitive sport than most people have thought. Think about this statement: “top players come up with more solutions to problems and quicker solutions to problems on the field than average players”. Top players also have superior technical ability, this allows them to execute skills at high rates of speed, making their problem solving and advanced anticipation skills even more effective. Lower level players are slower in the entire process of problem solving and executing their technical skills. Lower level players often get stuck in the process of problem solving and executing, while elite players are able to come up with solutions and execute them instantly. Think about those last statements, they really outline the difference between high-level and lower-level players. The

question now is; how do you train to become a high-level player? That question will be answered in detail throughout the course. The next part of the course will look at various sports performance theories, including the Bayesian Inference Theory and Grid Cell Theory. These theories will give you further insight into how the brain functions when performing motor skills. It is important to have a solid understanding and foundation behind the science of cognitive soccer development before progressing to the step of teaching it in a soccer context.

Let me end this Cognitive Soccer Introduction with part of an article written by the Neuroscientist Jeffrey Holt, (Thinking with Your Feet: How Soccer Rewires Your Brain", June 10, 2014), "This one rule takes away eons of evolutionary advantage we humans have developed. Hands are what we do best. A peek inside the brain of the average human reveals that the hands are vastly over-represented relative to other regions of the body. This is true for the cortical brain areas devoted to perception of touch and body position and even more so for the cortical areas that control the motor activity of body musculature. To convince yourself, try this at home: place your hand on a flat surface and lift just your middle finger. Now place your foot on a flat surface and lift just your middle toe. Both hands and feet contain sufficient musculature to accomplish these tasks. However, most people have difficulty lifting just their middle toe because they lack sufficient neural representation in the brain regions that control the feet. More than any other sport, soccer requires a brilliance that redefines the cerebral cortex, because the soccer player is limited by one simple rule: no hands! Yet, since soccer eliminates the use of hands and focuses on the feet, soccer emphasizes another powerful

human capacity: the plasticity of the human brain and its ability to learn and be shaped by experience. The feet, the principle instruments of soccer, are represented by a very small region of cortex in the average human brain. Remarkably, this feeble cortical representation is not set in stone; clay would be a better analogy because the brain can be molded by experience. In fact, the ability of the human brain to be remolded and learn from experience is so pervasive in humans that I would argue it is our greatest evolutionary advantage. The brain of a soccer player illustrates this point beautifully as it is reshaped by extensive training and experience. Since the soccer player's feet are both exquisitely sensitive and remarkably powerful and must be used as tools of the trade, as well as for their usual purpose, the brain regions devoted to the feet undoubtedly expand to allow greater neural representation. It is not difficult to imagine that the brains of Ronaldo, Messi or Neymar, currently some of the world's greatest soccer players, may be very different from the average human with expanded representation for the feet. A remolded cerebral cortex in the minds of the best soccer players is a testament to the incredible plasticity of the human brain and its ability to adapt and learn from new experiences. Every artful touch of the ball, exquisite pass, explosive burst of

speed and thundering shot on goal, begins in the cortex of evolution's greatest achievement, the human brain."

Grid Cell & Bayesian Inference Theory

“Insight Into How The Sports Brain May Work”

The “Grid Cell” and “Bayesian Inference” theories provide another viewpoint on how cognitive processes function in sports settings.

The Bayesian Inference Theory

Data or Sensory Input (example: data/sensory input gained from a person would be from their vision) + **Prior Knowledge** (memory/what a person remembers from past experiences) + **External Factors** (things like wind or an opponent using his force/body against you) = **Prediction of the Future**

Let’s look at an example of the theory in action. A tennis player has to return a shot. The opponent hits the ball and the returning player will need to judge where the ball will land, and how it will bounce in order to return the shot using sensory data, which is from the player’s vision. The player will also draw upon past experiences in order to help predict where

the ball will bounce or land. Past experiences will help to answer questions like, where did most of the prior similar type of shots land that were like this shot? But let me stop right there for second, past experiences matter and variety of past experiences also matter. This is an important cornerstone of cognitive soccer instruction and development. The more diversity and variety of training experiences a player has experienced, the more tools the player will have in order to solve problems on the field. In contrast, if in every soccer training the player experienced was 2-touches only, the experience would not be diverse enough to develop a well-rounded player with the ability to problem solve using various solutions. The player simply would not have developed the proper tools to play the real game, which requires more than playing 2-touch. Let’s get back to the tennis example, after seeing the ball served and recalling past experiences, the last step in the process would be for the brain to take in all the external factors, external factors would be things like the direction and force of the wind. Even from this simple example of a tennis serve, you can see that the brain must be well trained in order to come up with split second accurate decisions that account for all these variables. There is very little time to think in these situations, so players must be well rehearsed and trained, if they

hope to be successful. Becoming a high-level player doesn't happen overnight, it takes quality training, game experience and time. The top players are able to pick up on indicators or cues that lower level players might not, allowing them to sub-consciously read and gain predictive information by observing the opponents grip, hip position, shoulder position and much more even before they hit the ball, while the lower level player might be solely focused on racquet speed and racquet position. The top-level player will also be able to recognize patterns quicker, as a result they can anticipate and react much faster than the lower level player. Research does indicate that information usage may be related to a performers' visual search patterns. One of the differences between expert and novice players may lie in respect to the location, distribution and duration of eye movements. The expert over time has gained the experience and knowledge of where and what to focus visually, even if they don't consciously realize it. The Bayesian Inference Theory helps us understand how the brain actually works in sports specific situations that combine sensory input/data, drawing on past experiences and accounting for external factors, all this must be done in a split second to make a successful decision.

The next important theory in relation to how the brain works in sports is called the Grid Cell Theory. The Grid Cell Theory is different than the Bayesian Inference Theory because it primarily focuses on the athlete's spatial awareness abilities, it is literally the athlete's compass. The grid cells do not function alone, they operate in conjunction with head direction cells and place cells to determine the athlete's location at all times. In order to play at a high level, a player must first know where they are on the field in relation to their teammates, opponents, the ball, the goals and the general field boundaries. This information is critical in the decision making process, and it is even more important that the information be current. Gathering current information is accomplished by frequent player scanning or head movement, the current information is used by the player to make the best decision or football action possible. Being spatially aware is an essential skill for football players. Studies have shown that deficiencies in spatial awareness can diminish an athlete's chances of maximizing their true potential. From a coaching perspective it is very important to grasp an understanding of the science behind spatial awareness, this will help in the development of trainings and methodologies in regards to player development. Jeffrey Taube helps explain spatial

awareness and location in a pair of papers he wrote in the “Journal of Neuroscience” in 1990. Taube suggested that humans are biologically programmed to know what direction we are facing; as this skill has been fundamental to our survival. He stated that there are cells called “head direction cells”, located in the thalamus, that serve to tell us what direction the head is facing. There are also cells in the hippocampus called “place cells” that track our location relative to landmarks in the environment. These two types of cells work together to guide our movement; in what you may consider a cognitive map of sorts. The last cell that helps us with location and spatial awareness is called a grid cell. In 2010, scientists discovered that like rodents, the human brain contains what they refer to as grid cells, brain cells that help us to keep track of our location relative to other nearby objects when navigating new or unfamiliar environments. Grid cells get their name from the triangular grid pattern they appear to use that represents spatial location for humans and animals. Different locations are remembered in different areas of the brain using grid cells. In many ways, this grid cell theory helps to explain the decision making process of soccer players. A player will typically see hundreds of choices in 5-10 seconds of game action; the player must rely on their grid cells to

organize all the spatial information quickly. Grid cells literally map out a defined grid for the player to use as points of reference in the brain as past experiences will help build more reliable and functional grids; these points of reference (grid cells) are used by players to make split second decisions when playing. As I briefly mentioned before, different areas of the brain are responsible for organizing each spatial location. The more meaningful and diverse experiences players have, the more reference points they will be able to access. Neil Burgess a neuroscientist at the Institute of Cognitive Neuroscience at the University of College London, says, “grid cells provide a map of the whole environment, similar to the longitude and latitude of real maps, only in triangular patterns.” It is realistic to assume that frequently training on the same field or a similar field would establish a set of grid cells for that situation, combine that with the direction we’re facing (head directional cells), and then our location on the field (place cells), that will provide the player a very specific idea of location or spatial awareness when playing.

Grid cells, head direction cells and place cells help us understand the science behind spatial awareness and location, but decision making is a complex function.

There is a myriad of factors that will need to be considered and processed into the equation. These external factors include things like, where is the play located (attacking third, middle third or defensive third), what external factors are influencing the game (up a goal, down a goal, up a man, down a man & time left in the game), home crowd, is it a must win situation and what are the strengths and weaknesses of the other players on the field? Players must be able to process all these variables quickly in order to make quality decisions. Looking at the game from a cognitive processing perspective, you can begin to see how difficult it actually is to play soccer at a high-level. Here is a quote by Clint Dempsey that puts into context how many different variables a player has to think about when making a decision on the field, all in a split second, "If you look at the first one, it was a bit of a slow [pass], so I'm having to go farther to the near post, and then you don't have as much of an angle at the goal, what you're trying to do is hit it hard and low. Sometimes it goes through the keeper's legs. On the second one, there wasn't really an option to go to the right because there was a defender there. So then you have two choices, you can either strike the ball with the inside of your foot and try to place it at the near post in the corner. You can try to hit it with your toes down. Or, you can try to fake the shot and push

it wide so you can get more of an angle. But knowing how things were going, I didn't know if it made sense to try to risk it, I decided to take it first time."

Think about what you just read! Clint's decision had to be made in an instant but it took an entire paragraph to cover all the scenarios he had going through his head! Playing soccer at a high-level might look easy but it's far from easy.

The more diverse, cognitively challenging and high level training a player receives, the better developed and well rounded the player will become. When a player experiences various types of training environments it requires them not only to problem solve but it develops their spatial awareness and soccer IQ. Training in grids that are directly proportional to the shape and size of an actual playing field or a section of the field are important, but there is also a great benefit in training in different types of spaces and shapes. The important thing for now is that you grasp the general concepts of spatial awareness, grid cells and the Bayesian Inference theory and how they relate to the understanding and teaching of location, speed, timing, space and angles. Later in the course I will discuss concept "gridding for soccer", which is based directly upon grid cell research, where players train in spaces similar to

actual game locations, building familiarity within the space. Training in game realistic grids familiarizes players with the actual space they will be occupying when playing in the real game, making it easier to understand location, speed, angles, timing and space.

The Benefits of Diverse Training Experiences

Some players who have benefitted from diverse training experiences are Ronaldinho, Met Ozil, Peter Cech, Neymar and Thierry Henry. I would argue that all these diverse training experiences are incredibly beneficial cognitive soccer experiences. Ronaldinho would often speak about the unique touches on the ball he learned playing beach soccer in Brazil. He mentioned how those unique touches on the ball from beach soccer were subconsciously transferred over when he played on the grass field; other players simply couldn't understand the types of touches he was taking. Ronaldinho felt that his beach soccer experience provided him with special skills and an advantage over other players who never played beach soccer. Similarly, Met Ozil credits part of his development to "playing in the cage" at a young age in Germany. The cage was a small enclosed hard surface surrounded by a tall metal fence that didn't allow the ball to go out of bounce. Ozil would play against his older brother and friends, who were all faster, stronger, taller and older than he was. Inside the cage, Ozil was forced to out-think the other players because of the lack of space in the cage and the greater speed of the other players. The cage is a great example of a unique training environment, it

also fits into the category of a constraint based training method, which will be discussed later in the course. The cage was the teacher for Ozil, no coach needed! The cage forced Ozil to come up with solutions to problems at very fast speeds, this is extremely important and relates directly to the 11v11 game. Thierry Henry speaks about playing soccer in parking lots with shopping carts all over the place. He enjoyed the experience because there was strategy involved with playing soccer around shopping carts. Players could bounce the ball off the carts or use them to shield off opponents or just as a barrier to create space. The shopping carts made a regular soccer game more complex, making it a cognitive experience. The prolific Brazilian and Barcelona goal-scorer Neymar, credits his futsal experience in-part for his development as a world class player. Neymar says, "Futsal had a massive influence on me when I was growing up. It's a very demanding game and it really helped to develop my technique, speed of thought, and ability to perform moves in tight spaces. I think futsal is a fundamental part of a footballer's life. When you're out there playing, you're forced to think fast and move faster – if you lose a second, the ball will be gone. It's a more dynamic game and it's come in handy at Barcelona. When we play there's not much space on the pitch so you need to react

quickly on the field. There's no doubt futsal has helped me a lot in my career, it's one of the biggest passions in my life. I used to love playing it, but unfortunately I had to stop when I was 13 or 14 in order to grow up as a footballer."

Below is a quote from Peter Cech talking about the innovative methods he uses with his Goalkeeper Coach. This is from an article in the "Daily UK" newspaper.

"This is the way he works. We try to catch different shape balls, bigger balls or smaller ones because then you need to adapt your hand-eye coordination every time. Suddenly your brain starts working again. You can use colors. Imagine saving the ball but at the same time a card is held up. You save the ball and shout the color – you are concentrating on more things. That makes your peripheral vision better as well. Your brain is working much more than just with a simple catch. He is always searching for new things to bring it further, to be more efficient and try to make things happen for a goalkeeper to progress even at the highest level. I keep using a table tennis robot which shoots ping pong balls out. You have to catch it with one hand so it gives you a completely different hand-eye coordination. Then, when you

have both hands facing one football, everything becomes easier."

Ozil, Ronaldinho, Cech, Neymar and Henry all used non-traditional training methods to help them excel in the eleven a side game, there is no doubt that these player's "Soccer IQ or Game Intelligence" is very high. I believe their unique training experiences have made the actual 11 v 11 game easier for them, by giving them extra tools or skills that other players do not have, these acquired skills from the unique experiences, allow them to come up with more solutions and have options on the ball at faster speeds than other players. Training in different and unique environments may also allow players to see the game just a little bit differently. Here is a quote from the great Italian center midfielder Pirlo talking about how he sees the game differently, "I have reached one conclusion, though I think I've understood that there is a secret. I perceive the game in a different way. It's a question of viewpoints, of having a wide field of vision being able to see the bigger picture. Your classic midfielder looks downfield and sees the forwards. I'll focus instead on the space between me and them where I can work the ball through." Claudio Reyna, the GM of NYCFC, commented about Pirlo, explaining the differences

between Pirlo compared to other players in the MLS, “He’s a player who makes it look easy,” claimed Reyna. “We have Andrea (Pirlo) and Frank (Lampard) in midfield at NYCFC and they are a step ahead. The best players are two and three steps ahead of the opponent when they receive the ball and that’s what you have to do at the highest level where there’s limited space and the speed of play is much quicker – you have to think ahead.” Reyna even commented on his own development, crediting a unique playing environment that helped mold him into one of the best players the United States has ever had; “For anyone who remembers those fields, there was dirt, rocks and even glass, it was by far the worst field I ever played on, and I played more games on it than any other field. There was constant soccer there. Sometimes it was a dust bowl, sometimes it was frozen and the ball was bouncing every which way, as difficult as it was, you had to have your head up to play. That and playing with older players all the time developed me at a more rapid pace.” Later in the module, remember what Reyna just said, as it relates to constraint based training, especially environmental constraints.

The Importance of Deliberate Practice

Dopamine & BDNF in Soccer Learning

Learning is not easy; it requires high levels of focus, concentration, commitment, emotional control, hard work and patience. There are two chemicals in the brain that are proven to enhance the ability to learn. The first chemical in the brain that helps stimulate learning and motivation is called dopamine, in my opinion dopamine is the most important chemical in the learning process. The brain releases dopamine when experiences are challenging and contain novelty, new experiences. When dopamine is released it creates a sweet spot for optimal learning to occur. A good example is when Pep Guardiola pushes his players to play on the edge of their technical ability, while using diverse ever-changing training environments. By constantly adding challenging variations to trainings, Guardiola is creating an environment for optimum sweet-spot learning, where novelty is always present. By pushing and holding his players accountable, he is also introducing a healthy stress into the training environment, which further increases attention, focus and learning while upping performance levels. I recently watched Guardiola running training at

Bayern and noticed the players playing a juggling one-touch game into garbage cans. Imagine Bayern playing problem solving and skill games into garbage cans! Novelty & Dopamine at Bayern! The next chemical in the brain found to have an impact on learning is called BDNF or Brain-Derived Neurotrophic Factor. BDNF is very important in the learning process in terms of transferring learned skills into the long-term memory. Increased BDNF levels are proven to increase learning potential. The optimal learning environment for learning new skills that can be transferred to the long-term memory is when learning (training a new skill in soccer) is performed at lower intensity levels, below 70% of the Maximum Heart Rate and is discontinuous in nature. It is proven that learning complex things while working at physically high intensity levels above 70% MHR is less effective. The best way to make use of BDNF is by learning skills at below 70% MRH or right after higher intensity bursts of exercise. The next time you are running a practice session that is teaching a new technique or concept, remember the 70% maximum heart rate rule and the role of dopamine and BDNF. Teaching technique also requires ample processing time or settling time, down time, time to reflect, to be still and shouldn't be treated as a cardio workout. Instead, running technical training sessions that focus

on teaching a new skill should be at a slower pace, so players can really dissect the technique at slower speeds. Trainings can be at a higher intensity levels if the players are training skills they are already proficient in.

I would also note that a study out of the University of Oxford has shown that supplements of Omega-3 DHA (fish oil) significantly improved learning, attention and behavior in underperforming students. The reason I bring this up is because cognitive soccer development is complimented by the addition of living a cognitive healthy lifestyle. The player who is struggling with focus, attention and comprehension on the field, may very well benefit from off the field solutions. I would encourage coaches to start looking at soccer development from a wider perspective that encompasses much more than just what happens on the field.

The roles of Dopamine and BDNF also share many similarities with the concept of "Deliberate Practice". Anders Ericsson, a Professor of Psychology at Florida State University is a leading expert in an area called Deliberate Practice. Anders has found that becoming highly skilled in a field has more to do with how one practices compared to just the number of repetitions a person performs. Meaningful deliberate practice

should not be easy or take little mental effort; deliberate practice requires hard work mental bandwidth, concentration and focus. Anders also concluded that many highly skilled people break the learning of skills into smaller chunks while getting feedback from a master coach. Deliberate practice also focuses on continuously training the learned skill at more and more challenging levels, building neural pathways. Working from simple to complex is logical in the learning progression. In the context of soccer training we can use the example of learning a 1 v 1 attacking move; the initial stage would be learning the move at a very slow rate of speed, breaking the technique down into stages or chunks and then putting it all together once each stage is mastered. Once the skill is ready for whole practice, the player would gradually increase the speed of execution of the skill as proficiency increases. The next step would be to add cones that act as visual cues and spatial indicators for the player to execute the technique on. The cones force players to figure out space, timing, speed and proper angles. Example: The player has to execute the 1v1 scissors move skill, while dribbling at the cone. In order for the player to be successful, he must dribble at a certain speed, execute the move at the proper distance, the speed of dribble needs to be factored into timing of move and the proper

approach angle must be taken in order to get past the cone successfully. All these factors come into play just by having the player add a simple cone to the execution of the skill! The next step in the learning would be to add a passive defender, then 70% effort defender and finally a full pressure defender. The last stage of learning the 1v1 move is to understand when to use the move in a real game at speed; this is done in game realistic exercises. The last part involves actual strategy in the use of the skill. The player who has mastered the strategy component of a skill can then start adapt the skill when needed; this would be a higher-level player. The more technically skilled a player becomes the more potential for increased game intelligence they have. Why? The athlete who has mastered a certain skill will also be able to read that same skill coming from an opponent easier. Maybe your defenders or keepers won't ever use the 1v1 scissors move, but it may help their defending ability if they learn to recognize it coming at them. This would be considered learning predictive information that would help the defender or keeper anticipate the attackers next actions. Also, players that are technical will have the ability to save time on the ball by using the correct, efficient and proper technique, thus allowing for greater game intelligence.

It is important to note that during the learning process, the presence of a master coach who provides feedback will serve to increase the effectiveness of learning; this is a very important component to learning. The entire theory of "Deliberate Practice" is based off of the observations of highly skilled experts in all different types of fields. Deliberate practice focuses on teaching and embedding skills into a student's long-term memory; it clearly shows that experts learn to organize their knowledge in more practical and useful ways than non-experts. Elite athletes are without a doubt superior in rapid encoding, recall, retrieval and recognition of patterns in their respective sports. They are also superior in the advanced prediction & anticipation of the actions of opponents, they have the ability to chunk together indicators and cues in order to form patterns quickly in their minds, which overcomes many typical memory and processing capacity constraints. What that means is, elite athletes can organize and process meaningful information in their sport subconsciously without having to think, it just happens in a fraction of a second. The entire process bypasses the conscious mind, which is too slow in the processing information. This is why a skilled person in a particular field is able to learn new skills in that field much quicker than a person from outside the field.

The experienced skilled person already has the plasticity and synapses in place used to process the familiar information; while the novice learner must build their neural networks in order to increase their ability to organize and process information instantly. There is little question that “Deliberate Practice” when done correctly challenges the brain and enhances cognitive development and skill development. Deliberate practice contains importance lessons for all coaches and players in the area of skill acquisition.