

I CAN HELP YOU TO
PREVENT INJURY AND
RECOVER FASTER

I CONTROL YOUR INTERNAL
BODY CLOCK AND
AFFECT YOUR FOOTBALL
PERFORMANCE

FOOTBALL ON THE BRAIN

BY
THE UNIVERSITY
OF OXFORD
AND
SHE KICKS

I CONTROL HOW
YOU RESPOND TO
PRESSURE ON THE
PITCH

I CONTROL
EVERYTHING YOU DO,
THINK, AND FEEL, ON
AND OFF THE PITCH



FOOTBALL AND THE BRAIN

Your brain is important for all your footballing activities. It tells your muscles exactly how to move to execute that perfect free kick. It is also key for learning new skills, improving your ability to control and manipulate the ball with precision and confidence. Many think of football as being a physical game that needs fitness and coordination, but it is so much more. At the centre of every player's development the brain is controlling everything we think, feel and do. It has a role to play in:

- Optimising player experiences from grassroots to professional levels,
- Understanding how perception and experience shape decision-making,
- Nurturing player resilience to optimise performance under pressure,
- Injury prevention and recovery time,
- Coaching approaches for different ages and stages,
- Determining levels of risk associated with head injury,
- Social behaviours and their role in team cohesion.

THE FOOTBALL ON THE BRAIN PROJECT

The Project brings together researchers from The University of Oxford's Centre for Integrative Neuroimaging (OxCIN) and various football community partners to look at the links between football and neuroscience research. Through engagement with players, coaches and fans, the project aims to inspire people to find out more about the brain, inform through educational resources and shape future neuroscience research. Find out more about the team and our activities on pages 35 and 36.

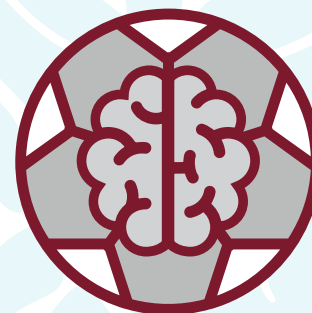
In partnership with SheKicks, the Football on the Brain team produced four magazine pullouts, one for each year of the project. This booklet is the product of this work, we hope you enjoy it!

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THE MORE YOU PRACTISE THE BETTER YOU GET

The brain is made up of billions of cells that send information using electricity, like a digital code. The cells connect together at junctions where they communicate through chemicals. There are trillions of these connections in every brain, making it an energy efficient supercomputer. Every time you do something, messages pass along interconnected cells. The more you do it, the stronger the connections become. This **neuroplasticity**, the ability of the brain to adapt and change, is how we learn new skills, change behaviour, or recover from injury.



FOOTBALL ON THE BRAIN

DID YOU KNOW YOUR BRAIN IS FUNDAMENTAL TO ALL YOUR FOOTBALLING ACTIVITIES?

I CONTROL YOUR MUSCLES,
HELPING YOU PUSH YOUR
BODY TO THE LIMITS...

I DRIVE THE EMOTIONS
YOU EXPERIENCE
BEFORE, DURING AND
AFTER A PENALTY

I HELP YOU
LEARN NEW
SKILLS

I MOTIVATE YOU
IN TRAINING
DRILLS

I PREDICT
WHERE THE
BALL WILL GO



YOUR BRAIN ON FOOTBALL

Playing football takes skill, practice, and a lot of brain power. You need to (1) be aware of where people are on the pitch and predict where the ball and the players will be, (2) make quick decisions, (3) make a pass and (4) learn from your experience.

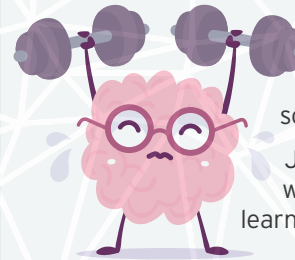
Here are some of the things your brain needs to work out just to make a pass:



NATALIE MINCHER/SPP

Aston Villa's Maz Pacheco in action

PRACTICE MAKES PERFECT



Did you make the pass? If so, your brain will strengthen connections to make it more likely to do the same again.

Did you miss? In this case, your brain will make sure you try something different next time.

Just like your muscles, your brain changes and improves activity with training, but mistakes are also important, as your brain can learn from them.



PETER SONANDER/SPP

Felicia Saving and Mia Jalkerd of Eskilstuna United celebrate their goal while Piteå's dejected players look on, during the Swedish Cup game at Tunavallen in Eskilstuna, Sweden, February 2022

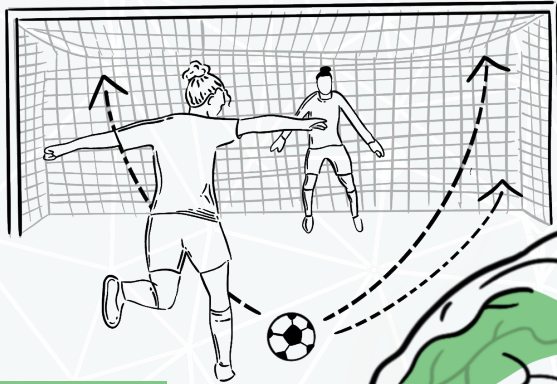
THE EMOTIONAL HIGHS AND LOWS OF FOOTBALL

The emotional side of football also relies on the brain - whether your head is in your hands after a missed penalty or you're enjoying a goal celebration after hitting the back of the net. The emotional centres deep in your brain can use this information to help improve your football skills.

As these examples demonstrate, football requires a large amount of brain power, making it a truly remarkable experience to play and to watch.



Did you know that different parts of your brain have different jobs? Your brain includes areas that are specialised for vision, movement, speech, learning, emotion and prediction, to name a few. All of these different brain areas get busy every time you play football!



**PREDICT WHAT
IS GOING TO
HAPPEN NEXT**



**COMMUNICATE
WITH YOUR
TEAMMATES**

**MOTIVATE
THROUGH
SUCCESS**



**MOVE YOUR
BODY TO PASS,
DRIBBLE &
SHOOT**



**SEE WHAT
HAPPENS ON
THE PITCH**



**OPTIMISE
YOUR SKILLS
THROUGH
PRACTICE**



BRAIN TEASERS

THE PREDICTIVE BRAIN

To make a perfect pass, your brain needs to make predictions - where will the ball travel? Where will your teammate be in a few moments? To figure that out involves taking in lots of visual information and doing some complex maths. Thankfully, the prefrontal cortex, at the front of your brain, does all this without you even being aware of it.



SPOT THE BALL

CAN YOU GUESS WHERE THE BALL IS IN THESE PICS?



To do this, your brain uses visual information about body shape and where the eyes are pointing to make a guess. We use similar information when we're playing.

THE EMOTIONAL BRAIN

Whether you're playing or spectating, football is an emotional rollercoaster. The amygdala, buried deep within the brain, helps to regulate our emotional responses.

Here are pics of emotional footballing moments. Can you guess what caused each of these emotional responses?



WORD SEARCH

Find the brain/football words in the grid. Can you tell which words are brain-y and which are football-y?

AMYGDALA
CORTEX
PENALTY
BRAIN
DEFENDER

POACHER
CORNER
EMOTIONS
PREFRONTAL



C	Y	U	S	N	Q	C	A	L	D	U	E	U	K	F
A	S	T	Y	S	O	G	S	A	E	T	S	F	L	H
A	L	W	L	R	Y	N	U	T	G	E	Y	H	X	Z
Q	Z	A	N	A	O	H	D	N	R	F	L	V	G	U
E	C	E	D	I	N	M	V	O	R	F	E	T	O	B
B	R	K	T	G	K	E	O	R	O	O	U	O	Y	E
G	I	O	V	X	Y	I	P	F	B	R	A	I	N	P
D	M	R	H	Z	N	M	O	E	U	Z	I	X	L	K
E	E	D	T	U	G	P	A	R	N	Z	M	V	J	T
L	Y	F	K	A	T	O	H	P	I	W	Z	R	J	T
J	D	P	E	L	U	A	L	B	B	Q	R	M	B	S
T	J	D	V	N	J	C	F	Z	Z	H	Z	H	O	B
T	V	L	X	W	D	H	M	L	Q	F	P	W	X	W
M	W	H	P	T	C	E	C	X	M	I	U	W	X	S
S	P	E	K	Q	W	R	R	X	E	T	R	O	C	I

Answers: A: England's Rachel Davis and Millie Bright celebrate after their Arnold Clark Cup tournament victory following their win v Germany at Molineux Stadium, Wolverhampton, in Feb 2022. (Daniela Forrelli/SPF)
B: Lyon's head coach Sonia Bompastor is angry on the sidelines during their 1-1 Arsenal match against Paris FC at Groupama Stadium in Lyon, France. (Lyubomir Domozetski/SPF)
C: Spain's Lucia Garcia looks dejected after missing a clear chance during the Arnold Clark Cup match v England at Carrow Road, Norwich, in Feb 2022. (Daniela Forrelli/SPF)
1. D4 & 2. B3
SPOT THE BALL:

THE LEARNING BRAIN

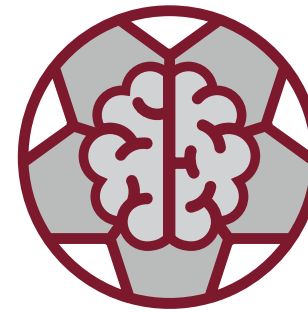
Every time you practice a skill, that training changes your brain. You strengthen brain connections and lay down pathways in the brain that make you a better footballer.

Try practising keepy-ups every day for a month (but don't worry about having the odd day off). Keep track of how many you can do in our handy planner.



Football on the Brain is a four-year public engagement project involving researchers and football communities understanding more about how our brains are involved in football. Follow along on social media: @FootballOnBrain #FootballOnTheBrain

DAY 1	DAY 2	DAY 3
DAY 4	DAY 5	DAY 6
DAY 7	DAY 8	DAY 9
DAY 10	DAY 11	DAY 12
DAY 13	DAY 14	DAY 15
DAY 16	DAY 17	DAY 18
DAY 19	DAY 20	DAY 21
DAY 22	DAY 23	DAY 24
DAY 25	DAY 26	



FOOTBALL ON THE BRAIN

DID YOU KNOW YOUR BRAIN HAS ITS OWN INTERNAL CLOCK CALLED THE 'CIRCADIAN RHYTHM'?

I HELP CONTROL YOUR 24-HOUR SLEEP CYCLE.

THIS HELPS YOU WAKE AND FALL ASLEEP AT THE RIGHT TIME OF DAY.

I IMPACT THE TIMING OF YOUR BODILY PROCESSES, SO I AFFECT YOUR FOOTBALL PERFORMANCE!

I'M MAINLY REGULATED BY THE DAILY CYCLE OF SUNLIGHT AND DARKNESS.

WHEN IT'S MORNING IN THE UK, IT'S NIGHT TIME IN AUSTRALIA AND NEW ZEALAND. HOW DO INTERNATIONAL COMPETITIONS AFFECT PLAYERS AND FANS?



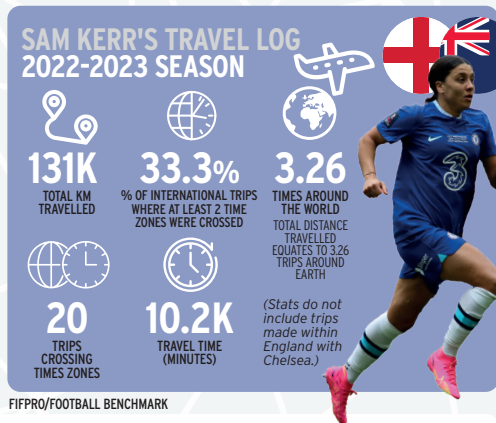
TRAVEL AND JET LAG

When we travel to a different time zone, our natural 24-hour circadian rhythm no longer matches up with the time of day. The effect this has on your brain and body is called 'jet lag'.

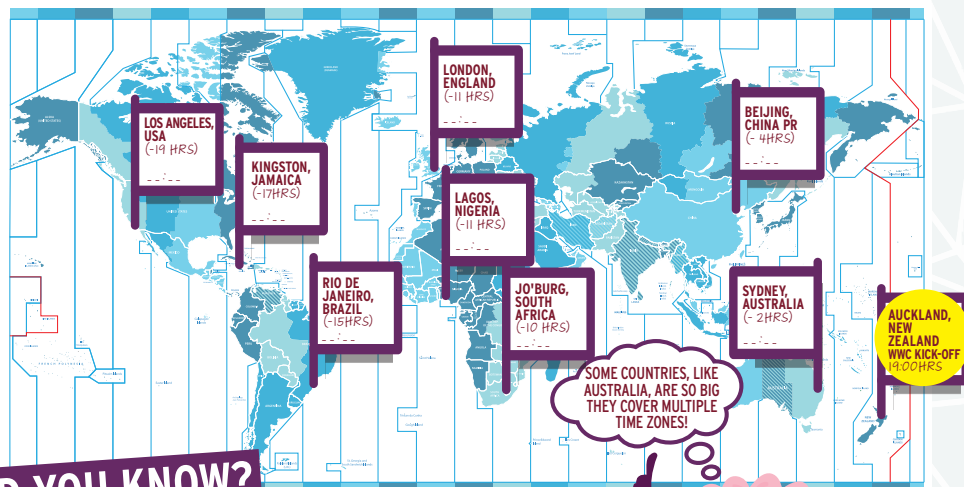
Some players, such as Australia's Sam Kerr, are used to jet lag because they frequently travel between their national country and club country.



Chelsea fans even made a chant about it - scan this QR code to listen!



IF AN INTERNATIONAL TOURNAMENT KICKS OFF AT 7PM LOCAL TIME IN NEW ZEALAND, WHAT TIME WILL THAT BE FOR FANS AROUND THE WORLD? WORK IT OUT AND WRITE IT IN THE FLAG. (HINT: THE INFORMATION IN BRACKETS TELLS YOU THE TIME DIFFERENCE).



DID YOU KNOW?

It is easier for your circadian clock to adjust if you travel in a westward direction, because you gain extra hours of daylight. Losing daylight by travelling eastwards is much harder to overcome.

JET LAG AND FOOTBALL PERFORMANCE

Footballers will experience jet lag after travelling to the World Cup, and unless they are afforded sufficient time to adjust, their performance will be suboptimal. Can you match the symptoms of jet lag to their impact on football performance?

1. FEELING EXHAUSTION

2. HIGH STRESS LEVELS

3. EMOTIONALLY REACTIVE

4. POOR DECISION MAKING

5. IMPAIRED MEMORY RECALL

A. FORGETTING THE COACH'S GAME PLAN

B. BAD PASSES AND LOST OPPORTUNITIES!

C. REDUCED GAME STAMINA

D. QUICKLY LOSE YOUR TEMPER... YELLOW CARD!

E. CAN'T COPE WITH PRESSURE, STRUGGLING TO SLEEP

DID YOU KNOW?

You don't just get jet lag from travelling across time zones! Having different sleep patterns between the week and the weekend might give you 'social jet lag'!

WHAT... LIKE STAYING UP ALL NIGHT TO WATCH FOOTBALL MATCHES?



THE DOS AND DON'TS OF TACKLING JET LAG



DOS



DO EXPOSE YOURSELF TO MORNING LIGHT IF YOU TRAVEL EAST, AND EVENING LIGHT IF YOU TRAVEL WEST



DO EAT HEALTHY MEALS AT THE RIGHT TIME OF DAY FOR YOUR NEW TIME ZONE



DO ALLOW TIME TO ACCLIMATISE AT YOUR DESTINATION - 1 DAY FOR EVERY TIME ZONE YOU CROSS IS BEST



DON'TS



DON'T USE YOUR PHONE AT NIGHT. IT COULD MAKE IT HARDER TO FALL ASLEEP



DON'T OVERLOAD ON CAFFEINE. IT MIGHT MAKE JET LAG WORSE



DON'T NAP FOR LONGER THAN 20 MINS DURING THE DAY

GET READY!

You need to be in New Zealand on 20th July for a big competition!

Fill in your boarding pass. Research says allow 1 day for every time zone you cross to acclimatise*.

*Shorter periods will affect players more than fans.

FOTB AIRLINES
PASSENGER TICKET AND BAGGAGE CHECK

BOARDING PASS
FIRST CLASS

FOTB AIRLINES
FIRST CLASS

Name of Passenger:

From:

Flight: **SK80** Departure Date: Time: **11.40** To: **AUCKLAND/AKL**

Gate: **03** Boarding: **11:00** Seat **1A** Terminal: **1**

Passenger:

From:

Departure Date:

To: **AUCKLAND/AKL**

Flight: **SK80** Time: **11.40**

Gate: **03** Boarding: **11:00** Seat **1A**

FILL IN THE TICKET WITH YOUR ESTIMATED DEPARTURE DATE

20623-20823

WHAT MAKES YOU TICK?

Your circadian rhythm is a 24-hour body clock, orchestrated by the brain. It controls all your bodily processes!

Use the diagram to learn more about the effects of the circadian rhythm, and what that means for your football performance across the day.



SCAN THE QR CODE AND WATCH THE VIDEO TO FIND OUT MORE.



Melatonin is a hormone that is released to promote sleep, so is high in the evening and low in the morning.

CHEMICAL CHANGES:
ADENOSINE LEVELS NOW HIGH;
MELATONIN RELEASE STARTS TO RISE

18:00

HIGHEST BODY TEMPERATURE

GREATEST CARDIOVASCULAR EFFICIENCY & MUSCLE STRENGTH

BEST COORDINATION

FOOTBALL PERFORMANCE IS OPTIMAL LATER IN THE DAY



MIDNIGHT



SLEEP IS IMPORTANT FOR RECOVERY

LOWEST BODY TEMPERATURE

06:00

CHEMICAL CHANGES:
MELATONIN RELEASE SLOWS AND ADENOSINE LEVELS ARE LOW



NOON

HIGHEST ALERTNESS & THINKING SKILLS

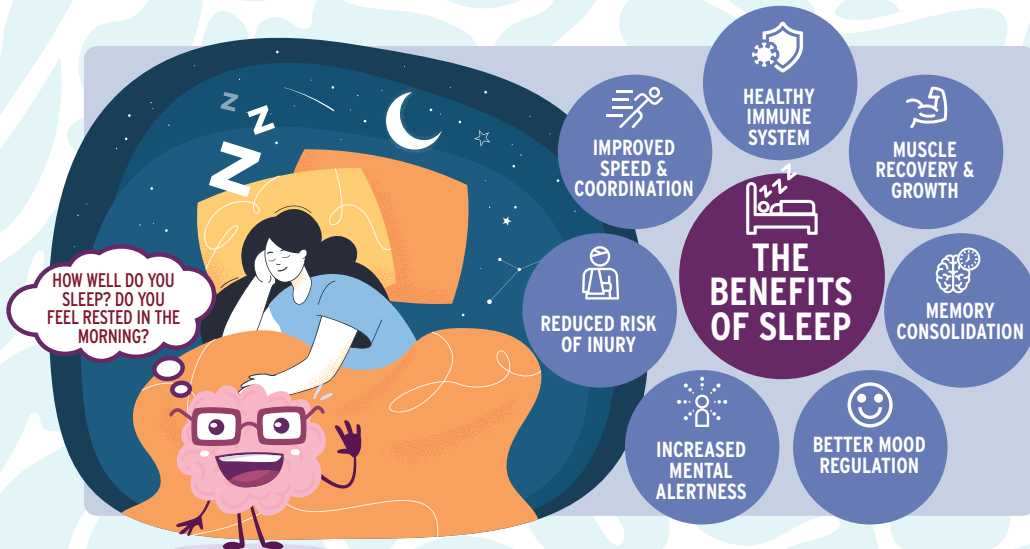


THIS IS A TYPICAL EXAMPLE FOR SOMEONE WHO WAKES UP AROUND 7AM AND GOES TO BED AROUND 10PM



WHY DOES SLEEP MATTER?

You might not be aware of it, but lots of things are happening in your body when you sleep. Without sleep, the brain cannot function properly!



WHAT ABOUT CAFFEINE?

CAFFEINE ADVICE:
Monitor your intake by checking your food and drink. Avoid caffeine within 6 hours before bed

PROS

- QUICKER REACTION TIMES
- LESS AWARE OF FATIGUE
- INCREASED ENDURANCE

CONS

- INCREASED BLOOD PRESSURE
- FEELINGS OF ANXIETY
- DIFFICULTY SLEEPING

Caffeine is a natural stimulant found in some drinks, food and medicines. It can make you feel more awake and alert by blocking adenosine, the tiredness molecule that promotes sleep and relaxation.

Some footballers have energy drinks before or during a match to boost their performance. But it can also have negative effects...

ITEM	CAFFEINE mg
Cup of tea	50
Mug of filter coffee	140
An espresso	80
Can of Coke	30
Can of Red Bull	80
Bottle of Lucozade	46
Bar of dark chocolate	50
Mars bar	10

Use the table to help you calculate your average daily intake.

Most days I consume: mg

SUGGESTED DAILY CAFFEINE LIMITS:
ADULTS 400mg
PREGNANT WOMEN 200mg
ADOLESCENTS 100mg

WARNING!!!
You can build up a caffeine "tolerance", meaning you will feel the effects of the same amount of caffeine less over time. It is also mildly addictive, so be careful to regulate the amount you have...



MATCH DAY TOMORROW GOTTA GET SOME ZZZZZZZZZS!

Spot the differences in Grace's bedroom and find out how you can improve your sleep environment.

REMEMBER! KEEPING A CLEAN AND HEALTHY BEDROOM ENVIRONMENT IS ONE IMPORTANT WAY YOU CAN IMPROVE YOUR QUALITY OF SLEEP!

EARLY BIRD CATCHES THE... GAME?

YOU MEAN, THERE'S A REASON I HATE EARLY MORNING FOOTBALL PRACTICE?

Everyone has a circadian rhythm regulated by light, but we all express our rhythm differently and show individual preferences for waking up and falling asleep at different times.

This individual preference is called your "chronotype", and it might impact the time of day you feel most active!

EARLY BIRDS

NIGHT OWLS

TURN OVER TO TAKE A QUIZ AND FIND OUT WHICH FOOTBALLER YOU SHARE A CHRONOTYPE WITH!

WHO'S ON YOUR CHRONO-TEAM? TAKE THE QUIZ BELOW TO FIND OUT!

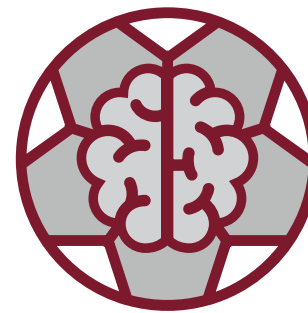


Compiled by Lauren Rudd, Louise Aukland, and the FOTB team.

Football on the Brain is a four-year public engagement project involving researchers and football communities understanding more about how our brains are involved in football. Follow along on social media: @FootballOnBrain #FootballOnTheBrain



FOOTBALL
ON THE BRAIN



FOOTBALL
ON THE BRAIN

DID YOU KNOW YOUR BRAIN IS IMPORTANT FOR INJURY PREVENTION AND RECOVERY?



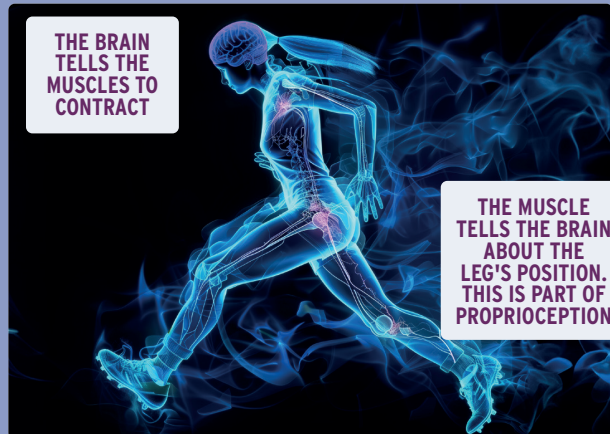
WHAT'S THE BRAIN GOT TO DO WITH INJURY?

We all know how good exercise is for health, but every sport carries a risk of injury. Impacts can be short or long term, affecting both player and team performance. The most common injuries in football involve soft tissues (muscles, tendons and ligaments) in the leg. Other parts of the body can also be injured, including the brain itself!

THE NEUROMUSCULAR SYSTEM INVOLVES THE BRAIN, NERVES AND MUSCLES WORKING TOGETHER TO CONTROL THE BODY'S MOVEMENT.



THE BRAIN TELLS THE MUSCLES TO CONTRACT



THE MUSCLE TELLS THE BRAIN ABOUT THE LEG'S POSITION. THIS IS PART OF PROPRIOCEPTION

The brain plays an important role in both preventing injury from happening and speeding up recovery. If correct movements are repeated, the relevant neural pathways are strengthened. However, if movements are repeated with poor form, it increases the risk of injury.

WHY WARMING UP MATTERS!

A good warm-up gets the muscles and brain ready for football. It breaks down football movements to activate neural pathways, preparing them for action. This reduces injury risk as the body learns good technique. Research has shown that completing a PEP warm-up as part of your training and pre-match routine reduces serious knee injuries by up to 50%.

Avoiding injury means you can play, train and learn more... and become a better player!

WHY NOT TELL YOUR COACH ABOUT THE FREE TRAINING PROVIDED BY POWER UP TO PLAY?



PEP STANDS FOR PREVENT INJURY AND ENHANCE PERFORMANCE



Power Up to Play was set up by medical professionals to help prevent serious knee injuries in grassroots sport. Watch their warm-up video by scanning the QR code, then have a go at the quiz opposite.



YOUR 10 MINUTE PEP WARM-UP

STEP 1: GET WARM (1.5 MINS)

Raise heart rate and body temperature to get oxygen to relevant muscles.



Example exercises:

- Jogging
- Side stepping
- Backward jogging

DID YOU KNOW? DURING THE WARM-UP YOU ARE ALSO PREPARING THE BRAIN FOR ACTIVITY BY WARMING-UP THE LINKS BETWEEN THE BRAIN AND OTHER AREAS OF THE BODY.



STEP 2: STRENGTHEN (3 MINS)

Strengthening muscles in key areas of the body reduces injury, promotes muscular endurance and improves performance.



Example exercises:

- Walking lunges
- Hamstring curls
- Single leg toe-raises

STEPS 3 & 4: GET MOVING

Train the neural pathways to perform relevant sport-specific movement patterns for explosive power and agility.



STEP 3: PLYOMETRICS (2.5 MINS)

- Example exercises:**
- Vertical jumps
 - Lateral hops

STEP 4: AGILITY (3 MINS)

Example exercises:

- Bounding runs
- Diagonal runs

WHAT ABOUT STATIC STRETCHING?

New research suggests that static stretching during a warm-up may have a negative influence on muscle performance. However, there is good evidence that static stretching after activity can improve range of motion in the limbs. This reduces injury and improves performance.

TIPS FOR GOOD FORM:

Keep hips, knees and ankles aligned.

Keep your upper body straight.

Do not let your knees buckle inwards.

QUIZ

Test your understanding of correct form. Put a tick or cross in the box below each picture to say whether or not Football on the Brain's researcher, Morgan Mitchell, is demonstrating correct or incorrect form for reducing the likelihood of injury!



RUNNING

☐ ☐


HIP-ROTATIONS

☐ ☐


WALKING LUNGES

☐ ☐


VERTICAL JUMPS

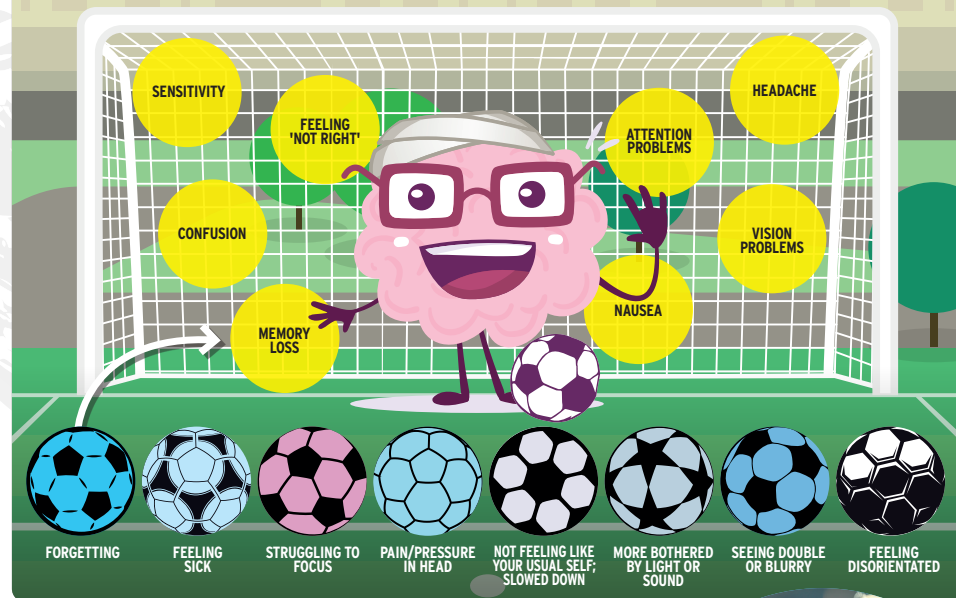
☐ ☐

HEAD INJURIES IN SPORT

Sport is one of the most common causes of head injuries in young people. Being familiar with the signs and symptoms of concussion can help keep both you and your team-mates safe after a head injury.

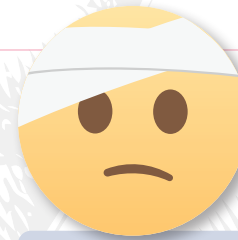


TARGET PRACTICE - MATCH THE DESCRIPTIONS TO THE CONCUSSION SYMPTOMS



WHAT A CONCUSSION CAN LOOK LIKE IN ANOTHER PLAYER

- Moving clumsily
- Answering questions slowly
- Dazed, blank or vacant look
- Forgetting instructions
- Being confused or disorientated
- Losing consciousness, even if just briefly



TEST YOUR KNOWLEDGE OF HEAD INJURIES

Your risk of getting any injury is up to 2.5 times greater after a concussion.	TRUE <input type="checkbox"/>	FALSE <input type="checkbox"/>
The risk of getting a concussion is equal between men and women.	TRUE <input type="checkbox"/>	FALSE <input type="checkbox"/>
Symptoms of head injuries always appear straight away.	TRUE <input type="checkbox"/>	FALSE <input type="checkbox"/>
The FA's guidelines on heading the ball are the same for children of all ages.	TRUE <input type="checkbox"/>	FALSE <input type="checkbox"/>
After a head injury, the FA recommends waiting a minimum of 14 days before resuming full contact practice.	TRUE <input type="checkbox"/>	FALSE <input type="checkbox"/>

ANSWERS ON PAGE 26

THE STATE OF PLAY IN CONCUSSION RESEARCH



Most research into concussion is based on studies in male professional players. This leaves young and female teams underrepresented. More research is needed in these groups to better understand the impact of head injuries.

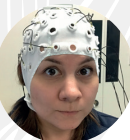


FIND OUT MORE ABOUT THE LATEST RESEARCH OF OXFORD UNIVERSITY'S PODIUM INSTITUTE HERE:

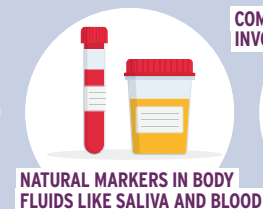
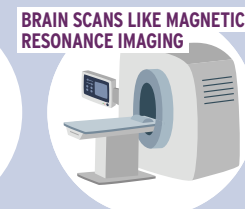
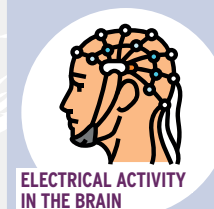


"At the Podium Institute, we reviewed the rates of concussion in the most popular sports across the UK. About 3% of professional footballers sustained a concussion in the sporting year."

DR LARA PRISCO,
NEUROINTENSIVE CARE
DOCTOR AND RESEARCHER.



ONGOING RESEARCH ON CONCUSSION AND INJURY IN SPORT:



CONCUSSION RECOVERY TOOLKIT

Here are a few things you can do to boost your recovery after a concussion:



1. Manage your activity levels

Researchers used to say rest improves recovery after a concussion. It has now been shown that light physical activity is a safe way to help recovery. Find the latest guidance from England Football here



2. Limit your screen time in the first 48 hours

Research has shown that those who limit screen time after a concussion recover faster than those who continued to use screens.



FOR MORE INFORMATION ON SLEEP, SEE OUR PULL-OUT FROM 2023



3. Maximise sleep

Poor sleep can slow down recovery after a head injury, so make sure you get enough sleep.

SHOULD WE CHANGE THE GAME TO PROTECT OUR BRAINS?

Playing football can exert forces on the brain, from rapid changes in acceleration or direct impact with the ball, other players, the ground or goal post. What do you think of these changes to training, tactics and rules to help look after our brains?

Heading impact:

- Play the ball shorter rather than high in the air.
- Train to receive the ball on the chest.
- Improve neck muscle strength.
- Correct ball pressure (not too firm!).

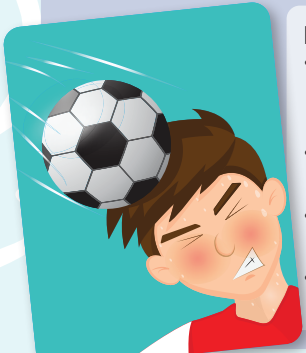
Reduce impact with players

- Minimise contact mid-air. Punish fouls.
- Punish high kicks and use of arms/elbows.
- Reduce full contact training.

Fall safely

- Reduce tackling from behind.

HEADING WILL BE PHASED OUT FROM THE START OF NEXT SEASON IN U7-U11 YOUTH GRASSROOTS FOOTBALL



MANAGING INJURY SPEAKING TO THE EXPERTS I'M INJURED - WHAT DO I DO?



LUKE TAYLOR
S&C COACH
AND HEAD
OF ATHLETIC
PERFORMANCE



"Use injury as an opportunity"

Maximise the time you've got by addressing other weaknesses and imbalances that you have, to make a strong return to the pitch.

"Target your cardiovascular fitness with cross-training"

Make use of machines such as a stationary bike, SkiErg machine, or cross-trainer. Out with a lower-limb injury? - Try seated boxing, one-legged rowing, or seated battle ropes.



AMY CRANSTON
PHYSIOTHERAPIST
& HEAD OF
MEDICAL
SERVICES

HOW CAN I HELP MY RECOVERY IN GENERAL



DR JAMES BALDOCK
CLUB DOCTOR SPECIALISED
IN EXERCISE & SPORT
MEDICINE

"Get the basics right"

- ✓ Hydrate to replace the fluids lost during exercise through sweating and increased breathing.
- ✓ Fuel with a good dose of both carbohydrates and protein to replenish your stores and help your body recover.
- ✓ Focus on getting enough vitamin D for immune function, injury prevention and performance.

INJURY AND MENTAL HEALTH

"As well as being painful, injuries can sometimes make us feel sad, left out and a bit less confident than before.

That's normal - finding other ways to be active, lending a hand at training, and seeing your team-mates after school can all be helpful until you're back on the pitch."



DR CATHERINE WHEATLEY
SPORTS AND HEALTH
PSYCHOLOGIST
PODIUM ANALYTICS

Interested in tracking injuries in your players?

"SportSmart is a schools and clubs programme from Podium Analytics that puts player welfare at the heart of decision making when managing injury. It gives a centralised view of all injuries across clubs and schools, helping you look after your players and keeping them playing the sport they love."



Podium
ANALYTICS

REMEMBER TO CHECK IN ON YOUR INJURED TEAMMATES.



ACTIVITIES TO TRY WHEN RECOVERING FROM INJURY

ADDRESS OTHER MUSCLE WEAKNESSES / IMBALANCES

PRACTISE DRILLS WITH YOUR OTHER LIMBS

SHADOW AND ASSIST YOUR COACH AT TRAINING TO LEARN FROM THEM

CROSS-TRAIN (SEE AMY'S SUGGESTIONS)

PRACTISE MATCH ANALYSIS TO DEVELOP TACTICAL INSIGHT

HELP OUT WITH THE TEAM'S SOCIAL MEDIA

TRUE OR FALSE ANSWERS (PAGE 23)

1. **True** - Whilst the cause is uncertain, a concussion significantly increases risk of being injured in the future.
2. **False** - Female athletes are more likely to get a concussion than men.
3. **False** - Symptoms can sometimes take 48+ hours to appear.
4. **False** - Different ages have different guidelines.
5. **True** - See the QR code on p6 'Manage your activity levels' for more guidance about returning safely to the pitch.

Do you have any other ideas? Write them in the box!

ALTERNATIVELY, FEEL FREE TO SIT BACK, ENJOY THE EXTRA FREE TIME AND READ SHEKICKS MAGAZINE!

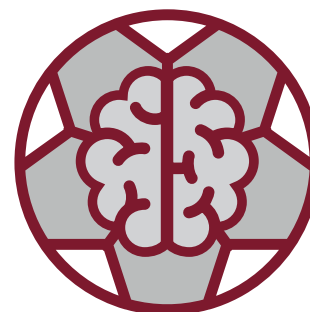
Compiled by Holly Jenkins, Izabelle Lovgren, Louise Aukland and the FOTB team, with the support of Jen O'Neill.

Football on the Brain is a four-year public engagement project involving researchers and football communities understanding more about how our brains are involved in football. Follow along on social media:

@FootballOnBrain #FootballOnTheBrain



FOOTBALL
ON THE BRAIN



FOOTBALL ON THE BRAIN

DID YOU KNOW YOUR BRAIN HELPS WHEN PERFORMING UNDER PRESSURE?

I'M YOUR STRESS MANAGER.

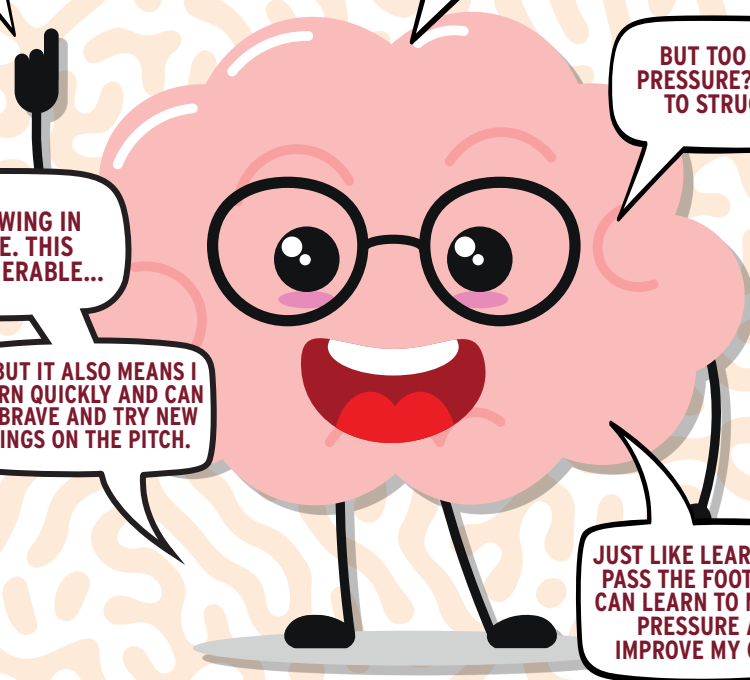
I HELP YOUR BODY AND MIND PERFORM UNDER PRESSURE ON THE FOOTBALL PITCH.

BUT TOO MUCH PRESSURE? I START TO STRUGGLE.

I'M STILL GROWING IN ADOLESCENCE. THIS MAKES ME VULNERABLE...

...BUT IT ALSO MEANS I LEARN QUICKLY AND CAN BE BRAVE AND TRY NEW THINGS ON THE PITCH.

JUST LIKE LEARNING TO PASS THE FOOTBALL, I CAN LEARN TO MANAGE PRESSURE AND IMPROVE MY GAME.



THRIVING UNDER PRESSURE AND DELIVERING WHEN IT MATTERS MOST!

Any player will be able to tell you that there is pressure involved in playing football. Whether it is the night before your first major tournament, penalties in a knockout match or final, or heading to an international competition as defending champions... different scenarios can have the same impact on player or team performance.

It isn't just the self-imposed pressure to perform at your best on the day. There can be additional external pressures from families, the coach, fans, the media, or sponsors. Or maybe just things happening in life outside the game that reduce the player's ability to cope on the pitch.

Managing high pressure situations is all part of playing football. Having a better understanding of the causes and effects of pressure can help players or coaches put in place (and practise) strategies that optimise performance when the pressure is on.



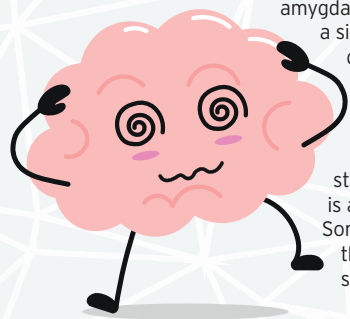
P SOARES/SHERICKS/SPP



B EAST/SPP

WHAT HAS THE BRAIN GOT TO DO WITH PRESSURE?

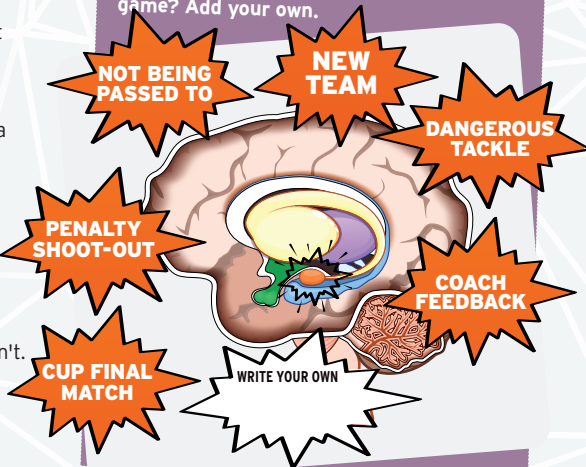
Football isn't simply about skill - it's about handling all aspects of the game. Pressure is the feeling of excitement, anxiety or stress experienced by a player when a situation is challenging or difficult, such as when the result is crucial. A small part of the brain, called the amygdala, assesses a situation and decides if it is a 'threat' or not. If it decides it is, the brain's stress response is activated. Sometimes this is helpful, sometimes it isn't.



WHAT 'KICKS' YOUR AMYGDALA OFF?

Everybody is different. The same situation might be 'exciting' to one player and cause a mental block to another.

Do any of these things affect you in the game? Add your own.



WHAT DO PLAYERS THINK ABOUT PRESSURE?

We asked the University of Oxford Women's Blues Team for their thoughts about performing under pressure. This interview was just days after the 140th Blues Varsity Match between Oxford and Cambridge, one of the oldest regular fixtures in global football. The match was played at the Cledara Abbey Stadium in front of thousands of spectators - a high stakes match for the Blues.

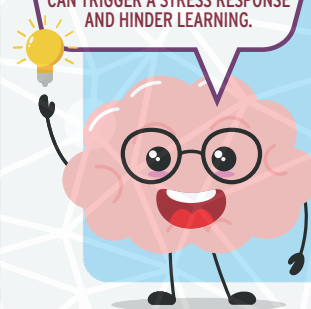


DOES THE TEAM'S RELATIONSHIP WITH THE COACH HELP?

"I think it makes a massive difference because if you have a coach who is always negative, you just stop backing yourself." **Anastasia Storey**

Players say they perform worse under constant negative feedback due to reduced confidence. By contrast, a coach that gives balanced or positive feedback helps players feel empowered and play better.

POSITIVE FEEDBACK ACTIVATES THE BRAIN'S REWARD SYSTEM AND PROMOTES LEARNING. NEGATIVE FEEDBACK, IF POORLY DELIVERED, CAN TRIGGER A STRESS RESPONSE AND HINDER LEARNING.



HOW DO INTERNAL AND EXTERNAL PRESSURES COMPARE? CAN TEAM COHESION HELP MANAGE PRESSURE?

"I think internal pressure is actually a bigger problem than external pressure... if I played in front of a crowd of 10,000, the amount of pressure I'm putting on myself would still be bigger than the crowd's..."

Kate Parsons
Tottenham Hotspur U15-U21;
Republic of Ireland U19

Players agreed that team cohesion improves their ability to deal with pressure and makes the game more enjoyable. Players praised the positive and supportive environment of the Oxford Blues in comparison to other 'cliquey' teams.



GOING INTO VARSITY, THE PINNACLE OF THE SEASON, WHAT STRATEGIES HELPED YOU DEAL WITH THE PRESSURE?

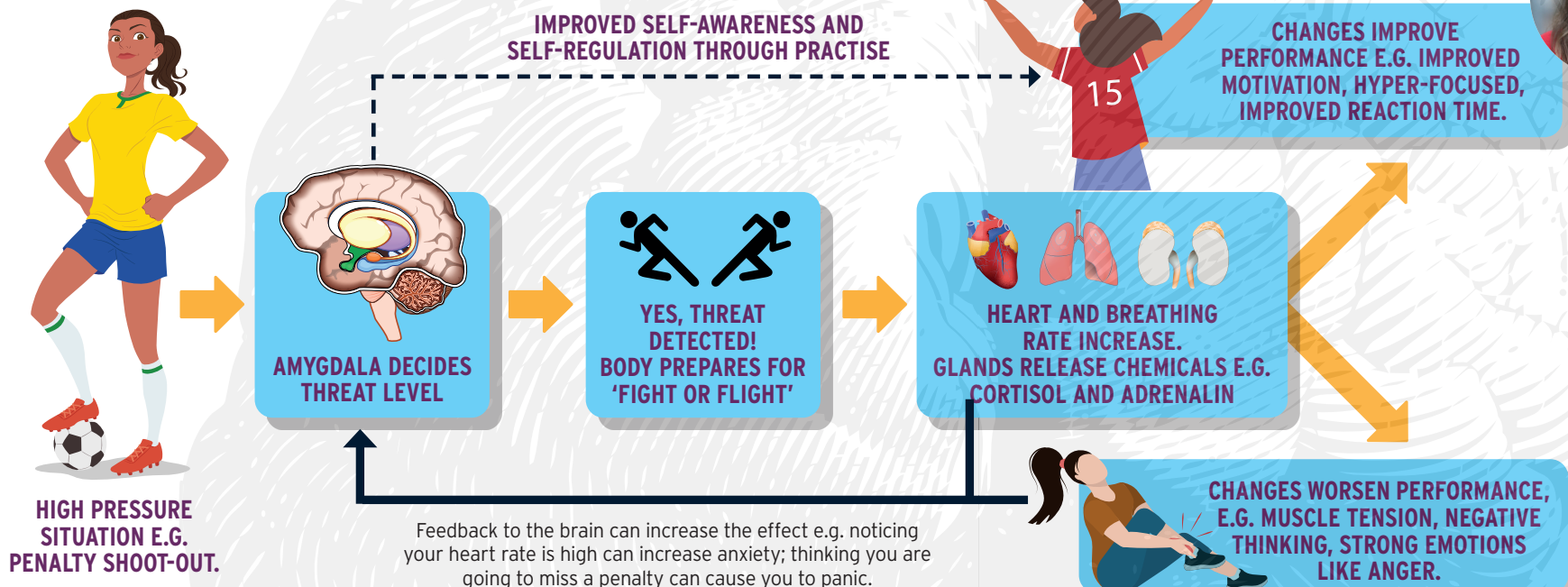
"The Varsity match is rooted in history, so it is a unique pressure. I try and think of it more positively - it's a privilege to play in - and that helps."

Jessica Young
Challenge SC and Vassar
College Women's Soccer

The Blues players managed the pressure by blocking out external distractions and spending time together as a team. This included several practices, strategy meetings and a pasta dinner in the week leading up to Varsity.



WHAT'S HAPPENING IN THE BRAIN, BODY AND MIND WHEN A PLAYER IS FEELING THE PRESSURE?



Dr Laurel Morris is a neuroscience researcher at the University of Oxford. She researches changes in the brain that take place when people feel stressed, anxious or depressed.

"Feeling stressed can result from changes in the body, like increased heart or breathing rate.

Changing your thinking around this biological feedback ("biofeedback") can be a helpful way of reducing the negative impact of pressure."

"Some of our research looks at how brain stimulation can shift negative thinking into a more positive mindset and support longer term health and wellbeing".

Jacinta O'Shea, Associate Professor of Cognitive Neuroscience at the University of Oxford.



Jacinta is part of the University of Oxford's BReal project. Researchers made 3 videos on the brain science behind resilience.

Watch them here:



WHAT HAPPENS TO YOU UNDER PRESSURE?

The changes caused by stress can vary depending on the individual and the circumstances. Which of these have you experienced before or during a big match?

- | | | |
|--|---|---|
| <input type="checkbox"/> Highly motivated | <input type="checkbox"/> Thoughts going round and round | <input type="checkbox"/> Think about how my team supports me and each other |
| <input type="checkbox"/> Thumping heart | <input type="checkbox"/> Getting emotional | <input type="checkbox"/> ...(add your own) |
| <input type="checkbox"/> Fast breathing | <input type="checkbox"/> Feeling 'pumped' after pre-game pep talk | |
| <input type="checkbox"/> Butterflies in your tummy | <input type="checkbox"/> Able to make quick decisions | |
| <input type="checkbox"/> Negative thoughts | <input type="checkbox"/> Getting angry or frustrated | |
| <input type="checkbox"/> Poor concentration | <input type="checkbox"/> Feeling brave / confident to take a chance | |
| <input type="checkbox"/> Hyperfocused on the game | | |
| <input type="checkbox"/> Too excited to sleep | | |

"Performing under pressure is key for elite football players. Our research found that elite players had lower levels of negative thinking. This suggests they are better at controlling negative emotions, and are more consistent in their preparation and training - factors that likely help them manage pressure more effectively."

DR LEONARDO BONETTI, SENIOR RESEARCH FELLOW, UNIVERSITY OF OXFORD



DOES AGE MATTER, AND IF SO, WHY?

Adolescence (between 10-24 years) is an important period in football. At this age players may peak, sign professional contracts, or even drop out of sport.

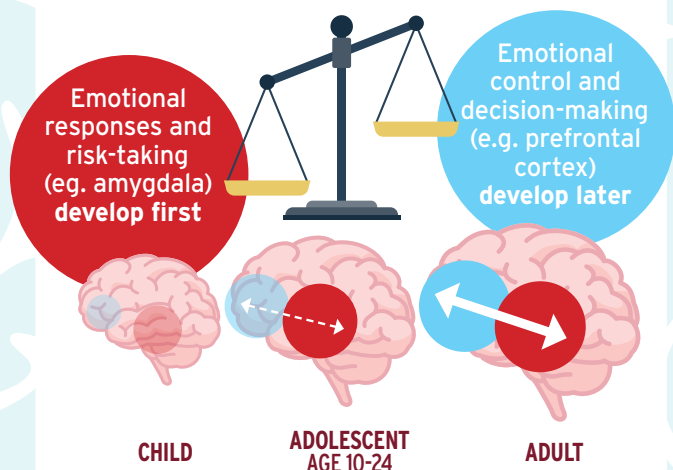
The brain is developing rapidly, particularly in areas controlling emotions, so coping with stress can be challenging. However, a changing brain learns quickly, so it is an important time to practise strategies to manage stress and pressure (see page 8).

ADOLESCENTS MAY FIND IT MORE CHALLENGING TO REGULATE THEIR EMOTIONAL RESPONSES.



WHAT IS HAPPENING IN THE BRAIN?

The regions involved in emotional responses and emotional control develop at different rates. Communication between the different brain networks also improves with age (shown by the white arrows on the diagram below).



J WHITEHEAD/SPP

At the 2023 WWC, England's Lauren James received a red card for stamping on Nigeria's Michelle Alozie. James was only 21 at the time. England boss Sarina Wiegman said: "She is inexperienced on this stage and in a split-second lost her emotions." James apologised and said she would learn from the experience. Do you think her age could partly explain her hot-headed reaction?

MATCHING GAME

Can you match these changes during adolescence to their potential impact on football performance?

STRONG EMOTIONAL RESPONSES	DEVELOPING NEW SKILLS
ADAPTABILITY	RESPONDING TO COACH FEEDBACK
RISK-TAKING	ARGUING WITH THE REFEREE
SOCIAL RELATIONSHIPS	TEAM BONDING
LEARNING	PERFORMANCE ANXIETY
HEIGHTENED STRESS	TAKING CHANCES ON THE PITCH

ANSWERS ON PAGE 33

THE SOCIAL BRAIN UNDER PRESSURE

The brain is primed for social interactions - helping us to communicate, cooperate and compete with others. Emotions play a key role in these interactions - particularly under pressure. You may feel pride if your team wins, or frustration if your team loses. These emotions can drive your behaviour with others - such as celebrating together or clashing with rival spectators.

ON THE PITCH - SOCIAL BONDING

Social interactions are crucial in a football match. How players behave towards their teammates under pressure can impact cohesion and motivation.

In the following scenarios, highlight the appropriate social response:

(1) A player is upset after missing a goal

- ☐ Show empathy and encouragement
- ☐ Ignore them
- ☐ Criticise them for missing the goal

(2) Your team is losing with 10 minutes left

- ☐ Focus on your individual performance
- ☐ Encourage more teamwork
- ☐ Give up and admit defeat

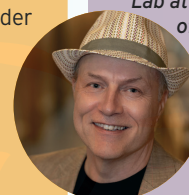
(3) Your team has a new player

- ☐ Exclude them from activities
- ☐ Challenge them to prove themselves on the pitch
- ☐ Involve them in play

BONDING UNDER PRESSURE

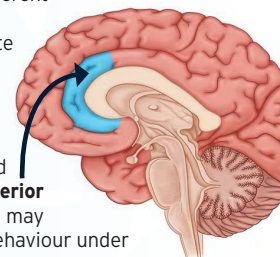
"Researchers from the Changing Lives Lab at Oxford's Centre for the Study of Social Cohesion have shown that suffering painful defeats in football increases fans' loyalty and commitment."

Professor Harvey Whitehouse



WHAT IS HAPPENING IN THE BRAIN?

Football fans show different brain activity! When watching their favourite team, there is increased activity in a brain region involved in emotions, motivation, and reward - called the **dorsal anterior cingulate cortex**. This may underlie their social behaviour under pressure.



OFF THE PITCH - SOCIAL IDENTITY

Football fans display many behaviours to express their identity and support their team. This strengthens their social connection to the team, and can promote feelings of belonging, passion, and pride. Can you spot 5 different ways these fans are supporting their team?



D PORCELLI/SPP



J WHITEHEAD/SPP



L ASMAN/SPP

Matching Game Answers: Strong emotional responses = arguing with the referee; social relationships = team bonding; heightened stress = performance anxiety; to coach feedback; risk-taking = taking chances on the pitch; social relationships = team bonding; heightened stress = performance anxiety.



WHAT'S IN YOUR PRESSURE MANAGEMENT KIT BAG?

We know that stress can affect player performance, both positively and negatively. To benefit from the changes in the brain and body you need to know when your brain has triggered a stress response and what to do about it. Have a look at some of our top tips below.

TIP 1: GET TO KNOW YOURSELF BETTER



Become more self-aware through regular check-ins. Notice how you are feeling and thinking in different situations. Or how your behaviour changes at different times of the day or in response to events.

TIP 2: HAVE STRATEGIES TO HELP YOU DURING GAME PLAY



Check in during breaks in the game (after a goal, when the ball is out of play, or during a substitution). If your stress and emotion levels are high, 'reset' yourself using techniques like:

- grounding (move your attention into your feet) - maybe pull your socks up
- take a few deep breaths
- reframe negative thoughts and use positive self talk
- focus on enjoying the game not on the outcome.

TIP 3: LOOK AFTER YOUR WELLBEING OFF THE PITCH



Make sure you are looking after your wellbeing off the pitch:

- sleep and eat well
- develop healthy relationships with those around you
- practise mindfulness

- write a journal
- develop a positive mindset
- talk to teammates
- focus on what you **can** control

WHAT STRATEGIES DO YOU USE TO MANAGE PRESSURE?

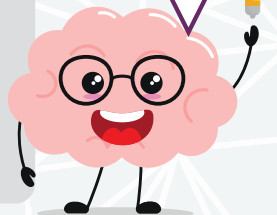
FOR PARENTS AND COACHES:



Your own behaviour is key to that of the players:

- create a safe environment where mistakes are seen as part of the learning process
- get to know and understand the players or young people ('person before player')
- give an appropriate level of challenge (this is how the brain learns best)
- Remember that non-verbal reactions (eye rolling/head shaking) will be noticed too!
- encourage open conversations

REMEMBER THAT THE MORE YOU PRACTISE THE BETTER YOU GET... AND THAT INCLUDES RECOGNISING AND RESPONDING TO HIGH PRESSURE SITUATIONS



Compiled by Megan Groombridge, Yiming Wei, Sonam Shulman, Anastasia Storey and Louise Aukland with the support of Jen O'Neill.

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@FootballOnBrain #FootballOnTheBrain



MEET THE FOOTBALL ON THE BRAIN TEAM:

The University of Oxford team involves neuroscientists, clinicians and methodologists from the Centre for Integrative Neuroimaging (OxCIN). We combine our expertise to understand how the brain works and to design diagnostic tools and treatments to improve brain health. Our Football on the Brain core team includes:



HEIDI JOHANSEN-BERG

Role: Neuroscience Professor
Interest areas: Brain plasticity - how the brain changes with learning, development, or recovery from damage.
Football: Girls' coach; plays walking football for Oxford United



HOLLY BRIDGE

Role: Neuroscience Professor
Interest areas: The visual system - designing rehabilitation interventions to improve vision after stroke or disease.
Football: Boys, girls and adult coach; plays walking football for Oxford United



MORGAN MITCHELL

Role: Neuroscience PhD Student
Interest areas: How the brain learns movement and how sleep aids the memory processes that underlie this type of movement learning.
Football: Girls' coach; Academy coach for Oxford United



LOUISE AUKLAND

Role: Education and Impact Lead
Interest areas: Translating brain research into fun and accessible content, activities or resources, and training others to do the same.
Football: Supports kids' teams; Oxford United fan



HANNA SMYTH

Role: Public Engagement Coordinator
Interest areas: Working with 300+ brain researchers to help them share their research with the public in interesting and effective ways.
Football: Vancouver Rise and Vancouver Whitecaps fan

MEET THE SHE KICKS TEAM:

First published as 'On the Ball' in 1996, She Kicks is the longest-running women's football magazine in the world. Available in both print and digital format it features exclusive interviews and news from the women's game within the UK and beyond.



NEIL SHAND

Role: Design & Layout
Interest areas: All things design and football
Football: Rangers and Scotland fan but currently not owning up to it



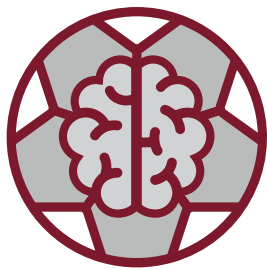
JEN O'NEILL

Role: Former Magazine Editor
Interest areas: Documenting and sharing the rich 'herstory' of the top levels of the domestic and international women's game
Football: Former player (and long-suffering supporter) of Sunderland AFC

OTHER FOOTBALL ON THE BRAIN PROJECT PARTNERS:

Oxford University Sport
Football Beyond Borders
Oxford City and Ignite Sport
Oxford United in the Community





FOOTBALL

ON THE BRAIN

PROJECT ACTIVITIES:

- Fun football roadshow activities for players, coaches and fans
- Coach and practitioner training
- Curriculum development for young players
- Ambassador programme for researchers
- Workshops for young people
- Collaborative workshops for researchers and practitioners
- Conference and networking events
- Future research collaborations
- Print media and blogs



**FIND OUT
MORE ABOUT
THE PROJECT
RESOURCES
HERE**



**ARE YOU INTERESTED
IN FOOTBALL? WHAT
QUESTIONS DO YOU
THINK NEUROSCIENCE
RESEARCH SHOULD BE
ASKING? LET US KNOW:**

