The Sporty Brain

It's hard to beat a brain that never gives up!

Go, Brain, Go!
On Your Marks...

This issue of the CNS Newsletter is dedicated to sports – as scientists, perhaps not something we’re particularly well-known for (thinking counts as exercise, right?). But this is a big year for sports, so it’s a theme that we at the editorial team have been looking forward to for a long time.

Every four years, we’re blessed with having not one but two massive sporting events take place within a period of a couple of months. This June, the UEFA European Championship, one of football’s most prestigious international tournaments begins in France, with Spain looking to defend the title and Germany looking for another major trophy. Just a few weeks later the world’s largest sporting event, the Summer Olympics, takes place in Rio de Janeiro, Brazil (and during “winter” for the very first time – see p. 8).

With all the sporting excitement to look forward to this year, we’re here to guide you. In this issue, you will find answers to such questions as: How can exercise be bad for you (p. 12)? Can/should I replace my gym membership with a gaming console (p. 6)? And what’s the deal with the Berliners clad in black tights, panting to the beat of music playing through their earphones while I reluctantly drag my overcaffeinated self to the lab at 6 in the morning (p. 10)?

For me (Ahmed), this issue is special because of another, less pleasant, reason. For seven issues now, I’ve had the honor of working with the smartest, most hard-working and supportive co-Editor-in-Chief one could ask for. Sadly, this is Apoorva’s last issue in that position, as she focuses on the remainder of her PhD. On behalf of the team, I wish her all the very best and truly hope that she will continue contributing to the newsletter. Taking her place from September onwards is none other than Constance Holman, an exceptional writer and enthusiastic member of the CNS editorial team.

Enjoy reading!

Ahmed Khalil and Apoorva Rajiv Madipakkam
Editors-in-Chief

Contest

We are always interested in including your contributions. You can submit anything you see fit on the topic of neuroscience. Send us your most exciting microscopic pictures, a creative photo, thoughts on neuroscience or self-written poems – whatever comes to mind! The best contribution will be published and rewarded with the book "Measuring the World" by Daniel Kehlmann. So, what are you waiting for? Start the engine of your mind and get going! Trust us, it’s worth participating! Send your contribution to cns-newsletter@charite.de to win. Deadline for submission for the next issue: July 20, 2016.

This issue's winner is Valerie Boujon who wrote a very interesting article on exergaming and a fantastic interview with an Olympic sailor (see pages 6 and 18). Congratulations Valerie and thank you very much for your contributions!
I was scared to death. My heart was pounding and my stomach was churning. I felt lightheaded and not only due to the altitude. There I was, at the edge of the mountain, ready to leap into a vast abyss with only a flimsy-looking paraglider attached to my back by a bunch of tangled strings (too thin, if you ask me), still lying on the ground like a casually thrown coat. “So this is what it means to live on the edge”, I thought. “Literally.” Hesitant, I gave myself several mental nudges towards the cliff. One final self-shove and in no time I was swooped in the air, heart in my throat, overwhelmed by this unique ecstasy of defying gravity. I was scared to death. And I loved it.

**Fight or Flight**

We usually sum up all these exciting sensations in one word – adrenaline, a hormone secreted in stressful situations by the adrenal gland. It is one of those biological substances critical to the survival of a species. Evolution has enabled us to react appropriately when our life is at stake. Adrenaline (along with some other hormones) physically prepares you for dangerous situations - it elevates your blood pressure and heart rate and mobilizes energy from your depots. In the classical example of predation it induces a state of readiness to either fight for your life or flee the scene. It's a life-saver. Other situations incite a similar phenomenon – such as falling in love or presenting in front of a big audience. Albeit not life-threatening, such instances bear important implications, hence the stressful interpretation by the body and the embarrassing trembling voice.

**Feeling Alive**

Extreme sports (base jumping, slacklining, canoeing, mountain biking, to name a few) are obviously a major source of adrenalin. So why consciously elicit adrenaline surges? Have we also learned to enjoy the reactions produced by this hormone? We hear that extreme sport enthusiasts are addicted to adrenaline, but I believe that what ‘adrenaline junkies’ aim for is much more than a micromolar hormonal pulse - it’s a complete new mental state. The free fall from a point where everything on Earth seems tiny or conquering the world’s highest peak or fastest river can incite an intense emotion that some people just can't get enough of. These occasions make you feel humble and grand at the same time and are a special state of being. The source of pleasure is individual and multifaceted – be it the beauty of discovering your own limits or limitlessness, the reassuring sense of control over your own life, or escaping the monotony of everyday life in order to ‘feel alive.’ We can even try to find a molecular explanation, like the secretion of neurotrophins as a result of the stress, which in turn might have an influence on neurotransmitter release and information processing in the brain leading to an improved (or specific) mood.

**We’ve All Got the Power**

Of course not everybody enjoys the adrenaline rush and some people will never dare to look down from the top of a tall building, let alone jump off a plane with a parachute. So, other than the lack of vertigo, what distinguishes the dare-devils from the prudent? How do they get hooked up? Is safe just boring? Although we like to phrase it as ‘living on the edge’ (and there are certainly edges involved), it doesn't have to be a safety issue. I love the thrill of a roller-coaster or bungee jumping, which I know are tested for safety. But there is always the reflex adrenaline jet that I can't avoid (to enjoy) and the peculiar feeling afterwards - having overcome the danger and regained control. To me it seems that the subconscious intention when seeking adrenaline is to prove to ourselves that we are not that fragile and are in fact in control of our lives. Is the audacity of adrenaline seekers in essence a compensation for a deeply rooted fear of life's ephemerality? Philosophical thoughts aside, I don't consider myself an adrenaline junkie per se - I tend to rationalize my actions and suppress my adventure ideas, considering them too risky. Then I settle for hiking or skiing. But from time to time I give in and realize that if it makes your legs tremble, it is worth doing. Whether it's falling in love or merely falling. A little adventure certainly gives a kick to life. If nothing else, it will make a fantastic story for your grandchildren. I'm planning a skydiving excursion next month. Want to join?

Elena Kochova  
MSc Student, MedNeuro
How Emotions Influence Sport Performance
Interview with Prof. Darko Jekauc, Sport Psychology, HU Berlin

CB: What is the focus of your research?
DJ: The main focus of my research is on the role of affective processes in sport and exercise. In the last five decades, a great deal of progress has been made in understanding how cognitive processes influence participation in sport. Currently, there are many cognitive models that try to explain why some people are more physically active than others. These models say that you will become physically active if the perceived benefits (e.g. health) are higher than the costs (e.g. time or money) invested. However, human nature means that people do not always act so rationally. In reality, they do not choose the behavioral option with the best cost/benefit ratio. People act rather emotionally. Although it seems obvious that emotions influence our behaviour and actions in every aspect of our life, including sport, it was neglected for a long time in psychological research. Today, we are still living in the “cognitive age in psychology”: Cognitive processes play the main role, and emotions are seen as something negative that should be banished in order to act logically. But we cannot make our emotions disappear; they are a part of our life. I think we should learn to manage them accordingly, and this is what we are investigating now: How can we learn to influence our emotions and use them to our advantage in sport?

CB: Which emotions are important to keep us motivated during sport?
DJ: The emotions important for our motivation to exercise depend on the behavioral stage. Negative emotions like dissatisfaction with our body shape or bad health status motivate people to start exercising. They are important in the stage of behaviour acquisition. However, negative emotions are not enough to make people continue practicing a sport for a longer period of time. At some point other emotions override these existing negative ones and people lose their motivation to continue doing sport. For example, stress at work or a family dispute might induce negative emotions which have at that moment higher urgency than dissatisfaction with one’s own body. This is the reason why many people drop out after a few weeks of exercise. Instead, it is important to have positive emotions during exercise like enjoyment in order to maintain physical activity. I think this aspect is important for sports instructors and trainers. They should learn how to induce positive emotions during training in order to keep up the number of participants. For example, in a weekly gymnastics course after five sessions there are only 70% of the participants remaining. After 10 weeks, only 30% participants still come to this course. What happens to all those people that drop out? Why don’t they come anymore? This is one question which we try to answer. What roles do emotional factors play for maintenance of physical activity? How can we induce enjoyment during physical activity in order to get people to continue doing sport?

CB: Are there specific sports that are especially susceptible to the influence of emotions?
DJ: I can’t say that there are particular sports in which you have more emotions than others. Regarding the athletes, however, there are huge interindividual differences: Some athletes experience strong emotions, others don’t, and others have effective control over their emotions. In competitive sports, we always have experiences of winning and losing. That is why we always have to productively deal with these emotions.

Regarding different types of sports, we always have different kinds of emotion which can emerge. In a football stadium, sometimes you can hear and feel the enthusiasm spreading over the crowd. Spectators sing, shout and applaud to support their own team and therefore the spectators can strongly influence the athletes. In other sports, athletes don’t show their emotions although they perceive them because it is not necessary to show them for their type of sport.

CB: I was very struck by the 7:1 victory of Germany over Brazil in the 2014 soccer world championship. Did the Brazilian team lose because they were emotionally unstable?
DJ: On the one hand, the Brazilian team was playing in its own country and public expectations were very high, so they had to deal with a lot of pressure. I don’t know if every player can deal with this kind of pressure. On the other hand, the German team had a lot of self-confidence after reaching the semi-final. After they shot the first goal, they appeared to be in a stage called “the zone”. It is like surfing on a wave of positive emotions. They used these positive feelings to further boost their performance. In general, success breeds success by fostering positive emotions which trigger even more success. It is a real skill to handle emotion in such a way that one may perform better in competition. Sometimes, it is favourable to have strong positive emotions to mobilize energy and to improve performance in competition. However, emotions represent a double-edged sword which can easily shift to become negative and turn against you. Handling emotions in a productive way is definitely a competitive advantage.
CB: How can I, as an athlete, use my emotions as an advantage during a competition?

DJ: First of all, I want to mention that the best strategy for handling emotions depends on the kind of sport you do. For example, in archery, you need a lot more tranquillity and concentration than in American football, where you primarily need a lot of strength. When you are angry in American football, it might improve your performance because you have more power and energy which you can use to push away your opponents. In archery—a sport with high precision—your emotional level should be as low as possible to keep your concentration and to achieve high accuracy. Furthermore, effectively dealing with emotions is highly dependent on the athlete’s personality. Therefore, each athlete should find his or her own way to deal with emotions.

CB: How do you train to use your emotions during competition?

DJ: An effective strategy we are using is mindfulness training. Mindfulness training helps us to focus on the present moment, and to perceive what is going on inside of ourselves. In this way, we can improve our awareness of what is happening in the moment. When I recognize that an emotion is developing inside of me, I can decide whether this emotion is purposeful or not. We can decide how we deal with this emotion. In many cases, when we are not aware of our emotions we get overrun by them. We notice that we are angry or afraid when it is too late, and the damage has already been done. Therefore, we use mindfulness training to learn to recognize our emotional states at an early stage. However, mindfulness is not easy to implement when you have never practised it before. During a competition, we have a lot of thoughts coming into our mind and we tend to get lost in them. When emotions are running high our thoughts tend to speed up and we get distracted from what we are doing. Therefore, we lose control over the situation.

For athletes without experience in mindfulness, one simple exercise to overcome this is to observe your breathing for some time. This seems very simple but it is challenging to maintain concentration. However, mindfulness, like sport, is a skill which can be improved by regular practice.

CB: Is it possible to work with your emotions to achieve better or faster recovery after sport or injury?

DJ: It is well proven that positive thoughts and emotions have a positive effect on recovery. If you imagine a situation where you feel well and healthy, the body has the impulse to achieve this state and start the recovery process. Our emotions and thoughts are closely correlated with one another. Negative emotions trigger negative thoughts, and this creates a vicious circle from which it is difficult to escape from. On the other hand, when we come into the “zone” that I talked about earlier, when you have positive emotions and everything works well, this triggers more positive emotions. Consequently, it can also influence recovery and regeneration.

CB: Emotions are also used by coaches, either in a “fierce” or “friendly” style. What do you think is the better approach, or does this depend on individual preferences?

DJ: I think this depends on the athlete’s personality. As a coach, whatever you say always has greater impact on your athletes if you say it with emotion. In the animal kingdom communication works mainly via emotions; this is actually similar to humans. We receive a lot of information via gestures and body language. It’s not only what we say, but also how we say it.

CB: I’ve learned that an athlete needs to learn to be master of his or her own emotions, but are there also external factors which influence how an athlete can control and use them?

DJ: Of course there are external factors which also play an important role: Emotions can spread from spectators to athletes and one athlete can transmit his or her emotions to others. Coaches or significant others can also influence the emotions of athletes. Non-social cues can also play a role. In a quiet environment, for example, you generally have more concentration and lower levels of emotion.

CB: Do you have some “emergency” advice to control and use your emotions during a competition?

DJ: The simple trick is to just take a deep breath. If you concentrate on your breathing for a moment, your arousal levels and intensity of emotions will be reduced and you may get distracted from the actual problems that you are facing. The process of rumination, or over-thinking, is temporarily stopped. This helps you to see the situation from a different point of view and contemplate different aspects of the competition. Taking a moment to stop and breathe is a very simple exercise, but it works! Plus, it only takes 5 to 10 seconds.

CB: Thank you for this interview!

*This interview has been edited for length and clarity.

Claudia Bentz
PhD Student, AG Eickholt
Depression Among Athletes – Up One Minute, Down the Next

Feeling down is not the first thing that people associate with athletics. Even so, more than 20% of high-performance athletes show recognizable signs of depression [1]. On second thought, this may not come as much of a surprise: Clearly, athletes are regularly exposed to high levels of stress and constant pressure to perform well [2], not least of all to secure their jobs. From this, depression is only a stone’s throw away.

Generally, exercise is taken to be protective against bad mood and, indeed, has proved beneficial against minor depression. While you would consider this an asset for athletes, it can also evolve into too much of a good thing: with long bouts of physical exercise without interlaced periods of rest, athletes are at high risk of developing overtraining syndrome [3]. Accompanied by fatigue, loss of appetite and low mood, this bears an uncanny resemblance to major depression. In addition, overtraining syndrome can be loosely associated with physiological changes that underlie depression. For instance, prolonged exercise leads to glycogen deficiency, which in turn affects hypothalamus regulation via cytokines and hormonal signals that all contribute to impaired physiological stress management [4].

"Physiological Burnout" Linked to Depression

Interestingly, several empirical investigations support a link between physical exhaustion and depression [5,6]. Together, these findings highlight important shared pathways between overtraining syndrome and depression that should serve as a warning against “physiological burnout” to people in the sports industry. From this perspective, the risk of depression presents a serious threat to mental health in high-performance athletes. Besides adequate psychoeducation, future efforts should aim to both increase awareness of mental illness among athletes as well as try to improve their working conditions.

[4] Steinacker et al., Hormone and Metabolic Research, 2005

Exergaming: The TV is Your Trainer!

Winter is over and the sprouting leaves and chirping birds tell us it is time to get fit again. However, the weather may not yet be conducive to swimming, running or cycling outside for those of us who dislike the cold spring air. The alternative, then, is the fitness center. But is it the only alternative? What about exergaming?

Exergaming is a portmanteau of “exercise” and “gaming”. It includes physically active videogames, such as aerobics, balance and stretching, as well as other recreational activities (e.g. tennis, bowling, dancing), and promises to increase the fun quotient of getting fit. The release (ten years ago!) of Nintendo Wii and Microsoft Kinect into the gaming market has been followed by the growing popularity of these innovative video games.

Effectiveness of Exergames

A study compared the effects of 30 minutes of brisk walking on a treadmill to playing Wii Fit “Free Run” on college students [1]. The results showed that the maximum heart rate and energy demand of the participants were significantly higher in the Wii Fit group than in the treadmill group. Moreover, the students perceived exercising with Wii Fit as more physically demanding, but rated their post-exercising well-being lower than when walking on the treadmill. The study concludes that the Wii Fit may be an alternative to traditional moderate-intensity exercises.

Further studies show that exergaming promotes physical activity, reduces body fat and a sedentary lifestyle [2, 3]. Even though pros acknowledge that virtual workouts may not be as efficient as real life intense exercise, and hence will not turn a couch potato into a “bikini body”, exergaming can certainly play a role in leading a healthy lifestyle!


From 0 to 100: The Science of Sprinting

Sprinting is the act of running over a short distance at (or near) top speed. Physiologically, a runner’s near-top speed cannot be maintained for more than 30-35 seconds because of a depletion of muscular phosphocreatine stores as well as excessive metabolic acidosis following anaerobic glycolysis [1,2]. Distances run by sprinters usually include 60m, 100m, 200m, 400m and relays- 4x100m and 4x400m [3].

Are Great Athletes Born or Made?
A sprinter’s potential is indicated by From 0 to 100 section.

From 0 to 100: The Science of Sprinting

Sprinting is the act of running over a short distance at (or near) top speed. Physiologically, a runner’s near-top speed cannot be maintained for more than 30-35 seconds because of a depletion of muscular phosphocreatine stores as well as excessive metabolic acidosis following anaerobic glycolysis [1,2]. Distances run by sprinters usually include 60m, 100m, 200m, 400m and relays- 4x100m and 4x400m [3].

Are Great Athletes Born or Made?
A sprinter’s potential is indicated by several biological factors, including muscular strength, adrenaline use, anaerobic respiration, breathing, footspeed and the proportion of fast twitch muscles [3]. Besides these factors, a fine-tuned nervous system and the relative leg length are also prerequisites for a world-class runner [4].

Have you ever wondered why some ethnic groups seem to run faster and better than others? A study by Dr. Alun Williams, director of the Manchester Metropolitan University’s Cheshire Sports Genomics Laboratory, suggests that athletic ability is dependent on both genetic and environmental factors. The running skills of the world’s fastest sprinter, Usain Bolt, have been debated on several platforms. While some think his skills are due to his cultural background, others think it is his genetics. Discrepancies aside, Usain Bolt has the biological factors of a good sprinter. He is 6 feet 5 inches tall, has long legs, and well-built muscles contributing to his world record of 9.58 seconds for 100 metres [4]. Whether the speed of a sprinter is determined by genetic factors or not will be discussed in the next section.

Genetically Enhanced Olympians
Athletes with West African ancestry have significantly more fast-twitch muscle fibres, which tire easily but contract more quickly than the slow-twitch fibres commonly found in long-distance runners. Professor Steve Harridge said that “to be a great sprinter, you need leg muscles that are dominated by fast-twitch muscle fibres because they shorten the muscle quickly and generate power” [5].

The muscle fibres of marathon runners differ from those of sprinters. While marathon runners have more slow-twitch fibres, sprinters have more fast-twitch muscles. This may explain why Paula Radcliffe, the world record holder in the marathon, cannot turn into a great sprinter overnight, or Usain Bolt into a good long-distance runner [4]. Although in theory training can make fast-twitch fibres thicker and stronger, no evidence exists for this conversion of one muscle type to another [6]. Certain natural variants of ACTN3 gene (α-actinin-3) can boost the performance of fast-twitch muscle fibres. A study comparing the contractile properties of muscle fibres deficient in α-actinin-3 and those expressing the protein, found that α-actinin-3 deficiency decreases the contraction velocity of isolated muscles. Thus, the morphological and contractile properties of individual muscle fibres enhance the performance of individuals with the α-actinin-3 gene [5].

However, perfect genetics does not automatically make one a good athlete or a champion. “But certainly, if someone has a very unfavorable set of genes, in many sports, no amount of training and diet will make them a champion” according to Dr. Alun Williams [5].

Beating the Odds
Regardless of the genetic factors associated with good sprinting performance, practice can improve personal performance. Consistent endurance training can help muscles develop more and improve their ability to cope with and adapt to the stress of exercise. Factors such as mental preparedness, good Nutrition, hydration and good rest can also boost performance [7].

“I believe that anyone can be a world-beater in any sport – it is just that some people (with ‘good genes’) will find it easier, that is, require less training and practice than others (with ‘less good genes’),” says Dr. Colin N Moran, MSB Lecturer in Health and Exercise Sciences from Scotland’s University for Sportimg Excellence [5].

2. [bit.ly/1Q2Lz4s
3. [bit.ly/1Nk0rf4
4. [ind.pn/1O48r7G
5. [bit.ly/1uqzwsj
6. [bit.ly/1ORyUqs

Priscilla Koduah
PhD Student, AG Meisel

www.medical-neurosciences.de
The Olympic Games and Their Historic Values

The 2016 Olympic Games in Rio are coming up, an over two-week event offering an innumerable amount of sports. Who came up with the idea of the Olympics, though? The Olympics are always considered to be of Greek descent, but are they really?

Here is a short summary of the Olympic history, from myths to nowadays practice.

The Ancient Games
The first Olympic Games were held in 776 BC in ancient Greece. The Games were held in the city of Olympia, at the foot of Mount Olympus, the mountain where the Greek Gods were said to live. This location was chosen, as the Games were one of the two great religious events celebrated in honor of the Greek Gods. Honor was what drove athletes of every city to participate as well. Winners were awarded with an olive wreath, the symbol of peace and distinction, and eternal prestige. In 394 AD, the Games were banned by the Roman emperor Theodosius I, who considered the Greek celebrations a pagan event [1].

Revival of the Games
For almost 1500 years no-one thought of this Greek festival. But then the French baron Pierre de Coubartin started sharing his dream of reviving the Ancient Games. His lobbying resulted in the first Modern Olympic Games, held in Greece in 1896. The foundation of the Games was based on what de Coubartin said: 'The important thing in life is not the triumph but the struggle, the essential thing is not to have conquered but to have fought well'. He founded the International Olympic Committee, which today still decides where the Olympics will be held and which sports will be a part of the Games [2]. In memory of its founder, the Pierre de Coubartin medal was invented and awarded to athletes who show true sportsmanship.

Symbols and Traditions
The Olympic motto 'Citius, Altius, Fortius' (Latin for 'faster, higher, stronger') exists since 1896. The symbol and flag, with the five colored rings intertwined on a white background, were designed in 1914. Both the motto and symbol come from Pierre de Coubartin. The symbol contains all the colors necessary to make the flags of all participating countries at the time. The rings resemble continuity and the human body [3]. New traditions have been added since - the relay carrying the Olympic fire from Greece to the host city of the current Games, started for the 1936 Berlin Games.

Facts showing the differences between the Ancient and Modern Games

<table>
<thead>
<tr>
<th></th>
<th>Ancient Games</th>
<th>Modern Games</th>
</tr>
</thead>
<tbody>
<tr>
<td>First edition</td>
<td>776 BC</td>
<td>1896 AD</td>
</tr>
<tr>
<td>Last edition</td>
<td>394 AD</td>
<td>ongoing</td>
</tr>
<tr>
<td>Inventor</td>
<td>'Greek Mythology'</td>
<td>Pierre de Coubartin</td>
</tr>
<tr>
<td>Number of sports</td>
<td>7</td>
<td>28</td>
</tr>
<tr>
<td>Participants</td>
<td>Free Greek men</td>
<td>Athletes from all over the world</td>
</tr>
<tr>
<td>Time interval</td>
<td>Every four years</td>
<td>Every two years, interchanging Summer and Winter Games</td>
</tr>
<tr>
<td>Length</td>
<td>5 days</td>
<td>17 days</td>
</tr>
<tr>
<td>Prizes</td>
<td>Olive wreath</td>
<td>Medals</td>
</tr>
<tr>
<td>Philosophy</td>
<td>Mythology: offerings to Zeus</td>
<td>Olympism: sports for education, peace, sustainability, development</td>
</tr>
</tbody>
</table>

Olympism
The values and ideals of the Olympic Games are written down in the Olympic charter. The philosophy following these fundamental guidelines is called Olympism. The Olympic Movement has six pillars: Sport for All, Development through Sport, Women and Sport, Education through Sport, Peace through Sport, as well as Sport and Environment [1].

To conclude, the Modern Olympic Games, though based on the Greek Ancient Olympic Games, were invented by the French Pierre de Coubartin. The number and types of sports have changed over time, however, fundamental values of sportsmanship and honor have always been the basis of the Olympic Games. As for relations to Greece, one of the traditions of the Modern Games, carrying the Olympic fire from Olympia, Greece, to the host city of the current Games, hints that people still prefer a mythical touch to this event of great emotion and mighty athletes fighting for honor, as it was more than two eras ago in Greece.

[1] www.olympic.org

Judith Houtman
PhD Student, AG Heppner
Faster, Higher, Stronger, More Inclusive: The Paralympic Games

Welcome to one of the most exciting and chronically underrated international sporting events of the 21st century: the International Paralympic Games. This body, originating in 1948 as a competition for wheelchair-using war veterans today has over 500 medal events, and hosts thousands of athletes from all over the world. Today, the Paralympic Games occur in the same location as the Olympics, and are scheduled after the main events. To many, this may seem like an afterthought, but in reality is an incredible showcase of human diversity, athletic prowess, and the merits of inclusionary sport.

Meet Your Athletes

Who competes in the Paralympics? According to the official guidelines of the International Paralympic Committee, there are three major categories: visual, intellectual, and physical disabilities. The latter category is also broken down into 8 different subtypes, reflecting different levels of ability. For example, table tennis has two major categories: players who compete using a wheelchair vs. standing. Within these two major categories, there are also subgroups, reflecting impairment in the playing arm, trunk stability, and other physical factors. These classes and categories differ from sport to sport, reflecting the demands of each discipline.

In addition, some sports in the Paralympics use ‘equalizing’ techniques to even the playing field for everyone involved. For example, in wheelchair rugby, individual players are given a score based on their ability (use and dexterity of limbs, core stability, etc.). These scores are added up, and a team may not have players with more than a cumulative number of points on the field at any time. On the other hand, goalball, a ball-throwing team sport for the visually impaired, requires that all players wear eye coverings to completely block vision. Thus, participants who are totally blind are still on the same level as those with milder visual impairments.

Up until the 1980s, eligibility for the Paralympics was determined purely by medical diagnosis, i.e. the reasons for a certain disability. Using these guidelines, a person who lost use of their arms due to a neurodegenerative disorder would not be able to compete with another individual whose arms were amputated. However, today most sports include athletes based on ability, i.e. the degree to which an individual can perform an activity and compete fairly with others. The exception to these rules are sports for the visually impaired, where more rigid definitions and thresholds for vision loss are employed.

Let’s Play

Within most sports in the Paralympics, there are several sub-categories, reflecting different levels of ability. For example, table tennis has two major categories: players who compete using a wheelchair vs. standing. Within these two major categories, there are also subgroups, reflecting impairment in the playing arm, trunk stability, and other physical factors. These classes and categories differ from sport to sport, reflecting the demands of each discipline.

In addition, some sports in the Paralympics use ‘equalizing’ techniques to even the playing field for everyone involved. For example, in wheelchair rugby, individual players are given a score based on their ability (use and dexterity of limbs, core stability, etc.). These scores are added up, and a team may not have players with more than a cumulative number of points on the field at any time. On the other hand, goalball, a ball-throwing team sport for the visually impaired, requires that all players wear eye coverings to completely block vision. Thus, participants who are totally blind are still on the same level as those with milder visual impairments.

Participation is Based on Ability

The Paralympics thus include very diverse athletes, and a broad range of sporting opportunities. The most famous sports are generally those closest to events in the regular Olympics. For example, wheelchair basketball or Paralympic triathlon are close to Olympic contemporaries, with the addition of mobility-assisting devices such as wheelchairs or prosthetic devices. Other examples include wheelchair fencing, para-snowboarding, or para-equestrian events. However, some Paralympic sports are unique. These include goalball (see above) and bocce, a sport similar to boules or curling.

Interestingly, there is also significant participation of non-disabled athletes at the Paralympics. Indeed, these assistants/guides are an integral part of the team, and receive medals along with their disabled teammates. In bocce, for example, teammates can also help severely disabled athletes prepare for ball throws. Sighted athletes also play a major role in events for visually impaired participants, by running alongside them in track events, or steering a tandem bicycle during cycling races.

In recent years, unfortunately, the Paralympics have not been without controversy: as with other Olympic sports, there have been allegations of doping, along with accusations of ‘understating’ athletes’ level of disability. But a lot of ongoing issues within (and at the fringes of) the Paralympics touch on much more troubling questions. How can the Paralympics be opened up to better funding, recognition, and respect? Should Paralympic athletes be allowed to compete directly against regularly-abled ones (think Oscar Pistorious)? It’s difficult to say exactly where these discussions will lead... but do tune in after the main games in Rio this summer, and see what all the excitement is about.


Source: Wikimedia Commons

Constance Holman
PhD Student, AG Schmitz

www.medical-neurosciences.de
Runner’s High

When accomplishing enduring and physically demanding tasks our body has a built-in reward system. This phenomenon is known as runner’s high, and is described as a sudden euphoria, anxiolysis, relief of pain and an enormous sense of well-being arising after 1-2 hours of exercise [1]. For many years, it has been known that moderate physical activity has positive effects on health of body and mind [2]. This has influenced the clinical sphere as well: Patients with depression can receive huge benefits from physical activity [3]. However, for a long time researchers and physicians doubted the existence of a physical/chemical “runner’s high”. How can mere exercise alter our neurochemistry in ways that prescription drugs often can’t? This question was partially unravelled when a nuclear medicine diagnostic group from Munich found a candidate agent in runners’ brains: endocannabinoids binding to opioid receptors in the prefrontal cortex and limbic system [4]. Their discovery also solved the longstanding mystery of neuroendocrine regulation.

Feeling Good From The Outside... In?

Endorphins (like epinephrine/adrenaline) are released into the peripheral vascular system with exercise, but how do these “feel-good” chemicals cross the blood brain barrier and cause euphoria? The secret is in the chemical nature of endocannabinoids: These lipophilic molecules have no trouble migrating through the barrier, on their way to reward centers in the prefrontal cortex and other areas [2].

Further investigation of the role of endocannabinoid system in animal models of depression and analgesia have identified the underlying molecular mechanisms, and provided a more definitive link between physical activity, and this type of signalling [1,2]. Could exercise, therefore, be the key to treating all kinds of physical and psychological ailments? Or can we mine its chemistry to get all of the benefits... minus the exertion? For now, we still have to keep moving! But stay tuned for new exciting benefits in this field in years to come!


Bettina Schmerl
PhD Student, AG Shoichet

Lacrosse

The Native American Way to Catch Insects

On my way to lacrosse practice, I feel like a bug hunter, out to catch a rare specimen. Indeed, I often get approached by people throwing curious glances at my netted stick, asking if I am going for a butterfly hunt. I answer that I am playing lacrosse but it doesn’t help much, as this is often confused with a crocodile-ornamented fashion label.

Lacrosse is designated as the fastest sport on two legs and is, though still unpopular in Europe, the Canadian national sport [1]. It was initially practiced by Native Americans and played with sometimes more than a hundred players per team to bond, prepare for war, and solve conflicts. The “younger brother of war”, as one of the Native tribes named it, indicates the violent nature of this game [2,3,4].

Modern lacrosse is practiced in about 38 countries [5], has exchanged wooden sticks for plastic ones and war play for friendly competition. Up to twelve players per team try to protect the ball during the run over the 110 meter long field [6] by passing it in the net of the lacrosse stick to finally shoot, with speeds of up to 183 kilometers per hour, into the goal [7]. While men play with helmets and body protection and women only with mouthguards, both are prepared for bruises, as the game involves both body and ball contact.

There’s a positive side to the sport being unpopular in Europe: In most teams, you can start playing lacrosse without much experience. In 2011, our women’s team from BHC Victoria in Berlin-Wedding started out as a spin-off of the men’s team and consists now of well over thirty registered players in the Bundesliga Ost. If you have become curious about lacrosse, come see us on Facebook [8]. We are always happy to welcome new players.


Pina Knauff
PhD Student, AG Wulczyn
Does Physical Activity Improve Learning?

As a teenager in high school, I spent most of my sports classes running away from the ball. Like me, many of us have wondered why we deserved this torture in the shape of sports classes. When I came to think about this question later, my main answer was the value of physical activity for healthy development. However, more and more evidence has emerged suggesting that the importance of sports goes far beyond mere physical education.

The relationship between physical activity and learning was first studied in rodents. In several experiments in mice and rats, running was found to enhance neurogenesis and improve spatial learning performance. The experimental findings suggested that physical activity can regulate hippocampal neurogenesis, synaptic plasticity and learning [1,2,3]. From this, it soon became clear that physical activity has a positive effect on learning abilities in rodents. But how?

What’s the Link Between Brains and Brawn?
The mechanism behind the positive effect in rodents was related to several effects in the hippocampus. Exercising was found to cause alterations in the hippocampal bound protein kinase C (PKC) activity [1]. Rats that had exercised showed enhanced hippocampal high affinity choline uptake (HACU) and muscarinic receptor binding. This enhancement in the hippocampal cholinergic functioning appeared to improve the learning performance [3]. Another effect of physical activity consisted in the induction of fibroblast growth factor 2 (FGF) and its mRNA in the hippocampus. These results demonstrate that exercise regulates FGF-2 expression and suggests that growth factors are likely mediators of the positive effects of exercise on the brain [4].

The effect of physical activity on learning abilities in humans is yet under controversy. Both results from studies with animal and cross-sectional studies with humans were consistent about the positive effect of aerobic exercise on cognitive functions. However, results from studies with humans cannot be interpreted that easily since individuals who select to exercise or not may differ on other variables that could influence cognitive performance. Therefore, in order to correctly test the hypothesis with humans, long intervention studies are necessary [5].

Nevertheless, indirect evidence for the positive effect of sports on learning was demonstrated in many studies. A meta-analysis from 2010 of over 30,000 patients showed that subjects who performed physical activity showed better cognitive abilities and were protected against cognitive decline [6]. Furthermore, several interventional studies in children showed improvement in different cognitive tests when engaging in physical activity, comparing to control groups who didn’t (7,8,9).

Aerobic training in particular seems to have a unique effect on learning compared with other types of sport. Immediately after intensive physical exercise, learning abilities are facilitated and brain-derived neurotrophic factor (BDNF) catecholamines levels are elevated, implying they mediate the way physical exercise improves learning [10]. Along with the positive effect on learning, aerobic training was found to improve cognitive function and protect against brain tissue loss in elderly people [11,12]. Therefore, aerobic training seems to have an especially beneficial effect on our cognitive functions and learning.

To summarize, more and more findings support the positive effect of sports on learning abilities. Through several physiological mechanisms, involving neurotrophic factors and neurogenesis in the hippocampus, exercising mediates and enhances learning abilities and protects against cognitive decline and brain tissue loss in old age.

[1] Fordyce and Wehner, Brain Res, 1993
[8] Hilman et al., Neuroscience, 2009
Too Much of a Good Thing
The Long-Term Negative Effects of Sports

I have never been the athletic type. When asked if I do any sports, I used to reply embarrassed with “I played basketball back in third grade”. If you are like me, you come up with any excuse to avoid exercise. I have multiple friends who have injured themselves while working out and are now still in pain months after the initial injury. Why would anyone voluntarily take this risk? In order to back up my sports aversion, I wanted to do some research and see if there is any scientific evidence for the negative effects of sports. Here is what I found...

Types of Sports-Related Injuries
Sports injuries are divided into two types: acute and chronic. An acute injury occurs suddenly after a traumatic event, such as a sprained ankle from getting fouled during a football match. Some common acute injuries are anterior cruciate ligament tear, shoulder dislocations, and fractures [1]. On the other hand, chronic injuries do not have one specific cause but occur over a period of time [2]. Chronic injuries are also referred to as overuse injuries, indicating that repetitive stress on a certain part of the body during sports or exercise is to blame. One example is the “tennis elbow” which refers to the inflammation related to an overuse of the forearm. This type of injury is seen in 50% of tennis players, hence the name [3]. Other examples of overuse injuries are shin splints, runner’s knee, and swimmer’s shoulder, many of which are named due to their prevalence in a certain type of sports, yet can also be caused by regular repetitive use outside the realm of exercise.

Acute and chronic symptoms can sometimes look very similar, such as swelling in the affected area and pain from performing any movements that include the injured part. However, the pain associated with acute injuries is usually sudden and severe, whereas in chronic injuries it can manifest as a dull pain [4]. Similarly, acute injury swelling is immediate, whereas chronic injury swelling can occur after every time that certain activity is performed. Another way to differentiate between the two is to consider the amount of time that the injury takes to recover. Typically, acute injuries heal faster than chronic injuries [2].

Steppin’ to the Chronic Side
Some types of acute injuries can become chronic if they keep re-occurring. The recent movie “Concussion” illustrates this transition between acute and chronic injuries related to head trauma. The central disease in the movie is referred to as chronic traumatic encephalopathy, caused by repetitive blows to the head [5] (also see article on page 13). Previously known as “punch-drunk syndrome” due to its prevalence in boxers, this condition is also common among many other sports including football, hockey, wrestling, and rugby. The disorder is characterized by impaired memory, speech, and behavior. Interestingly, on a molecular level, the disorder shares a similar pathology with Alzheimer’s disease in that both often exhibit tau neurofibrillary tangles [5].

Adding Insult to Injury
Even though acute and chronic injuries are seen most frequently in athletes, they can also occur with regular exercise. When doing any type of repetitive activity, such as running or weight lifting, we are subjecting our bodies to microtraumas which can lead to injury. The causes of these overuse injuries can be divided into intrinsic and extrinsic types. There are anatomic intrinsic factors that predispose us to overuse injuries, such as having flat feet or highly arched feet, being inflexible or having weaker bones or weaker muscles. These factors are not something that we can control, however, we can gradually train to become more flexible or strengthen our muscles in order to avoid overuse injury [6].

The majority of overuse injuries are due to extrinsic factors, such as improper training or technique. Our bodies are built to handle stress, and during exercise we expose our bones, muscles, and tendons to different types of stress such as stretching and contracting. Stress can be positive for our bodies because it makes us stronger, however this buildup can only occur after a period of recovery. There is a balance between tissue stress and recovery, and if this balance is tilted in favor of the former, this is where injury occurs [7]. This is reflected in the fact that most overuse injuries are caused by improper training [8]. If we push ourselves too hard from the beginning or if we exercise consistently without breaks then we increase our risk of injury. Other extrinsic factors include using appropriate gear during working out, such as running sneakers that are made to absorb a lot of impact.

As much as it pains me to report this, there is no excuse to avoid exercise due to risking injury. Yes, acute trauma can happen, and yes, overuse during exercise can cause injury, yet it can mostly be avoided with proper training.

MICHIKO HANADA
MSc Student, MedNeuro

Zain Alfanek
MSc Student, MedNeuro

BALANCE BETWEEN TISSUE STRESS AND RECOVERY

[1] http://abt.cm/1Qc1spj
[8] http://mayocli.in/1GRLj4o

Source: Boston University Center for the Study of Traumatic Encephalopathy

2016 International Graduate Program Medical Neurosciences
High Impact: Consequences of Brain Injury in Athletes

What does football sound like? Fight songs and shouted play calls, sure, but another less pleasant sound sometimes accompanies football games: the sharp crack of helmet-to-helmet collisions. In football, players run like bulldozers, ramming everyone in their way. If the heads of two football players collide, the impact can reach up to more than 100 g [1], similar to forces in a car crash; a high school football player experiences about thousand blows to the head each season [2]!

**Awareness has been rising since 2005**
Football has been played since 1869, but awareness that repetitive concussions and sub-concussive hits to the head may have long term neurodegenerative effects has been rising only since 2005. It all started when Bennet Omalu autopsied the brain of Mike Webster, a four-time winner of the Super Bowl who died at the age 50. After retiring from a long football career, he developed depression, took drugs, had memory and concentration problems, as well as shaking hands.

Mike Webster's brain showed amyloid plaques and neurofibrillary tangles in the neocortex, reminiscent of Alzheimer's disease (AD). Omalu diagnosed chronic traumatic encephalopathy (CTE) and hypothesised that head-to-head collisions were the cause [3]. With accumulating case studies, he also started making connections between repetitive mild brain injuries and depression. Later, a second group led by Ann McKee reported CTE in a larger cohort of post-mortem samples and confirmed many of Omalu's hypotheses [4].

**Upon impact, the brain hits the skull**
Helmets worn by the players only prevent skull fractures, but not internal damage; the brain hits the skull from the inside, referred to as "Brain Slosh". The shearing of brain tissue leads to excessive toxic release of neurotransmitters, changes in glucose-metabolism, immune activation, and damage of blood vessels. This leads to secondary injury: breakdown of the blood brain barrier, disturbances of cerebral blood flow, formation of hematomas, neuroinflammation and so on. The results are neurological symptoms during acute injury (dizziness, headache, nausea) which collectively persist in long-term deficits [5]. Neuronal damage and traumatic axonal injury further lead to accumulation of a-beta amyloid, tau and ApoE components [5]. Though sharing many similarities with AD, CTE-associated tauopathy differs with regard to the distribution: in CTE, tau is most prominent in superficial cortical layers and sulci, and tends to surround blood vessels [5].

**CTE is difficult to diagnose**
The clinical phenotype of CTE is still incomplete, because most of the knowledge comes from post-mortem analyses and retrospective data. In the 158 autopsy cases analysed so far, 80% showed signs of CTE [6]. However it is difficult to assess how natural age-related changes, unrelated psychiatric illness, alcohol/drug use or coexisting cognitive impairment contribute to the current picture of CTE; due to the long latency of CTE, co-morbidities are often present.

As of yet, there have been no established diagnostic criteria or in vivo biomarkers, meaning that CTE can only be diagnosed post mortem. But there is hope: Recent research developed means for premorbid identification of neurodegeneration in contact-sports athletes. NFL players with histories of mood and cognitive symptoms were subjected to positron emission tomography (PET) scans, which revealed that they had higher tau deposits than controls in all subcortical regions and the amygdala, areas known to produce tau deposits following trauma [7].

However the incidence and prevalence of CTE are still unknown and, to date, there is no consensus regarding which intensity of head blows is tolerable. Large-scale prospective, longitudinal studies of concussed and non-concussed individuals are needed to provide a better picture.

To further advance the research on biomarkers and treatment approaches, a mouse model has been developed. It uses controlled closed-head impacts on unanaesthetized mice to recapitulate the spectrum of behavioural symptoms noted in patients diagnosed with CTE [8].

**What are the consequences?**
Until recently, the National Football league (NFL) did not recognize these injuries as consequence of the sport itself. Rather, a common argument suggests that former players can't cope with not being the focus of attention anymore, which is why they develop depression and take drugs, which then goes on to eventually cause neurodegeneration. Several former NFL players sued the league for allegedly misleading them about the risks of brain injury and one player even resigned from the NFL because he feared the consequences of the daily brain trauma.

**Is this the end for football?**
Football has been played for 150 years. In 1905, 19 players died in a single season, most due to head and spine injuries. President Roosevelt, an avid football fan, ordered football coaches to reform the rules eliminating the more brutal features of the game. Since then, the sport has changed time and again. As a reaction to the current discoveries, President Barack Obama also expressed concern about college football players and the “problems with concussions and so forth” [9]. Football is just too big of a cult for this to be the end. New rules will hopefully be enforced to make the games safer for the athletes and still satisfying for fans.

---


---

**Interesting films to watch:**  
- 1954 On the Waterfront  
- 2015 Concussions

---

Claudia Bentz  
PhD Student, AG Eickholt

---

www.medical-neurosciences.de
The Connection of Weak Morals and Strong Arms

How Marshmallows Destroyed the Tour de France

There’s an issue that seems to leave no kind of sport unscathed. The careers of some of the world’s most famous athletes have been built and destroyed by it. And no matter the stringency of controls, it always finds its way into competitions on national and international levels.

Doping is the dark cloud looming over every major sports event, where winning can lead to instant fame, and losing may mean the devaluation of several years (if not one’s whole life) spent in training. Every time Usain Bolt sets a new sprint record, and generally every time an athlete does something which should not be possible for a mere mortal, mainstream media fill their pages with articles questioning the legitimacy and honesty of this victory. A major reason for athletes to try and bypass the ethics and honor of the competition is, without a doubt, the prospect of worldwide renown and reward (whichever form that may take); achievements they trained and fought for their whole career.

Your Brain Was Born to Win

Because the search for reward is one of our strongest driving forces (and thankfully so), our brain has a remarkable urge to make us exhibit our best form when scrutinized by others. As put aptly into words by Confucius: ‘The will to win, the desire to succeed, the urge to reach your full potential – these are the keys that will unlock the door to personal excellence’. It is this urge that makes the weight when balancing the chances of being revealed as a cheater and losing all achieved glory against the possibility of winning everything clearly pull in the latter direction for some.

The problem of resisting reward in the near future, when chances of negative consequences following this reward are to be expected, has been brought to popular attention by the ‘Marshmallow-experiment’ conducted at Stanford University. Over several years, Walter Mischel tested the self-restraint of young (~4yo) children by giving them the choice between helping themselves to a treat immediately while being ‘unobserved’, or getting double the amount if they could resist this short-term reward for a few minutes. Evaluating the life paths of the same children about 15 years later revealed a considerable relationship between a higher level of self-restraint and good social, cognitive, and mental health and behavior [1].

Have One Now or Two Later?

Whether or not one deems this experiment applicable to doping athletes, both cases clearly show the importance of delayed gratification in preventing undesired outcomes. Transferring the ideas of the experiment to the world of professional doping indicates that low morals may even pave the path to an indifferent conscience in the event of wrongful behavior of the individual in question. The world anti-doping agency (WADA) lists over 300 substances on their ‘Prohibited List’ [2], among them stimulants, steroids, growth hormones and narcotics – a selection so broad, how could all of them possibly be tested at once?

That must have been Lance Armstrong’s reasoning when he nearly single-handedly wiped the Tour de France off the screens of many people interested in clean and honestly competitive sports. His use of erythropoietin and glucocorticoids had long been suspected, while Armstrong failed one Marshmallow-test after the other. Of course, once you reach the top-most league of your discipline, you somehow also enter the business of entertainment, arguably putting a lot of extra stress on yourself. The pressure to deliver to your audience, for those susceptible, provides an ample source of anxiety and self-flagellation. Not far from how heroin or Xanax are used by some to cope with these problems, stimulants and pain medication can help a lot on the way to relieving that amount of stress, if only they help you win the most important race. In a similar way, these ‘little helpers’ can be extremely addictive and damaging to the (nervous) system, especially when used without expert supervision.

When the Olympic Games will be held this year, prepare to find this topic all over your newsfeeds – and bear in mind that your favorite athlete might just be the next contender for the golden syringe (which is sadly not an actual award – yet). On a more positive note: the overall use of stimulants in sports has significantly decreased between 1988 and 2004 [3].


Andreas Grasskamp
PhD Student, AG Walter
It’s All About the Pressure

Climbing or diving is something that requires a certain level of fitness. Both mountain climbers and divers may profit from exercise prior to jumping the challenge, yet keep in mind that a divergence in pressure affects our health and pushing yourself during the act is not recommended. Here is why.

Diving – Remove the Bubbles
Decompression illness occurs when the body is too rapidly exposed to a decrease in environmental pressure. This causes bubbles, often consisting of nitrogen, to form in the tissue, which leads to a variety of symptoms ranging from mild to fatal. Symptoms include pain in the large joints, shortness of breath, paralysis of legs, loss of consciousness and seizures [1, 2]. You can decrease the risk of decompression illness by making sure that your body is up for the challenge. Young, slim or aerobically fit divers have been shown to produce fewer bubbles than old or poorly trained divers do. In fact, adiposity is related to an increased risk of bubble formation as fat tissue contains the nitrogen better, which subsequently increases the total body nitrogen content [3]. In line with well-known benefits of exercise, performing a single bout of high-intensity aerobic exercise 24 hours prior to a dive has proven to be beneficial in terms of reducing the basis for bubble formation. This indicates that prior exercise may be used as a preventive measure. On the other hand, exercising shortly after a dive may promote bubble formation [4]. Thus, timing is key.

Climbing – Don’t Overdo it
Acute altitude sickness is the result of low oxygen levels (hypoxia) present at high altitudes. As opposed to decompression illness, symptoms of altitude sickness are mainly neurological and include dizziness, headache and nausea. Unsurprisingly, alterations within the central nervous system are thought to underlie the pathophysiology: More specifically, hypoxemia has been shown to increase nitric oxide (NO) and vasopressin levels, which has been associated with an opening in the blood-brain-barrier and an increase in extracellular water levels. This ultimately results in cerebral edema and increased cerebral pressure [5].

Based on all the positive talk about exercise, you ought to think that exercise is good for you no matter what. Yet, when standing on a high mountain, exercise exerts the opposite effect. Overexertion, independent of individual physical competence, increases the incidence and severity of altitude sickness [5]. A higher resting minute ventilation (Ve) and arterial oxygen saturation levels (SaO2) have shown to be important for adjusting to high altitudes. When volunteers exercised during the early hours of being exposed to altitude, the combination of low oxygen levels and exercise led to a decrease in both SaO2 and Ve, which altogether exacerbated altitude sickness [6]. Thus, you should rather have a slow and moderate ascent as opposed to a fast and tough one.

Enjoy the Moment
When it comes to performing extreme sports, such as climbing Mount Everest or diving deep somewhere in the Mediterranean, it helps to be fit. Nevertheless, when being exposed to these immense challenges, the question of when to exercise is crucial. Being a fitness hero and wanting to dive or climb fast, have negative effects on what you are trying to accomplish and can increase the risk of decompression illness and altitude sickness, respectively. Prepare your body for the challenge, but once you are finally doing it, take the time to enjoy it.


Henriette Edemann Callesen
PhD Student, AG Winter

Welcome to Rio!

Inside Information on the 2016 Olympic Venue

Rio de Janeiro, affectionately nicknamed ‘Rio’, will be the first South American city to host the Olympic Games, as well as the first city in the southern hemisphere outside of Australia. Brazil will be the first Portuguese-speaking host nation [1]. People from Rio are called cariocas - and as a carioca myself, I feel compelled to share a few fun facts about my city, other than the regular news coverage on the Zika virus.

The city’s name literally means ‘River of January’ because, when the Portuguese colonizers arrived, they thought they had encountered a river mouth - but it is actually a bay [2]. Plus, it was January. Yes, both creative and clever.

Known to over 6 million people [3] and one of the world’s biggest Carnivals, Rio is filled with beaches, lagoons, waterfalls and mountains. There, the typical elements of a big metropolis go hand in hand with an enormous tropical rainforest. Also known as ‘Cidade Maravilhosa’, or Wonderful City, Rio offers countless options for outdoor sports. It is very common to see inhabitants and tourists trekking, hiking, hang gliding or running along the Copacabana beach. When you have summer all year long, it’s always time for fitness!

Beyond That (In)Famous 7:1 Match

When Brazilians say just ‘Olympics’, without specifying, they are most probably referring to the Summer Olympics. Brazil does send some athletes to the Winter Olympics but it hasn't won a single medal so far (not surprising, since we don't have snow). Our country is best known for football, but lately it has actually had more success in surfing, by winning the past two world championships [4]. Another very well-known Brazilian sport is capoeira - a martial art that mixes elements of dance and acrobatics. Although not in the Olympics, it can be found in almost any sports center in Germany. At the Olympic Games, we usually have a good chance of scoring some medals in volleyball (both beach and court) and judo.

Many are skeptical about a country with political and infrastructural difficulties like Brazil hosting the Olympics. But if you are planning to visit Rio, don't let the news discourage you. Despite all its struggles, Brazil proved with the 2014 FIFA World Cup that, in the end, it all works out. So pack up some mosquito repellent and an open mind, and you won't regret it. "Third-world problems" aside, this is a truly gorgeous and unique city with citizens that will welcome you like family.

So please, come on in, and don't mind the mess.

The Olympic Torch Flies First Class

During the ancient Olympic Games, there used to be a flame that remained lit while the competitions took place. Before the event, it was taken from city to city, letting everyone know the games were about to start. This ritual is held until today, and is much more complicated than you might imagine.

A few months before a new edition of the Olympic Games starts, the ‘lighting ceremony’ occurs in Olympia, Greece, at the temple of Hera. There, a parabolic mirror is used to light a flame directly from the sun's rays, and with that flame the first Olympic torch is lit. It has two types of gas at the bottom, butane and propane, which make the flame bright yellow and visible during the day. Then, from torch to torch, the flame travels through several Greek cities. This year, it was taken from Athens to Switzerland, where it was displayed at the Olympic Museum, visited the United Nations Office in Geneva for the first time and, from there, boarded a plane to Brazil.

Once lit, the flame will only go out at the closing ceremony of the Games, this year at the Maracanã stadium in Rio de Janeiro. But wait, is it still burning even on the plane? Yes. The flame is kept lit through the flights in safety lanterns that are are cushioned on a seat, occupying the place of a passenger. But what if it goes out when someone is running with the torch? First, the torch is designed so that the flame never goes out, and undergoes several tests beforehand. Second, two runners carrying extra lanterns accompany the torchbearer, so in case the flame happens to go out, they will light it again using the original fire. But if you are still thinking "what if both the torch and the safety flame go out?". Well, fear not: there are actually six safety lanterns, just in case [1].

The torch relay in Brazil started on May 3rd in the capital, Brasília, and will end on August 5th in Rio, at the opening ceremony of the 2016 Games. The torch is going through over 300 Brazilian cities, carried by over 12,000 people. You can even follow the torch online to see where it currently is. But if that's a bit too much, you can at least be assured that the flame is being taken care of!


Mariana Cerdeira
PhD Student, AG Harms
Sports That Didn't Make It To the Olympics (This Year)

Does the thought of another soccer match on TV make you groan? Sick and tired of hearing about football players’ salaries, or who’s been kicked out of the hockey playoffs? Then boy, do we have the article for you! Here we present, without further comment, a selection of some of the weird and wonderful sports that people practice around the world...

**Buzkashi**
This sport, also known as ‘kupkari’ is a beloved traditional activity in Central Asia (think the ‘-stans’). Though there is a great deal of regional variation, the basic idea is that two opposing teams, mounted on horseback, compete to collect a prize and bring it to their end of the field. The prize happens to be a dead calf or goat, which you typically cram under one leg to keep your hands free. This sport evolved from battle tactics and involves strategy, speed, and a whole lot of guts. For example, under some rules, you are freely allowed to whip both your horse and players from the other team. Serious business indeed. Plus, it’s the national sport of Afghanistan!

**Caber Tossing**
This sport is an important component of traditional Highland Games, held yearly in Scotland and other countries. To win, the participant must pick up and throw a 6 meter long log (the caber), typically weighing about 80 kilograms [2]. The distance thrown is unimportant, but in order to score well, the caber must flip in midair, and land as vertically as possible. The origins of this sport are rather mysterious. Other related sports from the Highland Games, such as Stone Put (similar to Shot Put), have found a home at the Olympic Games, but Caber Tossing has yet to join. Maybe in another 4 years!

**Ferret-Legging**
Unfortunately (?), this one is for men only. The object of the English sport of ferret-legging is to put a ferret down under your pants – without underwear – and then see how long you can last without releasing it. Despite ferrets’ razor-sharp teeth and general excitability, the current world record is 5 hours and thirty minutes (side note: this was done for a fundraiser, which collected 1000 pounds, which seems pretty grim for the amount of bodies of water, it’s a heady combination. Suffice to say, the YouTube videos are worth a watch.

**Cheese Rolling**
Once a year, the sleepy town of Cooper’s Hill, UK, comes alive with international athletes, striving to be faster than a wheel of cheese. The format is simple: a 9-lb (4 kg) wheel of double Gloucester cheese is released from the top of a hill, and about 1 second later, dozens of people scramble after it. The first person to catch the wheel gets to keep it (along with the bragging rights). It sounds easy enough, but consider that the cheese can reach top speeds of 112 km/h and the hill is steep and uneven, the race can be a recipe for disaster. In fact, due to growing safety concerns, the real cheese was replaced by a foam version in 2013 [5].

**Wife Carrying**
For something a little closer to home, consider Fierljeppen, which is practiced in northern Frisian, regions of the Netherlands and Germany. Here, competitors perform a type of pole vaulting using a special 6-13 meter pole with a flattened end. Step one, stick the pole flat-side down in a body of water. Step two, run towards the pole and jump onto it. Step three, climb to the top of the pole. Step four, use your body weight to tip the pole away from the body of water and jump off of it again. Between the sickeningly wobbly poles and uninviting water, it’s a heady combination. Suffice to say, the YouTube videos are worth a watch.

**Jugger**
This sport is unique in this article for several reasons. First, it was actually inspired by a movie (‘The Revenge of the Jugger’, released 1989). Second, it is the only one with a thriving league in Berlin. Jugger consists of two teams, each of which compete to gain control of a ‘skull’, and bring it to the other end of the field. However, this is easier said than done, as all but one player are armed with an arsenal of foam-covered weapons. Getting hit with someone’s staff (or sword, or chain, etc.) causes a sort of time-out, and the more players are immobilized, the more difficult it is to move the skull around and score points.

Constance Holman
PhD Student, AG Schmitz

Sailing to Rio!
Interview with Nathalie Brugger

Nathalie Brugger is one of the most experienced and successful woman sailors in Switzerland. She started sailing aged 8 on an Optimist in Estavayer-le-Lac (Switzerland) and since then has participated in more than 20 European and World Sailing Championships. In 2008, she obtained an Olympic diploma in Beijing (6th place) and placed 14th in London (2012) in the Laser Radial class. Since 2012, Nathalie is training to compete at the Rio Olympic Games on the new Nacra 17 catamaran class, with her teammate Matías Bühler. The design of the Nacra 17 allows it to reach high speeds and it is sailed by mixed crew only.

VB: Hi Nathalie, congratulations on winning your qualification to the Olympic Games in Rio! How long ago did you start seriously training for this qualification?
NB: There is always so much more going on behind the scenes than anybody can ever imagine. Sailing is a sport built on experience, and so we have been training extremely hard since launching our project in 2012. Our goal for Rio in August 2016 is an Olympic Medal, and with this being my third Olympic campaign, everything that I have learnt from the past is now proving useful.

VB: There are now about 100 days to go before the opening of the Olympics this July in Rio. How will you train until then? What will you focus on?
NB: We will maximise our opportunities to sail as much as possible in the Bay of Rio, to get familiar with the wind, the local effects, and the current. I guess it is now the last sprint of the marathon that began four years ago! So we will give everything we can to be ready on time.

VB: Both physical and mental strengths are important when you compete as a professional athlete. How do you specifically train those aspects?
NB: Physically, I have had to train a lot in the gym, as the loads in the new boat are very high, and obviously quite different to those when I competed in Laser Radial. Endurance training is also very important as you work between 120 and 180 bpm throughout most races. The boat is always moving, especially in wavy conditions, so it is also important to have good stability and a perfect core. Mentally, elite level sports always present many challenges, so we also work alongside a mental coach, and enjoy incorporating yoga sessions.

VB: At the two previous Olympics in Beijing and London, you competed as a solo sailor and on a different type of boat (Laser Radial). What made you decide to switch to another category (Nacra17 class) where you are now competing in a duo mixed crew?
NB: I needed a change. My old boat was a one-design boat, speed-wise slow, but tactically very intense. I was looking for a new challenge and wanted to learn different things. The Nacra17 is very physically demanding, superfast, quite spectacular and also proving very technical. Sailing in a mixed category has made me learn more about myself, as well as a lot about men and how they communicate, how they think,
and how they respond to different situations, sometimes this can be very different than women.

**VB: How is sailing in a team different from sailing solo?**

**NB:** When you are solo you can be your own boss, and basically manage your campaign – what you do, and when you do it, however you want. In a team, it is a balance. Although you have the same goals within an Olympic campaign, you will often need to make some compromises, being patient and more open-minded towards the others in the team. Scheduling plans can become harder, both within the team environment and private life. You will however, have a greater platform for new ideas, and certainly learn new things along the way.

**VB: How do you deal with any conflict issues that might arise between you and your partner Matias? Who is the boss on the boat?**

**NB:** The skipper will always be the boss as he has the tiller in the hand and he decides where to go. But on board we have very well defined tasks of who decides what and when, and this helps to avoid any conflict on the water. On shore, both of us have different ways of doing things, and we have had to learn to accept it as you do in any relationship, otherwise we would be fighting over non-significant details.

**VB: What are your objectives regarding the ranking and which teams are your most serious competitors?**

**NB:** This year has begun quite well with a podium finish at the Miami World Cup in January, a win at the North American mid-winters, and a top 10 at the Clearwater Worlds in February. Unfortunately since then, my skipper Matias hurt his hand and we have been forced to adjust our plans. So far we have been mostly sailing within the top 5 teams, and will do our best to fight for a Medal in Rio! Our main competitors are the French, Australians and Italians.

**VB: What are the water and wind conditions in Rio?**

**NB:** What makes this Olympics very special for sailing is that we will race on five different racing areas, all which are very unique. We have two race courses outside the bay of Guanabara, where the waves can be really big. Inside the bay though, we can have flat water with strong currents and many local effects of the wind; particularly with the very high mountains surrounding the bay. With a nice sea breeze day, we can have 15-20 knots of wind on a racecourse while we may only get 5 knots outside the bay. So we need to be very adaptable.

The pollution of the water is a real problem. For our type of boat, which goes fast and has long dagger boards in the water, it can be dangerous, and we can easily capsize if we hit a piece of wood or garbage floating in the water. It is scary to imagine that one could lose their Olympic Gold because of a plastic bag. It would be a waste of four years of hard work. The poor water quality is a serious issue. The water is brown, and we know that the waste of millions of people is flowing straight into the Bay… but what can we do?

**VB: What are your plans after the Olympics?**

**NB:** I'm still not sure about my future plans, but I would like to combine my 12 years of experience in elite level sport with my master's degree in sports to work with young athletes to help develop their future opportunities.

---

**Awards for Young Scientists**

**DGPPN-Promotionspreis - Hans-Heimann Preis**

Your outstanding PhD thesis in psychiatry or psychotherapy can be awarded with the DGPPN-Promotionspreis - Hans-Heimann Preis. The PhD thesis has to have been finished within the last two years with magna or summa cum laude. Application is done together with your supervisor.

The total of €8,000 is split into €5,000 for you and €3,000 for your supervisor.

Deadline for application: June 30, 2016.

Further information: http://bit.ly/1U6YG90

**The Humboldt Prize of Humboldt-Universität zu Berlin**

You can apply again for the Humboldt Prize, which is awarded for the best thesis completed as part of the following degree programs:

- Bachelor's Degree - €750
- Master's Degree, Magister, Diploma, State Exams - €1,500
- Doctoral Degree - €3,000

The work must have been completed after the application deadline of the previous year (July 1, 2015) and must have been graded with a summa cum laude, sehr gut (1.5) or an "A".

Deadline for application: July 1, 2016.

Further information: http://bit.ly/1TP2wlk

**The Science & SciLifeLab Prize for Young Scientists**

The Science and SciLife Lab Prize awards $30,000 as the grand prize and $10,000 for each category winner (Cell and Molecular Biology, Genomics and Proteomics, Ecology and Environment, Translational Medicine). The prize is awarded annually to one young scientist for outstanding life science research for which he/she was awarded a doctoral degree in the previous two years.

Deadline for application: August 1, 2016.

Further information: http://bit.ly/1RAh73w

Thank you very much for this interview and we do hope you win that Olympic medal!

Valérie Boujon
PhD Student, AG Endres
What Is Messing With Our Magic?
A Look Into the Home-Field Advantage

Probably every enthusiastic fan has witnessed at least once during their lengthy and loyal supporter career a phenomenon where their team – which normally performs perfectly fine at home – suddenly loses all its magic when playing in a foreign environment. There is a plethora of factors that can influence an athlete’s performance during a game: the athlete’s skills and talent, their conditions right before and during the game, and external circumstances, such as the venue, climate and how much the athlete is used to these circumstances. The audience and their behavior towards the athlete are external and psychological factors that potentially affect the athlete’s performance to a great extent. All these factors contribute to what is termed as the home-field advantage.

The Home-Field Advantage
The home-field advantage is the benefit of the home team gained over the visitors, such as the venue, climate and the home team’s familiarity with the place and home court, living and training habits are not interrupted and, at best, the cheering audience pushes the team towards success. You might get the point that researchers assign a variety of things to having the power to influence an athlete’s performance.

Referees, Audiences and Hormones
The economist Moskowitz and sports-writer Wertheim described in their book that soccer benefits from the greatest home-field advantage around the world [2]. They believe that the factors mentioned above are not enough to create a big difference in the game’s outcome. Instead, they concluded that the referees treat home teams somewhat preferentially [3].

A publication by Dohmen states that the crowd can transfer its emotions to the referees, especially when the crowd sits closely to the field, which applies to soccer [4]. Or as Dohmen puts it: “The social atmosphere in the stadium leads referees into favoritism, although being impartial is optimal for them to maximize their re-appointment probability. So it looks like crowd support does matter – but not in the way you might have thought. Keep this in mind next time you’re shouting your brains out at a football game. Just make sure you know who you’re supposed to be shouting at.”

Other well-discussed reasons also add to the home-field advantage. A study from two neuroscientists found that salivary testosterone levels in British professional soccer players were significantly higher before a home game compared to an away game [5]. So, for whatever reason, performing in front of a friendly crowd tends to kick home team players’ hormonal systems into high gear.

But let’s stick to the idea of the audience’s power to influence a game’s outcome. Does this also apply to sports other than soccer?

Cheering or Jeering?
Epting and colleagues examined the effect of differential crowd behavior, which were cheers, jeers and silence on individual golfer, baseball, and basketball players’ performance [6]. The outcome differed depending on the sport. Golfers performed best during silence, baseball players’ performance deteriorated in response to an unsupportive crowd and basketball players were not influenced during their free throw performance in any of these conditions. Interestingly, there was no enhancing effect of a supportive and cheering audience. The authors tried to explain these discrepancies with various arguments, ranging from fairly small sample sizes, the lack of a ‘no audience’ condition, deviating complexities of the observed skills and, above all, the fact that athletes were not playing in a real game. This way, the motivation of athletes, who desperately want to win the match, was basically non-existent. In my opinion, this motivation essentially drives the athlete’s performance.

Taken together, it is probable that a combination of the mentioned factors influences a game’s outcome, which is why researchers are not able to narrow them down to just one or a few. However, no matter whether the audience can have a significant effect on the athlete’s performance or not, don’t stop cheering, or jeering either, because it provides you with tons of fun and the possibility to come out of your shell in a kind of rowdy manner. But remember: the opponent side is not your enemy, it’s just a game!


Anahita Poshtiban
PhD Student, AG Plested
But Mom, You're Too Old to Learn Wristlocks!
How Age Affects the Ability to Acquire Sports Skills

"No, mister, you have to grab his wrist from below, see?" At eight years of age, the sensei’s daughter was doing two things at once: showing a new student – an elderly man – how to pin another w down on the training hall floor, and giving me, also new, serious doubts about my chances of learning Aikido as an adult. Aikido is a complex martial art that involves numerous ways of approaching your training partner, wristlocks to immobilize them, and throws to deflect their attacks. For a newcomer, it looks like a combination of karate and tango that could only be mastered by starting at an early age.

Worries about being too old to learn a new sport often prevent adults from experimenting with sports types [1]. This fear hinders them from discovering ways of exercising that they actually enjoy. In turn, not making these discoveries decreases their overall engagement in sports, because having fun during exercise is the key to being physically active on a regular basis [2]. However, the anxiety associated with acquiring sport skills as an adult is mostly unfounded.

Similar Learning Pathways
Regardless of the type of physical skill, the learning process is thought to be structured similarly at any age. The first stage requires considerable cognitive activity in order to understand the movements, which are then repeated consciously and therefore inefficiently and awkwardly. Additionally, explicit memory is engaged for learning the rules of the sport. After learning the basics, the different movement types are gradually committed to procedural memory. Being associated better with one another, the movements become more fluid and require less conscious control. In the final stage, the motor control becomes autonomous, making refinement easier and allowing the athlete to focus on other aspects of the sport [3].

While the acquisition process in children and adults differs in certain aspects, it evens out at the level of net acquisition speed. Children, for instance, need to learn how to handle frustration when certain sequences of movement do not work out – adults tend to have a higher tolerance for failure. However, neuronal plasticity in adults is diminished and they are generally worse at tuning out visual distractions [4]. In turn, adults are aided by their experience with different kinds of movements and teams.

ADULTS NEED NOT BE INTIMIDATED BY YOUNG TRAINING PARTNERS

Tougher for Some than Others
Still, learning a new sport may be more difficult in some life phases. For instance, the adolescent growth spurt makes this age group more prone to frustration because of the drop in coordination and balance that they experience [6]. It also increases the risk of injury due to the lowered resilience of the growing joints [7]. Seniors are another group that is more prone to injury if the exercise is not introduced gradually in their lifestyle [8].

The most important factors that determine the ability to acquire sports skills are an individual’s capacities and preferences. For instance, it is not recommended for children suffering from attention deficit/hyperactivity disorder (ADHD) to engage in contact team sports like American football. Instead, they often excel at individual sports, like martial arts, because here they learn how to stay focused by competing solely against themselves [9].

Different Rewards
It is, of course, not just children who benefit from learning a new sport. If the learning process is adapted to the particular abilities of a person, the benefits are clear for all age groups. While children reap many benefits in terms of social skills [10], adults profit more clearly on the cognitive level. Adult mice that learned how to run on a new type of wheel with unevenly spaced rods had better myelination of their motor neurons [11] and an larger hippocampus [12], which were associated with better performance on cognitive tests [13]. In addition, a new physical activity increases levels of the neurotrophin brain-derived neurotrophic factor (BDNF) [14], which is known to enhance neuron survival.

With clear evidence that regular exercise improves our cognitive function and reduces our risk of developing dementia [15], there’s no reason why age should hold any of us back – go and start a practicing a sport that sounds fun. You might get your first Aikido belt faster than you can say “I’m too old for this!”

Dream a Little Dream To Win: Lucid Dreaming and Physical Training

Have you ever dreamt you were about to win a race or other sport competition, and then got a bit disappointed upon waking? What if we could hold onto such good dreams? Or even better: what if our dreams could actually make us win?!

Dreaming is an unconscious process which we experience during certain stages of sleep, mainly in the rapid eye movement, or REM, phase. Usually dreams are a sequence of images and ideas one cannot really control. However, there is a condition called lucid dreaming or lucidity, in which people become consciously aware of being asleep and dreaming [1]. About half of us experience this at least once in our lives [2]. During lucid dreaming, one can even influence the dream’s content and course of events. Lucid dreaming is not simply dreaming of being aware of yourself dreaming, as EEG/fMRI studies could show a distinctive brain activity pattern which clearly differs from typical REM sleep [1]. Spontaneous lucidity is relatively rare, but people can train and follow different strategies to “learn” and increase lucid dream frequency [1,3].

So, what would you do if you could control your dreaming? Go to Mars? Deep sea diving? Fly? What about a nice training session? Researchers have found that during lucid dreaming, one cannot only control dream events, but also actually improves motor task performance! In one recent experiment, people asked to perform a finger-tapping sequence task before and after a lucid dream training session. These participants significantly improved coordination and accuracy compared to controls, and could perform on a similar level to subjects who actually did a physical training session [4]. Apparently many athletes may already be applying this strategy. One study found that they have an increased percentage of lucid to normal dreams compared to the average population [5].

Thus, if you want to maximize the benefits of physical training you could add some sleep to your schedule. However, whether lucid dreaming of running alone in a marathon would actually increase your fitness remains... questionable. Maybe you should at least try wearing your running shoes when sleeping.

[1] Voss et al., SLEEP 2009

Bettina Schmerl
PhD Student, AG Shoichet

“Good Coach, Bad Coach”
Face-Off For Two Coaching Styles

Imagine you are an athlete in the most important game of the season. Your performance in the next seconds will be decisive for your team. To whom would you rather turn in this moment for support and strength: a friendly, smiling coach, saying “you can do it” or an angry coach, threatening you saying you should not mess this up?

The self-determination theory (SDT) discriminates between two coaching styles: ‘controlling’ and ‘autonomy supportive’ [1]. The controlling coach is fierce in the field, authoritarian and restrictive. The autonomy supportive coach, on the other hand, is friendly, provides information and gives the athlete the opportunity to decide [2,3].

But how does the way of coaching influence one’s performance? It seems that motivation is the key element that makes us perform best [4]. Consequently, the better coach is the one who motivates us the most. Indeed, studies show that athletes benefitting from an autonomy supportive training achieve a better performance due to a higher intrinsic motivation and well-being [2,5].

And how do you develop motivation? According to the SDT, every individual – in sports as well as in other life activities – seeks to fulfill three psychological needs: autonomy, competence and relatedness. Fulfilling these needs is what creates the motivation to make us pursue a goal [1]. Thus, to enhance motivation and performance, a good coach would guide us to mastery, while still letting us feel free in our decisions and promoting team-building. While a controlling coach might be beneficial for professional athletes by mediating competence, the autonomy-supportive coach is overall better at promoting positive outcomes [6].

In the end, you will perform best if you see your achievements while still enjoying what you are doing and feeling related to it – so turn to the friendly coach. This also implies that if you coach in a way that supports autonomy, your protégés will perform better!


Pina Knauff
PhD Student, AG Wulczyn
How Do Sports Affect Our Mind?

Sports are well-known to be good for our physical health. Many studies have confirmed the effectiveness of regular physical activity in the primary and secondary prevention of several diseases like cardiovascular disease, diabetes, cancer, hypertension, obesity, osteoporosis and premature death. Exercising appears to have a direct relationship with many aspects of our health status, i.e., exercising more leads to further improvement in physical well-being [1]. The next question is: what is the effect of sports on our mind?

Physical activity helps our brain in many ways. It decreases anxiety and depression, protects from loss of cognitive function in people with a risk of Alzheimer’s and conserves cognitive brain functions across one’s lifespan. Likewise, it helps healthy people by improving sleep, reducing the risk of Alzheimer’s and other neurodegenerative diseases [2,3,4,5].

Exercise Improves Mood Instantly

Our mood also benefits from physical activity. Regular exercise was verified to improve mental well-being in the general population. It increases our quality of life by enhancing self-esteem, improving mood and reducing stress [2]. Not only do sports help us in the long run, but they were shown to improve our mood almost instantaneously. Most likely, if you do 20 sit-ups right now, you will feel happier immediately (once you catch your breath) [6].

So the next time you go for a run, know that you are not only taking care of your body but also of your brain!


On the Psychology of Running a Marathon

Running has become the most popular sport, elating everyone from those in their early twenties to people in their sixties. Many regard finishing a traditional marathon of 42.195 km as the climax of months of long and hard training. But what is it that distinguishes marathoners from other recreational runners, besides the act of actually registering for the race?

According to the Motivations of Marathoners Scales (MOMS) there are four main factors motivating people to run a marathon: first of all, psychological motives to enhance self-esteem and bring a new meaning to life. Further, people train for or run a marathon to socialize with other runners – they want to gain approval from friends and acquaintances. There are also some reasons related to general health and competitiveness [1]. In these aspects, some variation, for example between men and women or different age groups, exists. Younger marathoners more frequently report running to gain a sense of personal accomplishment while older runners tend to emphasize that they do it for their health.

Psychologist Dr. Glenn Geher, a marathon runner himself, describes typical marathon participants as very task-oriented people as opposed to time- or relationship-oriented people. This eventually enables them to achieve their set goals. He reports an enormous level of camaraderie among marathon runners and states that runners show admirable degrees of dedication, self-sacrifice and time-management, attributes that are readily apparent to both the runner and his or her social circle [2].

Nonetheless, people who run marathons can be faced with many difficulties – the stress of training, pre-run nervousness, and the anxiety that comes with knowing that not everyone who starts a marathon actually finishes [3]. Many runners report “hitting the wall”, a phenomenon that can cause you to drop out of the race. This state does not only arise from depleted glycogen reserve [4] but is also a mentally challenging situation where runners experience pain, fatigue and despair [5]. Luckily, just like the body, the brain can also be trained – in fact, enhancing mental skills is a crucial part of the training of successful marathon runners [5].

Sport for Free or Cheap in Berlin: a Primer

Looking to get fit, meet new people, or just mix up your daily routine? Yet, you have a a typical researcher’s salary? Look no further! Here we’ve compiled a rough guide to the many affordable sporting opportunities in Berlin...

**Hochschulsport**
The largest, most affordable, and certainly most varied source of sporting opportunities comes from Hochschulsport, a loosely organized body providing many classes run out of universities. And saying ‘varied’ is no exaggeration: there are the usual suspects, like yoga, basketball, or aerobics, but also the more exotic Japanese Stick Fighting or Hula Dancing. What’s more, many schools offer 1-2 day excursions, for example, to go sailing or hiking. Depending on the sport, classes run from about 20-100 euros per semester, slightly more for non-students. Each university runs their own Hochschulsport webpage, so finding a course that you want in an area that you can manage can be a challenge, but usually pays off...

- **TU:** [http://bit.ly/1SoZOdx](http://bit.ly/1SoZOdx)
- **HTW:** [http://bit.ly/1SoZtr2](http://bit.ly/1SoZtr2)

**University Gyms**
If team activities aren’t your first choice, and you prefer to get down to the basics, all major universities in Berlin have gyms that can be used by students and others at relatively low prices. The HU, for example, operates a small gym close to the Mensa, as well as one in Adlershof. The FU’s gym (’KRAFTKLUB’) is less central, operating in the University center in Lankwitz. The TU’s gym, on the other hand, is located on the border between Moabit and Charlottenburg. All three gyms have membership for students between 15-30 euros/month, although the TU also requires an additional ‘Introduction Course’ (presumably to prevent lifting-related mishaps), which costs about 13 euros.

- **HU:** [http://bit.ly/1DmmU5g](http://bit.ly/1DmmU5g)
- **TU:** [http://bit.ly/1r94pmC](http://bit.ly/1r94pmC)

**Water Sports**
What about sports for those who choose to leave dry land completely? If you want to get back to nature, Berlin has an incredible number of lakes, many with beaches and associated infrastructure (changing rooms, showers, etc.). Most are free, although some (i.e. the beaches at Wannsee) do charge an entry fee. And the best-known ones tend to get crowded on hot summer days. However, there are dozens to choose from, so there’s likely to be something for everybody!

**Lakes of Berlin:** [http://bit.ly/20PsSt1](http://bit.ly/20PsSt1)

However, if it’s cold or you just want to do some serious laps, the city of Berlin also maintains a large network of public pools, both indoor and outdoor. Prices have gone up recently (a normal ticket costs about 6 euros), but there are ways to reduce the price, particularly by swimming at non-peak hours (10:00-15:00), buying tickets in bulk, or buying 45-minute passes. Hochschulsport also offers various water sports, so be sure to check the links above for other opportunities.


**Free Sports**
Of course, if you’re looking for a free way to get a good workout, Berlin hosts a hodgepodge of free sporting activities almost every day of the week. The website Gratis in Berlin hosts a listing of user-posted ideas, ranging from relaxation exercises to the enticing ‘Knight Training’. In addition, many studios or fitness courses offer a first session for free (aka ‘Schnuppertraining’), allowing you to shop around for the best option. Ditto for big-name fitness studio chains, although many have tricky contract clauses that can keep you coming back... whether you want to or not.


So whatever type of sport or activity you’re looking for, it’s likely that you can find it in Berlin at an affordable price. Have we missed anything? Has anyone ever undertaken some of the more peculiar options mentioned here and want to tell us about it (looking at you, knights)?? Be sure to let us know at [cns-newsletter@charite.de](mailto:cns-newsletter@charite.de).

Constance Holman
PhD Student, AG Schmitz

---

2016 International Graduate Program Medical Neurosciences
Animal Research – Necessity or Superfluity?

A laboratory full of abnormally behaving monkeys kept in small cages, metal cylinders drilled into their skulls, their heads bloodstained. What sounds like a sick horror movie is – unfortunately – bitter reality. Video footage and insider reports (e.g. [1]) demonstrate that such scenes are commonplace in animal research laboratories, involving not only monkeys but also many other species like rats, mice, cats, pigeons, and every other animal that researchers can get a hold of.

After a short life of agony in disproportionately meager enclosures the animals are usually killed when the experiment is over. This fact ignites acrimonious debates time and again. While opponents of animal research refer to its atrocity, the proponents emphasize its benefits and necessity. Of course, findings from experiments in animals have laid the foundation for important advances, especially for combating diseases in humans. But this alone does not provide a carte blanche for any experiment to be conducted in animals. It should be realized that, in principle, animal research takes place in an ethical borderland. This makes it especially important to carefully weigh its costs and benefits – for every single study anew.

The mere fact that a researcher is interested in studying a particular question, which – thanks to ethical regulations – cannot be performed in humans, can by no means be seriously adduced as a sufficient reason to use animals. Rather, for such experiments it has to be unequivocally made clear beforehand that the degree of the expected benefits of the study are so substantial that it would in turn be unethical to not carry them out.

In other words, research in animals should only act as the ultimate ratio and not something that is routinely performed!

Even the overstrained argument that animal research provides a vital contribution to the treatment of diseases should not function as an automatic door opener, since animal models often show only little correspondence to physiological responses in humans [2]. In any case, the unconditional acceptance of animal research possibly requires a high level of doublethink. Or would anyone in a clear state of mind sacrifice their own pet for research purposes?


Time for a Scientific (Ex)change

Becoming a researcher requires being up-to-date with recent advances in your field and with new methods that could be of value for your project. We all know very well that implementing a new method in the lab from a published protocol or even the methods section of a paper is time-consuming and frustrating, because small (sometimes essential) details are often missing. One simple solution is to visit the group that developed the method and learn directly from the experts.

Recently, I had the opportunity to take part in a so-called “Short Term Scientific Mission” (funded by the European Cooperation in Science and Technology/COST). I traveled to the Netherlands to work with one of our collaborators and from my experience there, I can tell you that one’s PhD project really benefits from such an exchange. In this article I would like to highlight why.

Leaving your lab for a certain time offers the opportunity to back away from your lab routine – it clears your mind. In addition, when your host lab is from a different scientific discipline (e.g. chemistry) you have the chance to get input from a very new perspective. This also means that you get to meet new scientists, the names of whom you’ve seen many times on papers. During the exchange you will focus only on one specific question. No procrastination. No excuses. Besides promoting your project, you can also train your soft skills.

Raising a grant to finance the exchange helps improve your scientific writing skills and your ability to convince people about your fascinating research. Of course, it can also further your career, mentioning it in your CV and/or Linkedin. Finally, you will very likely make friends and lay the foundation for future collaborations. In conclusion, I would like to encourage every PhD student or postdoc to think about doing a scientific exchange. So don’t waste your time – go ahead and exploit your options!

Eileen Schormann
PhD Student, AG Krüger

Source: “Piled Higher and Deeper” by Jorge Cham, www.phdcomics.com
Erratum

We apologize for the error in the article, “How Your Brain Wakes You Up” in the March issue of the newsletter (Volume 9 Issue 01, p. 20). The Herrera et al. Nature Neuroscience paper is the result of a collaboration between Antoine Adamantidi’s group (“The Swiss team”) and the PhD student Marta Carus-Cadavieco from the research group “Behavioural Neurodynamics” of Tatiana Korotkova and Alexey Ponomarenko at the FMP in Berlin.

Born to Run

Baylor College of Medicine researchers have discovered that maternal voluntary exercise during pregnancy leads to increased voluntary physical activity in the offspring.

The study, performed with healthy pregnant mice, is consistent with human studies showing that women who are physically active during pregnancy have children who tend to be more physically active. In humans, this could be attributed to the mothers’ influence or genetic predispositions. The study used mice that were genetically identical and divided them into two groups being either allowed or denied access to running wheels before and during pregnancy. The “runners” ran an average of 10 kilometres a night, declining to 3 kilometres as pregnancy progressed. Their progeny was about 50 percent more physically active than those born to mothers who did not exercise. Importantly, their increased activity persisted into later adulthood. In a following experiment, the offspring of the exercising mothers lost fat more easily during a voluntary exercise program.

If a similar effect can be confirmed in humans, it could represent an effective strategy to counteract the current worldwide epidemic of physical inactivity and obesity. Waterland, leading author of this study said, “If expectant mothers know that exercise is not only good for them but also may offer lifelong benefits for their babies, I think they will be more motivated to get moving.”

The quote from Waterland is from: http://bit.ly/1Ratnqf

Eclarinal and Zhu et al, FASEB J, 2016

Human ‘Mini-Brains’ to Revolutionize Drug Testing

Researchers at the Johns Hopkins Bloomberg School of Public Health have developed “mini-brains” - brain-like structures grown from human-derived cells and used to advance drug testing.

Induced pluripotent stem cells (iPSCs) from skin cells of healthy adults are stimulated to grow into four types of neurons as well as astrocytes and oligodendrocytes. After ten weeks the 350 micrometer diameter structures exhibit myelinated axons and show spontaneous electrophysiological activity.

The use of these mini-brains could change how new drugs are tested for effectiveness and safety, replacing animal experiments. They are probably even superior to studying mice and rats. As study leader Thomas Hartung put it: “While rodent models have been useful, we are not 150-pound rats. And even though we are not balls of cells either, you can often get much better information from these balls of cells than from rodents.” In the future, cells from people with certain genetic traits or diseases could be used to create mini-brains for the study of pharmaceuticals.

This is not the first microscopic brain model, but it is the best in serial production. Hartung is applying for a patent for the mini-brains and is also developing a commercial entity called ORGANOME to produce them.

The quotes from Hartung are from an interview with the BBC in 2015: http://bbc.in/1W4130C


The World’s Best MRI Scanner

The Cardiff University Brain Research Imaging Centre (CUBRIC) is set to become one of the top facilities for brain imaging when it opens its doors this March.

The new CUBRIC features four of the best magnetic resonance (MR) scanners for humans including a MAGNETOM® 7T, a MAGNETOM Connectom 3T Scanner with 300mT/m Gradients and two MAGNETOM Prisma systems produced by Siemens. The Connectom scanner will be the second in the world, featuring 300 mT/m gradient coils which are typically 6 times stronger than those found in conventional MR systems. This will allow researchers to study the connectivity map of the human brain in much finer detail.

“We will be able to look in exquisite detail at the information we get from brain cells and can start to look at how these affect how brain connections vary and how people perform in different tasks,” Prof Derek Jones, CUBRIC director, said. “It’s the most exciting and important development in neuro-imaging in the last 10 years,” he added. The £44M project is funded by the Wellcome trust, MRC, EPRSC, Wolfson foundation, the Welsh government and a European fund.

The quotes from Jones are from an interview with the BBC in 2015: http://bbc.in/1W4130C


Human ‘Mini-Brains’ to Revolutionize Drug Testing

Researchers at the Johns Hopkins Bloomberg School of Public Health have developed “mini-brains” - brain-like structures grown from human-derived cells and used to advance drug testing.

Induced pluripotent stem cells (iPSCs) from skin cells of healthy adults are stimulated to grow into four types of neurons as well as astrocytes and oligodendrocytes. After ten weeks the 350 micrometer diameter structures exhibit myelinated axons and show spontaneous electrophysiological activity.

The use of these mini-brains could change how new drugs are tested for effectiveness and safety, replacing animal experiments. They are probably even superior to studying mice and rats. As study leader Thomas Hartung put it: “While rodent models have been useful, we are not 150-pound rats. And even though we are not balls of cells either, you can often get much better information from these balls of cells than from rodents.” In the future, cells from people with certain genetic traits or diseases could be used to create mini-brains for the study of pharmaceuticals.

This is not the first microscopic brain model, but it is the best in serial production. Hartung is applying for a patent for the mini-brains and is also developing a commercial entity called ORGANOME to produce them.

The quotes from Hartung are from an interview with the BBC in 2015: http://bbc.in/1W4130C

22 New Master’s Students to Join the Program
With another March behind us, we are happy to announce that we admitted the top 15 candidates. Like last year, only 4 students are from Germany. Out of more than 350 applications, we narrowed down to a shortlist of 40 candidates, then 15. We are already excited and look forward to the start of the semester in October. Additionally, 7 first-year and 2 second-year Neurasmus students will join our program.

8 New PhD Students Admitted
We warmly welcome 8 new PhD students to our program: Nikolaus Gräber (AG Tarabykin), Verena Haage (AG Kettenmann), Stephen Horan (AG Rosario), Niklas Meyer (AG Kettenmann), Silvia Oldani (AG Schmitz), Fotini Paraskevopoulou (AG Rosenmund), Anahita Poshtiban (AG Plested) and Ferehteh Zarebidaki (AG Rosenmund).

Updates on PhD Program
We warmly welcome Veronika Lang as a new member of our office team. She is replacing Julia during her leave of absence and is responsible for all PhD matters. The next PhD Day will be on May 27th 2016 and will focus on poster presentation skills. The MedNeuro PhD retreat will take place in 1-3 September 2016. Apart from an intense scientific program, there will also be a career development workshop and networking opportunities.

15th Anniversary of Medical Neurosciences
As you already know, the Medical Neurosciences program is now in its 15th year! The office will celebrate this milestone from 7-8 October 2016 with its current master’s and PhD students and also alumni. For more details, or to join the organizing committee, email us at office-medneuro@charite.de.

Neurasmus Students to Meet in Budapest
From July 10-14, Budapest will be the host city of this year’s Neurasmus annual meeting. Besides board meetings and a scientific program including presentations of master’s theses, our partners in Laval, Canada, have also organized social activities. Neurasmus alumni from the Neurasmus Alumni and Students Association (Neurasa) are preparing a career development workshop. This year, the meeting will also include the graduation ceremony of the fourth cohort of students. Congratulations and best wishes from Berlin! The 2015 Neurasmus students will leave Berlin for Amsterdam, Bordeaux or Coimbra. We wish them all the best for their second year.

Upcoming Events

**June**
- 1–3 European Worm Meeting (EWM) 2016 (http://www.wormmeeting-berlin.de)
- 1–3 10th German Meeting on Immune Regulation (http://bit.ly/1WWuS2g)
- 11 Long Night of Science (http://www.langenachtderwissenschaften.de)
- 12–15 Conference on Developments in Protein Interaction Analysis (DiPIA) (http://bit.ly/1TAL7MW)
- 13–17 7th Summer School for Myology: International Graduate Program for Muscle Sciences (http://www.myograd.de)

**August**

**September**
- 7–17 International Literature Festival
- 5–9 World Congress on Alcohol and Alcoholism (http://isbra-esbra-2016.org/)
- 12–15 German Conference on Bioinformatics 2016 (http://www.gcb2016.de/)
- 20 30. Treffpunkt Medizintechnik "Glanzlichter der Medizintechnik" (http://bit.ly/1TOU3kS)

**April 2017**
- 1–4 Berlin Brain Meeting (28th Symposium on Cerebral Blood Flow, Metabolism and Function and 13th Conference on Quantification of Brain Function with PET)
First steps in a new world of health, insurance and more. New people, a new language, a new culture and new tasks – in your first days and weeks in Germany you’ll be bombarded by a lot of new impressions.

We are the health insurance fund which is there to help you as you start your new life in Germany.

For questions about German health insurance get in touch with us on:

Lutz Matuschke
lutz.matuschke@tk.de
Tel. 030 - 400 44-86 60