Interview Paper

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Sports Science and Chronobiology: An International Perspective

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Dr. Jacopo Vitale is a promising young sports scientist with an interest in biological rhythms with a chronobiological approach. At the University of Milan in Italy, Dr. Vitale completed a Master's degree (MSc) in Sports Science for Health in 2012, followed by a Doctoral degree (PhD) in Sports Science in 2016. He is currently a post-doc researcher in the Laboratory of Biological Structures Mechanics at the Orthopedic Institute of Galeazzi in Milan since 2016. Outside of academia, he is a strength and conditioning coach for professional American football, soccer, and skiing teams, with expertise in sports performance and injury prevention strategies.

AK: Abdel Khater (Interviewer)

JV: Jacopo Vitale (Interviewee)

AK: What has sparked your interest in sports science initially before starting your studies at University of Milan?

JV: When I was in high school, I did not find fields in humanities or basic sciences that motivated me enough to pursue them in university. My only great passion was sports. Towards the end of high school, I wanted to learn more about sports science and muscle physiology. I still think that physical activity is the most powerful non-pharmacological intervention for many pathological conditions. Sport does not just mean competition and athletes, but also wellness and health. Also, I used to sleep a lot in school, which is why I became interested physical activity and sleep behavior. I am happy to study the relationship between the two variables.

AK: How have your studies in different countries like Norway contribute to your current knowledge about Sports Science?

JV: I went to Alta, Norway for my Erasmus exchange program in my last year of studies. Being close to North Cape, I started to study the chronotype effect on physical activity under the extreme conditions such as darkness and low temperatures. I was tutored by Professor Andi Weydahl, who is an expert in chronobiology. This was a great experience because Norway is different from Italy in many ways, such as the economic power of the two countries. I personally noticed this as I had easy access to many services and resources in Alta, Norway that made work much easier. On the other hand, at the University of Milan it was not as easy to find money and

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grants to fund my research. It was very enlightening to know how work is done in other places. For any student, traveling abroad is an experience that is necessary to understand many things, particularly before deciding on the kind of work one will commit to.

AK: Can you tell us more about what chronobiology is?

JV: Chronobiology is a science that studies the time structures of many physiological and biological variables. It studies the biological rhythms of plants, animals, and humans of course. There are three types of biological rhythms: 24-hour circadian rhythms, shorter ultradian rhythms, such as the 1.5-hour rhythms in our sleep cycle, and infradian rhythms lasting longer than 24 hours. With Professor Giuseppe Banfi, we observed that both cortisol and Vitamin D show significant circannual rhythms in athletes; the peak of bone health being in the summer and their lowest values during the winter. The science of chronobiology studies these rhythms and I think this is very relevant for people and athletes.

AK: Ongoing research of chronobiology and its effects must have many important implications in the real world. How do you predict this research, in particular your studies on chronobiology and sports performance may impact the real world in the future? Or in other words, what do you hope to see as a result of your research?

JV: That's a nice question, although not easy to answer. Chronobiology can impact many different research fields. I'm happy to say that I now work with top-level athletes that will compete at the 2020 Olympics in Tokyo. I hope that my work will help them find the best way to prepare for this long trip and adapt as fast as possible. We are now studying jetlag symptoms, how sleep changes when you arrive to a new place, and the differences between travelling eastwards or westwards. It is interesting because no one in Italy studied these applications of chronobiology in sports medicine. I hope they achieve the best results in Tokyo.

AK: Given that there are some advantages certain chronotypes have with respect to others, is one able to modify their chronotype to a certain extent or will the change still be minimal given there is a significant genetic component to it?

JV: The 2017 Nobel Prize in Medicine went to Michael W. Young, Michael Rosbash, and Jeffrey C. Hall for their discovery of the molecular mechanisms of our biological clock genes. Thus, the genetic component of chronotypes cannot be ignored, but we can shift the chronotype a little towards morningness or eveningness. The real question is "is someone a morning-type since birth or were they not a morning-type person at birth but engaging in certain behaviors forced them to adapt into this chronotype?" Some polymorphisms for sure are different between morning and evening types, but the behavior of the person is extremely important in the determination of these characteristics.

AK: How do professional sports teams today use this research to optimize their players' performance?

JV: In short, I would say it is something that is overlooked. However, they are starting now to shift the focus on these players' circadian preferences and chronotype effects on physical performance and sleep behavior. We still need more time before this becomes the standard though. When you talk to some top-level athletes' trainers, they do not really know much about the importance of chronotype, sleep, and their relationships to sports. However, the awareness is increasing.

AK: Of course, everyone is aware of the benefits exercise provides. Some of these are sleep quality, glycemia level, etc. which you have studied in breast can-

cer patients as well. Could you tell us more about how physical activity can be used to improve the recovery of cancer patients?

JV: I am not really an expert in explaining the biological mechanism of physical exercise in cancer. We conducted an important study with breast cancer patients, where we proposed a 6-month program of physical activity with the aim of improving some physiological variables related to cancer recurrence. For example, we saw an improvement in sleep quality and sleep duration in this population. This is important as one of the key physiological mechanisms of sleep is inhibition of cortisol levels, and in general, sleep is essential for hormone expression and the more sleep, the better results. Physical activity can also have a positive impact on concentration, as well as the HOMA index. There is a lot of evidence in the literature proving that these concentrations are related to cancer development. This is why I mentioned that physical exercise is probably the most important non-pharmacological intervention. Physical exercise also improved their body composition through reducing fat mass, increasing muscle mass, and improving basal metabolism – all key variables in cancer.

AK: You have recently won the award in Italy for 'Young researcher of the year in Motor and Sport Sciences' for your scientific contribution to the field. I wanted to ask what are some challenges that you have faced on the way and how did you overcome them?

JV: It is important to say that for this award, I won because of my scientific production in terms of quantity in the previous 2 years, which is what the board evaluated. My goal however in the future is not just to improve my productions in terms of quantity, but also improving the quality of my research. I wanted to thank Professor Banfi for this prize because when I did my PhD in Sports Science at the University of Milan, there were many challenges that did not allow me to work at the Galeazzi Institute. I had to change my workplace completely, thus being a big obstacle in my career. I considered to stop pursuing research as it is not very easy to do so in Italy. However, Professor Banfi realized that it is important to have an expert in sports science and physical activity in an orthopedic institute like this one. This was not easy, because sports science experts in Italy cannot legally work in the hospital from a clinical point of view, in contrast to physiotherapists for example. I may actually be the first person with a sports science background working in a hospital, although in a non-clinical role. This made it more difficult as there was no mentor to guide me in this new position. We are now increasing in number, and hopefully my move will pave the path for other scientists in the future. While it is a great opportunity, there is great responsibility that comes with it.

AK: Any advice for other young aspiring scientists in the field?

JV: First of all, I would tell them that their passions should drive their motivations when it comes to decisions. For example, if someone wants to be a researcher, they must feel passionate about it because it is not an easy job. The other big thing to gain early success is to work, work and work. A young person needs to have a great passion and devotion towards their work.

AK: You're also a coach for American football, amongst other sports. Out of curiosity, how is the popularity of the sport changing in Italy?

JV: I was the head strength and conditioning coach for four years for the Rhinos Milano, the top team of American Football in Italy. Of course, it's not at the same level of the NFL or CFL, but it's interesting to note that in the 1980s, American Football had great

popularity in Italy, second only to soccer. In the 1990s, this interest in American Football disappeared because of problems related to doping and other issues. Now in the last 5 to 8 years, American Football activities and teams are on the rise again. Working with the Rhinos allowed me to work with an excellent American coach, Chris Holt, who worked with the Nevada Wolf Pack, part of NCAA in USA. Actually, playing in the top level of American football in Italy is unpaid, so it was interesting to learn from him how a professional approach can be applied in a non-professional team like the Rhinos, and thanks to him we improved our skills, mentality, and devotion to this sport. In 2016, we won the Italian championship which was also a great experience. In a comparative study we did, we looked American football players from the USA who were not drafted and compared them to Italian top-level players. The American players were still much better but this was expected anyway as there is a bit too much of an interest towards soccer in Italy and so potentially good American Football players may end up playing other sports like soccer instead. I have a double career, in the morning as a researcher and in the evening as a trainer for a basketball team and ski athletes competing at a national level. This is also important because I like to translate my knowledge and results from the lab to practice and vice versa.