

# Post Match Analysis

Dr Steve McNally, Head of Football Medicine & Science, Manchester United Football Club expands on how imaging research into human health complements the ongoing health and wellbeing work for football players.

Luke Shaw in action at Old Trafford Stadium

Why elite sports are looking forward to a bounce back of imaging surveillance & research work following Covid-19.







#### References

<sup>1</sup>Characterisation of LV myocardial exercise function by 2D strain deformation imaging in elite adolescent footballers' G.E. Pieles et al. *European Journal of Applied Physiology*, Oct 2020

**W**e have all had to live life with limitations to reduce the spread of coronavirus. The sporting world has not been immune to this. Some sporting activities were permitted during the various stages of UK restrictions as the benefits of physical activity on people's mental wellbeing were well recognised. However, the ability to exercise, partake in group games and even watch live sporting events together has had an on/off approach in tune with the challenges of lockdown regulations.

Professional football has not been without its own constraints. Government exemptions for professional athletes to return to training and compete in some domestic events with no 'spectators', allowed our first team players to return to training grounds in a 'relevant persons' bubble, but it was without the usual privileges and normal routines. The nature of our sports medicine work at the Manchester United Football Club Medical Imaging Centre using the very latest generation MRI, CT and ultrasound systems from Canon Medical also shifted from proactive health screening, surveillance and research to purely reactive work. This meant we could only use the systems to make clinical decisions on injuries or existing conditions.

This pause on important knowledge development and sports science research projects has created its own backlogs on proactive surveillance and created black holes in our health data collection on emerging young athletes. It is certainly not the same as delays to NHS cancer care due to covid-19 that may be life and death situations for people, but there will be impacts on the speed and amount of knowledge we can cascade to wider patient populations from our research collaborations with NHS clinicians and UK universities.

Our dedicated medical imaging systems at the Aon Training Complex in Old Trafford, provided by our official medical systems partner Canon Medical Systems UK, have been in place for over 8 years. It

gives us an on-site facility to undertake quick examination of all our players, from first teams to junior leagues, without the publicity that can accompany player transfers to nearby hospitals. The range of imaging usually includes examination of injuries sustained during games or training, procedures to pre-empt and prevent future injuries and adjust training schedules accordingly, plus mandatory and proactive health surveillance in the areas of cardiac and MSK.

#### **Cardiac profiling using Echo to avoid Sudden Cardiac Arrests & widen knowledge**

Our cardiac profiling work is a mandatory requirement every two years for anyone undertaking vigorous training and competitive matches. This is governed by FIFA and aims to identify anomalies that can lead to potentially fatal arrhythmias such as ventricular tachyarrhythmias and, in particular, ventricular fibrillation that can be the primary cause of Sudden Cardiac Arrests and Sudden Cardiac Death. Whilst relatively rare, the conditions are often asymptomatic and can be triggered by extreme physical exertion. We were grateful that assessments were undertaken as normal in July / August 2020 during a lift in Covid-19 lockdown restrictions and our cardiologists were able to do pre-season checks as normal. This involved our athletes undergoing a full structural and functional resting (baseline) ultrasound echocardiogram prior to exercise stress testing if indicated.

At the same time, we work with a number of luminaries to expand global knowledge of MSK and cardiology. Recently, a clinical study of 42 of our elite adolescent male football players from the Academy was undertaken by the National Institute for Health Research (NIHR) Biomedical Research Centre at the University Hospitals Bristol NHS Foundation Trust and the University of Bristol. The participants completed simultaneous cardiopulmonary exercise testing (CPET) and exercise echocardiography measurement of Left Ventricular



(LV) myocardial deformation by 2D strain imaging using a Canon Medical echocardiography ultrasound system. LV longitudinal and circumferential 2D strain and strain rates were analysed at each stage of incremental exercise and additional exercise of LV myocardial deformation and its relation to metabolic exercise parameters were evaluated at each exercise stage and in recovery.

The study showed that there is a specific response of longitudinal and circumferential myocardial performance to exercise stress; this provides knowledge that in the future might help differentiate between adaptive and maladaptive myocardial function in paediatric athletes and those with myocardial disease. It also provided the first initial reference data for 2D strain and strain rate values of the LV during exercise in the healthy adolescent elite athlete population. Gaining new science insights will help understanding of sporting cardiac matters and eventually cascade into mainstream cardiac paediatrics or wider cardiology to provide preventative protocols that help to save lives or give people greater opportunities to live more active lives beyond elite sports.

### Sports science has not escaped Covid imaging backlogs

On the flipside, some of our other proactive imaging programmes have had to stop completely during Covid-times. The recovery of this is very important to



Aaron Wan Bissaka, Marcus Rashford and Timothy Fosu-Mensah training at the Aon Training Complex

us as it can leave black holes in our data on emerging or established athletes. For example, our performance imaging programmes now have two cohorts of U18 and U17 professional players without information which is a huge disappointment following a five-year focus on muscle scanning and cartilage mapping. We use MRI spectroscopy to undertake muscle talent scans to code muscle fibre type. This tells us who can 'twitch' calf muscles quickly or slowly to identify performance characteristics. This information is vital to understand the potential of individual sportspeople and manage team performance over the long-term.

Another area of research halted during the pandemic crisis is our neurological data gathering via diagnostic imaging on the long-term effects of head

impacts especially Chronic Traumatic Encephalopathy (CTE) that can lead to dementia. This has been under the spotlight for many years in impact sports such as football, rugby and boxing. Early 2021 saw the introduction of a new substitution rule if a player suffers a head injury, even if all replacements have already been used during the game. Whilst welcomed to safeguard professional player health, there is so much more that we need to research to understand the structural and functional changes in the brain from impact in sports. Greater knowledge will help to introduce unified national protocols to protect the long-term health of elite and grassroots sportspeople.

### The horizon is much brighter due to the powers of science & medicine

Despite the delays we have all had to endure due to the pandemic, research in sports imaging will bounce back. The Covid-19 horizon is looking much brighter due to the innovations of vaccines and evolution of disease treatments. This shows us the key positive from all the virus pandemic disruption and grief – that when science, medicine and research push the boundaries of existing knowledge, innovation expands, knowledge is enhanced and lives can be saved. This is a strong message to all involved in medicine and science, and why we continually quest to undertake our sports imaging research work at Manchester United Football Club. //



Juan Mata, Odion Ighalo and Paul Pogba indoor training at the Aon Training Complex



Game play action from Bruno Fernandes at Old Trafford Stadium