COVER STORY

PEAK PERFORMANCE

SCIENTIFIC EDGE OF SPORTS EXCELLENCE

Susheela Srinivas
The Asian Games 2018 in Indonesia have generated tremendous excitement and anticipation as sportspersons stretch themselves to their limits to reach for new records. There is a need however to appreciate the inputs of science and technology that have not only made sporting activities safer and fairer but also enhanced sporting performances over the years leading to new records.
TAKE any sporting event of the present day, and one thing is apparent: the liberal use of technology.

As viewers, we are treated to faster and quality transmission, live feeds, new apps, reviews and more — all enhancing our viewing experience. On the field too, officials scurry about with wireless devices, tracking the multiple events to coordinate the activities; accuracy is the mantra as precision timers and electronic scorecards collect the data to update the latest records automatically. Along with this, logistics, facilities and amenities are also technology driven.

Tech-support is invaluable in organising and managing a sporting event. However, in new-age sports, technology is ruling every aspect of sporting, permeating deeply into the game, judgement and training of the sportspersons as well. In fact, sports have adopted technology to such an extent that today they are no longer skill oriented. Instead, they have transformed into performance-oriented arena.

Hence, it is not uncommon to see players zealously bettering their skills with the help of technology. Utilising scientific data and analysis from experts they are now taking tech-support at various stages of their training to get a better perspective of their strengths, honing their skills to reap maximum benefits.

Besides, every sport has seen unbelievable natural talents who have baffled scientists by their ability, skill, endurance and stamina. Not stopping at just admiring them researchers have got down to studying the way their body responds to intense activity by using the latest imaging systems.

Rigorous research has led to the emergence of a new and exciting field of study.

Welcome to Sports Science
Sports are no longer limited by the unknown. Researchers are studying every aspect of sportspersons and their response during performances. With real-time monitoring, the data collected is analysed and feedback provided to the athlete and their coaches opening new avenues for them to minimise their drawbacks and achieve peak performance.

Seeing a gymnast pirouette across the turf or on a narrow beam or wielding bars or rings is a visual treat. If ever you wondered how they could perform these mind-boggling bends and twists, which seem to get more and more complicated by the day, the answer may lie with strong scientific data to master the moves. With tech-support several biomarkers are placed on the gymnast’s body to monitor the muscle movements, angles and the extent of stretch in the ligaments and tendons.

The all-new, exciting and emerging field — sports science — incorporates psychology, physiology, medicine and rehabilitation into sports. With tech and science support, researchers are now able to study and analyse how muscles respond to intense activity, how the body copes and recovers, how nutrition and diet models affect performance, along with neuro-psychological responses. This invaluable data is helping the players to sharpen their skills and perform with knowledge of their strengths and weaknesses.

This form of visual analysis gives inputs to the athlete on where they go wrong and how to correct them in time. It is invaluable for trainers who can review, advise improvement in angling and posture and correct errors while training their wards. Often, comparative analysis with the best in the field gives a reference to the athlete to improve on technical aspects of the sport.

This smarter, scientific approach to sporting has seen a tremendous demand in the last couple of decades. Just about every sport is embracing science and tech support to maximise their performance. Now, every team has a scientific team working behind them, carefully monitoring their movement, response and threshold with the help of technology.

It is no longer a surprise to find sportspersons receiving inputs from Exercise Biologists, Sports Psychologists or Sports Scientists.

In fact, this field has turned out to be so lucrative that advanced nations like the USA, Japan and UK have commissioned grants to their universities which are offering specialisation courses in exercise biology and sports science. Typical areas of specialisation in sports science include biomechanics, biokinetics and biochemistry.

Safety First
When technology entered sports, the first improvisation came to sporting gear. Leading manufacturers of sports equipment collaborated with scientists to understand kinematics and motion science to provide better gear. Reinforced helmets, shoes, and other gear entered the arena to give athletes the extra edge in their game.

Designing better, sturdier and reliable gear is the norm today; as the field gets increasingly competitive, safety measures to minimise injuries take precedence. A visible change has occurred in track events and gymnastic equipment. The turfs are anti-skid giving the performers a better grip and

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avoiding injuries, and the rings are fitted with spring-loaded swivels to ease the strain on a gymnast’s shoulders as they perform dizzying routines. The four-inch balance beam now comes with a grip cover.

Safety devices are among the most sought-after tech-support that sports are witnessing. High speed and motoring events can lead to fatalistic accidents, with the head and neck trauma being most common. The HANS (Head and Neck Support) device comes to the rescue of participants. This U-shaped device is placed behind the neck, and two supporting arms cover the pectoral muscles of the chest. The contraption is in turn anchored to the helmet on either side, supported by the shoulders. In the event of a crash, the device prevents the neck from jerking back and forth and also prevents excessive twisting.

Wearable computers are another safety measure which continuously monitor the athlete’s vitals. Use of these devices has dramatically brought down the number of incidents of dehydration, heart attacks and excessive exertion.

Inputs from aerodynamic technology used to study friction on the skin have facilitated the development of distinctive clothing for speed-based sports like racing or biking. Coupled with 3-D body scanners and fluid dynamics algorithms, engineers can pinpoint and isolate high friction areas for the athlete.

With grants given by sports authorities and governments, millions are going into establishing research and technological hubs. These facilities provide customised solutions to athletes and teams to better their performance based on the individual requirement of the sport.

Another area of sea change is in sports clothing. Now we have biomarkers, heart-rate monitoring sensors and devices fitted all over the sportsperson’s body; these hexoskin shirts take real-time measurements of heart-rate, neurological responses and threshold levels, which record the electroactivity of the vital organs.

With this in-situ monitoring, live data is analysed to determine an athlete’s endurance level, and measures are taken to prevent mishaps. The coach makes strategic changes in the team by monitoring each player’s threshold, ensuring no player is pushed beyond their maximum limit.

Disability is no longer a limiting factor to participate in competitions, for customised prosthetics are coming to the rescue. The University of Pittsburgh’s Human Engineering Resources Laboratories places the athlete in body suits embedded with motion sensors. The athlete then goes through a series of drills based around athletic movement. Cameras and wearable tech report back on the changes. The prosthetic is then customised to their body movement which works in tandem with their body.

Healing Touch
Despite precautionary measures, sports is rife with debilitating injuries to players. Safety measures are incomplete without effective rehabilitation. Expert medical support is the key to put the players back on track.

Rehabilitation Sciences is a multidisciplinary active research area which works parallely with the team to provide quick, effective and long-lasting relief from injuries aiming to bring back the injured to peak athletic performance. With early diagnosis, personalised and targeted exercises, workload management and cutting-edge tech treatment facilities, medical experts ensure the players recover effectively from their injuries to pre-injury conditions and help in reducing the susceptibility to recurring injuries.

With knowledge about the physiological response to intense activity, experts are now able to provide unique and customised care. Isokinetic data help the medical team to pinpoint a player’s weak spots and overcome them by incorporating personalised training.

Sports Injury Rehabilitation now treats a range of sports injuries like acute and chronic musculoskeletal damages through cryotherapy; by monitoring the recovery response, their threshold is built up. This timely feedback plays a crucial role in a player’s quick recovery and return to the game.
Ultimate Fitness
Fitness is a crucial element to excel in sports, as games demand tremendous endurance, flexibility and mobility. Again, medical experts — who are a part of the new age sporting team — play an essential role in all-round fitness training of the players. Physiologists, dieticians, psychologists and neuroscientists work hand in hand with trainers to provide effective fitness regimen to sportspersons.

A classic example of fitness achievement is that of Indian cricketer Virat Kohli, who, at his coach’s behest, embraced a tech-supported fitness routine. The outcome of his diligence is there for all to see, as Virat is now among the world’s fittest sportspersons. In fact, to a media query, Virat admitted that though the fitness training programme was an arduous one, the results are very rewarding.

Thermometer pills have been developed by NASA for temperature monitoring for astronauts. This small capsule contains a quartz crystal sensor and a micro battery wrapped in silicon. A modified version used in sports is an ingestible pill with a sensor that sends temperature and heart rate data to the trainer positioned remotely.

The fitness of players is of utmost priority, and exercise routines have seen a vast change in the past couple of decades. Coaches no longer go easy on their wards. Luxury is ruled out during training, and there is no room for slackness or indulgences. Training is customised for each player, rigorous and streamlined to enhance their skills. The best of training equipment is rolled out to maximise endurance and agility. A player’s diet and nutrition take into account their food preferences; accordingly, personalised apps help them stick to their regime and monitor their progress. Some teams have rewards for their fittest player, encouraging them to prioritise fitness.

Coaching Capabilities
In the last two decades, sports coaching has risen to be the second fastest growing profession (being second only to IT). Intuitive and bare-eye coaching is a thing of the past. Coaches are now tech-savvy and come up with better solutions to lead winning teams. With data and visual analysis available on each player, coaches have an edge in tracking even minor flaws in their players and correcting them at the grassroots level, before muscle memory sets. Algorithms, graphical analysis and data updates help them in coaching their wards to their fullest potential.

In the present day, a team will encounter multiple coaches, each with an expertise in one aspect of the game. A modern-day coach is equipped with biomechanical and kinematic knowledge of the game. With relevant data feedback, the coach and players discuss the strengths and weaknesses of the team and strategise the technicalities accordingly.

Fair Judgement
Gone are the days when judging a game was dependent on the alert and intuitive skills of experienced referees. Now judging is predominantly done by technology. Strategically positioned cameras and replays of the game give a second perspective to the referee to carefully scrutinise the situation and then give the verdict.

Isn’t it interesting to know that a typical match has 34 cameras positioned at various angles to grab each moment of the game? Nothing goes amiss with tech support of the Hawk-Eye system — the most popular tech tool for sports like cricket, tennis, soccer and hockey. Swimmers no longer rely on the officials at the finish line. They now have touchpads to register the start-stop times, while special high-speed cameras record every possible angle of a gymnast’s twists and turns for evaluation of technique; manually operated timers no longer exist as the firing pistol is itself fitted with a digital timer and coupled with electronic finish line beepers. There is no room for foul play as the eye of the lens will capture the truth.

In all, technology has facilitated a fairer judgement in sports. Henceforth, new rules and newer formats may rule the roost on the field. Whatever may be the sporting challenge, a smarter approach will complement the hardwork and talent of a sportsperson.

Ms Susheela Srinivas is a freelance science writer. Address: #189, I F Cross, 3rd stage, 4th block, Basaveshwaraanagar, Bengaluru-560079; Email: sushsri@gmail.com