International Journal of Physical Education and Sports Sciences
Vol. 11, Issue No. 18, (Special Issue) January-2017, ISSN 2231-3745

Global Trends of Physical Education and Sports

Dr. Manjappa P.[1]* Dr. Manjappa Vijayapura[2]

[1]Sports Secretary, Author, Counselor, Dept. of Public Instructions, Govt. of Karnataka

[2]Honorary President Sri Sai Subrahamanya Eucational Trust ®, Honorary Member Vigour institute of Yogic Science and Studies

Abstract – "Sports is a universal language you can speak anywhere in the universe"

Today sports have become a common activity for the entire society. It may be for pleasure, popularity or performance. Physical education has been defined as a process through which favorable adaptations and learning organic, neuromuscular, intellectual, social, cultural, emotional and aesthetic result from and proceeds through fairly vigorous activities. Sports have a greater role in preparing a powerful human capital. Technology has invaded sports for performance, fitness and for health. There is various means through which science and technology has invaded the sports performance. The use of modern technologies in sports may mean that competition at the upper most level is only affordable to the leading top athletes due to potential high costs. Sports biomechanics is the sport science field that applied of specialized sports equipment. To promote vibrant culture of sports and to have health benefits tremendous amount of research in the areas of sports sciences have been attempted. Current technological revolutions can also be applied to sports. We need to explore largely on the impact of broad based participation and sports as a media for social inclusion. Technological changes frequently results in better building finishes that extend the life of the facility are safer for the participant and are less costly to maintain. It is also necessary to have a good understanding of the application of physics to sport, as physical principles such as motion, resistance, momentum and friction play a part in most sporting events. In relation to sport, biomechanics contributes to the description, explanation and prediction of the mechanical aspects of human exercise, sport and play. The laws of mechanics are applied to human movement in order to gain a greater understanding of sports performance and to reduce sport injuries. Proper understanding of biomechanics relating to sports skill has the greatest implications on sport's performance, rehabilitation and injury prevention, along with sport mastery. The knowledge of sports biomechanics is very essential to raise the level of performance of the players. Technology in sports is a technical means by players attempt to improve their training and competitive surroundings. The sports industry is growing opportunities for innovation, new ideas and investment and disruptive innovation is changing the competition.

Key words: Technology, Performance, Biomechanics, Competition, Rehabilitation, Prevention.

----------♦----------

INTRODUCTION

"Sports is a universal currency it can be used in every corner of the world"

Technology in Sports and physical education has made greater impact in education. Sports and exercises scientifically thought through e-teaching, e-coaching, e-learning, etc. Technology has an important role in sports, whether applied to a players health, technique or equipment characteristics. As sports have grown more competitive the need for better equipment has arisen. Camera stumps, Power cricket bats, Aerodynamic javelin, Hockey skates, Baseball sluggers, Tennis racquets, Soccer balls, Golf clubs…..etc. The equipment has all seen considerable changes when new technologies have been applied. The systematic training principles are law of overload, law of reversibility, law of adaptability, law of specificity, principle of individualism, principle of variety and principle of active involvement. The use of technology in the sports industry comes handy in terms of coming up new sports equipment that can help improve the performance of athletes and the whole sporting world in general. Technology can help athletes to perform better in there sporting events by using technicalities for stronger, faster, higher.

Sports technology has found its greatest proponents among professional athletes. In the twentieth century, the entire face of sports changed drastically with the advent of new technologies. Today advertisements for new types of running shoes, golf clubs, tennis rackets and hundreds of other sports accessories

bombard us. With new materials and computer engineering, improvements are being made on sporting equipment faster than marketers can publicize them. This advance in technology has broadened the spectrum of athletes. Improvements in safety standards, cost, have allowed more people to take advantage of formerly exclusive sporting events. Advances in sports equipment have undoubtedly played a role in the achievement in their respective fields.

The sports science has now acquired its place and has gained status within the vast domain of science and thus gained strategic significance. Science is a significant force in the field of sports that searches for solution to performance problems and explores factors that influence these problems. Advanced technology created new opportunity for research into sports. It is now possible to analyze aspects of sports that were previously out of the reach of comprehension. Being able to use motion capture to capture an athlete's movement or advanced computer simulations to model physical scenarios has greatly increased an athlete's ability to understand what they are doing and how they can improve themselves.

LATEST GADGETS AND THE PERFORMANCE:

"Sports is a universal currency you cannot demonetize"

The sports technologists have applied their ingenuity, creativity and expertise to develop better and safer equipment in the quest for sporting excellence, from the sports shoe to the swimsuit and the tennis racket to the football. The outcome has been enhanced performance better, safer and more effective sports equipment, precision measurement of performance, a multiplicity of ways to experience sporting events anywhere and at any time. The innovation of wide range highly sophisticated man-made materials including alloys and polymers. Stronger and lighter sports equipment made with these high-tech materials has enabled sporting people across the globe to reach new heights of achievement while minimizing the risk of injury, and has helped sports enthusiasts everywhere to enhance their performance. The training equipment like aquatic wheelchairs, starting block assemblies, stop-watches, golf clubs and gym equipment, sports drinks, muscle-building and nutritional supplements.

The technological advances in sporting equipment have added significantly to athletic presentation. For example,

- David Duval become the 2001 US Open golf champion because he used a titanium golf club
- Marion Jones wore ultra-light running shoes and tireless training that captured the 2000 Olympic gold medals in the Women's 100M and 200M races.
- At the Atlanta Olympics, Michael Johnson became the first male athlete to win both the 200 and 400 meter sprint. He also set the new world record in the 200meter sprint wearing specially designed ultra-light Nike running shoes weighing just 3.4 oz (96.39 g).
- The tennis player Venus William used graphite tennis rackets and won the Wimbledon in 2001.
- Now a day's many sprinters also wear full-body suits to reduce wind resistance, which could make the critical hundredth of a second difference in a race.

Athletes were performing without the benefit of graphite tennis rackets, fiberglass poles, ultra-light running shoes and titanium golf clubs. It is certain that athletes will continue to utilize advances in sports technology to enhance and better their performance.

- In the 2008 Beijing Olympic Games when Speedo released a new swimsuit designed in collaboration with NASA and the AIS (Australian Institute of Sport). The new fabric mimicked shark skin to reduce drag and the suit also acted to squash the swimmer's body into a more hydrodynamic shape and possibly also increasing buoyancy by trapping air. The compression of the suit also allowed similar effects to compression garments, apparently allowing greater oxygen flow to muscles and decreasing fatigue. Since the introduction of the first "high-tech" swimsuit, the Speedo LZR, 19 out of the 20 men's world records and 19 out of the 20 women's world records have been broken.
- Today, modern poles are made out of fiberglass and are much lighter than their bamboo or metal counterparts. The lighter pole allows athletes to run faster and gains the momentum they need to vault higher. The new poles also have more spring action. The fiberglass pole absorbs more of the vaulter's energy when it bends and as it straightens. The advent of aluminum, fiberglass and graphite poles, the pole vault record shot up 2 ft (0.61 m) in three years and now stands at over 20 ft (6.09 m). Prior to that technological innovation, the pole vault record increased only about 2 in (5 cm) to 16 ft (4.88 m) between 1942 and 1960. The first ever

women's 2000 Olympic gold medalist Stacy Dragila (American) in pole vault, it's impossible to ignore how improvements in sports equipment contributed to their success. The new fiberglass poles help athletes attain records that would be impossible to obtain using the traditional equipment. Computerized measuring devices might even change the judging of other sports like the pole vault. Historically, the pole vault has been judged strictly on the height of the bar that the athlete scaled. Now, poles with light-emitting diode (LEDs) can measure the actual altitude a Pole Vaulter has achieved.

- The Multi-Sport GPS watches offers real time information such as time, distance, heart rate, place, speed and calories burnt to runners, cyclists and swimmers. The watches have got a Quick GPS Fix, scratch resistant display, Bluetooth Smart technology and an indoor tracker.

- The equipment construction also benefits from the application of composite materials can certainly be found in high level competitive equipment such as bikes, skis, racquets etc to the elite competitor.

- Technology has influenced on tennis, as the tennis players wear synthetic fabrics for playing this gives a cooling effect and easy movements leading to greater performance. The technology is not just limited to improvements in equipment. The modern-day athlete can now depend on computerized training systems to analyze their swing, stride, and follow-through.

- The use of technology in sports has remained the subject of constant debates. All sport forms have embraced this technology in certain forms. For example, the governing bodies of sports like Cricket and Rugby have employed the use of technology for the officiating reasons. The television replays that we see every day after every match are often used for boundary calls, stumping decisions and run outs. The technological advances have made it possible to check the realities and highlight the umpiring errors through comprehensive television cover ages by fixing cameras at all angles. This has been a reflection that increase of technology would make the cricket much advanced by significantly reducing the umpiring errors.

- In athletic and games use of technology has its substantial effect, suppose a runner has face a serious injury that remains for long time to identify, now recent technological progress have solution for this. The Thermal Imaging-heat sensing cameras can be used to identify the changes occurring in the temperature of soft tissue. The Digital images are captured and sent to computer monitor then the technicians will analyze. The Normal and colder regions are identified by black and the hotter regions are identified by white. Another use of technology in modern sports is electromyography, pneumatic compression and the high speed videos.

- Top athletes all over the world are competing at the highest level to present their greater performance. Many sports companies have started manufacturing sport shoes from variety of materials and technology to offer strength and flexibility for sports persons. Materials like Kevlar which is stronger than the leather or canvas makes a shoe both strong and flexible. These technological advances in sports have brought a huge revolution in all forms of modern sports.

- Technological innovation in the surface of Pro-Kabaddi and Indoor kho-Kho etc.

The use of technology in sports is not new and has led to many benefits for mankind. In fact, in some ways, these advances in technology help to justify the expense of time and money that we invest in sports. The tools athletes use and the advances they take advantage of medicine, training, nutrition, and psychology have not presented any serious threats to sports. As long as the integrity of the game and the safety of athletes are not seriously violated by technological advances, athletes will still be the heroes of the games. The advanced technology in sports has significantly narrowed the gap between world record holders and the way the athletic achievement is perceived.

TECHNOLOGICAL ADVANCES IN SPORTS MEDICINE:

Sports Medicine has witnessed a technological revolution in diagnostic, clinical and rehabilitation areas which has taken the treatment in sports medicine to the next level. The Gait & Motion Analysis, Multi-joint Dynamometer with Sports Simulator, Balance Assessment and Training System (BATS), EMG Biofeedback, Human Performance Evaluation (VO2 max), muscular strength training/testing, advanced arthroscopic interventions are just few of the many examples of latest advancements in sports medicine technology and techniques, which has opened up a plethora of

options for the advanced treatments in sports injuries, performance enhancement and fitness.

GAIT & MOTION ANALYSIS:

The athlete needs efficient movement of flexible joints, strong muscles and balance between different muscle groups. If this is not there, the athlete is prone to many injuries. This is seen in many conditions of the foot and ankle, which maybe bony (leg length difference), muscular imbalances or tendon disorders. Gait and motion analysis has helped the doctors in finding the cause of many of these lower limb problems. Gait and motion analysis is an assessment of the way a sportsman walk and run. This analysis gives in-depth insight about the body biomechanics, weight distribution and relative movement of hips, knees, ankles during running. "Gait analysis is a very powerful tool to prevent many overuse lower limb and back injuries. This assessment is preventive and curative for athletes in various conditions like **plantar fasciitis, heel spur, flat feet, Morton's neuroma, hammer toe, shin splints, knee pain, chronic back pain, calf stiffness** etc. The motion analysis is utilized in analyzing a bowler's action or a T**ennis player serving motion or a Football players kicking motion**. These systems can give precise recording, analysis and interpretation of joint angles movements, segment orientations during any human dynamic movement. This is also used in scientific analysis of posture, balance and coordination.

MULTI-JOINT DYNAMOMETER WITH SPORTS SIMULATOR:

The multi-joint dynamometer can measure muscle strength of any major muscle group in three different modes; isokinetic, isotonic and isometric. This assessment helps in making rehabilitation programme and strength training schedule for patients with sports or other injuries, targeting isolated weaker muscle groups specifically. The training can be initiated on the machine using isokinetic mode in the early stage after injury reducing the impact on the joint. Sports simulator can simulate many activities / actions in sports like throwing, bowling, driving etc. This gives objective evidence in performing functional capacity evaluation and disability assessment.

BALANCE ASSESSMENT AND TRAINING SYSTEM (BATS):

This system helps in assessing the balance capabilities of a sportsman and evaluates the underlying cause of impaired balance in patients with sports injuries.

EMG BIOFEEDBACK:

EMG stands for electromyography, measures the electrical response of the muscles when contracting. The electrical response is measured with pads placed on the skin and results are displayed visually and indicated by a tone sound. It is used for muscle reduction and strengthening in sports rehabilitation following surgery or trauma, selective training of a particular muscle after injury and to remediate neck, scapular and lower back pain.

HUMAN PERFORMANCE EVALUATION (VO2 MAX):

To evaluate the oxygen consumption reaches a peak and remains at steady state despite achieving maximal or sub maximal heart rate of the individual. It helps in performance enhancement, to improve the cardio-respiratory endurance depending on the nature of the sport.

BIOMECHANICS:

Biomechanics is the study of the structure and function of biological systems by means of the methods of mechanics, which is the branch of physics involving analysis of the actions of forces. The branch of physics concerned with the effect that forces have on bodies and motion produced by those forces. The laws and principles used to explain the motion of planets or the strength of buildings and bridges apply equally to humans. All motions including the motion of the human body and its parts, is the results of the application of the forces and is subject to the laws and principles that govern force and motion.

SPORTS BIOMECHANICS:

Sports biomechanics is the science of movement of a living body, including how muscles, bones, tendons and ligaments work together to produce movement. It is the sports science field that applies the laws of mechanics and physics to human performance, in order to gain a greater understanding of performance in sports events through modeling, simulation and measurement. Biomechanics analyses of fundamental human movements begins with a discussion of the principles of biomechanics and then continues into more advanced study involving the mechanical and mathematical bases for a range of fundamental human activities and there variations, including balance, slipping, falling, landing, walking, running, throwing, lifting, striking, catching, climbing, swinging, jumping mechanics, object manipulation, variations, enhancement and safety.

SPORTS BIOMECHANICS:

- Bio-mechanics is mainly concerned with the forces (different in nature) that act on a human body and the effects that these forces produce.
- Physical education teachers/instructors/director/coaches and athletes/players are also much concerned with forces and their effects.
- To determine the internal and external forces acting on a human body.
- The ability to teach the basic skills, techniques of sports & games/physical activities mainly depends on their knowledge of the forces that cause these effects.
- The physical educators/coaches/athletes should look to biomechanics for the scientific analysis of sport and game techniques performed by the athletes.
- The Mechanical bases of biological, muscular activity and the study of the principles and relations involved.
- To know and understand how human body parts are moving during the performance of motor skills.
- The application of mechanical laws to living structures specifically to the locomotion system of the human body.
- The study of the structure and function of biological systems by means of the methods of mechanics.
- Biomechanics is the science concerned with the internal and external forces acting on a human body and the effects produced by these forces.
- To use and understand the different types of force for learning a wide range of techniques in sport and exercise.
- To apply the trial and error method of learning sport, physical activity, exercise and improve performance with economical expenditure of energy.
- To create the best base for acquiring skills, techniques and performing the same several times through which a way now techniques are developed for personal advantages.
- To attempt for improving techniques/technical performance as an ongoing process in most of the sport.
- To make use of an appropriate technique to the situations for benefits and advantages over opponents.
- To create overall champion as example having used bio-mechanical principles carefully in a particular technique/segment of a Skill/Technique.
- To make teachers and coaches well equipped with knowledge of motor learning and sound judgment on methods of instructions, length, frequency, nature of practice etc.
- The knowledge of physiology equips them to make sound judgments concerning the amount of type of training to prescribe in a given case.
- The knowledge of appropriate techniques and to detect the root causes of faults that may arise in their use.
- The acquisition of skills and physiology the science of underlying training and bio-mechanics is the science underlying techniques.
- The importance of knowledge on bio-mechanics to a coach depends to a certain extent on the sport involved and techniques play a significant role in total performance.
- The coach on the other hand, works at increasingly more advanced levels and hence is concerned not only with broad fundamentals but also with precise details.
- As the level of performance increases, so the coach needs a thorough knowledge of biomechanics where techniques play a very important role.
- The knowledge of Bio-mechanics is very essential for coaches to raise the level of performance of their athletes/trainees.

The sports biomechanics how and why a basic understanding of kinematics and kinetic helps to produce an improved performance. It helps the trainers/coaches and physical education teachers to able to look at the players/athlete's performance and if the actions in the player/athlete technique are good, but there are actions that are inefficient and need correcting. When the corrections are made the

athlete/player will have a more efficient technique and provide a better performance. The latest trend in the modern technology in sports is to create an atmosphere similar to the actual sports and games situation so that before the actual competition the competitors can identify the ways and means to defeat the opponents. The most advantage of this type of analyses is that the area of performance pre-requisites, deficiencies and advantages can be observed well in advance and the popular training can be adopted for the development of better performance factors.

VIDEO ANALYSIS IN SPORTS:

Video has many applications in sports and science. Coaches and athletes are using the medium more and more to measure and correct technique, and to analyze team and individual performances. Video analysis software can also be used for gait analysis and biomechanics research, and in injury rehabilitation.

TEAM PERFORMANCE ANALYSIS:

By watching video of match play can become much more useful the video in real time or after the game with chosen key points such as goals, errors, specific plays, and the involvement of each player. The coach or player see their chosen aspect of the game, such as all goals by a specific player or errors by the opposing team and access to many aspects of performance.

TECHNIQUE ANALYSIS:

Video analysis of technique is very useful for identifying and correcting problems with an athlete's technique. Things that can be measured and identified using video analysis include the following:

- Angle of release of thrown implements
- Ball release velocity and the arc of travel of the thrown implement.
- The head and body position during technique performance.
- The joint and segment angles and velocities.

ANGLE OF RELEASE:

For an object released at ground level, for any given release velocity, the maximum distance is achieved (Javelin throw) using an angle of approximately 45 degrees. However, as most implements in sport are released at a height above the ground, say from about shoulder height, the optimum angle at release is somewhat less than 45 degrees. For example, for the **shot put**, the optimum release angle is 40-42 degrees, and for the **hammer throw** it is 43-44 degrees. The actual ideal release angle can depend on the technique and physical attributes of the athlete. If the athlete can get a higher velocity at a lower angle, then there has to be a trade-off between the optimum release angle and maximum release velocity. This is often something that is worked out with trial and error over time.

Fast Bowling: The research into cricket has focused on improving and understanding of the relationships between fast bowling technique and improvements in performance and the likelihood of injury. In terms of injury potential (lumbar stress injuries) the research has moved away from the traditional back foot contact bowling action classification system and focused on the front foot contact phase of the delivery stride where the spinal postures are extreme and loading on the lower back is greatest. It is proposed that concurrent lower trunk extension, rotation, and extreme side-flexion during the early part of the front foot contact phase of the bowling action, at a time when ground reaction forces are also high, is the most important mechanical factor in lumbar stress injuries. The fastest bowlers maximize their horizontal breaking impulse during front foot contact as opposed to peak ground reaction forces and loading rates.

High jump: The use of computer simulation models of high jumping to address questions such as how the approach speed, leg plant angle and knee angle at touchdown affect high jumping performance and why elite jumpers use a curved approach.

Triple Jump: The optimum technique in triple jumping using computer simulation. A double-arm technique is shown to be the most beneficial and potential mechanisms for this benefit are meticulous. The changes in arm technique between an actual performance and an optimized simulation of the ground contact in the step phase of a triple jump.

Diving takeoffs: Research into springboard diving using computer simulation models has addressed questions of techniques for generating somersault rotation during takeoff and twist rotation during flight.

Force platforms or **force plates** are measuring instruments that measure the ground reaction forces generated by a body standing on or moving across them, to quantify balance, gait and other parameters of biomechanics. Most common areas of application are medicine and sports.

The modern era technology applied to sport has played an important role both in training and competition. The equipment used by the athletes in competition to the training support used by teams to prepare the athletes for competition. The application

of technology in sport facility design has yielded real changes in terms of athlete use, spectator comfort and usable life span. Equipment which makes competition judging and compiling results more accurate. The technological advances allow for a greater life span of the facility through the development of components such as better finishes and surfaces. Technological development as applied to sports equipment continues with the next generation of the "newest and the best" being developed. Physical education Teachers/Directors/Coaches/Trainers/Instructors generally works with beginners or near beginners and so is concerned with the broad fundamentals of sports techniques and the broad mechanical principles underling with them. Moreover, the processes employed in the adoption of technology and technological methods to enhance sport and recreation have accelerated with each successive Olympiad. These advances in technology as with all other walks of life have had a marked impact in most aspects of sports.

CONCLUSION:

The advanced technology will make more of a difference in the future than it has in the past. The time differences between first and second place will continue to shrink, allowing more room for technological improvements in equipment to give athletes an edge. Sports technology is not just limited to improvements in equipment. The modern-day athlete can now depend on computerized training systems to analyze their swing, stride, and follow-through. As the equipment and training regimes of athletes become more sophisticated, technological innovation will play a larger role in dictating winners and losers. In the future, records will be broken in vanishingly small increments, not because there are no more great athletes, but because technology is helping to optimize the performance of all. Many people appreciate sports for different reasons because sports provide entertainment, celebrity, instruction and development, commerce, aesthetics etc. People often come to a better understanding of the possibilities for improving their health by observing sports and hearing details of sports treatments and training. Sports provide a market that supports the development of new materials and the study of the physics of athletic equipment.

REFERENCE:

Adelman, M.L. (1983). Academicians and American athletics: A decade of progress, 1973

Andrews J.G. (1987). the functional Roles of the hamstrings and quadriceps during cycling: Lombard's paradox reviser journal of biomechanics 20, pp. 565-576.

Beashel P., Advanced Studies in Physical Education and Sport.

Crisfield. P, the Successful Coach.

Dal Monte A. and Komor A. (1989). Rowing and Sculling Mechanics in Vaughan C.L (ed) Biomechanics of sport. pp. 53-119 CRC press, Boca Raton.

Di Prampero, P.E., etal "Sprint Running a New Energetic Approach" Journal of Experimental Biology 208.14 (2005): pp. 2809-816.

Hubbard M & Always L. (1987). Optimum release conditions for the new rules Javelin International Journal of Sports and Biomechanics.

Journal of Sport History, (1982).10, pp. 80–106.

Marshall R.N and Elliot B.C (2005). Guidelines for athlete assessment in New Zealand Sport-Biomechanical Analysis science and Medicine in sport p. 117.

Rogers J. L., USA Track and Field Coaching Manual.

Roscoel D., Physical Education and Sport Studies.

Corresponding Author

Dr. Manjappa P.*

Sports Secretary, Author, Counselor, Dept. of Public Instructions, Govt. of Karnataka

E-Mail – vjp1359@gmail.com