

Ethical Considerations in the Use of Advanced Technologies in Sports

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ABSTRACT

Tremendous improvements have been recorded over the years in sports performance and development these were made possible through technology, in these sports where equipment is critical. However the use of advanced materials in sports equipment/facilities presents some ethical questions such as should players/athletes be allowed to use emerging technologies (equipment and facilities) to enhance their performance bearing in mind that sports isn't limited to enhancing performance; it potentially extends into rehabilitation and injury prevention or can we clearly enhance behavior by allowing the use of this technologies or should there be no restrictions. What is the social acceptance of sports technology by players, coaches and sports organization? This paper looked at ethic and ethical issues in sports; further more answered the following questions what are the ethical considerations surrounding the use of technology in sports and the paper consider that the use of technology in sports lead to further and faster performance and where should this end? Can we ensure that athletes/players are competing and not the advanced materials?

Keywords: Ethical, technology, athletic & performance

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1. INTRODUCTION

Sports have gone nuclear, technologies has made sporting activities to be more advance and because of the every athletes and coaches want to win at all cost, not minding the ethics of the game, which makes the game very interesting and enjoyable. Ethic consideration issues in sports is very important so as to provide a level playing ground for all, both able and disable to be able to participate in any sporting event. Technology in sports is a technical means by which an athlete's/players attempt to improve his/her training and competitive surroundings in other to enhance his/her overall athletes' performance (Albert, 2008). The question in the lips of fans/spectators are; Do sports participants often face with ethical choices such as should players/athletes be allowed to use emerging advanced technologies (equipment and facilities) to enhance and in performance? Advanced sporting technologies are man-made means developed to reach human interest or goals in or relating to a particular sport (Ethic and sports, 2014).

By ethical consideration we mean an accumulation of values and principles that address questions of what is good or bad in human affairs. Ethics search as for reasons of acting or refraining from acting, for believing or denying something about virtuous or vicious conduct or good or evil rude. Sporting technologies are man – made means development to reach human interests or goals or in relating to a particular sports. According to Morgan, (2007) Technology in sports is a technical means by which athletes/players attempt to improve their training and competitive surroundings in order to enhance their overall athletic performance.

Mechikoff & Estes (2006) pointed out that it is the knowledge and application of using specialized equipment and the latest modern technologies to perform tasks more efficiently. Kirk & Matt (2012) confirmed that the application of technology in sport facility design has yielded real change in terms of athlete use, spectator comfort and usable life span. Example of these change include: Equipment which makes competition judging and compiling results more accurate. Further, technological applications such as photo-finish timing devices tied in with communications technology for in-stadium displays such as scoreboards and broadcasting make the events more enjoyable for the spectators. Sports have always been considered an important place in which to learn about ethical or moral behavior. The question here is sport related to ethics? And how is ethic related to sports.

2. CONCEPT OF COMPETITION IN SPORT AND GAMES

Sport and games involve competition. Without competition, there is no game. Yet competition is among the most seriously misunderstood concepts (Siedentop, 2012). Some people advocate competition at all costs as a positive virtue. Others view competition as inherently bad and want to make sports less competitive; because competition is a controversial issue. Coakley (2007) submitted that competition is almost always defined first as a rivalry in which opponents strive to gain something at the expense of each other. The concept of competition is that there are three important and related meanings of the concept of competition (Siedentop, 2012). The first meaning is to come together, which denote the festive aspects of competition. All the world's great sport competitions are clearly festival-the Olympic Games, the World Cup in soccer. We find similar festivals on a smaller scale.

A second meaning of the concept of competition is to strive to achieve an objective; it is what we call the competence meaning of the term. The words compete and competence provides a forum within which people strive to become competent, to become excellent. When rules and conditions are standardized, performances can be compared fairly, and competitors can learn about their strengths and weaknesses. The pursuit of competence-trying to get better-is a fundamental, sustaining motivation for sport involvement (Coakley, 2007; Eitzen & Sage, 2003). This belief comes from evidence showing that young athletes rank wanting to get better as a primary motivation for their continued participation.

The third meaning of the concept of competition according to Siedentop (2012) is the one with which we are most familiar-to be in a state of rivalry. The opportunities do rivalry within sport are many and varied: team against team, individual against individual, individual against a record, individual against a previous best performance. Within the boundaries of a sport, individuals and groups compete, but seldom, if ever, is that competition a zero-sum arrangement. There are many ways to win and to lose within a competition, and the winning and losing have meaning only within the competition and, even then, only momentarily. If winning or losing has meaning that carries over from the competition to other aspects of life, then it clearly diminishes the play element in the competition. Sport, therefore, can be understood as a game occurrence in which playful competition is the primary motivational force. The players can practice diligently, train seriously, prepare strategically, and compete vigorously yet still manifest the play element in its fullest. Factors such as unevenly matched opponents, required participation, economic consequences, and pressures for winning that carry over to real life outside the sport event seriously diminish the play element in sport.

3. ETHIC AND FAIR PLAY IN SPORTS

Ethic is a branch of the sub-discipline of philosophy termed axiology which is the study of values (Yazid, 2007). Ethics, or moral philosophy, is concerned with how people ought to behave, particularly in situations in which there is potential for behaving well or poorly the ethical nature of sport often focus on rules and how rules are related to the purposes of games (Valesquez, 2002). The argument made is that the game is changed when the rules are bent, broken, or misused, and, therefore, that it is not possible really to win unless the rules are kept; Fair play encompasses how a sportsperson behaves not only during a contest but also before and after it.

The notion of fair play according to Siedentop, (2012) means that one plays by the rules, does not take un-fair advantage of an opponent even when the opportunity arises, treats the opponent with respect, and shows modesty and composure in both victory and defeat. This philosophy not only prescribes how one ought to behave with sport but also uses sport as a metaphor for how life should be lived. It is the antithesis of "win-at-all-cost" approach to sport competition. Within the tradition of fair play the primary goal of sport is victory within the letter and spirit of the rules, but not victory at any cost (Siedentop, 2012). The issue that surrounds ethical considerations in sports competition are its acceptability as being fair or unfair has been termed by Freeman 1991; Rintala 1995; (Holowchak 2002; (James 2010; Marcinelli et al. [2012]), Wolbring & Tynedal 2013, as performance enhancement, techno-sport, human enhancement technologies or mechanical ergogenics, technological doping or techno-doping.

3.1 Indices of Ethics in Sports Competition

The indices of ethics in sports according to Siedentop (2012) are three:

Fairness

All athletes and Coaches must follow established rules and guide lines of their respective sport. Teams that seek an unfair competitive advantage over their opponent create an uneven playing field which violates integrity of the sport. Athletes and Coaches are not participating in a sport, based on their race, gender, or sexual orientation. Referees must apply the rules equally to both teams and can not show bias or personal interest in the outcome.

Integrity

Similar to fairness, in that any athletes who seek to gain an advantage over his or her opponent by means of a skill that the game itself not designed to test demonstrates a lack personal integrity and violates the integrity of the game. For example, when a player fake being injured or fouled in soccer, he or she is not acting in a sportsmanlike manner because the game of soccer is not designed to measure athlete's ability to flop. Faking is a way of intentionally deceiving an official into making a bad call, which only hurt the credibility of the officiating and ultimately undermines the of the game.

Responsibility

To be sportsmanlike requires player and Coaches to take responsibility for their performance, as well as their actions on the field. This includes their emotions. Many times athletes and Coaches will make excuses as to why they lost the game. The most popular excuse is to blame the officiating. The honorable thing to do instead is to focus only on the aspect of performance, and to question yourself about where you could have better. Responsibility requires that players and Coaches be up to date on the rules and regulations governing their sports. Responsibility demands that players and Coaches conduct themselves in an honorable way off the field, as well as on it.

Respect

All athletes should show respects for team and opponents, Coaches, and Officials.

All Coaches should show respects for their players, opponents and Officials.

All fans especially parents should show respect for other fans, as well as both team and officials.

The sportsmanship model is built on the idea that sport both demonstrate and encourage character developments, which influences the moral character of the boarder community. How we each compete in sports can have an effect on our personal moral and ethical outside of the competition. Some argue for a "bracket morality" within sports, this approach hold that sports and competition are set apart from real life and occupy a realm where ethic and moral codes do not apply instead, some argue, sports serves as an outlet for our primal aggression and a selfish need for recognition and respect gained through the conquer of an opponent. In this view, for example a football player may be described as mean and nasty on the field, but kind and gentle in everyday life. His violent disposition on the field is not wrong because when he is playing the game he is part of a moral reality that is dedicated only the principle of winning.

Jack, (2010) confirmed that ethical approach to sports rejects this bracketed morality and honors the game and ones opponent through tough but fair play. This means understanding the rules and their importance in encouraging respects for your opponent, which pushes you to be yourself.

4. ADVANCED TECHNOLOGY AS AID IN SPORTS PERFORMANCE AN ADVANTAGE

The application of technology in sport facility design has yielded real changes in terms of athlete use, spectator comfort and useable life span. Example of these changes include: Equipment which makes competition judging and compiling results more accurate. Further, technological applications such as photo-finish timing devices tied in with communications technology for in-stadium displays such as scoreboards and broadcasting make the events more enjoyable for the spectators. Jack, (2010) posits that technological changes in sports equipment facilities have resulted in facilities that are more cost efficient to operate resulting in the freeing up of scarce financial resources for programs which would have otherwise been expended for operating costs such as utilities. Among these advances are lighting options that extends the useable hours of facility operation or computerized HVAC controls that gain operating efficiency as well as increasing both athletes and spectator comfort. And lastly, technological change frequently results in better building finishers that extend the life of the facility, are safer for the participants and are less costly to maintain.

Most notable in this area are finishers such as sports flooring and playing surfaces. While on the one hand technological advances allow for a greater life span of the facility through the development of components such as better finishes and surfaces, on the other hand technological change also drive obsolescence causing facilities to be replaced for economic reasons long before they are worn out. Thus stadia and auditoriums which should last more than 50 years are now being razed and replaced at great cost after only 30 years of service in many cities. Garcia, (2006) explained the use of technology in enhancing sports facilities and equipment as generally an expensive proposition. And because of the expense involve in these applications, the benefits derived at least initially tend to be limited to the upper end of the sports hierarchy. For example, because of cost, change brought about in sport through the application of technology tends to be available first to elite level athletes and teams.

By definition, elite level athletes and sports are exclusive and thus omit the broader base of participants further down the sport hierarchy. Ethics on sports, (2014) reported that there is a "trickle down" effect. As more people seek out the "best and newest" market economics come into play and the cost for equipment brought about or improved through technological innovation declines as distribution is expanded. Unfortunately, this trickledown effect is frequently a process that is measured in years. In the meantime, technological development as applied to sports equipment continues with the next generation of equipment of continues with the next generation of the "newest and the best" being developed. And as before, this new generation of equipment is out of the reach of many sports participants. And so the cycle continues. Bennett, (2009) is of the opinion that the relative cost related to the application of technology is also a challenge with respect to international sports as well. Wealthier nations, such as those found in Western Europe or the United States, can better afford the training facilities, expensive composite equipment and personal gear required for elite level competition.

Thus the benefits of technological advances applied to sports accrue most greatly to those who can afford the price. Garcia, (2006) re-affirmed that the point is that the application of technology to sports equipment is by no means universal and is, at best, unevenly applied. And solving this problem is very difficult because of the inherent conflicts of interests between the various stake holders or constituencies in sports. Among the stake holders are the fans who are the consumers of the sport product. The people who pay to see sport competitions, whether it be the individual fan or media companies, want the excitement of high scoring contests or record setting performances. Athletes and participants want the recognition that accompanies victory and the setting of records. Regulators such as the national and international sport governing bodies similarly are motivated to gain the best possible competitive advantage for their teams and athletes. Equipment manufacturers want to recoup their investment in research and product development.

Thus, at least at the upper end of the sports hierarchy, there is a natural pressure among all of these constituencies toward the ever more efficient and costly facilities and equipment. This process continues to increase the gap between those who can afford to acquire the “latest and the best” and those who cannot. It is very important, however, this natural tendency toward a division between the “haves” and “have not’s” be controlled in the best interests of the sports profession.

This is simply because central to the philosophy of sport is the concept that on any given day, every athlete participating in a competition has a chance to emerge victorious. It is this idea of competitiveness that keeps fans returning to the stadium and buying tickets, the revenue from which supports the athletes and the teams. Should the fans believe that too great an advantage has accrued to one competitor or another; their interest will diminished to the detriment of all. This is why drug abuse by athletes brings such severe penalties from sports regulators and why fans tend to lose in a given sport when the “best team that money can buy” consistently wins the championship.

4.1 Ethical considerations surrounding the use of advanced technology in sports

The concept of ethical considerations which is fairness (or unfairness) due to the introduction of advanced technology in sports was what this paper addressed. Dyer, (2015) identified five ethical considerations using the concept of fairness or unfairness in the use of advanced technology in sports as the use of assistive technology in able-bodied sport; Access and parity of sports equipment; the introduction of safety equipment in sport; ‘Re-skilling’ a sport through the use of new technology; ‘De-skilling’ a sport through the use of new technology; Governing body oversight issues, this will form the basis of this paper discourse that equipment in sport re-skilling (ESR’s) may provide an unfair advantage. By either increasing or reducing the energy required doing so or that their design could be optimized to assist in providing it, three cases will be used here to illustrate the case of Pistorius, Markus Rehm & Casey Martin.

The International Amateurs Athletic Federation (IAAF) commissioned a report in late 2007, the results of the report proposed that the technology provided Pistorius with a mechanical advantage over able bodied athletes of more than 30 %, had a 25 % reduced energy output for maintaining the same speed and possessed inertial benefits due to the reduced mass of the prostheses. (Wolbring & Tynedal 2013; Jones & Wilson 2009); the net result of the report proposed that ESR’s manifest some advantages and Pistorius was subsequently banned by the IAAF to run in able-bodied events. Pistorius himself then commissioned a counter-study (Marcellini, Ferez, Issanchou, De Léséleuc & McNamee 2012) that ultimately demonstrated that whilst he was mechanically different to able-bodied equivalents, he was physiologically similar. His ban was challenged at the Court of Arbitration for Sport (Marcellini, Ferez, Issanchou, De Léséleuc, McNamee 2012; Jones & Wilson 2009; Moses 2009) and was eventually overturned. Pistorius ultimately then competed at both the London 2012 Paralympic and Olympic Games using ESR technology (Wolbring & Tynedal 2013). Rehm is a uni-lateral lower-limb amputee who also wished to compete in able-bodied sport in the long jump event (Baker 2015). The controversy concerned the athlete specifically launching himself by using his prosthesis rather than his biological limb.

The German Athletics Association considered his prosthetic limb an unfair advantage and would not allow him to participate (Baker 2015). Martin was a professional golfer and a registered disabled citizen who suffered from a circulatory disorder in his lower right leg, known as Klippel-Trenaunay-Webber syndrome (Baker 2015). Whilst attempting to qualify for the Professional Golf Association (PGA) tour, Martin played golf using a powered golf cart. He attempted to use this technology to support his transit between strokes (Burkett et al. 2011) but the PGA attempted to prevent this. Golf carts were banned in professional golf at the time as it was felt that such technology would change the nature of the game by reducing the impact of the walk between each hole and provide players using them with an advantage over other golfers. This wasn't the first time that the specific needs of the disabled were called into question. There were safety concerns regarding the use of wheelchairs at the Boston Marathon which led to them being outlawed in 1975 (Hutzler 2008). Whilst these case studies have generally been legally resolved, there still remains a lack of understanding of the role of prosthetic equipment use in able-bodied sport.

According to Franklin, (2008) the use of modern advanced technologies in sports mean that competitions at the uppermost level is affordable to the leading top athletes due to the potential high cost of specialized sports equipments. In those sport those sports incorporating individuals with a particular disability, there is a variety of methods in which assistance can be given. For example, modifications to buildings can be made to make them wheelchair assessable. Specialized equipment can also be produced and training to sports members can be offered in order to give assistance to those with a disability.

5. ACCESS AND PARITY OF SPORTS EQUIPMENT

The use of full body swimsuits for example was the controversy surrounding the suit whether such technology was fair, in 1992 Olympic Games, Speedo introduced the S2000 fabric which reduced the drag of the swimmer by 15 % over more traditional fabrics, Speedo's new fabric ultimately led to them introducing full length swim wear in 1999, and at the Sydney 2000 Olympics. In 2000, a media frenzy occurred when it was revealed that the 'fastskin' swimsuits would be only given to athletes sponsored by Speedo. These suits were described as a further technological advancement of the company's 'aquablade' swimwear launched prior to the 1996 Olympic Games which had been approved by the governing body FINA (Stefani 2012). In 2000, the Australian Olympic Committee (AOC) wrote to the Court of Arbitration for Sport (CAS) seeking a ruling on the technologies legality which supported that the suits would remain in service as accessible unfair due to its sponsorship limitations or too expensive. In addition, it was suggested the suits could trap air (thereby improving their buoyancy) and was ultimately a 'technical aid'. Furthermore, later designs such as the 'X-Glide' by Arena and the 'LZR' by Speedo reduced the cross sectional area of swimmer and subsequently lowered the drag coefficient. Finally, it was also claimed that the suits compressed muscles and reduced muscle vibration, therefore improving endurance performance through the facilitation of venous return. However, a defense was provided by Speedo that suggested the suit only improved the management of existing forces rather generating new ones.

5.1 The introduction of safety equipment in sport

The impact of the call for or the introduction of safety equipment has occurred in three case; the controversy regarding American Football headgear surrounded the introduction of plastic-based helmets in 1939 (Gelberg 1995 & Miah 2005). Which were designed to replace the leather headgear that athletes had previously worn; the new plastic helmets were lighter, stronger and did not require re-branding after each game. It was envisaged that the adoption of more effective materials and design would reduce head related injuries to players. However, whilst the number of head injuries has been suggested as decreasing, the severity of those that did occur had been proposed to actually increase. The suggested reasoning behind this is that players would use the helmet itself as an instrument to perform harder tackles or to create a greater sense of invulnerability. Similar parallels were also evident in amateur boxing whereby controversy was created with their introduction of safety head gear (Dyer, Noroozi, Redwood & Sewell 2010).

Much like in American Football, the headgear was designed to reduce impact forces but may have indirectly created feelings of athlete invulnerability and therefore encouraged boxers to hit harder or to defend their headless. Alternatively, despite any safety benefits, discomfort or intimidation has been an alternative problem for headgear adoption. In ice hockey, the adoption of face masks for the goalkeepers or helmets for the field players varied in adoption from the 1950's up until the end of the 20th century, despite possible face strikes from high speed pucks, In the end, the governing body implemented mandatory use from 1979 (Bachynski 2012).

5.2 The use of non-human decision-making in sport

The key use of non-human decision-making technology has occurred in several sports including football, tennis, cricket, rugby, golf, rowing, stock car racing, basketball, American football and wrestling; these include video replay technology and or line judgment technology (Svantesson (2014). These non-human decision making technologies include

5.3 Video replay technology

Video replay technology has proven controversial for examples in golf, wrestling, rugby, and American football and sculling. Criticisms of video-replay technology when used in sport is that the stopping and starting of the game to check the video of a contentious moment will disrupt the flow and pace of football and in ice hockey. However, in both wrestling and rugby, the refusal by officials to review match footage at key moments then caused controversy which led to legal challenges. (Svantesson 2014); Post-game video replay has been successfully implemented feasibly into sport. For example, in 2000, golfer Brian Gay was credited with a birdie shot at the Honda Classic. However, use of video replays after the match indicated that a 16 s delay had taken place between the ball reaching the edge of the hole and then falling in. As a result, the ball was deemed to be 'out of play' and a stroke was added to his score (Nafziger 2004).

However, the use of such systems (either in real time or after the sport does not ensure a clear decision or outcome has been concluded. For example, a dispute between two sculls at the finish line of a women's skull race at the 2000 Olympic Games was challenged when it was deemed that video replay technology did not have the accuracy to judge a difference between two boats separated by 12 one thousandths of a second and therefore relied on human-based judgment (Nafziger 2004). However, the effectiveness of the official's decisions without use of video replay has been credited. For example, when a pilot programme was formally implemented in collegiate American football to check judgment call decision making, whilst only 50 of 11,000 games were actually reviewable, only half would have been overturned. This equated to a proportion of incorrect calls of less than a quarter of one percent (Nafziger 2004). Therefore, if human-based decision-making is robustly made, the philosophical debate surrounding line judgment technology is not really a polarized outcome of whether it should be used at all but whether it should act as a decision-maker or merely a decision aid (Collins & Evans 2008).

5.4 Line judgment technology

In football there has been some controversial decisions made by a human referee with respect to awarding a free kick, giving a penalty or knowing whether the ball has crossed the goal line; It was argued that such controversies could have been averted using line judgment technology, however Criticism of line judgment technology has been proposed as de-humanizing football and too expensive, or impractical to implement at all levels of the football game (Svantesson 2014 & Singh 2012). The technology has been disputed by arguing that human mistakes are a facet of both sport and everyday life and that the role of the referee is intended to be based on their interpretation, discretion and instincts rather than just the outright objectivity of the facts, Goal-line technology was fully adopted at the 2014 FIFA World Cup but it is still not currently used for typical domestic level league competition (Svantesson 2014). In cricket, controversy has surrounded bowling an illegal delivery of the ball or detecting a 'leg before wicket' infringement.

This has been attempted to be resolved using line judgment technology such as the 'Hawkeye' system (Collins & Evans 2008). However, controversies over line judgments have occurred when using 'Hawkeye' in Tennis, whereby the technology itself may have got a decision wrong. This has occurred in Wimbledon men's singles final; whereby the system judged the ball the wrong side of the line. As per any other form of measurement technology, the 'Hawkeye' system does carry a margin of error. It has been proposed that it carries an average degree of accuracy of 3.6 mm in Tennis or degree of error of 2.6 mm in Cricket. Such errors will vary based on ball speed, size of the playing area and recording rates, but there are concerns that without knowing this, naïve spectators might overestimate the technology's ability to resolve disagreements (Collins & Evans 2011).

6. 'RE-SKILLING' A SPORT THROUGH THE USE OF NEW TECHNOLOGY

Re-skilling is an increased level of skill required to perform a given task or a substantive change to the skill set; Technique-based re-skilling was found in golf and a croquet style putter design entered use which required a slightly different technique. (Sheridan 2006 & Carr 2008). Golf governing body banned it as they felt the skill required to use the putter deviated too far from what was traditionally expected in the game of golf. In tennis, re-skilling-based controversy was generated by the introduction of 'spaghetti' strung rackets; Spaghetti stringing was a double layer design of racket strings. These rackets seemed to grab the ball, hold it for fractionally longer and therefore impart excessive spin on the ball or to generate greater power and accuracy (Dyer et al. 2010, 2011). The controversy for this innovation originated in 1978 and involved opponents becoming confused when receiving a ball delivered from this racket design and led to them making an increasing level of mistakes. The governing body determined that the spaghetti strung racket design compromised the athletic challenge of the game and therefore banned its use. A similar problem in tennis also surrounded the design of the ball itself. In 1924, despite specifications being known for a balls size, weight and bounce, it was argued that American balls felt lighter in play than European balls. This meant that any players from outside of the balls country of supply would be subjected to a nature of response that they may not have trained for.

To address this, the governing body introduced a compression based requirement for balls from 1926. However, the issue surrounding ball specification arose again in 1999 when tennis's governing body decided to introduce three new designs of ball onto the male professional circuit, with each tailored to different playing surfaces. This was due to the premise that tennis had become a game of power serving and that with serves now being in excess of 140 mph, the service speeds were approaching the limits of human reaction time (Miah [2000]). However, in some cases, a technology which creates some level of re-skilling can be eventually adopted by a sport's governing body within its constitutive rules. For example, the digging of holes to locate the athlete's pole in the sport of pole-vaulting was initially considered unethical and subsequently banned by athletics' governing body. However its structure, dimensions and position was actually later formally adopted by them (VerSteeg 2005). Likewise, the adoption of fibre glass vaulting poles in the 1950's radically altered the achievable heights by athletes and required athletes to modify their technique. Fibre glass poles provide an increased mechanical advantage and increased vaulting height to its user by bringing the ends closer together as it bends, thereby temporarily lowering the vaulter's handgrip. As a result, the pole shortens its overall length by 15–25 % and allows the vaulter to raise their grip in turn by 15–25 % above the height that they are capable of holding without bending the pole (VerSteeg 2005; Dyer et al. 2010).

In running, controversy arose over whether a chip-based timing system should be used over that of a traditional starting pistol to record runners' times. By using the newer timing chip technology, each individual would receive an accurate time when they personally crossed the start and finish line. However, this would mean that the visible finishing order may not then be the true positions that they actually finished in. This example involves some level of re-skilling as the lack of true positioning of competitors could alter how a runner would approach their pacing strategy as the visual position of a runner might no longer be accurate. The governing body ultimately decided that the starting pistol would remain as the official time (Sailors 2009). However, this decision was challenged in 2008 at the Chicago Marathon whereby a runner who had started 5 min behind the elite category, actually set the 4th fastest time when going by his chip time. The race organizers refused to award him the 4th place prize money as he did not start with the elites. A few weeks later, a similar situation occurred again at the Nike Women's Marathon in San Francisco whereby a runner who had started in a citizens race (some 20 min after the elites), covered the course 11 min faster than anyone else. Ultimately, the governing body ruled that since these runners were not in the elite starting event, they were in a separate race and as such were therefore not entitled to any prize money (Sailors 2009).

7. 'DE-SKILLING' A SPORT THROUGH THE USE OF NEW TECHNOLOGY

De-skilling insinuates that a sport is made easier to undertake as a result of the introduction of a technology or product. For example, the sport of Golf has seen several examples of such de-skilling controversy. Controversies included club heads which used 'U' (or square) grooves. This feature provided a greater accuracy of the stroke. The PGA outlawed the design after it was felt that such designs reduced the skill required to play the game (Carr 2008; Miah 2006). The golf ball also saw complaints and controversy when it moved from its original construction to the more modern rubber core. The newer ball design was able to achieve greater travelling distance, therefore requiring fewer strokes to cover the course. The complaints for the new balls adoption originated from the players themselves who had become skilled in its use (Vamplew 2007).

This was a case whereby a governing body formally adopted some level of de-skilling to the game it regulated. Conversely, the attempted introduction of the 'Polara' golf ball decades later comprised an optimized dimple pattern on its surface which reduced the balls tendency to hook or slice (Dyer, Noroozi, Redwood & Sewell 2011). This innovation was described as benefiting lower skilled players more than those who were technically better at the game and was ultimately banned. In the end, the weight of widespread use of a new technology in society can ultimately force a ruling body to accept a contentious technology. For example, the rear derailleur used on a bicycle is a mechanism used to change gear by driving a chain across a series of wheel mounted sprockets on a bicycle. This innovation was not allowed into the Tour de France until some 40 years after its invention which was years after its initial introduction into commercial bicycles (Trabal 2008). The races director argued that it was dishonest and unfair and insinuated that possessing multiple gears degraded the challenge of the event (Trabal 2008).

8. GOVERNING BODY OVERSIGHT ISSUES

Sport technology's controversy stemmed from an absence of any governing body at all. For example, in the America's Cup, a large volume of rules but the lack of a specific governing body to apply them objectively has led to various disputes over yacht hull design (Nafziger 2004). Alternatively, having multiple governing bodies of the same sport which operated in different countries has caused issues whereby an innovation was accepted by one governing body but not by another. This occurred with the initial adoption of steel shafted clubs by golf American governing body from circa 1922, but not by the original governing body located within the Great Britain; for example a training technology that would straddle multiple sports (Vamplew 2007).

9. CONCLUSION AND RECOMMENDATIONS

In conclusion the issue of ethical considerations has becomes a matter of concern in sporting circle and if not properly addresses it will make sporting activities lose its respect and people will lose interest in partaking in sport activities and will result in lesser sponsorship and participation. Sport Technology is not limited to enhance performance; it potentially extends into rehabilitation and injury prevention; technology acceptance not only involves spectators but also the sport's governing bodies, as governing bodies can themselves be catalyst for change. Whilst in many sports it has been proposed that performance is starting to indicate a reducing or plateaued nature in their rate of improvement, it has been claimed that any significant gains in the future will be as a result of technological innovation. Any account of technology in sport was deemed controversial if there was a suggested or implied dispute (or debate) between any of its sports stakeholders regarding its use or inclusion.

The paper recommends the possibility of separating legal enhancement from disallowed once, and the rules will have to be change so as to reflect and acknowledged the tremendous improvement recorded in these sports where equipment is critical. Those who are in a position to develop rules with respect to the use of sports equipment or to fund equipment or facility acquisition for economically disadvantaged teams through the administration of grants need to bear in mind the fundamental principle of parity in competition.

We can clearly enhance behavior by allowing the use of advance materials but where the line should be drawn is should there be no restrictions? Should we allow competition at highest level to be only affordable to the elite because of the high cost of equipment? Changes or introductions of technology or equipment can affect how a sport is played or influence its performances. The concept of fairness (or unfairness) due to technological introduction was an overarching major theme for future work, Issues of applying technology in sports, the growing interest in and demand for better sports technologies, athletic performance, leisure, entertainment and how technology could affect the rules of the games, new design methods, customized production techniques, use of smart materials, ambient intelligence and added services have spawned a wide variety of future direction of new research

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