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**Technology Enhancement and Ethics
In the
Paralympic Games**

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ABSTRACT

Stavroula Bournas: Technology Enhancement and Ethics in the Paralympic Games

(Under the supervision of Konstantinos Georgiadis, Professor)

The aim of the present thesis is to present how the new technological advances can affect the performance of the athletes in the Paralympic Games. The main question that this paper aspires to address is whether the evolution of technology enables the athletes' natural performance or if it is used mainly for the enhancement of their performances. It is also mentioned how much technology should be allowed in the Paralympic Games and how the results of the games are being technology-dependent. In order to achieve this goal the essay includes references to the meaning of the Paralympic Games, what is disability, in which categories are separated through their impairment, what is the classification system according their impairment and the history of the games. Furthermore, it mentions the International Paralympic Committee-IPC, the creation of it, the core and the values behind that idea, the motto and the mission regarding the educational and developmental strategy of the IPC. In the second part, it is being analyzed the term techno doping and if the evolution of technology is being used by the athletes for a natural performance or for the enhancement of their existing performance. It is also being discussed a possible advantage of disabled athletes by using prosthetics in "normal" competitions, and how to be included in such competitions concerning the gradual improvement of technical aids. The results showed that due to technology improvement, International Paralympic Committee shall always mark the assistive devices of each athlete and set rules and regulations concerning them in a regular basis.

Keywords: technology enhancement, techno-doping, Paralympic Games, ethics, assistive devices in sports

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LIST OF ABBREVIATIONS

The following table describes the significance of various abbreviations and acronyms used throughout the thesis.

Abbreviation	Meaning
B	Blind
BC	Before Christ
CAS	Court of Arbitration of Sport
CP	Cerebral Palsy
CP-ISRA	Cerebral Palsy International Sport and Recreation Association
IAAF	International Association of Athletics Federations
IBSA	International Blind Sports Federation
ICF	International Classification of Functioning
IFs	International Federations
INASPID/INAS	International Sports Federation for Persons with Intellectual Disability
IOC	International Olympic Committee
IOSD	International Sports Organization for the Disabled
IPC	International Paralympic Committee
IQ	Intelligence Quotient
ISEA	International Sport Engineering Association
ISF	International Sport Federation
ISMWSF	International Stoke Mandeville Wheelchair Sports Federation
IWASA	International Wheelchair and Amputee Sport Association

Abbreviation	Meaning
LZR	Laser Race Swimsuit
NCPs	National Paralympic Committees
OCOG	Organizing Committee of Olympic Games
OCPG	Organizing Committee of Paralympic Games
WADA	World Anti-Doping Agency
WHO	World Health Organization

CHAPTER I: INTRODUCTION

Background

In this thesis it is presented a reference to the Paralympic Games, its history, its values, its categories of disability and sports and the Paralympic Movement. It is being analyzed an approach to the technology enhancement issue concerning the Paralympic Games. Furthermore, a discussion is being made in whether there is an ethical part in this worldwide phenomenon according these assistive innovations matters and concluding, it is important to answer what is the impact on the outcome of these advances to sport industry.

The target of the thesis is to explore the possibility of a technology doping issue in the athletes' performances and how much of that technology should exist in the Paralympic Games. Also, this study was designed to assess the hypothesis that the evolution of technology is being favorable to the athletes by enhancing their abilities and if the results of the games are being technology-dependent.

Sport industry

Sport was, is and will be a means to a person's well-being not only physically but also and most importantly, mentally. Sport might inspire human and through sport we can establish respect, understanding and coexistence between different countries and cultures. Creating the Olympics and eventually the Paralympics the world has found a base where different people seek to awaken the awareness and understanding of the diversity, excellence and courage of disabled people.

In human's history, sport is a widespread phenomenon in many civilizations and countries around the world. The origins of many aspects of sport can be seen thousands years ago; such as in 2300 Before Christ (B.C.) in Ancient Nubia -current Egypt- with wrestling events when men were trying to exercise themselves (Carroll, 1988) or in 2000-1900 B.C. (Mcinerney, 2011) in the Minoan civilization with the bull-leaping to the world of Homer with athletics contests appeared as funeral events such as those held for Patroclus by Achilles (Homer, Perseus Hopper).

The definition of sport, as cited by United Nations, "sport is all forms of physical activity that contribute to physical fitness, mental well-being and social

interaction, such as play, recreation, organized or competitive sport, and indigenous sports and games.” (UN, 2014)

Sport as we know it today has great differences than in the ancient times but the spirit of it remained the same which is the pursuit of excellence (IOC, 2014a). The pursuit of excellence is the vital goal of an athlete’s life and as Baron Pierre de Coubertin, the creator of the modern Olympic Games, has mentioned the practice of sport is a fundamental human right for all. According to him, there are two principles in the sport area, the effort of the self-perfection of body and mind and the development of social and moral behaviors while practicing sports which are founding the sense of Olympism (Naul, 2008:110-111). Coubertin wanted to revive the Olympic Games and was led to this idea by studying several educational systems, amongst of them the English educational program (Naul, 2008:19-20). He believed in the significance of Olympism and in all the benefits that could offer to the world. For these reasons, he worked with passion in the revival of the Olympic Games which he accomplished in 1896 with the first modern Olympic Games.

The milestone in the sport history is the creation of the Olympic Games which is the major sport event that athletes compete at their highest level of performance. The concept of the Olympic Games is coexistent with the concept of the Paralympic Games. These concepts are also coexistent through time. Every 4 years Olympics and Paralympics come together to celebrate sport and culture, to unify athletes from different countries and backgrounds around the world, to promote excellence, courage, determination. The Paralympic Games were created to enhance the awareness and understanding of the disabled people throughout the world in order to connect the world under no discriminations.

Disability Concept

As World Health Organization (W.H.O., 2014) states:

“Disability is an umbrella term, covering impairments, activity limitations, and participation restrictions. Impairment is a problem in body function or structure; an activity limitation is a difficulty encountered by an individual in executing a task or action; while a participation restriction is a problem experienced by an individual in involvement in life situations. Plus, disability is not just a health problem. It is a

complex phenomenon, reflecting the interaction between features of a person's body and features of the society in which he or she lives.”

Moreover, the term is focusing nowadays to the classification system of functioning emphasizing the relationship between capacity and performance (Scott, 2007). Furthermore, three dimensions of disability are recognized by the International Classification of Functioning (I.C.F.): body structure and function, activity (and activity restrictions) and participation (and participation restrictions) (Disabled World, 2014).

The disabled athletes that participate in the Paralympics have the same incentives as the athletes in general because overall, sport makes humans happy, help with the sociability, create friendships and enhance the physical condition (MU Health Care, 2014).

However, the main reason for practicing sport is the athlete's endeavor to achieve physical well-being which the same occurs for a disabled athlete. The benefits that a disabled person encounters by practicing sports basically are the rehabilitation process, the participation in a continued program for the cure and mostly the social adaptation after the injury (Hutzler & Bar-Eli, 1993).

After all, sport can shape a person's character; it can promote positive images and combat labels of perfect human bodies. Moreover, people should embrace the athlete's ability rather than the disability itself. People, in more, are reconsidering their approaches and behaviors towards disabled people which lead to a more inclusive society. Consequently, the Paralympic Games became a vehicle to embrace the diversity of human beings and empowered more disabled people to be active members of the community. In the end, that is the power of sport united all countries, all people under the grounds of race, religion, politics, economy, gender or disability issues.

Paralympic Games

The Paralympic Games are one of the largest international Olympic competition concerning athletic games but the first and top competition in the world concerning athletes with a disability that compete in various sports events.

The term Paralympic originated from the Greek preposition "para", which meaning is "beside" or "parallel", and "Olympics". The meaning of the word Paralympic is that these games are parallel with the Olympics as its core is the sporting excellence the athletes must accomplish despite the disability of the body (Athens 2004 Organizing Committee, 2002; Papakonstantopoulos, 2001:7).

The Paralympic Games are organized every 4 years as the Olympic Games and its duration is approximately 12 days. They are both organized in the same town, at the same athletic infrastructures and the Paralympics are the sequel of the Olympic Games. This memorandum came with the agreement between the International Olympic Committee (I.O.C.) and the International Paralympic Committee (I.P.C.) - two institutions responsible for the Olympic and Paralympic Games respectively- in the year 2000 concerning their future relationship (IPC, 2014b).

The motto of the games is “Spirit in Motion”, which was firstly introduced in the 2004 Athens Paralympic Games, and the Paralympic symbol (Picture 1) is three colored Agitos (from the Latin meaning “I move”) with the colors red, blue and green. These three colors are most widely represented in national flags around the world and at the same time they represent three different words which are mind, body and spirit, the three elements of human existence (Papakonstantopoulos, 2001:11).

The Paralympics are separated in the Summer and the Winter Paralympic Games. The Summer Paralympics have 19 sports similar to the Olympic Games, although there are some special rules and regulations in some of them, and three other sports like boccia, goalball and wheelchair dance competition that only in the Paralympics are included.



Picture 1. The Paralympic Symbol

([http://www.paralympic.org/the-ipc-brand#!prettyPhoto\[related_gal\]/0/](http://www.paralympic.org/the-ipc-brand#!prettyPhoto[related_gal]/0/))

The sports of the current Summer Paralympic Games are: archery, athletics, basketball, boccia, canoe, cycling, equestrian, fencing, football, goal ball, judo, power-lifting, rowing, rugby, sailing, shooting, swimming, table-tennis, tennis, triathlon, volleyball and dance contest. In the Winter Paralympics there are sports like alpine skiing, biathlon, cross-country skiing, ice sledge hockey and wheelchair curling (Picture 2) (IPC, 2014c).



Picture 2. The Winter Paralympic Sports. In the first line from left to right: Alpine Skiing, Cross-country Skiing, Biathlon. In the second line from left to right: Wheelchair Curling, Ice Sledge Hockey.

(<http://galleryhip.com/winter-olympic-sports-icons.html>)

Historical Information

The man behind the creation of the Paralympics was Dr. Ludwig Guttmann (Picture 3). He was a German-born British neurosurgeon who established these games in England in 1948. The story started at 1944 when the British government employed Dr. Guttmann to be a chief to a hospital facility at a British province. He appointed as director to the Stoke Mandeville Hospital in Buckinghamshire in England, a rehabilitation facility for the World War II injured soldiers, mostly with spinal

injuries, where he inserted a program of a sporting treatment for that kind of injuries. As his secretary Mrs. Joan Scruton recalls that it was not an easy task at the beginning because at that time the patients who arrived at the hospital not only they had serious injuries but also they had terribly infected wounds to the rest of their bodies which made the treatment even more complicated. He believed that sport was a necessity for those men to help them boost their attitude, reduce the social isolation and at the same time improve their physical strength. He wanted his patients to have their normal life and a new future again as soon as possible giving the fact that these men were young. Dr. Guttmann made it obligatory for his patients to practice sport while they were in the hospital. The patients started to play wheelchair polo. After a while, the polo was replaced by basketball due to many risks of injuries and in some time later, archery was the main sport in the hospital. This led to the creation of the first Stoke Mandeville Games for disabled people. These games were organized on 29th July in 1948 -the same day as the Olympic Games in London, England- and used the term paraplegic games which were to be known, later on, as the Paralympic Games (Steadward & Peterson, 1997:21-24).



Picture 3. Dr. Ludwig Guttmann
(<http://blogs.royalsociety.org/history-of-science/2012/08/29/olympians/>)

At the beginning, the games were held yearly and soon became international in the year 1952 with the addition of a Dutch team. Moreover, that year the International Stoke Mandeville Games Federation was created and after the years passing by, more countries were entered the games by the patients from disability institutions. In the middle of 1959, the International Stoke Mandeville Games Committee was founded with President Dr. Guttmann and members of 5 countries, Great Britain, Italy, the

Netherlands, Belgium and lastly France. The main aim was to create an elite sport competition for people with disabilities that would be equivalent to the Olympic Games and would follow them.

In 1960, the Ninth Stoke Mandeville Games were held in Rome, Italy and these considered being the first Summer Paralympic Games. In those games 400 Paralympic athletes were participated from 23 countries and the sports were archery, basketball, athletics, snooker, fencing, table tennis and swimming events (Athens 2004 Organizing Committee, 2001:255). With the passage of time, more sports were added in the program of the games. Moreover, the first Winter Paralympic Games were held in Örnsköldsvik, Sweden in 1976 with the participation of 250 Paralympic athletes from 16 countries. From that time on, Olympics and Paralympics were linked together in sport history and before Dr. Guttmann's death in 1980 these games had become a milestone in history alongside with the Olympics. In the end, Dr. Guttmann's dream was not only to enhance the patients' ability in order to achieve better physical activity but also to magnify their spirit towards life through sports. The aftereffect was the creation of the Paralympic Games.

In 1964 in Tokyo, Japan was the first appearance of the Paralympic flag and Paralympic anthem. Furthermore, in the games of 1968 in Tel Aviv, Israel South Africa delegation was participating up until 1980 although from the Olympics it was banned due to the apartheid. In 1972, the Games were held in Heidelberg, Germany and were the first time that athletes with visual or partially visual impairment joined the Games; also goal ball was introduced as a demonstration sport. The games of 1976 were organized in Toronto, Canada where amputees athletes joined the games and shooting events made an appearance whereas in 1980 in Arnhem, Netherlands the athletes with cerebral palsy participated for the first time. Also volleyball joined the sport events and although some countries had boycotted the Olympics, they did not do the same in the Paralympics.

The next games were held in 2 places, in New York, USA and Stoke-Mandeville, England. This situation happened because of the financial problems of the original host city of Illinois who at the last minute they withdraw. In 1988 the games were in Seoul, South Korea and since then the Olympic Games and the Paralympic Games were organized in the same city. Tennis event was first seen in

these games and also it was the first and last participation of Soviet Union before its dissolution. The games of 1992 were organized in Barcelona, Spain and athletes with intellectual disabilities made their first appearance in the games, although this particular athletic competition was held in Madrid (Paralympicanorak, 2012b). In the year 1996 the games were held in Atlanta, USA where the games committee achieved a huge amount of budget as they were of a huge media sponsorship deal. Next Paralympic Games were in Sydney, Australia in 2000 and they were the first Paralympic Games outside the northern hemisphere and the last time that athletes with intellectual disabilities participated due to the fact that the gold winning Spanish basketball team was found cheating in the games as only 2 out of the 12 athletes were indeed suffered from intellectual disability (Tomlinson, 2013). From that point these events were excluded from the program of the games. In 2004 the Paralympic Games were held in Athens, Greece with 135 countries having participated and the next Paralympic Games were in 2008 in Beijing, China and according to the President of the International Paralympic Committee Sir Philip Craven were the greatest of all times due to the 339 Paralympic records and the 279 world records that were broken. In those games 5 new countries were first seen such as Burundi, Georgia, Gabon, Haiti and Montenegro. The latest Paralympic Games were held in London, England in 2012 as new 14 countries also participated for the first time and the intellectual disabilities events were again in the games (Appendix I-II) (Steadward & Peterson, 1997:21-24).

Categories of Disability

Athletes with a disability can have physical, sensory and mental, permanent or temporary disability. In the Paralympic Games the athletes are separated into 3 main categories: athletes with physical disabilities, athletes with sensory disabilities such as vision, hearing impairment and athletes with intellectual impairment. To elaborate, the athletes have certain basic sub-categories (Athens 2004 Organizing Committee, 2002:1) according their impairment and can be separated into 6 sub-categories such as athletes with amputations, with cerebral palsy, with intellectual disabilities, with total or partially visual impairment, athletes in wheelchairs and athletes with other disabilities known as “les autres”.

Moreover, these 6 sub-categories are separated into several categories regarding the degree of the capability of the athlete. The degree of the capability is about the ability of the athlete to compete and it is not about the kind of disability from a medical aspect. That means that athletes from different sub-categories can contest in a category with the same or similar disability. That is why there are many subcategories even in one main category of disability (Athens 2004 Organizing Committee, 2001:258-261).

In the first category are included athletes with amputations. These athletes have lost at least one part of their limbs either from the elbow or the wrist, the knee or the ankle. In some cases, these athletes are competed with wheelchairs. In this category the disabilities are the impaired muscle power (e.g. paraplegia and quadriplegia, muscular dystrophy, Post-polio syndrome, spina bifida), impaired passive range of movement, limb deficiency (e.g. amputation or dysmelia), leg length difference, short stature, hypertonia, ataxia, athetosis.

The second category includes athletes with cerebral palsy that have lost their ability to control their muscles or their reflexives. In this category there are 8 different classes and the athletes are categorized depending on the extent of the disability which is quite difficult to define and especially because most of the time there is not a stable medical situation of the athlete. The Cerebral Palsy 1 (CP1) refers to athletes with very limited strength and movement who usually use electronic wheelchairs. The CP2 refers to limited strength but the athletes can move themselves with the help of manual wheelchairs. In the CP3 category the athletes have limited motion of the upper body but they can throw. The CP4 refers to athletes with good strength, minimum control problems and limited balance whereas the CP5 category refers to athletes with normal static balance but having movement problems. In the CP6 category are included athletes with lack of immobility, accidental movement and an inability of walking. Finally, the CP7 refers to athletes with muscular spasms without control and satisfied function whereas in the CP8 category the athletes have minimum uncontrollable spasms in one limb.

The third category refers to athletes with intellectual disabilities. A person has an intellectual disability when either his IQ score is 70 or 75, for a person's basics IQ range the score is about 90-110 (IQ Comparison Site, 2007), or when he has limited

skills, such as speech delays or lack of social functioning. This disability is usually presented before the age of 18 years old and these athletes are competed in swimming, track and field, basketball and Ping-Pong events. These athletes can cheat more due to the lack of the right procedures (IPC, 2014j; IPC, 2007) before, during or after the games and it has been verified that many countries promote this kind of attitude so as to gain the extra bonus of money due to federal grants (Lakhani, 2012).

The fourth category includes athletes with total or partially visual impairment that through surgery may have retained a part of their vision. There are athletes with total blindness, not able to see anything or may comprehend some kind of light but not able to identify objects, and athletes with minor or partial blindness. In total or partially visual impairment the athletes are separated into three classes, Blind 1 the ones that do not comprehend the light or there is a perception of light and do not see shapes, B2 the ones that recognize shapes but there is limited vision up to 2m and class B3 the ones that recognize shapes but the limited vision is up to 6m and their field of vision is between 5 to 20 degrees (Telegraph Sport, 2012). The lower the number of the class is the higher the level of loss vision the athlete has. In the marathon race, athletes from the B1 class run with the help of an escort, can have up to 4 escorts and can only take instructions when there is a turn or an uphill.

In the fifth category are included athletes in wheelchairs. These athletes have lost at least 10% of their functions of the lower limbs and the common categories are the paraplegia, quadriplegia, poliomyelitis and cerebral malfunctioning. Finally, in the last category are included athletes with other disabilities, known also as “les autres” such as dwarfism, polio and multiple sclerosis (IPC, 2014i).

Categories of Sports

Up until 1980s the classification system in the games was the medical diagnosis which consisted of the diagnosis of the impairment and the medical evaluation. But since the 1980s the focus of the classification system is the functional diagnosis which results to the impact of the athlete’s impairment to his athletic performance and also athletes are separated regarding the level of impairment. Nevertheless, only the International Blind Sport Federation (I.B.S.F.) is still using the medical classification system to its athletes.

The athletes are taking part to each game according their functional diagnosis. In the Summer Paralympic Games the athletes who participate to each sport are as following (IPC, 2014):

1. Archery, in which participate the athletes with physical impairment. They are competed in individuals and in groups such as in standing and wheelchair competitions.
2. Athletics, in which participate athletes from all the categories of disabilities, physical, visual and intellectual.
3. Basketball, in which participate athletes in wheelchairs and with physical impairment. The game lasts 40 minutes and the measurement of the court is the same as in the able-bodied basketball game.
4. Boccia, with athletes in wheelchairs having cerebral palsy impairment or other neurological conditions. It is played on a hard surface, and the goal is to throw the game balls so that they land as close as possible to a special target ball, which is called the “jack”. The game is played in groups or individuals.
5. Canoe, in which participate athletes having physical impairment. This sport will be included for the first time in the 2016 Paralympic Games in Rio de Janeiro, Brazil and the classification system is based on athletes’ functional ability when it comes to paddling and applying force to the foot board or seat to propel the boat.
6. Cycling, in which participate athletes with physical disabilities and with visual impairment but in this category the athletes are competed with an escort. The events are organized in public roads or inside the Velodrome and athletes race on bicycles, tricycles, and tandem or hand cycles based on their impairment.
7. Equestrian, in which participate athletes with any type of physical and visual disability. The athletes are competed in dressage events, a championship test of set movements and a freestyle test to music.
8. Fencing, in which participate athletes in wheelchairs having amputations, spinal-cord injuries or cerebral palsy impairment. In this event the wheelchair is being immobilized and the athletes can move only the upper part of their bodies.
9. Football, in which participate athletes with cerebral palsy in the 7-a-side event and athletes with visual impairment in the 5-a-side event. In these events there are modifications in the number of players, the measurement of field and have different regulations according to the original football game. The duration is also different, 1 hour and 50 minutes respectively.

10. Goal ball, in which participate athletes with total or partially visual impairment and are separated into 2 teams competing in 2 periods of 12 minutes. The athletes are wearing masks during the game trying to catch the ball which has inside a bell and from that sound the athletes can understand the direction of the ball.
11. Judo, participating athletes having visual impairment and competing in several weight categories. In this sport, the competition lasts five minutes and the athlete who scores the higher amount of points wins.
12. Power-lifting, in which participate athletes with physical disabilities and the event is classified exclusively by weight competing in a special designed seat.
13. Rowing, participating athletes having physical and visual disabilities. This sport is divided into 4 boat classes.
14. Rugby, in which participate athletes with physical impairment particularly with quadriplegia and the athletes compete in wheelchairs.
15. Sailing, in which participate athletes with any type of physical impairment and the classification system is based on four factors: stability, hand function, mobility and vision. They compete in 3 events which are single-person keelboats, two-person keelboats and three-person keelboats.
16. Shooting, in which participate athletes with physical disabilities. They are divided into 2 categories the standing position and the wheelchair position and they compete in pistols and rifles.
17. Swimming, in which participate athletes from all types of disabilities, physical, visual and intellectual, and in several events such as freestyle, butterfly, backstroke, individual medley and breaststroke.
18. Table-tennis, in which participate athletes with physical disabilities and athletes with intellectual disabilities. They are separated into 2 classes the standing and the sitting and they contest individual or in pairs.
19. Tennis, with athletes in wheelchairs having physical impairment. They compete in pairs or individuals and the basic difference is that the ball can heat the court twice before the opponent parries.
20. Triathlon, in which participate athletes with physical impairment. This sport will be making a debut in the 2016 Paralympic Games in Rio de Janeiro. Athletes race in three disciplines: 750m of swimming, followed by 20km of cycling and 5km of running.

21. Volleyball, in which participate athletes with physical impairment such as amputation, spinal cord injuries, cerebral palsy, brain injuries and stroke. It is competed sitting in a smaller court (10m x 6m) and a lower net. At all times, an athletes' pelvis must be touching the ground, and service blocks are allowed.

22. Dance contest, in which athletes compete in wheelchairs having physical impairment that affects the lower limbs and are divided in two classes. Athletes are classified according to their functional abilities based on sport specific tests which include wheel control, push function, pull function, full arm rotation and trunk rotation.

In addition, two sports -badminton and taekwondo- remain in contention for being part of the Tokyo 2020 Paralympics according to the IPC Governing Board (IPC, 2014p).

Respectively, the athletes who participate to each sport of the Winter Paralympic Games are as following (IPC, 2014k):

1. Alpine skiing, in which participate athletes of different categories. It is divided into six disciplines such as the downhill, slalom, giant slalom, the super-G, combined and snowboard. There are also three types of classes in this sport the standing and the sitting skiing for athletes with physical impairment and the visually impaired class.

2. Biathlon, with athletes of physical disabilities and athletes with visual impairment. These athletes are competed in cross-country skiing and rifle shooting. The athletes with visual problems in the shooting part are guided from an acoustic device.

3. Cross-country skiing, with athletes having physical impairment and visual impairment. They compete in standing or sitting position in two basic techniques such as classic-style and free-style (skate skiing). Also, they participate in groups or individuals at a distance from 2.5km to 20km.

4. Ice sledge hockey, in which participate athletes with physical impairment in the lower part of the body that would prevent them from competing in able-bodies ice hockey. Each team has six players and the duration of the game is 45min.

5. Wheelchair curling, with athletes having physical impairment in the lower half of their body, including spinal-cord injuries, cerebral palsy, multiple sclerosis and double-leg amputation. They compete only in teams of 5 athletes.

The training of such an athlete can be extremely difficult and arduous not only to them but also to the escorts or even the staff that surround them. These athletes can

be considered athletes with no limits, no boundaries and with large reserves of inner strength as some of their performances are quite extraordinary. To recall some, Ajibola Adeoye was a Nigerian athlete, four times Paralympic gold medalist, who had his left hand completely amputated (Mortimore, 1992). He won his first gold medal in T46 class winning at 100m race in 10.72s. He also held the world record in 1992 Barcelona Paralympic Summer Games, a record that it can be seemed much closed to the time record of the American bronze medalist Dennis Mitchell at the Olympics in 1992 with his time being 10.04. Another example is Arnold Boldt, a Canadian one-legged high-jumper in F42 class who participated in the 1976 Toronto Paralympics winning the gold medal with 1.86m (Saskatchewan Cycling Association, 2014) in comparison with the women's performances of Sara's Simeoni and Yordanka's Blagoeva who won the silver and bronze medal respectively with 1.91m. Boldt's best jump stands at 2.08m (Athens 2004 Organizing Committee, 2001:258).

International Paralympic Committee (IPC, 2011; IPC, 2010)

The foundation of the International Paralympic Committee was a hallmark in the history of the Paralympic Movement and it has created a unique doctrine under the umbrella of excellence and courage in which Para athletes can overcome their fears and reach perfection with their disabilities.

The core of the Paralympic Movement is the athletes, their sporting excellence, their improvement in Paralympic sports and the athlete's moral development. One of the main essences of the Committee states: "The athletes are the essence of the Paralympic Movement. It is the goal to empower Para athletes at all levels to enjoy the opportunity to practice sports and to facilitate the development of competition pathways from grass roots through to the Paralympic Games. This requires the development of a well-functioning system of organizational structures, capable human resources and access to the necessary resources. In this system, the work and initiatives of International Federations (I.F.), National Paralympic Committees (N.P.Cs) and Regions need to be synchronized to complement each other and to form a coherent plan" (IPC, 2013) (Appendix III-IV).

The National Paralympic Committees are national organisations recognized by the IPC as the sole representatives of athletes with impairment from their respective countries. Furthermore, the Regional organizations are independent of the IPC and

recognized as the sole representatives of IPC members within a specific part of the world. The IPC currently recognizes four Regional Organizations: African Paralympic Committee, Asian Paralympic Committee, European Paralympic Committee, Oceania Paralympic Committee (IPC, 2014e).

The motto of the IPC concerns the three main structures of the essence of human and that is the mind, the body and the spirit. This motto was firstly seen at the Paralympic Games in Seoul, South Korea, in 1988 and since then not only it became worldwide known as the core of the IPC but also it is being represented by the three drops of tears in the Paralympic flag.

Human Resources

The International Paralympic Committee was founded on 22 September 1989, based in Bonn in Germany and is a determinant factor for the spread of the Paralympic movement throughout the world. Its current president is Sir Philip Craven, a British former Paralympic athlete in wheelchair basketball, in track and field athletics and in swimming. Sir Philip Craven is also today an Ambassador for Peace and Sport, an international organization, committed to serving peace in the world through sport. It is run by 177 National Paralympic Committees, 5 highest International Federations and the 4 International Organizations of Sports for the Disabled. IOSDs are independent organizations and act as the only representatives of a specific impairment group.

The board of the IPC is elected every 4 years and consisted by the President, Vice-President, the General Secretary, the Treasurer, the Medical Councilor, the Technical Councilor, each Representative from the 5 of the International Federations, each Representative from one of the continents, one Representative from the athletes, one Representative from the Summer Sports and last, one Representative from the Winter Sports.

The structure of the IPC includes the General Assembly and meetings of the Membership, the Governing Board and Councils, Standing Committees, Commissions and the Management Team directed by the Chief Executive Officer. The International Paralympic Committee can be seen not only as a governing body of the Paralympic

Movement but also as an International Sport Federation for several Paralympic sports from which it directs the competitions around the world.

The Purpose and Goals

The mission of the IPC is to promote sport for athletes with disabilities without discrimination on the basis of race, gender, nationality, ethnic origin, religion, philosophical or political opinion, marital status or sexual orientation throughout the world and in general, link sport with the social awareness about disabilities issues and equal opportunities for all individuals.

The vision of the IPC is "To enable Paralympic athletes to achieve sporting excellence and to inspire and excite the world" (IPC, 2014f). Moreover, to explain it word by word the IPCs' goal is to enable, to create the right conditions for athletes' empowerment, the Paralympic Athletes, which is the primary focus from lower to elite level, to achieve sporting excellence and to inspire and excite so as to touch the heart of all people for a more upstanding society. Overall, IPC became one of the most successful and influential sport organizations in the world.

The main values that exist in the Paralympics are courage, determination, inspiration, equality, excellence, fair play and respect. The base behind the Paralympic Movement is not only to unify the ideals and values that come along with the Olympics but also to create the awareness and understanding toward disabled people.

In parallel, the main objectives of the Paralympic Movement are to ensure the development and strength of the Paralympic Movement, to supervise the organization of Summer and Winter Paralympic Games and to ensure their best possible success plus the satisfaction of all participating stakeholders. Other objectives are to enhance the knowledge and awareness of the Paralympic sports and to change societal perceptions and attitudes towards disabled people. Finally, to support and encourage educational research that promote Olympism, the values and the sporting/mental improvement of the athletes and last to ensure the funding of the organization and establish partnerships/alliances that will benefit the organization (IPC, 2014g).

As Philip Craven had said at the 2014 Paralympic Winter Games in Sochi-Russia: "the inspirational athletic performances have redefined the boundaries of

possibility...You have shown the world that absolutely anything is possible and that life is about amazing capabilities and not perceived deficiencies” (CBC Sports, 2014).

The Role

One of the crucial and disputable role of the IPC is the classification of the athletes. Each sport has its own special examining committee that athletes are obliged to be examined so as to classify them into categories according their disabilities and their function capabilities. The athletes are being classified and in this procedure there are three parts: the permanent, the re-examined and the new one. The permanent is the one that the athlete has been tested several times from an international recognized committee. The re-examined one is when an athlete is being tested and verifies that his disability is improving or worsening and that this athlete should be tested again. In the third category, the new, is when an athlete is new in the sport and he has never been tested from an international recognized committee.

In the latest years, the committee has had important issues to solve according cheating matters regarding the athletes. The first issue is the fact that parts of the athletes are cheating in the classification system so as to be put in a more favorable class, the second issue is the so-called “boosting” that some athletes have shown great performances which are a little bit peculiar as to how a disabled athlete can achieve such an appearance and the third issue is the techno-doping matter. To elaborate, Paralympics athletes may cheat in the class system due to the lack of proper qualification system which athletes can underplay their level of ability such as the incident with the Spanish basketball team in the 2000 Sydney Paralympic Games (Mackay, 2013) and in the 2012 London Paralympic Games when 7% of the entrants-athletes had been called for rechecks to verify their disability (Davies, 2012). Regarding the second issue, many athletes harm themselves in order to enhance the athletic performance by increasing the blood pressure and heart rate through breaking bones or tight-fitting clothing. This procedure is called boosting and it is seen more often than before (McGrath, 2012). Another issue is the technology-doping which will be thoroughly explained in the following chapter.

Moreover, there are 177 National Paralympic Committees and most of their duties are (Papakonstantopoulos, 2001:12) (Appendix V):

1. The country's representation in the Paralympic Games,
2. Ensuring equal opportunities for all disabled athletes,
3. Informing the stakeholders upon the technological developments in the field of sport for the disabled athletes,
4. The cooperation with the Olympic Committee and the Federations of disabled athletes,
5. The preparation program of the Paralympic delegation,
6. The cooperation with sponsors that promotes the ideals of the Paralympic Movement,
7. The doping control system,
8. The creation of committees responsible for ranking athletes according to their degree of disability,
9. The selection of disabled athletes to participate in the events of the IPC abroad,
10. Keeping archives with the winning results,
11. The training of the coaches and other officials.

The IPC shall not work with a view to profit which means that the IPC's activities shall not be aimed at commercial purposes and the funds shall only be used for purposes that come along with the Constitution and the IPC Handbook. This handbook includes details about the duties and responsibilities of all IPC members (IPC, 2014m).

Furthermore, one of the main duties of the IPC is to give the full responsibility of the Paralympic Games to each Organizing Committee of the Paralympic Games (OCPG) 5 years before the beginning of the Games. The OCPG is established by members of the National Paralympic Committee, the Ministry of Athletics, members of the Municipality of the organizing city and by the Organizing Committee of the Olympic Games (OCOG).

The OCPG and the OCOG are two independent organizations although they have direct and absolute cooperation. The goals of this affiliation are:

1. The maximum usage of the combined infrastructure of the Olympic Games and the Paralympic Games,

2. The total independence of the OCPG regarding the organization of the Games,
3. The avoidance of interference between the organizations to each other territory.

The OCPG has also some duties in the Paralympic Movement which are the signage of a contract with the IPC, the organization and delivering of the Games according the contract, the organization of the entire trip of the athletes, escorts and judges which includes their accommodation, transport and nutrition. And finally, another duty is the funding of the OCPG (Papakonstantopoulos, 2001:15).

Other Activities of IPC

The IPC is supported by the National Paralympic Committees and 5 highest International Sports Federations in equal terms (Papakonstantopoulos, 2001:11):

1. International Blind Sports Association-IBSA,
2. Cerebral Palsy International Sports and Recreation Association- CP-ISRA,
3. International Sports Organization for the Disabled-ISOD,
4. International Stoke Mandeville Wheelchair Sports Federation-ISMWSF,
5. International Sports Federation for Persons with an Intellectual Disability-INAS-FID.

The IPC has a cooperative working relationship with the IOC, although they are separated units, and few of the members of the IPC are also members of the IOC. Also, the IPC has partnered with the World Academy of Sport to create the IPC Academy -an educational center for improving educational standards within sport throughout the Paralympic Family and to provide world class programs like Paralympic school days and other activities (IPC, 2014n).

Another institution that has been created in 2007 in order to implement the work of the Paralympic Movement is the International Paralympic Foundation (IPF). Its aim is to extend the knowledge in the athlete development and the education part of the sport industry.

Moreover, the IPC has created the Agitos Foundation (Picture 4), a development fundraising agency so as to fulfill the philanthropy goal through donations and activities and also to educate through several programs towards sport and disabled athletes. The Agitos Foundation increases the awareness of the world about disabilities issues, forms partnerships with sponsors and secures the appropriate

and necessary resources to implement the programs. The main areas that covers are: sports development, awareness and education, advocacy and inclusion, knowledge and research (IPC, 2014o).

The IPC, with the collaboration of Agitos Foundation and WADA in order to ensure that sport is being practiced in a healthy and fair-play environment and also in order to protect the athletes themselves, has created the IPC Youth Education Program. This program has been created so as to inform the athletes about anti-doping



Picture 4. The Agitos Foundation Symbol
(<http://www.fireball.co.uk/ParalympicBall/agitos.php>)

and ethical issues by specialized educators and moreover, to promote the Paralympic values as well as the notions of diversity, equality and fair play. Veteran athletes are also being role models and describe their experiences through the corresponding programs (IPC, 2013). Last, the Agitos Foundation so as to raise the awareness of health and respect conducts several surveys in different competitions to always enrich and update their data in order to know how to proceed further.

To sum up, the IPC is an organization that does enhance the awareness of disabled people and promote diversity and determination throughout the world. Under its wings, such values are being taught to people that despite physical and mental impairment a person can still practice sport, inspire and establish not only the physical but also the moral improvement of mankind.

CHAPTER II: BIBLIOGRAPHY REVIEW

Background

The thesis is documenting the appearance of the Paralympic Games and the technology doping issue that is revealed within these games. The technology doping issue has occupied the sport area in the recent years. The term was first seen in 2006 when Wada proposed a session on technology doping, stating that officially is being accepted as a threat although techno-doping appeared years ago in its early form in the year 1988.

Since the paper is a literature review the references of the study is based on a research through the Peloponnese's university library link <http://library.uop.gr/ilektroukes-pig> in the HEAL-link data base. The search for relating articles was conducted using the following key words: technology enhancement in the Paralympic Games, techno-doping, performance enhancement and Paralympic Games, ethics disability sports, assistive devices in sports, disability athletes and technology enhancement and techno-doping athletes. The key words that were used helped the thesis to be formed properly although research must thoroughly continue and be constant due to the advances of technology. The research resulted in 250 related articles but in this paper there were used only 100 of them according to their relevance to subject in discussion and due to the shortage of sources related to the area of the subject.

Furthermore, material were used from articles about experiments in exploring advantages or disadvantages using prosthesis by authors such as Arellano, C. J., McDermott, W. J., Kram, R., & Grabowski, A. M. (2015), Berger, M. A., Nieuwenhuizen, M. v., Ent, M. v., & Zande, M. v. (2012), Brüggemann, G.-P., Arampatzis, A., Emrich, F., & Potthast, W. (2008), Dyer, B., Noroozi, S., Redwood, S., & Sewell, P. (2010), Dyer, B., Sewell, P., & Noroozi, S. (2013), Grabowski, A. M., McGowan, C. P., McDermott, W. J., Beale, M. T., Kram, R., & Herr, H. M. (2010), Hassani, H., Ghodsi, M., Shadi, M., Noroozi, S., & Dyer, B. (2014), Hobara, H., Baum, B. S., Kwon, H.-J., Miller, R. H., Ogata, T., Kim, Y., & Shim, J. (2013), Lechler, K., & Lilja, M. (2008), Lee, J. B., James, D. A., Ohgi, Y., & Yamanaka, S. (2012), Lee, M.-Y., Lin, C.-F., & Soon, K.-S (2007) and Noroozi, S., Sewell, P., Rahman, A. G., Vinney, J., Chao, O. Z., & Dyer, B. (2012).

Also, this thesis has attempted to contribute to existing literature exploring the techno-doping subject, the ethics in the Paralympic Games and the purity in sport using materials from authors like Booher, A. K. (2010), Bruce, D. (2007), Burkett, B., McNamee, M., & Potthast, W. (2011), Dvorsky, G. (2007), Freeman, W. H. (1991), Howe, D. (2011), Loland, S., & Murray, T. (2007), Marcellini, A., Ferez, S., Issanchou, D., Léséleuc, E. D., & McNamee, M. (2012), McNamee, M. (2006), Miah, A. (2003, 2005, 2009, 2011), Pérez Triviño, J. L. (2013), Ryall, E. (2012, 2013), Turbow, J. (2012), Weyand, P. G., Bundle, M. W., McGowan, C. P., Grabowski, A., Brown, M., Kram, R., & Herr, H. (2009) and Wrenn, E. (2012).

Lastly, the thesis also contributes to literature on Paralympics, disabled athletes while striving to contribute to the understanding of techno-doping in the games and how much of this issue can alternate the face of sport in the Paralympics and eventually shape the sport itself.

CHAPTER III: MAIN RESEARCH SUBJECT

Enhancement in the sport area

Nowadays there are new territories regarding sports industry such as sports physiology, psychology, kinesiology, biomechanics, physiotherapy, sports nutrition, sports engineering, sports sociology, education, sports philosophy/ethics, sport media/communication, sports management/marketing, sports tourism, sports law and sports medicine. When it comes to the sports medicine, it is concluded that therapy and enhancement are two different distinctions. Providing comfort to the human pain can be issued as logical to ethical discourses whereas improving a person in order to win in a competition has contradictory views in the sports area. Thus, sports engineering, a pivotal part of the sports science, is a field of science which involves the design, improvement and testing of sports equipment. Therefore sports technology is also involved with the process of improvement. Various researchers have attempted to establish what defines enhancement in sport in general and, in addition, what the role of technology in sport is.

As the Olympic motto captures the feeling of the games of athletes being faster, higher, stronger, athletes are striving to a sporting excellence in their performances sometimes no matter the cost. Therefore, it drives them, in some extent, to achieve the highest level through the back door.

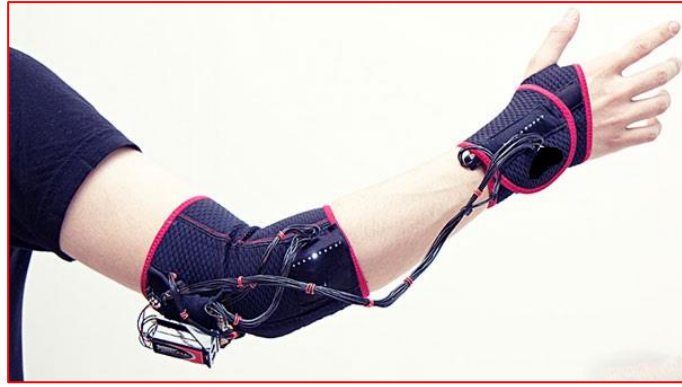
Human enhancement reflects many controversial discourses among the sport industry, the ethicists, the philosophers and sportsmen and has many aspects of exploration. Although, there is a difference between medical enhancement for the purposes of assisting your capacity in life and the enhancement that gives you an extra level from what means being natural. In that sense, people argue that enhancement can diminish the nature of human being and consequently ruin the clarity of sport. So, therapy and enhancement are two different concepts. The important factors, according to Donald Bruce (2007), can be seen in these distinctions namely: i) enhancement as a change of state or a change of degree, ii) permanent or reversible enhancements, iii) external or internal enhancement technologies and iv) enhancement as opposed to therapy.

Moreover, as Vincent Menuz, Thierry Hurlimann and Beatrice Godard (2011) have mentioned, human enhancement can be divided into 4 categories: the implicit approach, the therapy enhancement distinction, the improvement of general human capacities and the increase of individual well-being. Though, to simplify, a clear definition of human enhancement is not defined in current literature as it can be focused only by individual perceptions.

In sport, it is a debatable issue in what extent should technology exists. Through technology way human beings are able to overcome the biological borders and adjust their needs to the technology science. Technology has been used in sport throughout history and has an increasingly vital role in sport especially in the major events such as Olympics, Paralympics and World Championships.

As Emily Ryall (2013) defined technology as being “the application of scientific knowledge for practical purposes using tools and machines.” Hood (1972) explained how Aristotle’s view on technology implying that, “technology is a human arrangement of technics, tools, machines, instruments, materials, sciences, and personnel to make possible and serve the attainment of human ends” (Hood, 1972:347). In fact, technology is “the whole range of means by which humans act on their environments or seek to transcend the limits of their natural capacities” (Oxford Reference, 2014). The history of technology, as Miah Andy (2009) cited, “located within the world as an instrument of humanity.” Also, it is drawn to the etymology of the word ‘techne’, which has its Greek root in the notion of ‘art’ (Miah, 2009:91).

There are several improvements that can be considering enhancements in the sport arena such as advanced clothing and equipment -ski suits, ghost gloves (in swimming events by vibrating feedback on the form and posture) (Picture 5), LZR racer swimsuits (Picture 6), electronic monitors for achieving better performances, let alone the performance-enhancing drugs. Furthermore, in the Paralympics there has been an increase in technology development regarding clothing, prosthetics, specific hearing/visionary devices, or assistive devices such as hi-tech foam seats or carbon-fibre wheelchairs, exo-skeletons uniforms (Picture 7) or throwing frames for thrower athletes, headsets for blind runners or brain sleds for winter sports athletes, the well-known carbon blade-runner and sockets with silicone liners helping the connection between the body and the artificial limb (Wrenn, 2012).



Picture 5. Ghost Glove

(<http://www.medgadget.com/2012/09/ghost-smart-sensor-glove-coaches-blind-athletes-video.html>)



Picture 6. LZR Racer Swimsuit

(<http://www.factmonster.com/sports/swimming/lzr-racer.html>)



Picture 7. Exo-skeleton uniform

(<http://www.wsj.com/articles/SB10001424052970204346104576639063324567764>)

So new challenges have appeared in the sport area and eventually sport officials are called to determine the boundaries between natural and enhancing technologies that seem to form unfair advantages in a game.

In sport, according to IPC rules and regulations there have prohibited devices that assist athletes and therefore, considered to be performance-enhancing drugs (IPC, 2014a). An example of that are the wheelchair athletes in the marathon race given the possibility of speed. But, on the opposite sight, we can see that some technological advances are being in favorable to the governing bodies as it can be very helpful to the athletes in overcoming their abilities in certain sports. A given example of that are the tent-like devices where athletes can sleep in and are designed to simulate high altitude and increase oxygen-carrying ability.

With the new technologies being developed and utilized in Paralympic sports a new era has arrived with many challenges in the horizon. One of the new challenges is the technology enhancement of the devices used in the Paralympic sports or as it is well known the techno-doping issue.

The norm techno-logy doping

It is a new norm in the sports industry and mostly it is referred in the Paralympic Games. Techno doping is when an athlete uses equipment to his advantage so as to win a competition among other athletes (Paralympicanorak, 2012a). According to Donald Bruce (2007), in order for a technology to be banned from sport should be occurred 2 out of 3 conditions: whether it is harmful to health, being performance-enhancing and against the ‘spirit of sport’.

In depth, lays the question whether the best engineering and the best financed teams will eventually win over other less advantage teams. Some countries might have benefiting lead simply because of their access to superior technology. It can be suggested that this sporting technology has advanced with three aims in mind, as Howe David (2011) claims, to produce better performances, to increase the comfort for an individual – athlete and to enable an improvement in the efficiency of movement.

Furthermore, referring to Andy Miah’s perception (2005) enhancing technologies can be categorized as: 1. technologies that make sport possible, 2.

technologies that improve safety and reduce harm, 3. technologies that de-skill or re-skill sports, 4. technologies that dehumanize performances, 5. technologies that increase participation and/or spectatorship and last technologies that have an ambiguous effect on the sport or for which there are a number of unknown consequences. Although, sporting technology, concerning Butryn's view in Miah's article (2005), separated into five types: playing surface and arena (landscape technologies), tools and equipment (implement technologies), medical and rehabilitative technologies, movement and biomechanical skill analysis, and technologies that are directly designed to affect the human body and mind (self-technologies). Whereas, Yan Yang's & Weimo Zhu's (2014) opinion, there are 5 key ethical issues regarding technology enhancement: 1. unfair advantage, 2. personal health, 3. psychological dependence, 4. sportsmanship, 5. commercial conflict interests.

Hence, new challenges are coming to the sports technology so as to prevent disabled athletes exploiting the unnatural advantages of these advances, in order to exclude any unfair edge over other athletes. As Miah (2009) has cited in one of his articles, technology can allude us to the creation of Frankenstein monster and that the eligibility of these disabled athletes are complicated one as it needs thoroughly medical and functional examinations. The consequence of such actions can be the physically modified athletes and thus, the genetic modified athletes. So then, we must consider whether the prosthetics are giving an unfair advantage to an athlete, and if so, then to where do the sport goes next and to how should an athletic body look like. Such examples can be named Oscar Pistorius -an amputee athlete who wanted to compete against able-bodied athletes in track event- and Caster Semenya – a gender testing athlete regarding her exceptional records and breakthroughs in running events.

Sport is about excellence but athletes aim at winning regardless the way they are going to achieve that. A central concern, in the sports institutions, is how to set the boundaries between natural and enhanced technology, the fair and unfair advantage in a sport contest.

When assistive devices go from therapy to enhancement

There are many kinds of artificial limbs, wheelchairs and aid that are available to the disabled athletes and therefore there is much discrimination towards athletes from less developed countries where technology is simply far behind.

The prosthetics has changed its purposes from restoring function to a more complicated one. The progress in computer technology, biology, engineering and electronics into the field of biomechanics, has driven to the advancements that have come in the form of equipment to maximize the athletic performance by increasing muscle strength, speed, endurance or even reduce the athlete's injuries which led to new standards in athletic performances. New equipment can be considered the equipment design, athletic suits designs in track events or in swimming, tuned running track and cycling equipment.

To elaborate, in a training field, athletes interact with certain technology enhanced devices such as training machines that measure heart rates, blood pressure, body positioning, having motion sensors so is there a fair competition due to equal access among competitors which ultimately questions the purity of sport?

Technology's advancements have raised questions of whether certain forms of these improve the athletic environment or provide a certain advantage to the athletes competing. As mentioned, the LZR racer swimsuit has been proved that reduces drag in the water and has optimal flexibility, reduces muscle oscillation giving a way of assistance to the athlete which ultimately giving him an edge compared to an athlete that does not wear one of these (Shiple, 2009). So, lays the questions of what then will be the level of human effort required by the athlete regarding human athletic capabilities. Also, many would argue that even some technology-equipment devices which are not prohibited do create advances, don't they still need the athlete to use them?

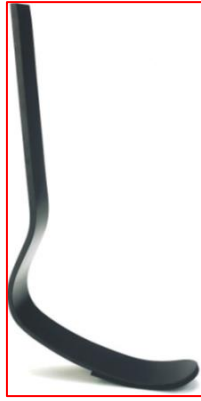
If we consider, technology do serve the majority of sports divisions. For instance, many sports would not exist without these advances such as basketball, volleyball, football, goalball, archery, shooting, also cycling would not be feasible without the bikes or ski equipment for ice hockey and alpine sports or helmets and body suits in several disciplines of sports and all that equipment are manufactured

better and advanced each period due to health/injuries risks. Even the advance in cameras in the refereeing of matches is thought to enhance justice.

In the Paralympics, the developments of certain prosthetics were seen up until 1980s. Nowadays, the amputee athletes participate in more energy-storing-and-returning feet, such as the Flex-Foot prosthesis and in more advanced wheelchairs than before. To elaborate about the feet prosthetics, prosthetics technology is currently governed by the IPC. The use of such devices can be seen centuries ago although due to the utilization of biotechnology such devices can now be more useful, comfortable and aesthetically pleasing. At the beginning, these devices had restorative purposes -improving the quality of life- and now there are more enhanced. The first prosthetic foot that was energy-restoring and returning prosthesis was introduced in 1985 with the name Seattle Foot, built by the Model & Instrument Works, Inc and has modernized the lower-limb prosthetic devices (Lower Limb Prosthetic Devices, 2014). After the advancements in materials, methods and research, prosthetic limbs can now be fit more to the requirements and needs of the amputees and let alone the athletes. In the 1988 Paralympics was first seen the Flex Foot device (Picture 8) and later on, the prosthetic sprint Flex Foot Cheetah (Picture 9) appeared in the athletic field.



Picture 8. Flex Foot
(<http://www.adepa.fr/protheses/les-pieds/pied-de-classe-i-ii-iii/>)



Picture 9. Flex Foot Cheetah

(http://www.oandp.com/shop/product.asp?supplier_id=014A20FB-FFD5-4EFC-B9EE-7BF0F97C661C&product_id=42F7F394%2D26AC%2D4734%2DA885%2D2DD910D6B68D&department_id=0D21D990-A824-479D-A687-EF28503027D8)

In the Paralympic Games is being watched athletes compete each other having homemade prosthetic limbs or braces cobbled together from scrap metal in some cases. In the other hand, it is seen athletes such as Oscar Pistorius and Alan Oliviera, both double leg amputee runners, with thousands of dollars being spent in high tech prostheses devices like carbon fiber blades and the computerized C-Leg worn also by many athletes but in several countries this cost is prohibited to them.

According to Maslin (2012) most of the paralympic athletes are competing in numerous different versions in technology aspects claiming a report from Donna Fisher, a prostheses technician from Dublin, stating that “the devices used by Paralympic athletes from poor countries were often decrepit and sometimes painful to wear”. For example, she remembers from a Haitian amputee who lives on crutches because his prosthetics is too painful to have them all day long. She has also a photograph from a rust-encrusted wheelchair that brought to her an Egyptian athlete. Moreover, one leg brace belonging to a Nigerian weight lifter, she said, was made of animal hide, pieces of metal plumbing and string. Referring to the athletes as she said, “they’re so talented, but they’re hugely disadvantaged”.

Concerning the impact of such devices, as Noroozi et al., (2012) wrote in an analysis for the prosthetic energy-storing-and-returning feet:

“The energy efficiency of such prostheses will vary, and energy return rates have been found to range from 31% up to as high as 95%. Studies of the biological lower-limb have found that the ankle can generate a 241% energy return, with the addition of the concentric plantarflexion contraction which has led to the conclusion that prosthesis is fundamentally restorative technology and still falls a long way short of replacing the mechanical performance of the biological limb.”

But to add, as Grabowski et al., (2010) reported, due to an experiment conducted with 6 healthy unilateral transtibial amputee elite sprinters so as to measure ground reaction forces and stride kinematics at a series of velocities, that across all speeds, the prosthetic leg produced meaningfully fewer vertical forces (9% less) than the intact leg and that the leg swing times were similar in each leg. In this experiment unilateral amputees were ideal subjects because each amputee’s prosthetic leg can be compared with their intact leg. Overall, by this study, it has been proposed that running-specific prostheses damage force generation and probably limits top speed. So, in the case of unilateral amputees the prosthetic leg is inferior to the human leg with the existing technology. Therefore, the level of technology should be controlled and be determined by the IPC as a restorative or enhanced one so as to minimize unfair advantages in the sport arena and consequently protect the purity of sport.

Additionally, over the last years manual wheelchairs have developed from the heavy wheelchairs into lightweight ones having improvements in the vehicle mechanics, the human movement system and the wheelchair–user interface (Van der Woude et al., 2006). In the wheelchairs category there are 4 main separations: the hand-cycles, the court chairs, all terrain wheel chairs, and the racers (Laferrier et al., 2012). There are a number of multi-sport chairs available that having different settings and being specialized to each athlete in a different way in different sports and even for different played positions. In such cases the athlete may utilize his equipment as much as he can, resulting to optimize his athletic performance generally (Picture 10).



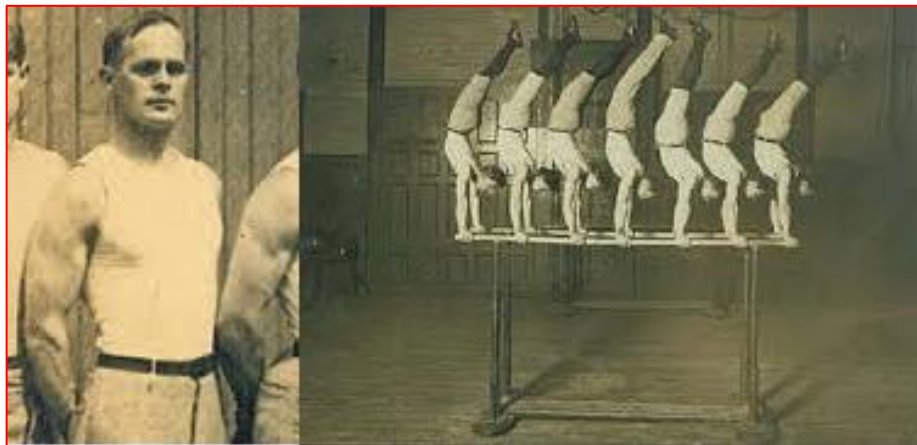
Picture 10. On the left side: Wheelchairs for Activities of Daily Living. On the right side: Sports Wheelchairs
(<http://www.sciencedirect.com/science/article/pii/S1350453305002560>)

Through the years, disabled athletes' performances have narrowed the gap between the able-bodied athletes' performances through the advancements and innovations in every aspect of sport technology. It is likely that the impact of technology on the prosthesis is affecting the capabilities of the athlete and as a consequence is giving unfair terms to athletes that do not have access to these innovations. Further attention should always be given to equipment selection by the IPC in order to infiltrate the enhancing aspects of such devices.

Athletes with impairment that have participated in the Olympics

In the history of the Olympic Games there have been some disabled athletes that have competed in the Olympics years ago before the attempt of an athlete named Oscar Pistorius who wanted to enter a track event in 2012 London Olympics which have been a huge controversial issue amongst ethicists, members of the Movement and each sportsmanship of the olympic family (Topendsports, 2014; Paralympicanorak, 2013).

The first disabled athlete who ever competed in the Summer Olympics was George Eyser (Picture 11), an American 3 times gold winner in gymnastics who competed in a wooden leg at the 1904 Olympic Games in St. Louis.



Picture 11. George Eyser
(<http://www.theatlantic.com/technology/archive/2012/08/how-a-guy-with-a-wooden-leg-won-6-olympic-medals/260988/>)

The list continues with Oliver Halassy, a Hungarian left-leg amputee swimmer, who competed in the 1928, 1932 and 1936 Olympics. At the same Olympic Games in 1928 two others athletes competed for their teams, it was an Italian deaf boxer athlete named Carlo Orlandi and British deaf/mute rower athlete Donald Gollan. Moreover, in the next Games of 1948 Olympics it was Karoly Takacs, a Hungarian shooting athlete who competed without his right hand due to an accident which left him amputeed. From the Olympics of 1952, 1956 and 1960 3 more athletes were participated respectively such as Lis Hartel, Danish paralyzed athlete in equestrian dressage event, Harold Connolly, American hammer thrower having Erb's

palsy -arm malfunction- (OrthoInfo, 2014) and Ildiko Ujlaky-Rejto, a Hungarian deaf fencing athlete who also participated from the 1960 Olympics until 1976 Olympics. Other disabled athletes were Vyacheslav Skomorokhov, Ukrainian deaf athlete in the 1968 Olympics, Neroli Fairhall from New Zealand who was paralyzed from the waist down due to an accident and the first paraplegic athlete who competed in archery in the Los Angeles 1984 Olympics and also, in the same Olympics was Jeff James Float, an American deaf swimmer champion.

Next in line, from the 1988 Olympics until 2000 Sydney Games were, respectively, athletes such as Antonio Ally, British deaf diver, Dean Barton-Smith, Australian deaf decathlete, Sonia Vettenburg, a Belgium shooter, Italian Paola Fantato who was born with polio and confined in a wheelchair competed in archery, Terence Parkin, South African deaf swimmer, and Marla Runyan, a blind runner from the United States who competed in the 1500m at the Sydney 2000 Olympics and in 5000m in the 2004 Athens Games. In the games of Athens, there were, also, Im Dong-Hyun, a South Korean athlete who was legally blind in his left eye but competed even in the 2012 London Olympics, Frank Bartolillo, deaf fencer from Australia, Hugo Passos, a Portuguese deaf wrestler and Tamika Catchings, an American deaf athlete who belongs to the USA women basketball team competing from the Athens Olympics until the latest Olympics and she will also take part in the 2016 Rio de Janeiro Olympics.

In the 2 latest Olympics, the 2008 Beijing and the 2012 London Games, there were, correspondingly, several disabled athletes that also competed such as Chris Colwill, an American deaf diver, Natalia Partyka, table-tennis athlete from Poland who was born without a right hand/arm, Natalie du Toit, a South-African left-leg amputee open water swimmer, David Smith, an American deaf volleyball player who wears hearing aids and reads lips in order to understand his teammates and Oscar Pistorius, a double-leg amputee running athlete from South Africa who uses specially constructed blades in order to compete. That man wanted to be the first Paralympic athlete who would compete in a track event both in the Olympic and Paralympic Games and the first athlete who uses prosthetics-technology in the competition.

Though, a vast majority of the society were unaware of these historical cases and only when Oscar Pistorius claimed the right to compete in both Olympic and

Paralympic Games there were debating issues regarding technology advantage towards the able-bodied athletes (Topendsports, 2014; Paralympicanorak, 2013).

The case of Oscar Pistorius

Oscar Leonard Carl Pistorius (Picture 12) is a bilateral transtibial amputee sprinter who wanted to compete in the able-bodied athletic competition such as the Olympics. He was the man who raised the debate about disabled athletes participate together with the non-disabled athletes and also, competing with his assisting devices like prosthetics benefiting him with an advantage as many people claimed.



Picture 12. Oscar Leonard Carl Pistorius (<http://www.dailymail.co.uk/news/article-2303864/Oscar-Pistorius-Blade-Runner-pictured-running-track-time-killing.html>)

Pistorius was born in Johannesburg, in South Africa, in 1986, having no fibula in both legs, the long, thin bone that anchors the calf muscle and forms the outside of the ankle. His parents decided to amputee his legs in order to give him the chance of walking with prosthesis devices. When Pistorius started to involve in athletics, he became too good in that. To elaborate, he has won the gold medal in 200m at the Athens Paralympic Games in 2004 and the bronze medal in the 100m. In the 2008 Beijing Paralympics he has won the gold in the 100m, 200m and 400m events. In 2012 London Paralympic Games he won the gold in 4*100m and 400m events and a silver medal in 200m. He holds the Paralympic world record for the 400m (45.39s) and, mind the fact that, the world record in able-bodied athletes is 43.18s held by the

American athlete Michael Johnson (IPC, 2015; IAAF, 2014). He runs with carbon-fibre prosthetic devices called the “Cheetah Flex-Foot” blades which are being manufactured by the Icelandic company Ossur and looks alike the J-shaped rear leg of a horse or a cat.

In March 2007 IAAF, the governing body of athletics, decided to introduce an amendment to IAAF Rule 144.2 for the purpose of regulating the use of technical devices. The new rule bans the use of any technical device that incorporates springs, wheels or any other element that provides the user with an advantage over another athlete not using such a device (IAAF, 2008).

On 15 June 2007, at a press conference in Oslo in the Golden League meeting, the IAAF President, when asked about the eligibility of Pistorius, stated that he would not be disqualified unless the IAAF received scientific evidence demonstrating that his prosthesis gave him an advantage. He was therefore considered eligible to compete at that time in track events. Consequently, when Pistorius wanted to compete in the 2008 Beijing Olympics, IAAF invited Pistorius to participate in a series of biomechanical tests at the Institute of Biomechanics and Orthopaedics at the German Sport University in Cologne, Germany under the supervision of Professor of Biomechanics Dr. Peter Brüggemann and Elio Locatelli, the IAAF’s Director of Development at that time, so as to clarify any favorable advantage in his prosthetic blades against the able-bodied athletes.

Brüggemann et al., (2008) reported that Pistorius's limbs used 25% less energy than able-bodied runners at the same speed, and also the tests revealed that running with prosthetic blades led to less vertical motion combined with 30% less mechanical work for lifting the body. After these results, IAAF ruled that his prosthetic legs were giving him an advantage over the other athletes and contravenes the rules on technical aids. So, Pistorius appealed on 13 February 2008 to the Court of Arbitration for Sport (CAS) in Lausanne, Switzerland due to false leading process. According to Pistorius, there are many difficulties in sprinting on carbon-fiber legs because at the beginning of the race he needs about 30 meters to gain his rhythm and as following his knees do not flex as willingly, limiting his power output and when he runs with a wind he must fight rotational forces that turn his prosthetic devices sideways.

To elaborate, in order to prove his eligibility accordance his abilities, a scientific team conducted another research in 2009 under the supervision of Peter Weyand, back then an associate professor of applied physiology and biomechanics at Southern Methodist University (SMU) to overrule the exclusion of IAAF from able-bodied competitions such as the Olympics and World Championships. The authors of the study were Peter Weyand of SMU, Matthew Bundle of the University of Wyoming, Craig McGowan of the University of Texas at Austin, Alena Grabowski and Hugh Herr of the Massachusetts Institute of Technology (MIT), Mary Beth Brown of Georgia Institute of Technology and Rodger Kram of the University of Colorado at Boulder. The experiments were conducted at the Locomotion Laboratory of Rice University in Houston, Texas. The scientific team compared the biomechanical and physiological demands of running of Oscar Pistorius with 4 able-bodied male 400m sprinters of similar performance. He evaluated the energy cost of running, the fatigue resistance/sprinting endurance and the sprinting mechanics. The team concluded that Pistorius' energy cost of running is similar to that of accomplished male distance runners, but 17% lower than that of performance-matched male sprinters (Keogh, 2011; Weyand, 2009). Also, it showed that Pistorius' ability to hold his speed over longer sprint races is identical to that of intact-limb athletes and that Pistorius sprinting mechanics are markedly dissimilar to intact-limb track athletes (ScienceDaily, 2009a). Overall, the team concluded that Pistorius' physiology (energy cost and fatigability) is generally similar to that of intact-limb athletes, but his sprint running mechanics are markedly dissimilar. Further, the bilateral transtibial amputee sprinter produced smaller ground reaction forces and showed dissimilar shapes (Keogh, 2011). These results were released to The Journal of Applied Physiology in 2009 stated that Pistorius was “physiologically similar but mechanically different” to someone running with intact legs (Eveleth, 2012). After that, IAAF's decision was revoked.

Furthermore, to summarize, Weyand's belief was that Pistorius prosthetics allow him to move in a way that no non-prosthetics wearer could, giving him an advantage via a faster repositioning of the legs during the swing phase and Kram's belief was that his blades hinder him just as much as they help, reporting that: “We found that Pistorius and the other amputee sprinters have leg swing times for both their prosthetic and biological legs that are very similar to those of Usain Bolt. We

think the amputees learn that swinging their legs rapidly can help to partially compensate for their force disadvantage” (ScienceDaily, 2009b). The CAS determined that Pr. Brüggemann only tested Pistorius’s prosthetics on a treadmill not a 400m race and that in the report did not consider the disadvantages that Pistorius suffers at the start and acceleration phases of the race (*Pistorius v IAAF*, 2008). As Tara Magdalinski (2013) reported, Elio Locatelli, argued with the CAS ruling stating that the purity of sport would be in jeopardy and therefore IAAF cited the reasons of safety in order to discourage Pistorius and the South African Olympic Committee from selecting him in the events. The CAS reestablished its ruling for eligibility in track events for Pistorius declaring that he shall only use this particular model of Cheetah Flex-Foot prosthesis which was the subject of the Cologne tests and that “this ruling has no application to the eligibility of any other amputee athletes, or to any other model of prosthetic limb and it is the IAAF’s responsibility to review the circumstances on a case-by-case basis” (*Pistorius v IAAF*, 2008). So, in the 2012 London Olympics, Pistorius became the first amputee sprinter to compete with his carbon-fibre blades against able-bodied athletes running at the semifinal in the 400m race holding, though, the last position.

In general, the results of these studies on amputee sprinting athletes indicate that advancements in the prosthetics have contributed to the enhanced paralympic athletic performance and as Pistorius case was seen ambiguous by many sports followers bear in mind that he is, after all, a man without legs and that fact does give him a disadvantage over the human entity.

Ethics alongside with technology

Ethics is the academic examination of the practical behavior of human. The history of ethics is in line with the history of philosophy regarding life and goods. The word ethics origin from the noun ethos, Aristotle’s connection with that word was virtue and disquisition. Socrates believed that there is a steady moral objectivity which you can define. The Olympic ideal cultivates ethos, it is ground on the principals of democracy, consistency and morality. From an ideal ethical point, sport can shape the athlete in a more disciplined, respectful ground; it can cultivate sportsmanship, self-awareness and most importantly humility.

In Pierre de Coubertin's time, the man who revived the modern Olympic Games in 1896, when the birth of sport excellence was occurred through the Olympics, sport was seen without any sociological or political impact, serving only the dream of athlete striving to his excellent capabilities. Nowadays, the matter of longing to become an Olympian, by the words of the same Olympic motto "citius, altius, fortius", athletes claiming that in sport there are no limits to them therefore should emerge the need to come in terms with the matter of justice regarding technology advances but, in fact, as Freeman (1991) declares, we should define first what is proper and what is improper in our striving for the distant peak of Olympic success.

Loland (2002) has marked 3 ideal-typical theories of athletic performance in compliance with the technology in sport. Moreover, he indicates the non-theory, the thin theory and the thick theory. To explain, the non-theory perspective is, basically, no theory of sport which is a "purification of the sport understanding of totalitarian regimes and of cynical commercial interests accepting any kind of sport technology as long as it serves the purpose of reaching the desired external goals." The thin theory accepts "all means of performance enhancement as long as there is equality of opportunity in terms of equal access to all competitors." This perspective has more objective settings in testing the human boundaries and requires equal opportunity in competitions. Last, there is the thick theory perspective which indicates certain rules regarding the use of technology in sport and "its basic premise is that sport should be an arena for moral values and for human self-development and flourishing." As Loland (2002) commented the thick theory is the most promising to him as in this theory, sport is considered a social activity with its own characteristic norms and values which conclude to more general human virtues and in fact, represents the only possibility of technological ethic in sport.

To the matter of technology and focusing on equality, it should be clear by the IPC ethical commission as to what will be the role of technology advances such as prosthesis in sport, whether it is of restorative or enhanced one in the name of fair participation. Consequently, lays the matter of accessibility of technology that countries have or have not in the playing field due to the financial matter. The expensive nature of such equipment or funding has made it clear that in some years or

why not now, it would be a separation in sport regarding cost/access between rich countries and poor and therefore well-funded athletes and not.

What, also, has occurred, through the technology impact in sport, is the unexpected effect. As Dyer et al. (2010) mention, by advances in the equipment, for instance, in the protective headgear in boxing made the sport itself crueler and more aggressive than it really was. So, due to the athletes' lack of invulnerability, when wearing them towards the opponent or other assistive devices in various sports, we question the ethical boundaries raised due to hazard risks in sport.

As technology is growing, people wonder what will be the impact in sport system. It came the time that the technological training is here and as Freeman (1991:6) mentions through Bouchard's view: "it is too late to worry about the future because the future is now." So, do we need to set the ethical boundaries between sport and technology enhancement? The matter of that point is to find the perfect connection with the three elements in the Paralympic Movement such as therapy, enhancement and ethics. Due to therapeutic purposes, technology advances have been supported by the society but we should also consider the transformations that have been made in the concept of the human body. So, are we living in a society that is welcoming the idea of posthumanism which will ultimately result to a completely different species?

At the present time, human technology has reached the point of emulating the human body the so-called osseointegration in which a limb is connected directly to the body and neural control. By the time these advances being penetrated to the Paralympic sports we will be heading to a completely new sport era. So lays the question about what do we want sport to be like. As Weyand asked: "On the one extreme, is it supposed to be biological and pure, or on the other, will we be perfectly okay with it being a gladiator sport and pharmaceutical freakshow?". On the other hand, as Miah has said: "Fifty years from now, we may not have [the Olympics and Paralympics]-we may have only one set of performances that people compete in, that reveal how capable they are at using their bodies in combination with technology. . . ." (Turbow, 2012).

It is not arguable that prosthetic technologies are a kind of performance enhancing devices, since they allow the athlete, even, to compete. So, if we think

about it, we should constitute what is fair and unfair performance which regulates the value and purity in sport in general. Moreover, performance enhancement in sport cannot be excluded since it runs with progress and there is no doubt that technology will continue to contribute to the athletes' performances with devices, clothing equipment, innovations in prosthetic, bionic and genetic alterations but what is clear is where to draw the line. After all, we do wish to watch sport between athletes based on their athletic ability and not between enhancing technologies. Therefore, as the medical science is mandatory for its therapeutic purposes, the issue here is not the science but the nature of society we wish to live in.

CHAPTER IV: CONCLUSION

Results

The evolution of technology is progressing with rapid rhythm and it is being logical that such developments in athletic territory will raise important issues towards sport human capabilities and technology interference. Disabled athletes are being faster, higher and stronger than they used to be, proposing another species in the athletic world under the shield of cyborgization. Technics such as the “Tommy John” surgery in the elbow injuries brought into the light the possibility that athletes in an average athletic stage can proceed in such therapeutic surgeries in order to make their body advanced (Lamb, 2009). Has this kind of time come to an athlete who face a dilemma between rehabilitation and amputation? Is he eventually choosing the amputation hoping for a metal in the Paralympics facing the fact that prosthetics could be an improvement, not impairment? Is the athlete choosing to intentionally harm himself so as to get access in prosthetic materials? The techno-doping debate has come to formulate people and attitudes, the athletes and the ethical world.

In the pursuit of high athletic performance in major competitive sports such as the Olympics, Paralympics and World Championships it has been seen high level of advancements in technologies, techniques and supplements. Many arguments have been placed in the sports community about these technologies being used by disabled athletes. Some believe that these enhanced performance devices undermine the notion of the human body accepting the norm of posthumanism by generating cyborg athletes and as a whole, challenge the purity of sport. Others contradict this opinion believing that these kinds of technologies are acceptable in the world of sports, thus helping the athlete to perform in a normal way. But, the vital question in the Paralympic Games is whether these improvements are fair and to what extent should be allowed in order to keep the balance consistent with the Olympic values of fair play and equality. Also, it will be interesting whether the IPC will set new rules and regulations on technological advances in prosthesis and how much this will affect the spirit of sport. In a world where winning in a competition is occurred more by technological advances than the effort itself, it can be seen that the system of justice is under contestation in the society.

Eventually, are the Paralympic Games a competition for special-abled athletes or a competition for super-abled athletes? Is it, in the end, a competition of technological innovations between the competing countries? And where are the boundaries of the ethical part of these dilemmas? These questions remain unanswered and have raised large numbers of debates in the sports community.

Discussion

The aim of the present paper is to present how the new technological advances can affect the winning result or the performance of the athletes in the Paralympic Games. The results showed that due to technology improvement, International Paralympic Committee shall always mark the assistive devices of each athlete and set rules and regulations concerning them in a systematic basis. Therefore, the results of the hypothesis that the evolution of technology is being favorable to the athletes by enhancing their abilities was ambiguous to some extent by being dependent to the degree of technology in the assistive devices that the athlete uses.

The Paralympics provide a world-class competition for elite disabled athletes at the highest level. These valuable athletes can show us a new way of life by promoting Olympism, by teaching us how to appreciate life and yet to respect them as human beings with no flaws or differences. These athletes teach the rest of us that disability is not an obstacle but a change in the life course that can make a person much stronger. The Paralympic Movement and the Paralympic Games has left an important educational and sporting legacy in many areas of the sport development. The Paralympic Games were created to enhance the awareness and understanding of the disabled people throughout the world so as to connect the world under no discriminations.

When we consider ethics in our minds comes the word values. Sport teach values –fair play, discipline, respect for rules, for others, for diversity. According to these values we proceed in our lives and in any other activity such as sport. So, in sport there are rules in a game but in our lives there are values that set us ready and equipped. In the Paralympic Movement these values are courage, determination, inspiration and equality. These traits are among the ones that a Paralympic athlete must possess and that is what defines him. As Coubertin has quoted in his letter about the 4 main areas in the context of Olympism –he identified the “muscles” as the physical training, the “understanding” as the social training, the “character” as the moral training and last the “conscience” as the mental training of a human entity (Naul, 2008:130).

So far, the Paralympics Games were designed to celebrate difference which is distinct from the able-bodied norm. Yet today it appears that Paralympic alteration

take on a more cyborg form. In the long run, the Paralympics risk becoming a show of technology, rather than a show of athleticism, resulting at a world of power and technology advances. Few years ago, lots of scientists in physiology, nutrition, biomechanics started to study the athletic performance in a more insightful way causing scientific and technological discourses as to where to draw the line between what is 'natural' and what is artificially enhanced. The enhancement debate is not only just a discussion due to technical rules but also it bases in a more uncertain ground as to what people see essential about their norm of entity and what impact posthumanism has. We need to comprehend the role of technology in sport, to establish technological guidelines so as to avoid techno-doping behaviors and provide a fair sport environment. In further study, more research is needed to focus on the relationship between technology enhances, sport and ethics.

BIBLIOGRAPHY

- Apelmo, E. (2012). Falling in love with a wheelchair: enabling/disabling technologies. *Sport in Society: Cultures, Commerce, Media, Politics*, 15(3), 399-408.
- Arellano, C. J., McDermott, W. J., Kram, R., & Grabowski, A. M. (2015). Effect of Running Speed and Leg Prostheses on Mediolateral Foot Placement and Its Variability. *PLoS ONE*, 10(1).
- Athens 2004 Organizing Committee. (2001). *Olympic Games References-Approaches*. Athens: Ellinika Grammata & Livanis.
- Athens 2004 Organizing Committee. (2002). *Paralympic Games From 1960 to 2004*. Athens: Pallis ABEE.
- BBC Sport Olympics. (2008, January 14). 'Blade Runner' handed Olympic ban. Retrieved January 17, 2015, from BBC News: <http://news.bbc.co.uk/sport2/hi/olympics/athletics/7141302.stm>
- Berger, M., Nieuwenhuizen, M., Ent, M., & Zande, M. (2012). Development of a new wheelchair for wheelchair basketball players in the Netherlands. *Procedia Engineering: Engineering of Sport Conference 2012*, 34, 331-336.
- Booher, A. K. (2010). Docile bodies, supercrips, and the plays of prosthetics. *International Journal of Feminist Approaches to Bioethics*, 3(2), 63-89.
- Bruce, D. (2007). *Human Enhancement? Ethical Reflections on Emerging Nanobio-technologies*. Edinburgh: Edinethics.
- Brüggemann, G.-P., Arampatzis, A., Emrich, F., & Potthast, W. (2008). Biomechanics of double transtibial amputee sprinting using dedicated sprinting prostheses. *Sports Technology*, 1(4-5), 220-227.
- Burkett, B., McNamee, M., & Potthast, W. (2011). Shifting boundaries in sports technology and disability: equal rights or unfair advantage in the case of Oscar Pistorius? *Disability & Society*, 26(5), 643-654.

- Camporesi, S. (2008). Oscar Pistorius, enhancement and post-humans. *Journal of Medical Ethics*, 34(9), 639.
- Carroll, S. T. (1988). *Wrestling in Ancient Nubia*. Retrieved October 30, 2014, from Library la84:
<http://library.la84.org/SportsLibrary/JSH/JSH1988/JSH1502/jsh1502b.pdf>
- CBC Sports. (2014, March 16). *Sir Philip Craven's closing ceremony speech*. Retrieved October 27, 2014, from CBC Sports Paralympics:
<http://www.cbc.ca/sports/paralympics/news/full-text-sir-philip-craven-s-closing-ceremony-speech-1.2574955>
- Dasgupta, I. (2011, August 17). *Is Oscar Pistorius the First Posthuman?* Retrieved January 12, 2015, from Berman Institute Bioethics Bulletin:
<http://bioethicsbulletin.org/archive/op-ed-is-oscar-pistorius-the-first-posthuman>
- Davies, G. A. (2012, August 29). *Paralympics 2012: 300 athletes 'bending rules' in quest for gold*. Retrieved November 4, 2014, from The Telegraph Sport:
<http://www.telegraph.co.uk/sport/olympics/paralympic-sport/9504811/Paralympics-2012-300-athletes-bending-rules-in-quest-for-gold.html>
- Disabled World. (2014). *Definition of Disabilities*. Retrieved October 20, 2014, from Disabled World: <http://www.disabled-world.com/disability/types/>
- Dvorsky, G. (2007, April 25). *Is the world ready for cyborg athletes?* Retrieved January 11, 2015, from Sentient developments:
<http://www.sentientdevelopments.com/2007/04/is-world-ready-for-cyborg-athletes.html>
- Dyer, B., Noroozi, S., Redwood, S., & Sewell, P. (2010). The design of lower-limb sports prostheses: fair inclusion in disability sport. *Disability & Society*, 25(5), 593-602.
- Dyer, B., Sewell, P., & Noroozi, S. (2013). How should we assess the mechanical properties of lower-limb prosthesis technology used in elite sport?—An initial investigation. *Journal of Biomedical Science and Engineering*, 6(2), 116-123.

- Eligibility for an athlete with disabilities to compete in IAAF-sanctioned events alongside able-bodied athlete, A/1480 Pistorius v IAAF (Court of Arbitration for Sport May 16, 2008).
- Eveleth, R. (2012, July 22). *Does Double-Amputee Oscar Pistorius Have an Unfair Advantage at the 2012 Olympic Games?* Retrieved January 15, 2015, from Smithsonian: <http://www.smithsonianmag.com/summerolympics/does-double-amputee-oscar-pistorius-have-an-unfair-advantage-at-the-2012-olympic-games-2655123/?no-ist>
- Foley, A., & Ferri, B. A. (2012). Technology for people, not disabilities: ensuring access and inclusion. *Journal of Research in Special Educational Needs*, 12(4), 192-200.
- Freeman, W. H. (1991). Sport and Technology: Ethics on the Cutting Edge. *Annual Meeting of the American Alliance for Health, Physical Education, Recreation and Dance* (pp. 1-9). San Francisco: .
- Fuss, F. (2008). Closing the gap through technology. *Sports Technology*, 1(4-5), 169-171.
- Grabowski, A. M., McGowan, C. P., McDermott, W. J., Beale, M. T., Kram, R., & Herr, H. M. (2010). Running-specific prostheses limit ground-force during sprinting. *Biology Letters*, 6, 201-204.
- Hassani, H., Ghodsi, M., Shadi, M., Noroozi, S., & Dyer, B. (2014). A Statistical Perspective on Running with Prosthetic Lower-Limbs: An Advantage or Disadvantage? *Sports*, 2, 76-84.
- Hobara, H., Baum, B. S., Kwon, H.-J., Miller, R. H., Ogata, T., Kim, Y., & Shim, J. (2013, September 27). Amputee locomotion: spring-like leg behavior and stiffness regulation using running-specific prostheses. *Journal of Biomechanics*, 46(14), 2483-2489.
- Homer. (n.d.). *Perseus Hopper*. Retrieved February 8, 2016, from Perseus Digital Library:
<http://www.perseus.tufts.edu/hopper/text?doc=Perseus%3Atext%3A1999.01.0134%3Abook%3D23%3Acard%3D226>

- Hood, W. F. (1972). The Aristotelian versus the Heideggerian approach to the problem of technology. In C. Mitcham, & R. Mackey, *Philosophy and Technology: Readings in the philosophical problems of technology* (pp. 347-363). New York: The Free Press.
- Howe, D. (2011, October). Cyborg and Supercrip: The Paralympics Technology and the (Dis)empowerment of Disabled Athletes. *Sociology*, 45(5), 868-882.
- Hutzler, Y., & Bar-Eli, M. (1993, December). Psychological benefits of sports for disabled people: a review. *Scandinavian Journal of Medicine & Science in Sports*, 3(4), 217-228.
- International Association of Athletics Federations. (2008). *IAAF Competition Rules 2008*. Retrieved January 17, 2015, from Dis Deutsches Sportschiedsgericht: http://www.dis-sportschiedsgericht.de/Material/DLV/IAAF/IAAF_Competition_Rules_2008.pdf
- International Association of Athletics Federations. (2014). *Sprint 400m*. Retrieved November 4, 2014, from IAAF: <http://www.iaaf.org/disciplines/sprints/400-metres>
- International Olympic Committee. (2014a). *Ancient Olympic Games-History*. Retrieved October 17, 2014, from IOC: <http://www.olympic.org/ancient-olympic-games?tab=history>
- International Olympic Committee. (2014b). *Paralympic Games-History*. Retrieved October 19, 2014, from IOC: <http://www.olympic.org/content/olympic-games/paralympic-games/?tab=history>
- International Paralympic Committee. (2007, November). *IPC Classification Code and International Standards 2007*. Retrieved November 1, 2014, from IPC: http://www.paralympic.org/sites/default/files/document/120201084329386_2008_2_classification_code6.pdf
- International Paralympic Committee. (2010, December). *IPC Strategic Brochure*. Retrieved October 16, 2014, from IPC:

http://www.paralympic.org/sites/default/files/document/120118143826469_rz_ipc_11_strategic_brochure_long_0.pdf

International Paralympic Committee. (2011, December). *IPC Constitution*. Retrieved November 3, 2014, from IPC:

http://www.paralympic.org/sites/default/files/document/120203111622073_sec_i_chapter_1.0_ipc_constitution_adopted_by_ga_2011.pdf

International Paralympic Committee. (2013, June). *IPC Development Strategy*.

Retrieved October 16, 2014, from IPC:

http://www.paralympic.org/sites/default/files/document/130702120952328_ipc+development+strategy_0.pdf

International Paralympic Committee. (2014a, January). *IPC Athletics Rules and Regulations 2014-2015*.

Retrieved November 10, 2014, from IPC:

http://www.paralympic.org/sites/default/files/document/131218164256138_2013_12+ipc+athletics+rules+and+regulations+2014-2015_digital.pdf

International Paralympic Committee. (2014b, September 16). *First IPC-IOC Agreement*.

Retrieved October 31, 2014, from IPC:

<http://www.paralympic.org/feature/7-first-ipc-ioc-agreement>

International Paralympic Committee. (2014c, October 7). *IPC Governing Board approves first 16 sports to be included in the Tokyo 2020 Paralympic Games*.

Retrieved October 30, 2014, from IPC: <http://www.paralympic.org/news/ipc-governing-board-approves-first-16-sports-be-included-tokyo-2020-paralympic-games>

<http://www.paralympic.org/news/ipc-governing-board-approves-first-16-sports-be-included-tokyo-2020-paralympic-games>

International Paralympic Committee. (2014d). *The IPC-Who we are-Paralympics-History of the Movement*.

Retrieved October 18, 2014, from IPC:

<http://www.paralympic.org/the-ipc/history-of-the-movement>

International Paralympic Committee. (2014e). *The IPC-Who we are-Regional Organisations*.

Retrieved October 19, 2014, from IPC:

<http://www.paralympic.org/the-ipc/regional-organisations>

- International Paralympic Committee. (2014f). *The IPC-Who we are-About us*. Retrieved October 26, 2014, from IPC: <http://www.paralympic.org/the-ipc/about-us>
- International Paralympic Committee. (2014g). *The IPC-What we do-Education*. Retrieved October 27, 2014, from IPC: <http://www.paralympic.org/the-ipc/education>
- International Paralympic Committee. (2014h). *Education Committee*. Retrieved October 28, 2014, from IPC: <http://www.paralympic.org/the-ipc/committees/education>
- International Paralympic Committee. (2014i). *Classification*. Retrieved November 1, 2014, from IPC: <http://www.paralympic.org/classification>
- International Paralympic Committee. (2014j). *Classification Code*. Retrieved November 2, 2014, from IPC: <http://www.paralympic.org/classification-code>
- International Paralympic Committee. (2014k). *Winter Sports*. Retrieved November 3, 2014, from IPC: <http://www.paralympic.org/sports/winter>
- International Paralympic Committee. (2014l). *Sport specific classification*. Retrieved November 4, 2014, from IPC: <http://www.paralympic.org/classification/sport-specific>
- International Paralympic Committee. (2014m). *The IPC-Who we are-IPC Handbook*. Retrieved November 6, 2014, from IPC: <http://www.paralympic.org/the-ipc/handbook>
- International Paralympic Committee. (2014n). *The IPC-What we do-IPC Academy*. Retrieved November 7, 2014, from IPC: <http://www.paralympic.org/the-ipc/ipc-academy>
- International Paralympic Committee. (2014o). *Agitos Foundation-what-we-do*. Retrieved November 8, 2014, from IPC: <http://www.paralympic.org/agitos-foundation/what-we-do>
- International Paralympic Committee. (2014p, March 6). *Badminton, taekwondo move forward in Tokyo 2020 process*. Retrieved November 8, 2014, from IPC:

<http://www.paralympic.org/news/badminton-taekwondo-move-forward-tokyo-2020-process>

International Paralympic Committee. (2015). *IPC Athletics World Records*. Retrieved January 16, 2015, from IPC:

<http://www.paralympic.org/sdms/web/at/record.pdf.at.php?xml=0&rct=RCTWR&spec=out&gen=M&evt=AT004>

IQ Comparison Site. (2007). *IQ Basics*. Retrieved November 1, 2014, from IQ Comparison Site: <http://www.iqcomparisonsite.com/iqbasics.aspx>

Jones, C., & Wilson, C. (2009, March). Defining advantage and athletic performance: The case of Oscar Pistorius. *European Journal of Sport Science*, 9(2), 125-131.

Jones, D. (2012, September 3). *Raging Oscar and a hint of hypocrisy: After years fighting claims his high-tech blades gave him an advantage, now Pistorius cries foul over rivals' performance*. Retrieved January 9, 2015, from MailOnline: <http://www.dailymail.co.uk/news/article-2197901/Oscar-Pistorius-After-years-fighting-claims-blades-gave-advantage-cries-foul-rivals-performance.html>

Keogh, J. W. (2011). Paralympic sport: an emerging area for research and consultancy in sports biomechanics. *Sports Biomechanics*, 10(3), 234-253.

Laferrier, J. Z., Rice, I., Pearlman, J., Sporer, M. L., Cooper, R., Liu, T., & Cooper, R. A. (2012). Technology to improve sports performance in wheelchair sports. *Sports Technology*, 5(1-2), 4-19.

Lakhani, N. (2012, August 25). *Learning disabilities: Paralympic 'cheats' no more*. Retrieved November 2, 2014, from The Independent: <http://www.independent.co.uk/sport/olympics/paralympics/learning-disabilities-paralympic-cheats-no-more-8079338.html>

Lamb, R. (2009, February 11). *Is surgery changing baseball?* Retrieved February 25, 2015, from HowStuffWorks: <http://health.howstuffworks.com/medicine/modern-technology/surgery-change-baseball.htm>

- Lechler, K., & Lilja, M. (2008). Lower extremity leg amputation: an advantage in running? *Sports Technology*, 1(4-5), 229-234.
- Lee, J. B., James, D. A., Ohgi, Y., & Yamanaka, S. (2012). Monitoring sprinting gait temporal kinematics of an athlete aiming for the 2012 London Paralympics. *Procedia Engineering 34: Engineering of Sport Conference 2012* (pp. 778-783). Elsevier Ltd.
- Lee, M.-Y., Lin, C.-F., & Soon, K.-S. (2007, December). Balance control enhancement using sub-sensory stimulation and visual-auditory biofeedback strategies for amputee subjects. *Prosthetics and Orthotics International*, 31(4), 342-352.
- Loland, S. (2002). Technology in sport: Three ideal-typical views and their implications. *European Journal of Sport Science*, 2(1), 1-11.
- Loland, S., & Murray, T. (2007, June). The ethics of the use of technologically constructed high-altitude environments to enhance performances in sport. *Scandinavian Journal of Medicine & Science in Sports*, 17(3), 193-195.
- Longman, J. (2007a, May 15). *An Amputee Sprinter: Is He Disabled or Too-Abled?* Retrieved January 17, 2015, from The New York Times: http://www.nytimes.com/2007/05/15/sports/othersports/15runner.html?oref=slogin&_r=0
- Longman, J. (2007b, July 20). *Fit Young Pitchers See Elbow Repair as Cure-All.* Retrieved January 3, 2015, from The New York Times: http://www.nytimes.com/2007/07/20/sports/baseball/20surgery.html?pagewanted=all&_r=0
- Lower Limb Prosthetic Devices. (2014). *The Seattle Foot*. Retrieved January 10, 2015, from Lower Limb Prosthetic Devices: <http://prosthetics.umwblogs.org/the-seattle-foot/>
- Mackay, D. (2013, October 7). *Spaniard behind Sydney 2000 Paralympic basketball scandal finally brought to justice.* Retrieved October 26, 2014, from Inside the games: <http://www.insidethegames.biz/paralympics/1016379-spaniard-behind-sydney-2000-paralympic-basketball-scandal-finally-brought-to-justice>

- Magdalinski, T. (2013). Restoring or Enhancing Athletic Bodies: Oscar Pistorius and the Threat to Pure Performance. In J. Tolleneer, S. Sterckx, & P. Bonte, *Athletic Enhancement, Human Nature and Ethics: Threats and Opportunities of Doping Technologies* (pp. 237-251). Springer.
- Marcellini, A., Ferez, S., Issanchou, D., Léséleuc, E. D., & McNamee, M. (2012, August). Challenging human and sporting boundaries: The case of Oscar Pistorius. *Performance Enhancement & Health*, 1(1), 3-9.
- Maslin, S. N. (2012, September 8). *Paralympians' Equipment Raises Debate on Fairness*. Retrieved November 17, 2014, from The New York Times: http://www.nytimes.com/2012/09/09/sports/equipment-used-by-disabled-athletes-fuels-debate-on-fairness.html?_r=4&
- McEvoy, J. (2013, February 14). *Pistorius: I wouldn't want to run if I was cheating. I believe in the purity of sport*. Retrieved January 11, 2015, from MailOnline Sport: <http://www.dailymail.co.uk/sport/olympics/article-2027614/London-Olympics-2012-Oscar-Pistorius-I-wouldnt-want-run-I-cheating-I-believe-purity-sport.html>
- McGrath, M. (2012, August 22). *Paralympic athletes who harm themselves to perform better*. Retrieved November 6, 2014, from BBC News: <http://www.bbc.com/news/science-environment-19325756>
- McHugh, J. (2007, March). *Blade Runner*. Retrieved January 18, 2015, from Wired: <http://archive.wired.com/wired/archive/15.03/blade.html>
- McInerney, J. (2011). *Bulls and Bull-leaping in the Minoan World*. Retrieved October 30, 2014, from Penn Museum: <http://www.penn.museum/documents/publications/expedition/pdfs/53-3/mcinerney.pdf>
- McNamee, M. (2011). After Pistorius: Paralympic Philosophy and Ethics. *Sport, Ethics and Philosophy*, 5(4), 359-361.
- McNamee, M. J. (2006, October). *Ethical Issues regarding Human Enhancement Technologies*. Retrieved January 19, 2015, from House of Commons-Science and Technology:

<http://www.publications.parliament.uk/pa/cm200607/cmselect/cmsstech/67/67we16.htm>

- Menuz, V., Hurlimann, T., & Godard, B. (2013, March 19). Is Human Enhancement also a Personal Matter? *Sci Eng Ethics*, 19(1), 161-177.
- Miah, A. (2003, October). Be Very Afraid: Cyborg Athletes, Transhuman Ideals & Posthumanity. *Journal of Evolution and Technology*, 13(2), 1-18.
- Miah, A. (2005). From anti-doping to a 'performance policy' sport technology, being human, and doing ethics. *European Journal of Sport Science*, 5(1), 51-57.
- Miah, A. (2009). A Critical History of Posthumanism. In B. Gordijn, & R. Chadwick, *Medical Enhancement and Posthumanity* (pp. 71-94). Springer.
- Miah, A. (2011). Physical Enhancement: The State of the Art. In J. Savulescu, R. t. Meulen, & G. Kahane, *Enhancing Human Capacities* (pp. 266-273). Oxford: Blackwell Publishing Ltd.
- Miller, S. (2012, November 26). *Should prosthetics be allowed in non-amputee events?* Retrieved January 12, 2015, from UkSportSci: <https://uksportsci.wordpress.com/2012/11/26/prosthetics-in-sport/comment-page-1/>
- Mortimore, G. (1992, September 1). *Ajibola Adeoye*. Retrieved October 29, 2014, from Gettyimages: <http://www.gettyimages.com/detail/news-photo/nigerian-athlete-ajibola-adeoye-is-congratulated-after-news-photo/80905880>
- MU Health Care. (2014). *Benefits of Sports*. Retrieved October 20, 2014, from MU Health Care: <http://www.muhealth.org/services/pediatrics/conditions/adolescent-medicine/benefits-of-sports/>
- Naul, R. (2008). *Olympic Education*. Oxford: Meyer & Meyer (UK) Ltd.
- Norman, M. E., & Moola, F. (2011). 'Bladerunner or boundary runner'? : Oscar Pistorius, cyborg transgressions and strategies of containment. *Sport in Society: Cultures, Commerce, Media, Politics*, 14(9), 1265-1279.

- Noroozi, S., Sewell, P., Rahman, A. G., Vinney, J., Chao, O. Z., & Dyer, B. (2012, March 2). Modal analysis of composite prosthetic energy-storing-and-returning feet: an initial investigation. In I. o. Engineers (Ed.), *Proceedings of the Institution of Mechanical Engineers Part P Journal of Sports Engineering and Technology*. 227, pp. 39-48. SAGE.
- OrthoInfo. (2014). *Erb's Palsy (Brachial Plexus Birth Palsy)*. Retrieved November 22, 2014, from OrthoInfo: <http://orthoinfo.aaos.org/topic.cfm?topic=a00077>
- Oxford Reference. (2014). *Technology*. Retrieved January 10, 2015, from Oxford Reference:
<http://www.oxfordreference.com/view/10.1093/acref/9780195123715.001.0001/acref-9780195123715-e-1667?rskkey=kEIQRF&result=1666>
- Papakonstantopoulos, T. (2001). *Disabled athletes-Paralympic Games*. Athens: Athletic Organization of the Municipality of Kifissia.
- Paralympicanorak. (2012a, April 12). *Technological Doping/ Cyborg Athletes*. Retrieved November 15, 2014, from Paralympicanorak:
<https://paralympicanorak.wordpress.com/2012/04/12/technological-doping-cyborg-athletes/>
- Paralympicanorak. (2012b, June 25). *Madrid 1992 – the Paralympic Games that time forgot!* Retrieved November 1, 2014, from Paralympicanorak:
<https://paralympicanorak.wordpress.com/2012/06/25/madrid-1992-the-paralympic-games-that-time-forgot/>
- Paralympicanorak. (2013, August 2). *Athletes with a disability and the Olympic Games*. Retrieved November 15, 2014, from Paralympicanorak:
<https://paralympicanorak.wordpress.com/2013/08/02/athletes-with-a-disability-and-the-olympic-games/>
- Pérez Triviño, J. L. (2013, March 01). Cyborgsportpersons: Between Disability and Enhancement. *Physical Culture and Sport. Studies and Research*, 57(1), 12-21.
- Ryall, E. (2012). Humans, athletes and cyborgs: Where next for sport? *Bulletin of Sport and Culture*, 35(7-9), 1-6.

- Ryall, E. (2013, October). Conceptual Problems with Performance Enhancing Technology in Sport. *Royal Institute of Philosophy Supplement*, 73, pp. 129-143.
- Saskatchewan Cycling Association. (2014). *Arnold Boldt*. Retrieved October 28, 2014, from Saskatchewan Cycling Association:
<http://www.saskcycling.ca/Athlete%20Profiles/arnold.html>
- ScienceDaily. (2009a, August 4). *Oscar Pistorius: Amputee Sprinter Runs Differently*. Retrieved January 14, 2015, from ScienceDaily:
<http://www.sciencedaily.com/releases/2009/06/090629132200.htm>
- ScienceDaily. (2009b, November 9). *Notion That Amputee Runners Gain Advantage From Protheses Further Disputed*. Retrieved January 16, 2015, from ScienceDaily:
<http://www.sciencedaily.com/releases/2009/11/091104123041.htm>
- Scott. (2007, October 8). *The World Health Organization's New Definition of Disability*. Retrieved October 19, 2014, from Rolling Rains Report:
<http://www.rollingrains.com/2007/10/the-world-health-organizations-new-definition-of-disability.html>
- Shipley, A. (2009, July 24). *FINA Opts to Ban All High-Tech Swimsuits*. Retrieved January 14, 2015, from Reachforthewall:
<http://reachforthewall.com/2009/07/24/suit-story/?hpid=artslot>
- Simpson, J. (2012, August 8). *'No Advantage to Being an Amputee': A Defense of Oscar Pistorius's Protheses*. Retrieved January 13, 2015, from The Atlantic:
<http://www.theatlantic.com/entertainment/archive/2012/08/no-advantage-to-being-an-amputee-a-defense-of-oscar-pistoriuss-protheses/260878/>
- Sokolove, M. (2012, January 18). *The Fast Life of Oscar Pistorius*. Retrieved January 17, 2015, from The New York Times:
http://www.nytimes.com/2012/01/22/magazine/oscar-pistorius.html?pagewanted=all&_r=0
- Steadward, R., & Peterson, C. (1997). *Paralympics*. Edmonton: DW Friesens Ltd.

- Swartz, L., & Watermeyer, B. (2008). Cyborg anxiety: Oscar Pistorius and the boundaries of what it means to be human. *Disability & Society*, 23(2), 187-190.
- Telegraph Sport. (2012, August 24). *Paralympics 2012: classifications explained*. Retrieved November 2, 2014, from The Telegraph: <http://www.telegraph.co.uk/sport/olympics/paralympic-sport/9494025/Paralympics-2012-classifications-explained.html>
- Thomas, G., & Banks, T. (2013). 'We aren't racing a fair race': Rawls, Sen, and the Paralympic Games. *Sociological Research Online*, 18(3), 1-4.
- Thompson, W. R., & Vanlandewijck, Y. C. (2013, July 4). Science and the paralympic movement. *British Journal of Sports Medicine*, 47(13), 1.
- Tomlinson, S. (2013, October 14). *Man that led shameful Spanish basketball team who pretended to be disabled to win Paralympic gold found guilty of fraud*. Retrieved November 1, 2014, from MailOnline Sport: <http://www.dailymail.co.uk/sport/othersports/article-2459172/Spanish-basketball-team-pretended-disabled-win-Paralympic-gold-guilty-fraud.html>
- Topendsports. (2014). *Disabled Olympic Participants*. Retrieved November 20, 2014, from Topendsports: <http://www.topendsports.com/events/summer/highlights/disabled.htm>
- Turbow, J. (2012, August 3). *Bigger, faster, stronger-Will bionic limbs put the Olympics to shame?* Retrieved February 02, 2015, from Wired: <http://www.wired.com/2012/08/next-gen-prosthetics-and-sports/>
- United Nations. (2014). *Why sport?* Retrieved October 15, 2014, from UN: <http://www.un.org/wcm/content/site/sport/home/sport>
- Van der Woude, L. H., Groot, S. D., & Janssen, T. W. (2006, November). Manual wheelchairs: Research and innovation in rehabilitation, sports, daily life and health. *Medical Engineering and Physics*, 28(9), pp. 905-915.
- Vlahovich, N. (2014, March). *Sport Technology*. Retrieved January 10, 2015, from Clearinghouse for Sport:

https://secure.ausport.gov.au/clearinghouse/knowledge_base/organised_sport/sports_and_sports_organisations/sport_technology

- Weyand, P. G., Bundle, M. W., McGowan, C. P., Grabowski, A., Brown, M., Kram, R., & Herr, H. (2009, September). The fastest runner on artificial legs: different limbs, similar function? *Journal of Applied Physiology*, *107*(3), 903-911.
- Wild, S. J. (2010, April 20). *On Equal Footing: Does Accommodating Athletes with Disabilities Destroy the Competitive Playing Field or Level It?* Retrieved January 18, 2015, from Pepperdine Law Review: <http://digitalcommons.pepperdine.edu/plr/vol37/iss4/6/>
- Wong, K. (2008). Will expensive technology and funding limit the growth and development of disability sports in ASEAN? *Sports Technology*, *1*(2-3), 85-85.
- World Health Organization. (2014). *Disabilities*. Retrieved October 25, 2014, from World Health Organization: <http://www.who.int/topics/disabilities/en/>
- Wrenn, E. (2012, September 4). *From the wheelchair based on an F1 car to the 'Terminator' exo-skeleton suit: How technology is transforming the Paralympics*. Retrieved November 8, 2014, from MailOnline Science: <http://www.dailymail.co.uk/sciencetech/article-2198013/Paralympics-2012-How-technology-transforming-Games.html>
- Yale Journal of Medicine & Law. (2013, February 17). *Prosthetics and the paralympics*. Retrieved January 15, 2015, from Yale Journal of Medicine & Law: <http://www.yalemedlaw.com/prosthetics-and-the-paralympics/>
- Yan, Y., & Zhu, W. (2014). Peer-Reviewed Abstracts. *Research Quarterly for Exercise and Sport*, *85*(1), pp. 105-105.

APPENDICES

APPENDIX I
SUMMER PARALYMPIC GAMES OVERVIEW

Year	Location	Disabilities	Countries	Athletes	Highlights
2016	Rio (BRA)	Spin. Injury, Amputee, Vis. Impairment, Cereb. Palsy, Les Autres, Intell. Disability	---	4,200	Para-Canoe and Para-Triathlon added as sports bringing total number to 22
2012	London (GBR)	Spin. Injury, Amputee, Vis. Impairment, Cereb. Palsy, Les Autres, Intell. Disability	164	4,237	After an absence of 12 years intellectually disabled athletes competed in athletics, swimming and table tennis
2008	China (CHN)	Spin. Injury, Amputee, Vis. Impairment, Cereb. Palsy, Les Autres	146	3,951	Rowing added as sport. Cumulated TV audience of 3.8 billion
2004	Athens (GRE)	Spin. Injury, Amputee, Vis. Impairment, Cereb. Palsy, Les Autres	135	3,808	Football 5-a-side added as a sport
2000	Sydney	Spin. Injury,	122	3,881	Sailing and

SUMMER PARALYMPIC GAMES OVERVIEW

Year	Location	Disabilities	Countries	Athletes	Highlights
	(AUS)	Amputee, Vis. Impairment, Cereb. Palsy, Les Autres, Intell. Disabled			Wheelchair Rugby added as sports. Record ticket sales
1996	Atlanta (USA)	Spin. Injury, Amputee, Vis. Impairment, Cereb. Palsy, Les Autres, Intell. Disabled	104	3,259	Equestrian added as a sport. Track cycling added as a dis
1992	Barcelona (ESP)	Spin. Injury, Amputee, Vis. Impairment, Cereb. Palsy, Les Autres	83	3,001	Event benchmark in organizational excellence
1988	Seoul (KOR)	Spin. Injury, Amputee, Vis. Impairment, Cereb. Palsy, Les Autres	61	3,057	Judo and Wheelchair Tennis added as sports. Co- operation between Olympic and Paralympic Organizing Committees. Shared venues

SUMMER PARALYMPIC GAMES OVERVIEW

Year	Location	Disabilities	Countries	Athletes	Highlights
					with Olympics which has continued ever since
1984	Stoke Mandeville (GBR) & New York (USA)	Spin. Injury, Amputee, Vis. Impairment, Cereb. Palsy, Les Autres	41 (GBR) 45 (USA)	1,100 (GBR) 1,800 (USA)	Football 7-a-side and Boccia added as sports. Cycling added as a discipline. Wheelchair Racing included as demonstration event at Olympics
1980	Arnhem (NED)	Spin. Injury, Amputee, Vis. Impairment, Cereb. Palsy, Les Autres	42	1,973	Sitting Volleyball added as a discipline. Events for athletes with Cerebral Palsy included
1976	Toronto (CAN)	Spin. Injury, Amputee, Vis. Impairment, Les Autres	38	1,657	First use of specialized racing wheelchairs. Volleyball (Standing), Goalball and Shooting added as sports
					First quadriplegic competition

SUMMER PARALYMPIC GAMES OVERVIEW

Year	Location	Disabilities	Countries	Athletes	Highlights
1972	Heidelberg (GER)	Spin. Injury	43	984	added. Demonstration events for visually impaired athletes
1968	Tel Aviv (ISR)	Spin. Injury	29	750	Lawn Bowls added as a sport
1964	Tokyo (JAP)	Spinal Injury	21	375	Weightlifting added as a sport
1960	Rome (ITA)	Spin. Injury	23	400	First Games with a disability held in same venues as Olympic Games

<http://www.paralympic.org/paralympic-games/summer-overview>

APPENDIX II

WINTER PARALYMPIC GAMES OVERVIEW

Year	Location	Disabilities	Countries	Athletes	Highlights
2018	PyeongChang (KOR)	Spin. Injury, Amputee, Vis. Impairment, Cerebral			
2014	Sochi (RUS)	Spin. Injury, Amputee, Vis. Impairment, Cereb. Palsy, Les Autres	45	541	316,200 tickets were sold, the most ever for Paralympic Winter Games. Para-snowboard made its Paralympic Winter Games debut as part of IPC Alpine Skiing.
2010	Vancouver (CAN)	Spin. Injury, Amputee, Vis. Impairment, Cereb. Palsy, Les Autres	44	502	Ticket sales exceeded 230,000, the most ever.
2006	Torino (ITA)	Spin. Injury, Amputee, Vis. Impairment, Cereb.Palsy, Les Autres	39	477	Wheelchair Curling added as a new sport.
2002	Salt Lake City (USA)	Spin. Injury,	36	416	Number of tickets

WINTER PARALYMPIC GAMES OVERVIEW

Year	Location	Disabilities	Countries	Athletes	Highlights
		Amputee, Vis. Impairment, Cereb. Palsy, Les Autres			on sale had to be augmented due to high demand
1998	Nagano (JAP)	Spin. Injury, Amputee, Vis. Impairment, Cereb. Palsy, Les Autres	32	571	Demonstrated rising media interest in Paralympic Winter Sport
1994	Lillehammer (NOR)	Spin. Injury, Amputee, Vis. Impairment, Cereb. Palsy, Les Autres	31	492	Ice Sledge Hockey added as a sport
1992	Tignes- Albertville (FRA)	Spin. Injury, Amputee, Vis. Impairment, Cereb. Palsy, Les Autres	24	475	Biathlon added as a discipline. Demonstration events: Alpine and Cross Country Skiing for athletes with an intellectual disability. First Games to share Olympic venues. Continued ever since
1988	Innsbruck (AUT)	Spin. Injury, Amputee,	22	397	Sit-Ski events

WINTER PARALYMPIC GAMES OVERVIEW

Year	Location	Disabilities	Countries	Athletes	Highlights
		Vis. Impairment, Cereb. Palsy, Les Autres			introduced in the sports of Alpine and Nordic Skiing
1984	Innsbruck (AUT)	Spin. Injury, Amputee, Vis. Imp, Cereb. Palsy, Les Autres	21	457	Demonstration event at Olympics in Sarajevo: Giant Slalom.
1980	Geilo (NOR)	Spin. Injury, Amputee, Vis. Impairment, Les Autres	18	350	Demonstration event: Downhill Sledge Racing
1976	Örnsköldsvik, Sweden	Spinal injury	16	250+	Demonstration event: Sledge Racing

<http://www.paralympic.org/paralympic-games/winter-overview>

APPENDIX III
GOVERNANCE OF PARALYMPIC SPORTS

<u>SPORT</u>	<u>INTERNATIONAL FEDERATION</u>
Alpine Skiing	International Paralympic Committee(IPC) with the cooperation of ISF
Archery	World Archery Federation (FITA)
Athletics	International Amateur Athletics Federation (IAAF) with IBSA,ISOD,ISMWSF,CP-ISRA
Basketball	International Wheelchair Basketball Federation (IWBF)
Biathlon	International Paralympic Committee (IPC)
Boccia	Boccia International Sports Federation (BISFed)
Canoe	International Canoe Federation (ICF)
Cross-country skiing	International Paralympic Committee (IPC)
Curling	World Curling Federation (WCF)
Cycling	International Cycling Union (UCI)
DanceSport	World Dance Sport Federation (WDSF)
Equestrian	International Equestrian Federation (FEI)
Fencing	International Wheelchair and Amputee Sports Federation (IWAS)
Football 5-a-Side	International Blind Sports Federation (IBSA) Using the rules of FIFA
Football 7-a-Side	Cerebral Palsy International Sports and Recreation Association (CPISRA) Using the modified rules of FIFA
Goalball	International Blind Sports Federation (IBSA)
Ice-sledge hockey	International Paralympic Committee(IPC)
Judo	International Blind Sports Federation (IBSA) Using the modified rules of IJF
Powerlifting	International Paralympic Committee(IPC)
Rowing	International Rowing Federation (FISA)
Rugby	International Wheelchair Rugby Federation (IWRf)

Sailing	International Association for Disabled Sailing(IFDS) with the cooperation of ISF
Shooting	International Paralympic Committee (IPC)- IPC Shooting
Swimming	International Paralympic Committee(IPC) with the cooperation of International Swimming Federation (FINA)
Table Tennis	International Table Tennis Federation (ITTF) through the ITTF Para-Table Tennis Committee
Tennis	International Tennis Federation (ITF)
Triathlon	International Triathlon Union (ITU)
Volleyball	World ParaVolley (WOVD)

<http://www.paralympic.org/the-ipc/international-sport-federations>

APPENDIX IV
INTERNATIONAL SPORTS FEDERATIONS

The IPC currently recognizes 15 International Federations

World Archery (WA)
International Equestrian Federation (FEI)
International Wheelchair Basketball Federation (IWBF)
International Table Tennis Federation (ITTF)
International Tennis Federation (ITF)
International Federation for Disabled Sailing (IFDS)
International Rowing Federation (FISA)
International Cycling Union (UCI)
World ParaVolley (WOVD)
International Wheelchair Rugby Federation (IWRF)
World Curling Federation (WCF)
International Triathlon Union (ITU)
International Canoe Federation (ICF)
Boccia International Sports Federation (BISFed)
Badminton World Federation (BWF)

<http://www.paralympic.org/the-ipc/international-sport-federations>

APPENDIX V
NATIONAL PARALYMPIC COMMITTEES

Africa Paralympic Committee	It is occupied by 49 NPCs
America Paralympic Committee	It is occupied by 30 NPCs
Asia Paralympic Committee	It is occupied by 42 NPCs
Europe Paralympic Committee	It is occupied by 48 NPCs
Oceania Paralympic Committee	It is occupied by 8 NPCs

<https://www.paralympic.org/africa>