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Coaching Athletes with Disabilities: Challenges and Recommendations for Effective Training

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Abstract

The article briefly discusses athletes with disabilities and how their condition can be matched with suitable activities to allow them to participate in physical activity and sports. The article also aims at assisting coaches who conducts training for people with disability to understand their condition first, and then devise programs that are appropriate for their condition. Furthermore, it highlights the barriers and conditions that affect athletes with disabilities participation in sports, especially those related to the health, safety, and medical considerations that coaches should understand and manage carefully. The article offers recommendations on how coaches should train athletes with disability.

Keywords: *athletes with disability, conditions (disabilities)*

Introduction

Sports for the persons with disabilities like the able bodied, provide many benefits, including; increase strength and endurance, improvement in performance, restoration of activity of mind, increased self-confidence, and overall improvement in their quality of life. Moreover, sports play a major role in social medical, educational, and vocational aspects of comprehensive rehabilitation programs for people with disability. Due to these reasons, the first competitive sports for the physically disabled were introduced by Sir Ludwig Guttmann at Stoke Mandeville Hospital in 1948 called the Stoke Mandeville Games (SMG) which continues currently as the International Stoke Mandeville Games (Skaggs & Hooper, 1996).

Although, all able-bodied and persons with disabilities focus on their quality of life and wellbeing (Woude, Veeger & Rozendal, 1989), persons with disabilities generally are less likely to have opportunities to be active, making their health concerns due to inactivity greater than the able-bodied (Block, 1995; Colak,

Bamac, Aydin & Ozbek, 2004; Longmuir & Bar-Or, 2000; Messent, Cooke & Long, 1999; Pitetti, Climstein & Barret, 1992). For example, persons who are visually-impaired use more energy during activities of daily living (Buell 1982) and tend to have lower levels of physical activity and health-related fitness than those who are sighted (Horvat, Ramsey, Miszko, Keeney & Blasch, 2003; Lieberman, Byrne, Mattern, Fernandez-Vivo & Robinson, 2006; Sit, Lindner & Sherill, 2002; Williams, 1990). Furthermore, impairments affect muscle strength and motor control performance for those with motor impairments and these limit their participation in sports.

With the special needs of persons with disabilities in mind, coaches should design their training programs to deal appropriately with these needs. In fact, coaching athletes with disabilities is not a difficult task if a coach is able to accept each participant as an individual and deal with their specific needs and conditions. As a coach, it is important to be aware of each person's disabilities and the level at which these athletes are capable of functioning. Remember that even people with the same physical condition (throughout this article the term condition(s) is used synonymously with disability (disabilities)) may choose different activities and develop the skills associated with those activities, albeit to different levels of performance. Coaches should also understand the definitions of different types of disabilities. For example, coaches should understand athletes with Cerebral Palsy (CP), amputations, and spinal cord injury (SCI). Coaches should also be aware that mental disabilities can be grouped into various conditions such as Down syndrome, slow learner, autism, dyslexia, and mental retardation. There are also other categories of disabilities, including athletes who are visually-impaired and hearing-impaired. Physical disabilities may also affect mobility, balance, agility, strength, endurance, cardiovascular or combination of these capabilities. The foregoing lists different types of disabilities that might influence sports participation and performance which coaches should consider as they train athletes with disabilities.

Important Factors to Consider in Training Athletes with Disabilities

Below are some important suggestions that coaches need to include in their training programs for athletes with disabilities.

- Keep a good balance among mind, technique, and body of athletes with disabilities in training programs.
- Accept each athlete's disabilities/physical conditions as unique and design appropriate training programs for them.
- Have adequate knowledge of the rules and laws of sport and how they might affect athletes with disabilities.

- Develop an awareness of the equipment that athletes with disabilities use including gloves, rams, and wheelchairs and make sure they are suitable for the particular sports.
- Compared to coaches of able-bodied athletes, coaches of athletes with physical disabilities require greater flexibility and lateral thinking in order to attain the best possible movement patterns for their athletes.
- Coaches of athletes with physical disabilities have to address the added dimension of analyzing the movements of an asymmetric body with a restricted range of movement (ROM).

While, the above are general advice for coaches for training athletes with disabilities, we now discuss athletes with specific disabilities and their specific needs that coaches must incorporate into their training. These athletes with specific disabilities are, visually-impaired athletes, athletes with amputations, athletes with neurological conditions, athletes with cognitive disabilities, and athletes who are deaf.

Visually-impaired Athletes

Most of the studies related to visually-impaired athletes suggest that athletes' who are visually-impaired, are prone to inactivity throughout their life span, and this is confirmed by studies focusing on children with visual impairments that indicate that they engage in less physical activity than persons with other disabilities (Lieberman & McHugh, 2001; Rimmer, Braddock & Fujiura, 1993). Moreover, they also demonstrate delayed motor development, such as poor balance and inefficient gait, which may be due to their sedentary behaviors during the developmental years (Bouchard & Tetrault, 2000; Higgs, 1990). Concomitantly, vision loss may affect most of the skill acquisitions, such as running, throwing, and jumping techniques in several ways (Bouchard & Tetrault, 2000; Higgs, 1990). It is also more difficult to learn physical skills through verbal instruction than demonstrations, and this limits the opportunities available to visually-impaired athletes to learn new skills (Bouchard & Tetrault, 2000).

Many athletes who are totally or partially blind are unable to use vision to determine the proper direction while running, throwing, or adjusting the direction of the throws. Throwing direction may also be affected in terms of the direction of the implements and balls. Moreover, throwing implements in track and field, throwing and placing balls in lawn bowls and tenpin bowling, playing goalball, and using effective stroke in swimming are all limited by visually-impaired athletes' inability to use vision. In athletics and swimming events, visually-impaired athletes need to know when they are approaching at the end of the race. The use of a full hand of verbal descriptions by a coach during demonstrations would be ideal. Using the hand-body manipulation and brailing technique during the warm-up and

skill sessions will make it easier for coaches to conduct the training sessions. Coaches should understand that the sports participation by the visually-impaired athletes requires the use of a guide or partner. Sports like lawn bowl require using a director to assist athletes to know and maintain the direction of the throws. Running in athletics of visually-impaired athletes requires the use of a guide runner, and also the tether (rope) to guide the athlete to the finish line.

For field events, especially jumping events, the coach have to train a visually-impaired athlete to use step counts to estimate the length of the runaway. It is suggested that a coach should instruct assistants to use the device called bonk/tapper, in order to tap at the back of visually-impaired athletes in swimming events, to make them aware that they are approaching at the end of the pool. In cycling event, a front rider (sit at the front) pedal together with the visually-impaired athlete (sit at the back) using the tandem bicycle. Using methods such as hand-body manipulation technique and brailing technique would also be beneficial in assisting a visually-impaired athlete learn new skills. For example, with regard to hand-body manipulation, a coach could manipulate the athletes' limbs in such a way as to allow the execution of a skill or movement, while brailing technique could help athletes use their kinesthetic-tactile sense to feel the movement or skill that their coach is executing.

Athletes with Amputations

Amputations refer to a condition in which part or all of one or more extremities are missing. An athlete with arm or leg amputations might experience problems with balance and speed while executing running, jumping, and throwing motion. Therefore, coaches must be creative when applying principles of biomechanics for these athletes. One example is when coaching an athlete or sprinter with a single above elbow (AE) amputation, his or her performance in balance and the sprinting ability decrease because without upper limb(s), the body cannot propel efficiently to generate force. Using hand prosthesis might be a good solution but wearing prosthesis requires good skin care including skin checks to avoid skin stress due to abnormal shearing force. The same thing applies to leg prosthesis. Using leg prosthesis can increase speed of the athlete as it is biomechanically efficient.

In jumping events, an athlete does not want to use leg prosthesis because they are uncomfortable with it, and are also afraid the prosthesis might give them problems during jumping. It is also not advantageous to use prosthesis in an event such as high jump, since the force from the amputated leg will be transferred to the jumping leg during the take-off phase. In running events, using the J-shape prosthesis might give an advantage to the runner, especially those with below knee (BK) amputations. Even though Oscar Pistorius (who has double below-knee amputations and run using a carbon-fiber blades) wished

to run at the Beijing Olympics 2008, was not allowed, due to his additional mechanical aids, but he is still known as “the fastest man on no legs”. He has also run the fastest 400 meters with a time of 46.90 seconds, and has created a phenomenon by proving that running techniques is not always the same as our previous understanding from theories and books. For example, in November 2007, German professor Gert-Peter Brueggemann began testing Oscar Pistorius advantages, and his study found that the artificial limb used 25% less energy than able-bodied runners to run at the same speed, and they led to less vertical motion combined with 30% less mechanical work for lifting the body. These findings were used by the International Association of Athletics Federations (IAAF) to ban Oscar Pistorius from participating in the Olympics, but later they reversed the verdict to allow him to compete in the Olympics, but to qualify on merit by achieving the qualifying time of 45.55 seconds in the 400 meter. He, however, failed to achieve the qualifying time.

In swimming, using artificial limb would not be advisable since it will make the swimmer experience difficulty in movement, by using more drag force and jeopardize the recording of fast time. So it is better for an amputee-athlete to swim without using it. It is also vital for an amputee-athlete to use prosthesis in badminton, cycling, lawn bowl, table-tennis and even archery. In throwing events, it is necessary for a shot putter or a discus thrower to use prosthesis leg in order to gain ground reaction force.

Athletes with Neurological Conditions

Athletes with disabilities such as Cerebral Palsy (CP), Acquired Brain Injury (ABI), Stroke and Spinal Cord Injury (SCI) have some difficulties coordinating and controlling their movements. This is because the more severe the condition, the more likely that these athletes will also experience limitations in functional range of motion (ROM). The coach’s aim is to help these athletes achieve greater motor control and greater flexibility.

CP describes a group of disorders that affect the development of movement and posture, causing activity limitation, and are attributed to non-progressive disturbances that occurred in the developing fetal or infant brain. The motor disorders of CP are often accompanied by disturbances of sensation, cognition, communication, perception, and/or behavior and/or by a seizure disorder (Bax, Goldstein & Rosenbaum, 2005). CP can be classified by motor involvement and its distributions or pattern. The most common patterns are spastic. Coaches should be aware of some components of movement such as balance, coordination, and muscle tone of spastic athletes are affected by their condition and appropriate training programs should be designed for them. It is recommended that if spastic athletes experience problems in balance while in standing position during

stretching, the coach should allow them to perform stretching in a seated position or get help from others to assist them.

Athletes with paraplegia, can utilize their upper limbs to do exercise, whether using isokinetic machine, resistance band, or engaged in active and passive stretching. This is to enhance their fitness level, blood circulation and also prevent blood pooling especially at the lower limb. Paraplegic athletes should also avoid sitting too long on wheelchair, since it will lead to the development of pressure sores that can be detrimental to their health.

For athletes with disabilities who are involved in the sport of Boccia, integration of strength training into their training program would be vital. Persons with lower-limb disability who have to rely on manually propelled wheelchair for locomotion, have a limited mobility and range of action compared to able-bodied individuals. It is, therefore, suggested that wheelchair mobility of disabled athletes can be optimized by improving the vehicle mechanics of the wheelchair, adjusting the wheelchair design to be appropriate for the user, as well as improving the individual's functional capacity (Thibout, Smith & Labanowich, 1996). In this respect, the assessment of cardio respiratory fitness of wheelchair users has emerged as an important area of interest in the field of sports performance evaluation. Using arm-crank ergometer or modified shuttle run test can be used to assess those athletes with paraplegia and tetraplegia with neurological conditions or spinal cord damage.

In order to produce aerobic effects, the amount of effort expended by athletes with some disabilities may have to be greater than that required for athletes without disabilities. Hooker and Wells (in Fox 2000), for example, found that producing training effects for persons with spinal cord injuries requires higher maximal heart rate levels of 70 percent than the general population.

For athletes with SCI condition, using resistance training such as bands and cords could help them develop a better feel for the desired movement. SCI athletes, who uses sport/racing wheelchair can propel them well, provided that they have their upper body strength and arms. Coaches have to make sure that the paraplegic athletes can throw using the rotation of their waist because some higher classes of SCI athletes depend only on their arms and wrist to throw. Some SCI athletes lose their thermoregulation system function due to their high level of spinal injury. The higher and more complete the spinal cord damage above T6, the greater the strain to the cardiovascular system and temperature regulation system when the body is exposed to the heat (Gehlsen, Davis & Bahamonde, 1990). Most people with paraplegic do not sweat below the level of the injury, because with the loss of the ability to sweat (Higgs, 1990). This condition is known as poikilothermic (Higgs, 1990). The best way to deal with this condition is for the coach to advise the athlete to wrap cold towel behind the neck, and would be considered as artificial sweat. These athletes should not be exposed too long under the hot sun, and should drink plenty of water and always cool themselves. If training under

the hot sun, the coach should reduce the intensity or bout of the training. Another possible option would be to train them in an indoor arena.

Those athletes, who have high level of injury, tend to loss their bowel and bladder control (Gehlsen, Davis & Bahamonde, 1990). So hygiene is very important, to make the athletes comfortable during their activity. A coach should make sure to provide extra catheter and urine bag for them. A coach should always focus on the athletes' strength, and not on their weaknesses. It is also recommended that during training under hot humid environment, a coach should decrease the intensity and duration of the training session, while advising athletes to consume more fluid to ameliorate the effect of the heat.

Athletes with Cognitive Disabilities

Athletes with disabilities such as mental retardation, severe learning disabilities, Down syndrome, autism, and dyslexia generally have physical ability to perform running, throwing and jumping motion using the correct technique. Resistance exercise programs for individuals and also athletes with mental retardation are especially important because they have positive impact relative to normal activities of daily living (Draheim, Williams & McCubbin, 2002; Frey, McCubbin, Hannigan-Downs, Kasser & Skaggs, 1999). However, coaches will need to give extra attention to principles of motor learning, when introducing a new skill because these athletes tend to forget whatever skills they have learned yesterday (Messent, Cooke & Long, 1999). A coach should use simple one-part or two-part direction, to introduce new skills gradually and review their progress frequently. Especially in running events, to describe using the right or left leg need some time to be understood by the athletes, and this make demonstrations extremely important in describing and explaining every skill. Since such athletes cannot read or write properly, or even differentiate between each limbs well, a coach needs to explain many times until they know what to do, how to execute every skills.

Athletes with Hearing-impairment

Athletes with hearing-impairment have the physical ability to perform running, jumping and throwing motions. However, frequent demonstrations are very useful for training them, and a coach should instruct them to repeat the desired motions to ensure understanding of correct techniques or skills that they are taught. Using peer/partner to demonstrate skills to them would be an ideal way to help them understand and learn new skills. Because of their hearing-impairment, some movement that involves balance may be affected and this should be considered by a coach when designing training programs for them. A coach should also remember to teach the athlete to use the flag or light or cues such as writing on a piece of paper, books, whiteboard, or even writing imagery on hands to show or

communicate the right way to perform particular skills. Learning sign language by a coach is not necessary but knowing some important cues would make it easier to handle them in training. Using methods such as video recording, interpreters, illustrations and pictures would be beneficial for a coach to train the hearing-impaired.

A coach should learn to recognize non-verbal cues such as posture, facial expressions, gestures, and movements and also observe the athlete's response to instructions, explanations, and/or demonstrations to help them learn new skills. During verbal communication, a coach should position himself or herself so that the athlete can see you. A lot of messages can come from a coach's facial expressions and body movements. The message should be clear, concise and presented in an interesting manner through demonstrations or sign language. Modeling can also be a good way to teach skills to enhance the performance of athletes with hearing-impairment, by instructing them to observe quality performances by others. It is better for a coach to allow athletes a few minutes to observe new drills from a model and try to ensure that you use competent models so that the athletes copy the desired movements or drills effectively. A coach should avoid or reduce some activities that focus on the movements such as agility and balance since they tend to lose some balance due to their disability. In achieving this, the main questions to be asked are as below. First, why is that athletes' on wheelchair race tend to have very low heart rate levels even with high intensity of training?

This is because wheelchair-bound athletes have Spinal Cord Injury (SCI) which is damage to the spinal cord that results in loss of functions such as mobility or feeling. Immediately after the spinal cord injury, the loss of movement, sensation, and reflexes below the level of the spinal cord injury can occur. Sexual dysfunction and loss of bowel and bladder control may also occur, depending on where the spinal cord injury occurred and if the spinal cord was completely severed or partially severed. The sympathetic nervous system generally excites the body by doing things such as increasing both the heart rate and blood pressure. The parasympathetic nervous system generally calms the body down by doing things such as decreasing both the heart rate and blood pressure. Both sympathetic and parasympathetic systems are affected by spinal cord injury. As a result, spinal cord injury patients represent a very specific population, whose physiological responses differ significantly from those of normal, able bodied persons (Pare, Noreau & Simard, 1993). Coutts (1988) investigated the heart rate responses of SCI patients during several different wheelchair sport activities to investigate which activities produced the highest heart rates over sustained periods. Coutts found that the average heart rate elicited during a wheelchair basketball game was 148 bpm. This was the highest average heart rate. Other sports elicited lower rates, including volleyball (115), tennis (128), and racquetball (134). Newly spinal cord injured patients usually

have a very low fitness level following hospitalization which put them at risk for adverse reactions to maximal training including the risk of vertebral fractures. Coutts also stressed the need for a standardized piece of equipment such as the wheelchair ergometer to accurately predict aerobic power and establish norms for wheelchair-bound athletes. Some of their significant findings was that the maximal heart rate for paraplegic patients was only approximately 5 bpm lower than the predicted maximum ($220 - \text{Age}$). A larger upper body muscle mass allows a higher efficiency of physiological adaptation to wheelchair exercise, while a smaller muscle mass may induce inappropriate adaptations to exercise such as poor muscle blood flow, higher muscle tension, and rapid contribution of anaerobic metabolism (Pare, 1993). From the foregoing, it is clear that it is difficult to monitor athletes with SCI to ensure they have reached their training zone or capacities, as even with strenuous training, their heart rate will not elevate above 120-140 beats per minute(bpm). It is imperative to design appropriate methods to accurately measure their training capacities.

Second, how about missing a finger or two, can such disabled persons compete in disability sports?

In medical term, amputation can be defined as surgical removal of all or part of a limb, an organ, or projecting part or process of the body. In Paralympics sports, there are various categories of disability, and in a specific category, like amputation, there are also classifications that are different to cater for each group in the amputation. In sports classifications, amputations can be defined as at least one limb missing. Missing limb here referred to the lost of the functional joint or joints. Example, if a person loses a finger, he or she still manages to lift objects, but if he or she lost all his or her fingers, then it would be difficult to lift objects.

In sports classification, there are four (4) categories of amputations:

- Below elbow (BE) amputations- an amputation that is categorized from elbow joint and down up to the palm.
- Above elbow (AE) amputations – an amputation that is categorized from elbow joint and up to the shoulder.
- Below knee (BK) amputations – an amputation that is categorized from knee joint to the foot.
- Above knee (AK) amputations – an amputation that is categorized from knee joint to the hip joint.

Thus, if a person lost his or her finger or two, then he or she cannot be considered to participate in Paralympics sports.

Third, who do you think will ran faster than the other; an athlete who has below knee (BK) amputation or above knee (AK) amputation? Why?

The higher the level of amputation the more difficult for a person to walk, jog or even run. Even using a prosthetic makes it difficult to maintain his or her body balance and may have difficulties moving from one place to another, and becomes

more difficult for fast movement such as running or sprinting. For example, athletes with above knee (AK) amputations have difficulties when it comes to getting a great push on the backside of the running cycle and to gain a quicker and more powerful knee drive in the swing phase on the front side of running phase since they cannot flex their knee joint, so they will perform in a 'chopping' movement. Athletes with below knee (BK) amputations will have more freedom to run, since they can flex their knee joint to gain ground reaction force to run or sprint much better and in a balanced way.

Finally, in a creative way, how do you teach a learning disabilities (LD) athlete the direction of movement or the location of the limb (for example, which is right or left)?

Athletes with LD or intellectual disabilities tend to forget whatever techniques or skills that have been explained or taught to them for the first time. They will have certain level of abilities. It is preferable not to make assumptions about what they can do or cannot do as each of the athletes has their own unique ability. Some even may have additional impairments such as hearing impairments. So there are some important methods to use to teach and make them understand what we are teaching them and exhibit them. As a coach, it is important to make sure that the levels of instructions and directions that can be understood by your intellectually-challenged athletes are provided. This can be done through the use simple, brief, concise language, while avoiding the use of jargons and complicated language. If you use complicated language, intellectually disabled athletes might not understand you at all. It is also recommended that colored ribbons are used to differentiate between athletes' left hand and right hand. For example, you may tie different colored ribbons to their hands and clarify that red ribbon represents their left hand, or the blue ribbon represents their right hand.

Performance Enhancement

Satisfaction with performance appears to be of vital concern to athletes with physical disabilities. To date most research are performed by biomechanists, particularly those interested in wheelchair propulsion. Higgs (in Gehlsen, Davis & Bahamonde, 1990) found that proficiency in wheelchair racquetball corresponded with 'greater distances covered per rally, greater wheelchair speed, and a higher degree of maneuverability'. He also stated that peak velocity of a hand-pushed wheelchair is influenced by a variety of interrelated factors, including stroke frequency, range of contact of the handrim, and the amount of percent of time in contact with the handrim. It also appears that the greater the stroke frequency, the greater the range of contact on the handrim, and the less time in contact with the handrim, the greater the peak velocity of the wheelchair. Another study by Gehlsen et al. (in Fox 2000) demonstrated that changes in trunk position produced greater peak velocity among wheelchair athletes.

Conclusion

Most of the suggestions in this article are not intended to offer complete explanation or detail techniques for coaching athletes with disabilities. There are also many things that coaches have to consider and acquire knowledge through research and education that would be ideal for them to help athletes with disabilities to improve their performance. Most of the research findings are also on able-bodied athletes and coaches may not be able to apply directly to athletes with disabilities. It is, therefore, important for coaches of disabled athletes to find aspects of the available research findings on able-athletes that they can transfer into sport programs for athletes with disabilities. Research related to sport and physical activity offers important, practical information for people with disabilities to enjoy and excel in sports. People with disabilities should be able to choose to participate in separate or parallel sports [20], and leaders or coaches of these activities must be kept informed from time to time about scientific developments in training of disabled athletes to help them improve their competitive performance.

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