



## TABLE OF CONTENTS

<b>GENERAL GUIDELINES</b>	<b>2</b>
<b>1. PROGRAM VARIABLE INFORMATION</b> .....	<b>2</b>
<i>1.1 Evaluation of Biological Parameters</i>	<i>2</i>
1.1.1 Cardiovascular endurance	3
1.1.2 Anaerobic capacity (muscle endurance and muscle power)	3
1.1.3 Muscle strength	4
1.1.4 Speed	4
1.1.5 Flexibility (Joint range of motion)	5
1.1.6 Body Composition-Somatometric Characteristics	5
<i>1.2 Evaluation of Technical Parameters</i>	<i>5</i>
1.2.1 Goallball	6
1.2.2 Sitting Volleyball	6
1.2.3 Football 5x5	6
1.2.4 Shooting	7
1.2.5 Boccia	7
1.2.6 Swimming	7
1.2.7 Bench Weight Lifting (Powerlifting)	7
1.2.8 Table Tennis	7
1.2.9 Track and Field	8
1.2.10 Wheelchair Basketball	8
<b>2. BENEFITS FROM THIS APPLICATION</b> .....	<b>9</b>
<i>2.1 BIBLIOGRAPHY</i>	<i>10</i>
<b>3. ACTIONS FOR IMPROVEMENT</b> .....	<b>12</b>



## **GENERAL GUIDELINES**

### **1. PROGRAM VARIABLE INFORMATION (Explanation of the variables of the program)**

The items are inserted into this program in order to create the personal profile of the user, for evaluation. The results of these personal profiles, are related to exercise or training general guidelines for the enhancement of the performance. These items are separated into two categories: the biological and the technical variables of the program. The biological and technical variables formulate the personal profile of evaluation for athletes or participants in exercise. Each profile consists of the variables applicable to athletes (biological and technical variables) and to participants in exercise (biological variables), respectively.

#### **1.1 Evaluation of Biological Parameters**

The special physiological characteristics and demands of each sport (e.g. biomechanical or metabolical demands) dictate the evaluation variables related to the performance of the athletes/participants in exercise. More over the different types of disability are possible to change the method or the evaluation procedure in every biological variable. Therefore, the evaluation of each variable is based on scientific data, supporting the validity and reliability of each test, and is characterized by sensitivity towards possible changes as a result of training effect or individual clinical characteristics of the participants (Johansen, 1999).

Often the use of wheelchair by people with physical disabilities is needed in order to participate in athletic activities. Parameters of fitness like, muscle strength and power, muscle endurance, cardiovascular endurance and flexibility, indicate the

performance of athletes/participants in exercise with physical disabilities (Booth, 1994). The groups of athletes/participants in exercise with visual impairments, mental retardation or kidney disorders seem that can be evaluated in the same biological variables of fitness as the able-body co-athletes (Winnick 1985; Chantias, Reid and Hoover 1998; Eichstaedt & Lavay, 1992).

Consequently, as biological variables, are defined all the measurements that indicate the biological/physical characteristics of the participants. These variables are: a) cardiovascular endurance (measurement of aerobic capacity), b) anaerobic capacity (measurement of muscle endurance and muscle power), c) strength, d) speed, e) range of motion (measurement of the range of motion in basic joints), f) body composition and body measurement (Body Mass Index).

### **1.1.1 Cardiovascular endurance**

*Cardiovascular* endurance -aerobic capacity is the maximum functional ability (VO<sub>2</sub> Max) of the cardiovascular system responsible for transfer of the oxygen as well as the ability of the muscles to use it (McArdle et al., 2000). According to international data this variable plays a very important role in the biological variables of athletes/participants in exercise in every physical activity or sport. This parameter is recommended for the evaluation of sports like: wheelchair basketball, track athletics, swimming, goalball, and football 5X5.

### **1.1.2 Anaerobic capacity (muscle endurance and muscle power)**

Muscular endurance is the ability of a muscle or a group of muscles to perform repeatedly a movement with sub maximal resistance. Muscle power is the ability of someone to produce maximum force with maximum speed (McArdle et al., 2000).

Differentiations regarding this capacity are obvious in athletes/participants in exercise with physical disabilities (e.g. cerebral palsy, spinal cord injuries, spina bifida, e.t.c.) (Glaser, 1985; Coutts and Stogryn, 1987; Unnithan et al., 1998; Coutts et al., 1993). According to the data collected in this study regarding the

participation of athletes with physical disabilities in anaerobic sports, the measurement of this variable is recommended into the following sports: wheelchair basketball, bench weight lifting, athletics (track and throwing), swimming (50m., 100m.), seating volleyball, boccia, goalball, football 5x5 and table tennis.

### **1.1.3 Muscle strength**

*Muscle strength* is the maximum force that one muscle or a group of muscles can apply against a certain resistance (McArdle, 2000). The evaluation of this variable contributes importantly not only to the enhancement of the athletic performance but also in the prevention of sport injuries in athletes /participants in exercise.

Baring in mind that, approximately 64% of the playing time in a wheelchair basketball game is spent in locomotion (Vanlandewijck et al., 1995; Veeger et al., 1992), it is clear that the evaluation of the upper body muscle strength is very important in sports where the use of wheelchair is needed (wheelchair basketball, track athletics, table tennis), but also in sports where wheelchair is not needed, whereas upper body strength is vital like, bench weight lifting, seating volleyball, e.t.c.

### **1.1.4 Speed**

*Speed* is the time needed for covering a certain distance (Walsh, 1997). The speed of locomotion with or without wheelchair is strongly related with the performance of athletes /participants in aerobic or anaerobic sports. The maximum speed of a wheelchair succeeded during tests seven to ten seconds long is highly correlated with maximum muscle power (Less, 1993; Tsukagoshi et al., 1994; 1995). Also the measurement of speed, with or without wheelchair, could predict the cardiovascular endurance during every day motor activities.

### **1.1.5 Flexibility (Joint range of motion)**

The normal range of joint movement, of the upper limbs and the trunk, plays important role in the improvement of performance as well as in the prevention of injuries (Booth, 1994; Kennedy, 1988). Specially, for the wheelchair athletes/participants in exercise, the joints of the shoulder is necessary to move in extreme ranges, in order to improve their mechanical performance. The restriction of the range motion particularly the shoulder's is usual in people with nephropathy because of the bloodletting fistula (Johansen, 1999).

### **1.1.6 Body Composition-Somatometric Characteristics**

The measurement of the body's characteristics is a part of a broader evaluation that is connected directly to the athletic performance of the athletes/participants in exercise. These measurements, are used mainly for the indirect evaluation of the type of body (somatotype) or the percentage of body fat, and give valuable information for the more objective and better evaluation of other biological parameters of athletic performance (e.g.resistance, power e.t.c.) (Hutzler, 1993; Coutts and Stogryn, 1987; Tordi et al., 1998; Tien-shang Huang et al., 2000).

## **1.2 Evaluation of Technical Parameters**

In Greece officially we perform, with National Championships, the following sports: goalball, seating volleyball, football5x5, shooting, boccia, swimming, bench weight lifting, table tennis, track and field, and wheelchair basketball.

It is important to mention that in "closed" individual sports that take part in stable circumstances and environment (e.g. swimming or weight lifting) athletes are evaluated with their record. On the contrary, sports that take part in "open" and constantly changing environment (e.g. football 5x5) consist one great variety of technical parameters, which are evaluated through battery tests.

As technical parameters, for every sport, are defined the movements that are required for the execution of a skill (e.g. standing shot in basketball) as well as the records in specific technical characteristics of each sport (e.g. shots in basket

during a basketball game). Finally, we have to mention that the technical parameters of each sport changes because of the type of disability of athletes/participants in exercise. For instance, the demands of wheelchair basketball are different for people with mental retardation and people with physical disability. Accordingly, different technical parameters and tests are needed for the complete evaluation of all sport and all types of disability.

### **1.2.1 Goallball**

Goalball is a sport in which take part athletes with visual impairment. Is played with 2 teams against each other with 3 players in every team. Each team is trying to throw the ball aiming the line, of the opposite team's goalpost, on the other side of the field. According to Davis (2002), basic technical skills necessary for this sport are throw, pass and stop/rebound of the ball.

### **1.2.2 Sitting Volleyball**

Sitting Volleyball is similar with ordinary Volleyball, as we know it. Basic technical skills for successful performance are common for both sports. The most important skills/technical parameters that are mentioned in bibliography for athletes without disabilities are (Davis, 2002): pass (front or back of the head), attack strike, block, serve. These same parameters were evaluated in adapted form, for the athletes with disabilities, because of the similarity that the two sports have. The only parameter that differs is the movement of the athletes in the field.

### **1.2.3 Football 5x5**

Football 5x5 for athletes with visual impairment has many similarities with ordinary football, as we know it. The difference of football 5x5 is that the field of play has shorter length of and smaller goalposts. In addition, basic adaptation of the game is the sound signal of the ball that must be heard by the players. The skills/technical parameters referred important in bibliography are: manipulation and dribble of the ball, shoot and pass (accurate in distance). These same

parameters were evaluated in adapted form for the athletes with short vision or blindness because of the similarity that the two sports have.

#### **1.2.4 Shooting**

Shooting for people with physical disability belongs to the “closed” individual sports that take place in certain circumstances and stable environment. It contains limited number of technical parameters and their record evaluates athletes.

#### **1.2.5 Boccia**

Boccia for people with physical disability belongs to the “closed” individual sports that take place in certain circumstances and stable environment. It contains limited number of technical parameters (like throw on target) and their record evaluates athletes.

#### **1.2.6 Swimming**

Swimming for people with physical disability and visual impairment belongs to the “closed” individual sports that take place in specific circumstances and stable environment. It contains limited number of technical parameters and their record evaluates athletes.

#### **1.2.7 Bench Weight Lifting (Powerlifting)**

Bench Weight Lifting for people with physical disability belongs to the “closed” individual sports that take place in specific circumstances and stable environment. It contains limited number of technical parameters and their record evaluates athletes.

#### **1.2.8 Table Tennis**

Table Tennis is a paralympic sport for athletes with physical disability. The rules are the same with the table tennis for people without disabilities. There is only one adaptation: each athlete who has not the ability of holding the racket can stabilize it in his hand. Bibliography refers as important the following technical

parameters for people without disabilities: serving accuracy, first pass/reception accuracy. These same parameters were evaluated in adapted form for the athletes with physical disability because of the similarity the two sports have.

### **1.2.9 Track and Field**

Track and Field (running, throwing jumping) for people with physical disability belong to the "closed" individual sports that take place in specific circumstances and stable environment. Track and Field contain limited number of technical parameters and their record evaluates athletes. Their record in each different sport evaluates athletes with nephropathy too.

### **1.2.10 Wheelchair Basketball**

Wheelchair Basketball for people with physical disability has many similarities with ordinary Basketball. It takes place in the same field with the same dimensions and the same height and size of the basket ring. The wheelchair that athletes use is considered by the rules as an extension of their body. The teams have 35sec to complete their attack. The skills/technical parameters that bibliography refers as important (Davis, 2002) are: passing of the ball (chest pass, bounced pass, reverse pass), free throw-shoot, moving the ball (static dribble, moving dribble), manipulation of the ball-dribble (stop dribble, turn dribble), bringing the ball back into the field.

Wheelchair basketball is internationally a very popular sport. There are suggested reliable tests for the evaluation of technical parameters of that sport. Vanlandewijck et al (1999), suggest the following battery test: 1) wheelchair manipulation with ball, 2) wheelchair manipulation without ball, 3) wheelchair speed up, 4) lay-up accuracy, 5) shoot, 6) pass for accuracy. This battery test was applied for the needs of this research project.

## 2. BENEFITS FROM THIS APPLICATION

This application aims to enhance the Greek and international market with an innovative tool of evaluation of individual records of athletes with disabilities. Via the program the direct categorisation and elaboration are feasible, of individual and common records of athletes with disabilities in Pan-Hellenic level. More specifically, it constitutes the base for:

- a) the evaluation of their performance. With the collection of items for the variables the individual profile of evaluation of each athlete can be conducted. Through this profile, it is possible to evaluate his output, in individual level (with measurements per regular time intervals), as well as on the total (if it compares his records with them of other athletes).
- b) the increase of effectiveness of exercising programs. The data base gives the possibility to locate the dexterities in which the each athlete falls short. Having as indicator these items, a program of exercising can give accent in these dexterities, in order to improve its effectiveness.
- c) the orientation of athletes with disabilities in a suitable sport. The combination of biological characteristics of athlete with the running records in a concrete sport, could predict his/her future performance. If the level, that he/she can achieve in the future, is optimistic, then he/she can remain in the particular sport. If the probabilities of improvement are small, then, according to the biological characteristics, he/she can be promoted in some other sport, where the probabilities of good performance are more optimistic.

The particular program: a) records with precision the scores of participating athletes with disabilities, b) compares the records of athletes with common characteristics in Greece (as for the gender, age, sport and type of disability), c) provides elements for the improvement of their records in individual and

common level, d) provides precious advisory driver in trainers, who work with athletes with disabilities, e) helps in the planning and in the concretisation of programs from the State, that will be addressed to athletes with disabilities.

Finally, this program will promote the knowledge that will be accumulated by the recording of performances, in institutions and private individuals that deal with sports of individuals with disabilities. Its promotion is addressed in public and private institutions, that deal with programs of exercising, as the General Secretariat of Sports (G.S.S.), Federations of Persons with special needs, private gyms, Universities, etc. The G.S.S. could record the size and the development of performances in exercise programs. The Federations of Persons with special needs can: a) watch the records of athletes with disabilities that make elite competitive sport and b) compare these records with corresponding records of athletes in Greece or abroad. The private gyms can use the data base in innovative programs for athletes with disabilities. The data base can be used also, from individuals who will be able to record their own scores and they want to compare them with other athletes with common characteristics (sex, age, sport and type of disability). Particular gravity, also, can have the final product for the athletic science in Academic level, giving stimuli of growth and application of research in the sector of athletes with disabilities and the growth of scientific programs of exercising for the improvement of their performance.

## **2.1 BIBLIOGRAPHY**

1. Chanas, A., Reid, G., & Hoover, M (1998). Exercise effects on health-related physical fitness of individuals with an intellectual disability: A meta-Analysis. *Adapted Physical Activity Quarterly*, 15, 119-140.
2. Coutts, K., & Stogryn, J. (1987). Aerobic and anaerobic power of Canadian wheelchair track athletes. *Med. Sci. Sports Exerc.*, 19, (1), 62-65.
3. Davis, R. (2002). Inclusion through sports. *Human Kinetics*. Champaign IL. USA.
4. Davis, G. M., & Shephard, R. J. (1990). Strength training for wheelchair users. *Br. J Sports Med*, 24, 25-30.
5. Eichstaedt C. & Lavay B. (1992) Physical activity for individuals with mental retardation. *Infancy through adulthood*. Human Kinetics: Champaign IL
6. Glaser RM. Exercise and locomotion for the spinal cord injured. In : Tergung RL, ed. *Exerc. Sports Sci. Reviews*. New York: Mac Millan, 263-303, 1985

7. Hutzler Y. Physical performance of elite wheelchair basketball players in armcranking ergometry and in selected wheeling tasks. *Paraplegia*, 31: 255-261, 1993
8. Johansen KL. Physical functioning and exercise capacity in patients on dialysis. *Adv Ren Replace Ther.* 6(2):141-8, 1999
9. Lees A. Performance characteristics of two wheelchair sprint tests. In: van de Woude LHV, Meijs PJM, de Boer YA, editors. *Ergonomics of manual wheelchair propulsion, state of the art.* Amsterdam: IOS press,: 85-91, 1993
10. McArdle, Katch F, Katch V. *Essentials of exercise physiology.* Philadelphia: Lippincott Williams & Wilkins, 2000
11. Tien-Shang Huang, Yen-Ho Wang, Ssu-Yuan Chen, Huang T-S, Wang Y-H, Chen S-Y. The relation of serum leptin to body mass index and to serum cortisol in men with spinal cord injury. *Arch Phys Med Rehabil* 81:1582-6, 2000
12. Tordi N, Gimenez M, Predine E, Rouillon JD. Effects of an interval training programme of the upper limbs on a wheelchair ergometer in able-bodied subjects. *Int J Sports Med.* 19(6):408-14, 1998
13. Tsukagoshi KM, Iida M, Kamikozuru T, et al. A method for determining maximal anaerobic power in wheelchair users. 3<sup>rd</sup> International Congress of the Asian Society for Adapted Physical Education and Exercise, Oct 22-23, Taipei, 1994
14. Tsukagoshi KM, Iida M, Kamikozuru T, et al. Maximal anaerobic power during maximal arm cranking in wheelchair athletes and non-athletes (abstract). 10<sup>th</sup> International Symposium on Adapted Physical Activity, May 22-26, Oslo, 1995
15. Unnithan VB, Clifford C, Bar-Or O. Evaluation by exercise testing of the child with cerebral palsy. *Sports Med.* 26(4):239-51, 1998
16. Vanlandewijck YC, Daly D, Theisen D. Field test evaluation of aerobic, anaerobic and wheelchair basketball skill performances, *Int J Sports Med*, 20: 548-554, 1999
17. Vanlandewijck YC, Spaepen AJ, Lysens RJ. Relationship between the level of physical impairment and sports performance in elite wheelchair basketball players. *APAQ*, 12: 139-150, 1995
18. Veeger HE, Lute EMC, Roelevent K, Van de Woude LHV. Differences in performance between trained and untrained subjects during a 30-s sprint test in a wheelchair ergometer. *Eur J Appl Physiol*, 64: 158-164, 1992
19. Walsh CM and Steadward RD. *Get fit. Muscular fitness exercises for the wheelchair user.* Edmonton: Research and training center for the physically disabled, University of Alberta, 1984
20. Winnick, J. P. (1995). *Adapted Physical Education and Sport* (2<sup>nd</sup> ed.). Champaign, IL: Human Kinetics.

### **3. ACTIONS FOR IMPROVEMENT**

In order to improve the personal profile of the athletes/people who participate in exercise, it is recommended for every sport and each test where he/she has scored below the average T-score of 50, to include in his/hers training program, exercises, that will enhance the specific performance.