CHAPTER 4
Down Syndrome and Exercise

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To Cite This Chapter:
Tuzcuogullari, O. T. (2023). Down syndrome and exercise. In M. Ozdal & F. Alincak (Eds.), *Current Studies in Sports Science 2023* (pp. 29-45). ISRES Publishing.

1. Disability

In general terms, disability can be defined as involuntary sanctions, obstacles or disadvantageous situations that an individual encounters in social life and in fulfilling his/her professional obligations as a result of having a disability (Karataş, 2000). In other words, it can be said as the inability to fulfill the social roles required by age, gender or status due to the disability of the individual. The problems faced by individuals with disabilities in adapting to social life also arise as a result of their mutual communication with those around them. Social disability occurs when the individual cannot have the same opportunities in socio-cultural, physical and other areas as the individuals in the community in which he/she lives. The same opportunities are the loss and obstacles for the disabled person to have equal rights and benefit from equal opportunities with other people in the society. For example, autism disease is defined as a disability in the individual, when the individual cannot find a job in the society due to this disability and cannot participate in socio and cultural activities, he/she is exposed to social disability (Ünsal, Babacan, Ateşoğlu, 2006).

The World Health Organization (WHO) has examined disability under three separate sub-headings;

1. Impairment: a deficiency or difference from the norm in health, psycholo-gical or functional aspects.

2. Disability: the inability or limitation to perform any activity under normal conditions at the level of normal individuals.

3. Disability: the limitation or impossibility, due to impairment or damage, of performing the required behaviors expected of a person in accordance with age, gender, social and cultu-ral factors.

2. Causes of disability

With the advent and development of technology, advances in health, a wide range of human definitions and human rights have been effective in revealing the importance of disabled people in the society in which they live. Today, in some countries or regions, the difference in social life between disabled and non-disabled people has been reduced to a very small level, while in some other regions and countries, this situation is still the same as before and disabled people are still excluded. When the World Health Organization (WHO) explains the disability rate according to the development level of countries, the disability rate in developed countries is 10%, while in developing countries this figure is accepted as 12%. Based on these data, it is assumed that the number of disabled individuals worldwide is around 500 million and that 6-7 million of this figure lives in Türkiye (Baykan, 2000; Last Access Date: 17.08.2018). The causes of disability are generally analyzed under 3 main headings. These are pre-birth, moment of birth and post-birth causes.

3. Pre-birth causes

The health status of a newborn baby is automatically closely related to the health status of the mother. The mother's previous illnesses, tinnitus, medications, nutrition, age and genetic characteristics have a direct impact on the health of the newborn baby.

The reasons that will negatively affect the health of the newborn baby are listed below:

- Hereditary diseases that have been in the family for a long time,
- Especially marriages between relatives with hereditary diseases,
- Blood and Rh incompatibility between mother and father,
- Chromosomal causes,
- Births where the mother becomes pregnant at an age below or above the age of birth,
- Use of medication during pregnancy without doctor's advice,
- Smoking, alcohol, drug use by the mother during pregnancy,
- Exposure to ionizing X-rays during pregnancy,
- Poor nutrition during pregnancy,
- Exposure to febrile, infectious diseases, trauma during pregnancy,

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- Accidents, extreme stress, poisoning during pregnancy,
- Failure to have health checks and tests during pregnancy,
- Lack of vitamins and minerals that should be taken before and during pregnancy,
- Having many and frequent pregnancies or births,
- It is defined as the presence of diseases such as high blood pressure, heart disease and diabetes in the mother (MEB, 2011).

3.1. Causes at the moment of birth

- Failure to deliver in a health institution and by health professionals,
- Labor is premature and difficult,
- The baby is born with a low birth weight,
- Trauma to the baby during birth,
- Oxygen deprivation of the baby during birth (MEB, 2011).

3.2. After birth causes

- Severe and febrile illness of the baby after birth,
- Failure to check the baby's health, failure to carry out necessary tests,
- Failure to vaccinate the baby regularly,
- Severe jaundice at birth,
- Inadequate and unbalanced nutrition of the baby,
- Home, work, traffic accidents,
- Poisoning,
- Lack of education in the family and environment,
- Neglect and abuse of individuals,
- Natural disasters (MEB, 2O11).

3.3. Types of disabilities

A person with disability is a person who is restricted in many areas of life as a result of social/administrative attitudes and preferences based on congenital or acquired diseases or accidental disabilities (visual/functional/mental/spiritual differences of the body).

Disability groups;

- Visually impaired,
- Hearing impaired,
- People with orthopedic and chronic diseases,
- Intellectual disabilities,
- People with speech and language difficulties,
- People with learning disabilities,
- Gifted and talented,
- They are grouped as those with emotional and behavioral disorders (MEB, 2011).

3.4. Down syndrome

Down syndrome is one of the most prevalent chromosomal diseases. On average, one in 660 babies is born with Down syndrome (Basil, Zitelli, McIntire, Andrew, Nowalk, 2007). There is no effect of ethnic group or race on the prevalence of Down syndrome, but the prevalence may vary by geographical region. In terms of gender, there is no difference in the prevalence of the disease between boys and girls (Ulukutlu, Aydın, 1991).

A number of defects are observed in the body system of the baby with Down syndrome in which genetic factors are dominant. In Down syndrome where genetic factors are dominant, the baby has defects in different systems. These defects are reported to be due to the absence of myiotic segregation that occurs in normal chromosomes in Down syndrome (Roizen, Patterson, 2003; Shapiro, Marks, 2004). In addition, the age of the mother and the number of children she has had before can also be said to be a significant feature (Roizen, Patterson, 2003). The majority of individuals with DS, approximately 95%, have three copies of chromosome 21 and these are the known classical type of trisomy, 4-5% have the translocation type and 1% have the mosaic type (Roizen, Patterson, 2003; Smith, Borsatto, 1998). Chromosome 21 is one of the smallest chromosomes and has been found to have the least amount of active genetic material of autosomes (Raji, Rao, 1998).

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4. Description and History

The history of Down syndrome goes back a long history. In ancient Greece, individuals with Down syndrome were abandoned to nature, in medieval Europe they were burned as 'sorcerers' and their problems were confused with those of the mentally ill and they were thrown into asylums. In the Turkish world of the Middle Ages, contrary to Western practices, it is known that individuals with Down syndrome were tried to be treated with music (Üstündağ, 1994).

In the nineteenth century in England, Dr. John Langdon Down named these individuals as 'Mongols' in his study titled 'Observations on the Ethnic Classification of Fools'. The resemblance of the individuals to the Mongolian race led to the use of this term. Because of this definition, the term 'mongolism' was used for the disease (Üstündağ, 1994; Neyzi, Ertuğrul, 1993; Doğru, İmamoğlu, Öcal, Sarıbaş, Tümer, 1984; Elams, et al. 2000). Since it was the first study conducted on behalf of individuals with Down syndrome, this disease was named after Dr. John Langdon Down and later referred to in the literature as Down syndrome. In 1932, Dr. Down's son Reginald stated that Down syndrome could be due to a chromosomal abnormality. In 1959, French Dr. Lejeune put this view on a scientific basis with his studies (Üstündağ, 1994; Neyzi, Ertuğrul, 1993).A normal individual without a disability has 46 chromosomes. Half of these 46 chromosomes come from the father and the other half from the mother. During cell division, these pairs split symmetrically and the newly formed chromosomes have the same characteristics and number. But people with Down syndrome have 47 chromosomes. Individuals with Down syndrome have two of the 21st chromosome, which causes an extra protein synthesis and affects the normal development of the baby (Üstündağ, 1994).

Individuals with Down syndrome belong to the group of mild intellectual disabilities that can be trained and taught. Occupational schools for individuals with intellectual disabilities are planned to complement the education of these educable and teachable individuals. In addition to the occupational education provided in these schools, general culture courses are also given in accordance with the level of the individuals. Individuals with teachable intellectual disabilities receive education in special education schools. Individuals aged 16 and above with intellectual disabilities attend occupational education centers opened to provide basic skills for a job or profession (Karatepe, 1986).

5. Etiology and Epidemiology

In studies on the etiology of Down Syndrome, statistical associations have been found with advanced maternal age, presence of Down syndrome or an external chromosomal disease in the mother's previous children, presence of balanced translocation in the mother, presence of chromosomal disorders in the parents, but no significant association

has been found with drugs, toxins, vitamin deficiencies, hormonal or viral causes (Davidson, 2008) and smoking (Chen, Gilbert, Daling, 1999).

In general, all women are at risk of giving birth to a baby with chromosomal defects. The likelihood of carrying this risk varies from person to person based on some factors. The age of the mother, the duration of pregnancy and chromosomal defects may include individual-specific risk factors. These risk factors are calculated by comparing a number of screening tests performed at different times during pregnancy (Kafkaslı, 2004). Since the 1970s, maternal age has been a common issue in screening and testing methods (Urban, Stewart, Ruppelt, Geerts, 2011).

Studies on the incidence of Down syndrome have revealed that the risk of DS is 1/880 in women aged 30-40 years and 4 times higher in women aged 35-40 years. The risk of 1:300 for a 35-year-old woman who is 16 weeks pregnant increases to 1:22 for a 45-year-old woman who is the same week pregnant (Connor, Ferguson, 1994).

Despite the fact that 70% of Down syndrome babies are born to mothers under 35 years of age, maternal age is still the most widely used screening test in the world. When 35 years of age is taken as a threshold, although there are differences between populations, 5-10% of the pregnant population will constitute the at-risk group and amniocentesis will be recommended for this group. The rate of maternal age to detect Down syndrome is 30% (Kafkaslı, 2004). Morris et al. reported that the risk of having a baby with Down syndrome is 16 times higher for a 40-year-old woman than for a 25-year-old woman (Morris, Alberman, 2009). In another study, Morris found that the average age of mothers who had babies with Down syndrome increased from 30.6 years in 1989-90 to 34.4 years in 2007-8 and showed that increasing maternal age caused a 48% increase in the incidence of Down syndrome in 1989-91 and 2005-2007 (Kafkaslı, 2004). No significant effect of paternal age was reported (Snijders, Sundberg, Holzgrev, Henry, Nicolaides, 1999). The risk increases with maternal age and decreases with gestational age (Kafkaslı, 2004; Altınkök, 1983), as 31% of affected fetuses will be lost between 10 weeks of pregnancy and delivery and 18% between 16 weeks of pregnancy and delivery.

5.1. Physical and Clinical Characteristics

The physical appearance and general health status of individuals in the intellectual disability group differ when compared to a normal individual. However, the appearance and some motor skills of individuals with mild mental retardation in this group do not differ much from those of normal individuals. Individuals with Down syndrome, who make up approximately 30% of this group, have a lot in common with each other. Down syndrome is characterized by distinctive features such as ears, head, eyes, finger and toe structure and weak muscles.

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Typical findings of the disease include hand transfer line creases, short and stunted fingers, different neck appearance, greater width between the toes, epicanthal fold that gives the eye its unique appearance, low muscle tone, large tongue structure due to muscle laxity, and short extremities (Karatepe, 1986).

5.2. Phenotypic Features

These features are normally noticeable in appearance but do not cause any functional impairment. One of the first physical findings that attracts attention is growth disorders in the skull and long bones. Growth defects in the skull bones contribute to the facial appearance characteristic of Down syndrome (Ulukutlu, Aydın, 1991; Altınkök, 1983). The head is circumferentially small and the frontal and occipital distances of the skull are shorter than normal. The face is flattened and round in appearance. Fontanelles close late. Bony orbitae are smaller than normal. The nose is small and the nasal root is flattened. Ears are small. The earlobe is either absent or small. The upper part of the helix is excessively curved. They have a small mouth. Since their jaw structure is small, the tongue hangs outward (Doğru, İmamoğlu, Öcal, Sarıbaş, Tümer, 1984). Their hair is straight, sparse and soft. Their necks are short and because of this, it gives the feeling as if the head is sitting on the body (Ulukutlu, Aydın, 1991).

Fingers are plump and short, with a single line on the palm. They have hypotonic muscles, approaching normal muscle tone as they grow. This hypotonia in the abdominal muscles gives a protruding appearance to their abdomen. This increases the possibility of abdominal hernia (Doğru, İmamoğlu, Öcal, Sarıbaş, Tümer, 1984). Not all of these physical differences may be present in individuals with Down Syndrome. Especially in newborn babies, it may not be possible to see such physical findings clearly, so it is appropriate to perform chromosome analysis at specified periods in order to reach a definite conclusion and make a healthy decision (Osborn, Dewitt, First, Zenel, 2007).

5.3. Eye findings

The eyes have a slanted appearance. There is an inner epicanthus. There are mini light colored prominent white spots around the iris layer. These are called Brushfield spots (Ulukutlu, Aydın, 1991). A condition called 'Mongoloid Eye Axis' is observed. Here, the eyelids are narrow and the axis of the eye is tilted from the outside to the inside and from top to bottom. Strabismus, also called strabismus, can be seen. Biefaritis, conjunctivitis and refractive disorders are common. Opacity in the lens is found in 59% of cases with half-lamp examination. Rarely nystagmus may be observed (Doğru, İmamoğlu, Öcal, Sarıbaş, Tümer, 1984).

5.4. Skeletal System Findings

Their height is shorter than the average grade point average. By the age of 15, there is a

halt in height growth. The average height is 155 cm for males and 145 cm for females. The little finger is pointed outwards and is shorter than the others. This condition is called 'clinodactyly'. There is excessive flexibility and mobility in the joints. Since the metacarpals and phalanges of the hand and foot are short, the hand is wide, blunt and square in appearance. The space between the big toe and second toe is wide. The frequency of funnel and pigeon chest deformities is high. There may be an opening in the vertebral arches in the lower parts of the spine. Cases with missing costal bones have been reported.

5.5. Congenital Heart Disease

Approximately 40 percent of individuals with Down syndrome have heart anomalies. Atrioventricular interval, ventricular septal defect, "patent ductus arteriosus" and "atrial septal defect" are common cardiac anomalies. Down syndrome individuals with congenital heart disease have shorter life spans (Doğru, İmamoğlu, Öcal, Sarıbaş, Tümer, 1984). It has been observed that fetuses with Down syndrome have a higher rate of congenital heart disease compared to those born alive. The risk of congenital heart disease is higher in female cases. It has also been observed that the height and weight of Down syndrome individuals with congenital heart disease are lower compared to individuals without heart disease (Doğru, İmamoğlu, Öcal, Sarıbaş, Tümer, 1984; Osborn, Dewitt, First, Zenel, 2007).

5.6. Hematological findings

The likelihood of congenital leukemia is also higher than in normal individuals. In most of these cases, lymphoblastic leukemia is more common. The incidence of leukemia in Down syndrome is 15 times higher than in healthy individuals. Serum gammaglobulin levels are high in most older children and adults with Down syndrome. IgG level was found to be low in newborns (Doğru, İmamoğlu, Öcal, Sarıbaş, Tümer, 1984).

In a study, hematologic data of 18 individuals with Down syndrome between the ages of 2-6 years and 18 healthy individuals were compared. The hematocrit rate was higher in individuals with Down syndrome compared to the control group. In 33% of individuals with Down syndrome, the rate of white blood cells was lower than in the control group (Roizen, Amarose, 1993).

6. Types of Down Syndrome

6.1. Trisomy 21

Trisomy 21, the most common type of Down syndrome, occurs in approximately 90-

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95% of cases and is caused by a defect in chromosome 21 that occurs during meiosis and is usually maternally related. The total number of chromosomes is four and there are three chromosomes 21. The advanced age of the mother is thought to be associated with this problem (Genetics, Lecture, Last Accessed: 17.08.2018).

6.2. Translocation type

Translocation is the exchange of parts between two different chromosomes. In this type, the number and characteristics of genes are the same. Maternal age, which is an important factor in trisomy 21, is not an important factor in this type (Apak, 2003). The average translocation rate in Down syndrome children of mothers less than thirty years of age is 9% (Hall, 2004).

6.3. Mosaic type

The mosaic type is the rarest type of Down syndrome. Compared to the other types, the prevalence rate is only 2.4%. In this type, chromosome 21 is not 3 in every cell. Some cells have 3 21st chromosomes. However, these cells spread throughout the body and neighbor normal cells. Children with mosaic type Down syndrome have better intelligence levels than other types.

As mentioned earlier, the correlation between the age of the father and the occurrence of Down syndrome is low. The reason for the increased risk of Down syndrome with increasing maternal age is not explained. Down syndrome, which is seen once in 2000 births at the age of 25 years and before, can reach a frequency of one in 12 births at the age of 45 years and after (Doğru, İmamoğlu, Öcal, Sarıbaş, Tümer, 1984).

7. Developmental characteristics of children with Down syndrome

A person's behavior is handled in 3 dimensions. These can be classified as cognitive, affective and psychomotor. If such a classification is made, it ensures that the issues in the developmental and learning dimensions of the human being are handled separately from each other. Even though these topics are handled separately, they are still closely related to each other (Bilginer, 2002; Martin, Klusek, Estigarribia, Roberts, 2009; Nilholm, 1996).

Individuals with Down syndrome have differences in affective, cognitive and psychomotor development depending on their genetic structure. However, some studies have revealed that there is not much difference in the type of disability that these individuals have, such as trisomy 21, ozaism and translocation type. Therefore, in any research to be conducted on these individuals, knowing the type of disability, gender and characteristics of these individuals will be very effective in terms of placing the research on a more solid ground

and obtaining generalizable results. Because, according to the literature review, it is said that each individual exhibits different developmental characteristics according to the characteristics mentioned above. It was reported by Rosecrans in 1971 that individuals in the mosaicism group have higher levels of intelligence (Rosecrans, 1971).

In addition to the types found in Down syndrome, the gender characteristics of individuals are also said to have an effect that can make a difference in the developmental process. When comparisons are made according to gender characteristics, it is generally stated that girls with Down syndrome have better motor skills and higher intelligence levels than boys. Boys are said to be more socially active than girls (Bilginer, 2002). Another factor, physical characteristics, causes individuals with Down syndrome to have different developmental characteristics. Due to the small mouth and large tongue structure of individuals with DS, there are deficiencies in speaking skills. However, it is possible to correct or even completely eliminate such a deficiency with some studies and exercises. On the other hand, these individuals have a muscular hypotonic structure. This feature causes children to lead a more sedentary and sedentary life (Bilginer, 2002).

As a result, while individuals with Down syndrome complete their development in a relatively similar way and in the same order compared to their non-disabled peers, they make much slower progress in the rate of development than their non-disabled peers. In the early stages of life, such developmental disorders are not very noticeable, but as the age progresses, there are noticeable differences between them and their non-disabled peers. Therefore, in the treatment of individuals with Down syndrome, it is necessary to make an evaluation in terms of three developmental areas and to carry out applications for developmental areas accordingly (Kobal, 2004; Lott I.T, McCoy, Wiley-Liss, 2004).

7.1. Cognitive Development

Cognitive development, which has an effective function between body and intelligence, is important for individuals with Down syndrome. Cognitive development, which starts from the moment of birth until death and enables us to communicate with our environment, learn, perceive and make evaluations, is an area of development that covers all mental combinations (MEB, 2009).

The fact that individuals with Down syndrome have different levels of mental disability causes differences in terms of cognitive development. The rate of mild disability in individuals with Down syndrome is approximately 80%, and in addition, there are individuals with agor and moderate intellectual disabilities (Roizen, 2007). In connection with the mental development in these individuals, some language development disorders also occur. This language development disorder can continue throughout life. In the

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language development stage, it may take approximately 1.5 years for these individuals to use their first words (Martin, Klusek, Estigarribia, Roberts, 2009). Considering that all developmental areas cannot be independent from each other, cognitive development disorder in individuals with Down syndrome negatively affects the affective and psychomotor development areas.

7.2. Emotional Development

A child's emotional and social development can be examined under the title of emotional development. The concept of emotion can be defined as an individual's reactions to his/her own inner world or to external situations and events that indicate his/her liking or dislike. These reactions can be shown as fear, excitement, joy, pain and anger. The attitudes, feelings and behaviors that an individual exhibits towards the members of the society in which he/she lives can be examined within the framework of social development. Social development is the process of shaping behavior in accordance with the rules and practices of the society in which the individual grows up, and this process continues in a cycle from birth to death (Binbaşıoğlu, 1990).

Infants with Down syndrome have the same reactions as their normal peers. For example, they may laugh or react loudly when their parents speak to them, show that they want to have fun, and make different noises to attract the attention of their environment. These symptoms are important elements in monitoring and analyzing the cognitive and psychomotor development of individuals with Down syndrome. In addition, individuals with Down syndrome show more sociable and friendly profiles in terms of peer relationships than their peers with and without intellectual disabilities (Moore, Oates, Hobson, Goodwin, 1998; Fidler, Hepburn, Rogers, 2006).

7.3. Psychomotor Development

Psychomotor development includes physical, nervous and muscular developments and changes. The indicator of development is behavior. In which direction and to what extent a child develops and how to plan for them can be understood from the behaviors exhibited by the child. Although a child may appear to have different developmental processes and speeds in terms of cognitive, intellectual, social and motor development, it is a well-known fact that they are all interconnected and that an effect in one can be reflected in the other (Özer, Özer, 2001).

7.4. Physical fitness and physical activity in children with Down syndrome

It is a known fact that every individual living in the society needs sports regardless of age

and gender factors. The importance of each individual in society cannot be discussed, the capacities of these individuals always differ from each other and individuals are evaluated according to these differences (Altun, 2010). It cannot be thought that the segment that makes up the society consists only of healthy individuals. Individuals with disabilities also live in the same society and these individuals can show themselves in various fields thanks to the physical activities offered to them. They can reduce or forget the situation that disability has given them. The self-confidence of the individual develops and the phenomenon of social communication and sharing is positively affected. Therefore, physical activity can also be seen as a social treatment tool for these individuals. Situations such as jealousy, anger and aggression, which are the effects of the psychological approach of the society on disabled individuals, will be dampened with physical activity (Gür, 2001).

In addition to psychological and physical contributions, physical activity also has inclusion, rehabilitation and integration effects for disabled individuals (Gür, 2001). Considering these positive effects on individuals with disabilities, there are many reasons for these individuals to participate in physical activity programs. As a result of the researches conducted on adults with Down syndrome, the financial situation caused by the physical activity program, lack of adequate transportation conditions, determining how, where and when the physical activity to be applied, insufficient awareness about the use of tools, hesitation from the society, the lack of experts in the field to do these physical activities, and some difficulties in accessing sports centers are among the reasons for not participating in activities (Heler, Hsieh, Rimmer, 2002).

Physical and motor fitness factors are necessary to acquire simple vital activities, to be involved in physical activities, to be able to run, walk, skip, jump, jump, catch, hold, throw, and to reveal motor skills sufficiently. When it is revealed that individuals with intellectual disabilities at the educable level need to develop their physical characteristics before the development of mental skills in order to spend more active and independent time in life, the development of physical and motor fitness elements and capacities is seen as a priority (Özer, 2001).

The mobility of the individual is important for his/her own health and the environment. In this context, movement plays an effective role in the individual's communication with the environment (Hasırcı, 2000). Researchers have explained in their studies that sportive activities create a rehabilitation effect on the individual. Performing sportive exercises contributes greatly to the formation of strong muscles, balance development, coordination development, posture, control development, flexibility development, especially the development of circulatory and respiratory systems and the prevention, reduction or complete elimination of various diseases arising from these systems (Özer,

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2001).

Physical activities are important not only for normal individuals but also for individuals with disabilities (Gordon, 2006; Johnson, 2009; Matson, Boisjoli, 2009; Davis, Hodson, Zhang, Boswell, Decker, 2010). Since the risk of obesity is high in individuals with Down syndrome, physical activity is more important in this group compared to their peers with other intellectual disabilities. However, there are some problems that may prevent individuals with Down syndrome from participating in physical activities. These problems include excessive flexibility and mobility of the joints, muscle hypotonia, obesity, short stature and an underdeveloped respiratory-circulatory system (Pastore, Marino, Calzolari, Digilio, Giannotti, Turchetta, 2000; Gonzalez-Agüero, Vicente-Rodriguez, Moreno, Guerra-Balic, Ara, Casajus, 2010). Individuals with Down syndrome, who are disadvantaged in terms of health problems compared to their peers without disabilities, are overprotected by their families due to the thought of being harmed. This situation causes these individuals to lead a passive life and remain immobile (Gonzalez-Agüero, Vicente-Rodriguez, Moreno, Guerra-Balic, Ara, Casajus, 2010). The impaired motor development of these children leads them to a sedentary life and causes secondary health and social problems. In addition to these problems, obesity, which is one of the most important problems seen in individuals with Down syndrome, occurs at a very high rate.

It has been reported that physical activities that are regularly designed and performed within a certain program improve the physical fitness and motor skills of individuals with Down syndrome. It has been reported that studies in this field have focused especially on the effect of exercise on body composition, but the number of studies examining the effect of exercise on lean body mass, body fat ratio and bone mass is limited and more studies should be conducted on this subject (Gonzalez-Agüero, Vicente-Rodriguez, Moreno, Guerra-Balic, Ara, Casajus, 2010). There is a large body of research indicating that individuals with Down syndrome have a weaker cardiovascular system compared to their peers with and without intellectual disabilities (Gonzalez-Agüero, Vicente-Rodriguez, Moreno, Guerra-Balic, Ara, Casajus, 2010). Problems in the cardiovascular system, which are highly associated with heart disease, cause these individuals to lead a leaner and shorter life. However, studies in this field have not been sufficient and have been recorded as studies on different fields. Therefore, there is a need for qualified studies that can prove that cardiovascular system problems constitute a risk factor for shortening life expectancy in these individuals (Gonzalez-Agüero, Vicente-Rodriguez, Moreno, Guerra-Balic, Ara, Casajus, 2010).

The muscle strength of an individual is important for that person to lead an independent life and to maintain his/her life at a certain pace. This muscle strength may not maintain its level with advancing age. As a result of the increase in the average life expectancy of individuals with Down syndrome, it has become increasingly important to conduct

studies to evaluate the development of muscle strength in individuals with Down syndrome and to plan muscle strength studies specific to the regions in need.

In conclusion, in addition to the limited studies in the field, there is a need for more studies examining the effects of exercise and physical activity on health-related physical fitness and motor fitness of individuals with Down syndrome.

As in children with and without intellectual disabilities, the level of physical fitness in individuals with Down syndrome is related to the level of motor skills. Improving the motor skills of individuals with Down syndrome through early intervention programs is very important for these individuals to participate more easily in physical activity and sports (Gonzalez-Agüero, Vicente-Rodriguez, Moreno, Guerra-Balic, Ara, Casajus, 2010).

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