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Effect 0f 6-Weeks Aerobic Exercise on Physical Fitness Indices Among Down Syndrome Individuals at Therapeutic Inclusive Secondary School, Abakpa-Nike, Enugu, Nigeria.

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Abstract: The study assessed the effect of aerobic activities on certain physical fitness indices among adolescent DS in Therapeutic Inclusive Secondary School, Abakpa Nike, Enugu East LGA. Two research questions and two hypotheses in line with the purpose of the study guided the study. The hypotheses were tested at .05 level of significance. Two groups pretest, posttest Quasi experimental research design was used. The population consisted 28 male and female adolescent DS individuals in therapeutic inclusive secondary school abakpa nike. A total of 28 male and female adolescent Down syndrome individuals in the school served as research participants hence census sampling techniques was applied.. The materials used in the measurement of body parameters include; weighing scale, stadiometer and stopwatch. The training protocol, resting and measurement of variables in the study followed established standard. The participants which consisted of the aerobic group and the control group were not previously involved in any aerobic activities programme. Training was conducted three times per weeks on alternate days with each training session lasting for 30 minutes. Warm-up exercise that lasted for 5-10 minutes preceded each training session. Data were collected from 25 participants that met the criteria set for the study. Data collection was carried out with weighing scale for body weight, stadiometer for height measure and stopwatch for static balance. The analysis of data was done with descriptive statistics of mean, and SD while analysis of covariance (ANCOVA) was deployed as inferential test statistic. Findings revealed that the adolescent DS individuals in therapeutic inclusive secondary school Abakpa-Nike had BMI values within normal range. In addition, the static balance of these individual was found to be low. It was concluded that the motor skill development of adolescent DS individuals in the school is under serious threat which makes them susceptible to hyperkinetic diseases. It was recommended among others interventions in the area of equipment and facility provision with qualified physical trainers deployed to train and supervises these individuals in the school. The school management should reach out to PTA, government and non-governmental organizations for assistance in order to improve upon exercise facilities in the school.

Key words: Aerobics, Physical fitness, BMI, Balance.

Introduction

Down syndrome is one of the several challenges affecting man congenitally and is generally recognized as the 4th of the five common serious birth defects of genetic or partially genetic origin worldwide. The condition occurs when there is an extra copy of a specific chromosome: that is chromosome 21 aside the 23 each that is usually inherited from both parents. According to Mik, Gholve, Scher, Widdman, & Green, (2008), Down syndrome (DS) is not recognized as an illness but a term describing the features resulting from this chromosome which can affect a person's physical features, intellect and overall development. This may imply that it could also increase the likelihood of some health problems.

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There are global incidence variations of DS worldwide. The reported global incidence of DS shows a prevalence estimate of 1 in 700-1000 live births and these individuals are living longer into adulthood than ever before. In United States, DS is one of the most common birth defects with approximately 6000 births annually resulting in an estimated birth prevalence of 14 per 1000 live births **(**Kafeel, Asif, Riaz,, & Hamid, (2017). Down syndrome is the commonest identifiable cause of intellectual disability accounting for almost one third of cases. It occurs equally in all races with an overall incidence of approximately 1 in 800 births. This is much lower than the actual conception rate due to a high incidence of spontaneous and surgical abortion (Lewis, 2020).

The increase in incidence with advancing maternal age is well-known but what is not commonly realized is that most children with DS are born to mothers who are less than 30. This is due to greater number of pregnancies in this age group (Lewis, 2020). Majority of women commence procreation at the age of 30 in South East geopolitical zone of which Enugu State is part hence a study of this nature is crucial in such a locality. It has been observed that before the age of 30, DS occurs in fewer than in 1000 pregnancies and that after the age of 40, this figure rises to about 12 in 1000 (National Down Syndrome Society, 2011). This could be a pointer to the submissions of Albin (2016), that finding s on the specific statistical data on incidence of DS may be challenging because many pregnancies may not complete until full term and spontaneous miscarriages take place in some cases which justifies the need for this investigation. Furthermore, Nigeria has no record of official data regarding the incidence ratio of DS which makes it imperative that a study of this kind be conducted as majority of couples in the country begin procreation after age 30, considered to be the most vulnerable group. DS is of public health concern even with known causes.

Down syndrome causes could be said to be genetic in origin. There is this other argument that the probable cause for the increase in DS is related to the trend toward later childbearing, with women over 35 years being five times more likely to have children with DS than younger women (Marwa, & Ghada, 2015). DS irrespective of the cause manifests with several characteristic in the individuals suffering it.

Individuals with DS present associated medical conditions that are either present at birth or develop over time which include: Intellectual disability (Low 1Q), heart problems frequently present at birth, thyroid abnormalities, hearing and vision problems, gastrointestinal problems, like constipation, gastro esophageal reflux (when fluid from the stomach re-enters the esophagus) and celial disease (intolerance for wheat protein). There are also the presence of autism with social skills challenges, communication and repetitive behavior, Alzheimer's disease, which cause memory and thinking problems in older age (Skrypnik, Bogdanski, Madry, KaroLkiewicz, & Ratajezak., 2015). Muscular and orthopedic anomalies are well known in DS. These include: flat foot, patella instability which is the main cause of working problems and sever static troubles such as scoliosis and kyphosis postural problems (Shrutika, Meruna, Sakina, Ramandeep, Madhura, & Pooja, 2009). Furthermore, increased risk of dislocation exists after cervical traumas or abrupt head movements with neurological complications occurring by cervical cord compression. Dislocation can also produce a condition of quadriplegia with incontinence which can be preceded by head tilt, abnormal staggering gait and emergence of neurological signs (Kremers, 2013). Sexual maturation is similar to that of the general population for both sexes. However, menstrual pause occurs -early in females. Fertility ratio is reduced in females; only a small number of pregnancy has been observed. Males are almost invariably sterile (as only few cases of fatherhood have been reported (Skrypnik et al, 2015).

Down syndrome individuals present anatomical abnormalities, mental and or facial problems that present a

large impact in quality of life. In addition, DS patients are more susceptible to infections including an increased prevalence of periodontal diseases, almost 100% under the age of 30 years, present mild to moderately reduced T and B cell counts, suboptimal antibody responses to immunization, decreased immune globulin A in saliva (Shin, Siffel, & Correa, 2009). They are easily identified by certain physical features which include; similar facial resemblance eyes that slant upwards, have oblique fissures, skin folds on the inner corner and white spots on the iris. Other features include low muscles tone, small stature, short neck, a flat nasal bridge, protruding tongue, a large space between the large and second toe and a single flexion furrow of the 5th finger (Anderson, 2011).

DS individuals are often described as stubborn and obstinate. For example, children with DS show high rates of attention problems, social withdrawal, noncompliance and compulsions such as arranging objects and repeating certain actions as well as high rates of self-talk (Frey & Joncs, 2006; Dyer & Kasari, 2007). With increasing age, they may be having associated anxiety, depression and withdrawal will also increase. The teeth of children with DS tend to be small, irregularly spaced and misshaped which most often than not may affect them psychologically. The DS individuals at therapeutic inclusive secondary school in Abakpa-Nike could also be living with the identified conditions which may require interventions. This fear is yet to be established empirically ascertained hence the need for this study which is set to determine the effect of aerobic exercise activities on certain physical fitness indices among individuals with Down syndrome in Therapeutic Inclusive secondary school, Abakpa-Nike, Enugu East Local Government Area of Enugu State.

People with DS frequently present alterations in the development, structure and functions of several organs or systems that can lead to complications sometimes severe for their health and determines their quality of life. Many of these complications can be prevented if they are kept in mind and managed at early stage, with the correct application of specific programme like aerobic activities especially dance aerobics.

Aerobic training is a process whereby the heart and lungs are trained to pump blood more efficiently thereby allowing more oxygen to be delivered to muscles. Oxygen is a determining factor in performance of activities that last beyond 2 minutes. This is enhanced through aerobic exercises such as running, swimming and aerobics (Lewis & Fragala-Pinkham, 2005). Aerobic training could be an enhancing option because people with DS report upper and lower air way abnormalities due to a small upper airway, decreased numbers of alveoli and reduced surface area for gaseous exchange. This is due to the fact that aerobics trains the entire body muscles of the participants. Aerobic training programmes which conform with the American Council of Exercise (ACE) guidelines have been found to be were very effective for improving maximum oxygen consumption ($MaxVO_{2)}$ peak ventilation time to exhaustion and/or maximum work rate (Dodd and Shields, 2005). Marwa and Ghada (2015)**,** however, observes no change in $MaxVO_2$ peak but did improve treadmill test time by 90%. Aerobics targets the heart and the lungs and could also benefit DS individuals. Aerobic training studies and specifically dance aerobics are limited in persons with DS let alone adolescents with DS and as such, a study of this nature is crucial.

Dance aerobics progresses from low to high impact and carries the heart and the lungs in a gradual form. Besides, dance aerobics conforms with American Council of Exercise (ACE) (2008), guideline regarding cardiovascular training programmes. Leveraging from the guidelines, Beker, & Dusing, (2010), suggested that cardiovascular programmes for individuals with DS should comprise sessions of 20-60 minutes of aerobic activity performed on 3 to 7 times per week. The intensity should also be 55% to 99% of peak heart rate or 40 to 85% of

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maximum oxygen reserve, the dance aerobics to be utilized in the treatment of the participants in this study lasted for 30 minutes on 3 days of the week at 55% of peak heart rate. This ensured gradual challenges of the heart and lungs.

The dance aerobics utilized in the treatment of the participants was accompanied with music to sustain their interest due to short attention span of DS individuals. The specificity principles stipulates that for any exercise programme to achieve designed goals/result, it must take into account the intensity at which it is conducted, the length of period for the exercise and the mode. Even with strict application of the principles of specificity, there are also other physiological and psychosocial variables that strongly play out during trainings which must be identified and addressed before any meaningful change could take place in the course of training, dance aerobics inclusive. The variables of muscle fibre composition and the self-efficacy, self esteem and motivational level of the individual concerned are very crucial in exercise trainings ( ). Perhaps with adequate motivation through musical accompaniment, DS individuals may develop interest to regularly engage themselves in it. This could be adopted by the handlers in the school to improve their physical fitness status and possibly minimize the health challenges associated with the condition. Even if dance aerobics is already in place, the mode of administration in terms of frequency, duration, intensity and mode may also need considerations at the Therapeutic inclusive secondary school.

Adolescent physical activity and motor development are parameters that can be influenced and that are positively associated with physical fitness (Kristensen, Moeller & korsholem, 2010). Having Down syndrome of more sever levels of specific challenges are associated with low fitness. Previous researches have shown that improving the physical fitness, activity and motor skills in adolescents with DS is possible (Frey, Temple & Stanish, 2017). This may also imply that achieving efficiency in certain physical fitness components could result in improved body mass index (BMI). The study intends to investigate the BMI status of the participants.

Body mass index (BMI) is a recognized measure of body composition which also defines the fitness level of an individual. BMI is a calculation of the ratio of body weight in kilograms to body height in meters which indicates whether an individual has a healthy amount of the body fat or not (Emiola, 2008; Okuneye, 2013). BMI could be used to search for both overweight and obesity in adolescents. With higher obesity levels generally observed in persons with DS, the interaction between autonomic control and obesity maybe an important avenue to investigate in this population since some of the identified conditions may be a direct result of abnormal BMI values. An excellent BMI by DS individuals in the centre could also facilitate balance especially static balance. Assessment of static balance forms part of investigation set to achieve in this study.

Balance is a key fitness component of task accomplishment in individuals including DS patients. Enhancing the balance ability of an individual with DS is important because better balance will decrease their fear of falling or getting hurt and thereby increasing their desire to participate in physical activity **(**Palomba, Perez & Tafuri, 2020)**..** A recent study by Reis, Neiva, Filho, Golac, Veradi, Siqueina and Tonello, (2017)**,** observes that there is a relationship between motor coordination, balance and body mass index for adolescents with DS. It has been reported that increased balance and stability for children with DS allow them interact with a computer simulated environment and receive real time feedback on performance thus allowing them to rely more on internal feedback and self evaluation of a self environment (Wuang, Wuang & Huang*l*, 2008). A similar trend could also be possible among the adolescent group particularly adolescents in Therapeutic Inclusive secondary school, Abakpa-Nike, Enugu East LGA. Perhaps, adding aerobic

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training activities may enhance the static balance of these individuals it is yet to be empirically ascertained hence the need and justification for the study which is to determine if the static balance as well as other physical fitness could be improved among the adolescent DS individuals by exposing them to a 6-weeks duration of aerobic activities. The participants of this study are young individuals that are rehabilitated at Therapeutic Inclusive secondary school, Abakpa-Nike, Enugu East LGA who are suffering from DS According to WHO (2015), adolescent is an individual who is within the age bracket of 11- 19 years old. The report pointed out that the period of adolescent is a critical stage in the lives of the youth and full of experimentations. Adolescent male and female DS individuals were the focused in this study because, during this period, young people are beginning to mature and always wanting to engage in one form of physical activity or the other. DS adolescents who may decide to engage in one form of physical activity or the other without adequate physical fitness may result in complicating their already abnormal condition. This cut across gender and justifies its inclusion as a variable in this study.

Gender differentials exist in virtually all aspects of human endeavours. Gender in this study is a male or female adolescent DS that must have spent at least one academic term at Therapeutic inclusive secondary school Abakpa-Nike, Enugu East LGA of Enugu State. According to Adigun, Onihunwa, Irunokhai, Sada and Adesina (2015), gender is a psychological term, which describes human behavioural characteristics pertaining to and differentiating between the feminine and masculine (female and male) population. Adejimi, Omokhodion and OlaOlorun (2020)**,** report that there are gender differences in the sexual behaviour of adolescents. The authors further stated that girls are more likely than boys to report pressures from peers and elderly ones, in order to abstain from sex. There could be a similar trend playing out among the adolescent male and female DS individuals at the Therapeutic Inclusive secondary school Abakp-Nike, Enugu East LGA with respect to physical fitness indices of BMI and static balance. That is why the study intends to ascertain if aerobic activities could be used to enhance their current status of those physical fitness indices in order to motivate them to meaningfully engage themselves in physical fitness activities requiring gross motor movements.

Down syndrome individuals from the expert submissions have shown strong deficits in many physical fitness indices as BMI, heart rate, static balance and others. However, the adolescent DS individuals in Therapeutic Inclusive secondary school, Abakpa-Nike, may be showing low fitness status for these indices which may further complicate the already existing conditions in them. An insight into the effect of aerobic activities on their fitness status may go a long way in providing interventions within the limit of resources of the school in order to improve upon their motor performance for a more purposeful life and resourcefulness to the community while growing into adulthood hence the need for the present study.

Statement of the Problem

Poor physical fitness status are special features of individuals with intellectual disabilities (ID) DS individuals inclusive. Low physical fitness is a risk factor to cardiovascular diseases, diabetes mellitus, poor mental health and the likes. The researchers following a visit to Therapeutic Inclusive secondary school, Abakpa-Nike, Enugu East LGA during the 2019 Fathers' Day celebration as part of spiritual tithing and benevolence to the less privileged in Enugu metropolis and its environs, observed abnormal body weight status among the inmates of the school. Overweight is a recognized risk factor to cardiovascular diseases such as hypertension and heart attack, diabetes mellitus (Okuneye, 2013) Although the school curriculum contents has a good coverage of physical regimen, its implementation is largely centered on general body conditioning going by the school Director's

briefing on that day. Spring bounce station, bicycle ergometer as well as nursery drills equipment are the only visible physical fitness promotion equipment provided in the school. Besides, there is no physical therapist like exercise instructors under the employment of the school to conduct physical fitness regimen.

From the interactions with the management officials during the presentations of gift items to the school, current care and support focus mainly on activities of daily living skills, like getting dressed and unguided eating with little focus on improving their physical fitness status. Perhaps, the most worrisome is that parents and guardians send these individuals to conventional schools which lack the necessary facilities and manpower to man them. This results in delay in the commencement of motor skills learning. Previous studies on aerobic training among individuals with DS focused on use of exercise machines such as treadmill, bicycle ergometer and aquatic exercises which involves huge financial and manpower input as against dance aerobics which require just the instructor, an open arena, a music box for additional motivation to the participants. This raise some questions as what is the BMI and static balance status of DS individuals at therapeutic Inclusive Secondary Schools Abakpa-Nike, Enugu. East LGA.

Purpose of the Study: The specific purposes included to:

1. determine the effect of aerobic activities on body mass index status of individuals with Down syndrome at Therapeutic Inclusive secondary school, Abakpa-Nike, Enugu East LGA based on sex.
2. determine the effect of aerobic activities on static balance of individuals with Down syndrome at Therapeutic Inclusive secondary school, Abakpa-Nike, Enugu East LGA.

Research Questions

The following research questions guided the study

1. What is the status of body mass index (BMI) of Down syndrome adolescent based on sex?
2. What is the effect of aerobic activities on static balance of adolescent with Down syndrome in Therapeutic Inclusive secondary school, Abakpa-Nike, Enugu East LGA?.

Research Hypotheses

1. There is no significant effect of aerobic activities on BMI status of adolescents with Down syndrome based on sex.
2. There is no significant effect of aerobic activities on static balance of adolescents with Down syndrome based on sex.

Method:

Research Design: The study adopted quasi experimental research design consisting of two group pretest posttest factorial design.

Area of the Study: The study was conducted in Therapeutic Inclusive Secondary School, Abakpa-Nike Enugu East Local Government Area. The choice of the school is based on the fact that it is the only registered rehabilitation centre in Enugu State that/which admits and train individuals disabilities (ID) including Down Syndrome individuals.

Population for the Study: The population for this study consisted 28 (11 Males and 17 Females) male and female DS individuals in the Therapeutic Inclusive secondary school, Abakpa-Nike, Enugu East LGA, Enugu State

A total of 28 (11 Males and 17 Females) male and female DS individuals in the Therapeutic Inclusive secondary school, Abakpa-Nike, Enugu East LGA, Enugu State were the participants. The entire population was studied because the population size is small and therefore, is manageable hence there was no sampling.

The following instruments were used in the measurement of parameters for the study; Weighing Scale, Stadiometer (Height Measure) and Stopwatch for measuring time spent performing static balance.

To measure standing height, the participant was asked to remove shoes, heavy outer garments, and hair ornaments.

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The participant was made to stand on the base of the stadiometer with bare feet shoulder width apart to maintain stability. The back of the head, back, shoulder blades, buttocks, calves and heels touching the vertical board. The top of the external auditory meatus (ear canal) on same level with the inferior margin of the bony orbit (cheek bone). The participant was asked to look straight. The head piece of the stadiometer was lowered to the vertex.. Height measure was then be read off at the nearest 0.5 cm.

To measure body weight, the participant was made to dress lightly (short and shirt/ singlet) and all accessories; shoes, scarf, bangles removed. The scale was placed on a hard flat surface and then turned on by pressing firmly on the center of the scale. When the zero end appears, the participant was asked to get on it and stand straight at the center of the scale without support, arms held loosely by the sides, head upright, facing forward so that the weight is distributed evenly on both feet. When the reading appears after few seconds, the number makes changes, and then stops. Reading was taken to the nearest 0.1kg (WHO, 2016).

Static balance was measured through the following procedures;

Step 1: Participant was instructed to adopt a position with the supporting leg in a semi -flexed at 90º, arms crossed and hands resting on the shoulders with eyes closed.

Step II: When the tester is satisfied that he or she has maintained a relative balance, the stopwatch start button was pressed to time the participant. The stopwatch is stopped when it is noticed that the participant is unstable or showing signs of instability.

Step III. The time spent was recorded. The test was repeated with the opposite leg. The decision Rule was that; If held for below 10seconds, is weak static balance, 11-19 seconds is average static balance. If held for 20 seconds and above shows good static balance (Matheus, Aline & Rodrigo, 2017).

The training venue was at the Therapeutic Inclusive secondary school, Abakpa-Nike, Enugu East LGA of Enugu State. The assembly ground of the centre was used for the training. The training period started at 10.00am during the long break. The aerobic dance administration was administered by the aerobic instructor who is also a physical trainer for 6 weeks. Each session lasted for 30 minutes on three for alternate days of the week (every other day). This ensured adequate recovery of muscle fatigue before the next training session.

Each training session commenced with light warm – up exercises that lasted for 5-10 minutes. Activities to be performed will include; walking, slow jogging, limbering and deep muscle stretches. There was music accompanying the activities to be performed. The resource person (Aerobic Instructor) played a non-stop music that was properly synchronized and keeps with trendy music for adolescents.

At the completion 6 weeks of training, only the participants that met the criteria set for the study were utilized for data analysis. Research question 1 that bothers on BMI status of the participants was answered with mean (x) while research questions 2 was answered with mean and standard deviation. The inferential statistics was Analysis of Covariance (ANCOVA) test statistic at .0.05 level of significance. The decision rule for the BMI was based on the BMI range provided by Okuneye (2014), recommendations for estimating underweight, normal weight, overweight and obesity in adolescents and adults. According to the scale, a BMI value below 18.5 is underweight; 18 – 24.9 is adjudged normal weight; 25 – 29.9 is regarded as overweight while a BMI of 30 and above is obese.

Result

Research question One: What is the status of body mass index (BMI) of Down syndrome adolescent based on sex?

Table1: Extract of Mean Distributions of the Male and Female Participants on BMI Status.

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n=25

Variable	mean(X)	SD	Dec
BMI	22.3497	5 .31013	Normal

Key: BMI-Body Mass Index.

Data as presented in Table 1 shows that the BMI mean scores of the participants is 22.3497 with SD of 5.31013. This signifies normal BMI values. This means that the posttest body weight status of male and female adolescent DS individuals in Therapeutic Inclusive secondary school Abakpa-Nike on the basis of BMI scale falls within normal range

Research Question One: What is the status of body mass index (BMI) of Down syndrome adolescent based on sex?

Table 1.1: Extract of Mean Distributions of the Male Participants on BMI Status.

n=11

Variable	mean(X)	SD	Range	Dec
BMI	22.7675	5.17494	16.66	Normal

Key: BMI-Body Mass Index.

Data as presented in Table 1.1 shows that the BMI mean scores of the participants is 22.7675 with SD of 5.17494 while the range is 16.66. This signifies normal BMI values. This means that the posttest body weight status of male adolescent DS individuals in Therapeutic Inclusive secondary school Abakpa-Nike on the basis of BMI scale falls within normal range**.**

Research Question One: What is the status of body mass index (BMI) of Down syndrome adolescent based on sex?

Table 1.2: Extract of Mean Distributions of the Female Participants on BMI Status.

n=14

Variable	mean(X)	SD	Range	Dec
BMI	21.9979	5.53710	18.53	Normal

Key: BMI-Body Mass Index.

Data as presented in Table 1.2 shows that the BMI mean scores of the participants is 21.9979 with SD of 53710 while the range is 18.53. This signifies normal BMI values. This means that the posttest body weight status of male adolescent DS individuals in Therapeutic Inclusive secondary school Abakpa-Nike on the basis of BMI scale falls within normal range

Research Question Two: There is no significant effect of aerobic activities on static balance of adolescents with Down syndrome based on sex.

Table 2: Extract of Mean Distributions of the Participants on the Effects of Aerobic Activities on Static Balance Status.

n=25

Variable	mean(X)	SD	Dec
STAT BAL	9.6571	2.68923	Weak

Key: STAT BAL-Static Balance.

Data as presented in Table 5 shows that the mean static Balance values of the participants is 9.6571 seconds with

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SD of 2.68923 which is below 10 seconds on the basis of established norm . This signifies weak static balance. This means that the posttest static balance values of male and female adolescent DS individuals in Therapeutic Inclusive secondary school Abakpa-Nike following 6-weeks aerobic activities participation is weak.

Hypothesis 1: There is no significant effect of aerobic activities on BMI status of adolescents with Down syndrome based on sex.

Table 3: Extract of Analysis of Covariance (ANCOVA) Test of Difference on Effect of Aerobic Activities on Participants' BMI Status.

Dependent variable	Type 11 sum of square	df	mean square	F	Sig
BMI	363.894	1	363.894	67.869	.000

From the data presented in Table 6 regarding effect of aerobic activities on BMI has a significance value of .000. This means that the calculated value of the significance is less than the probability value set for the study. Hence the null hypothesis was not rejected. Therefore, there is a significant difference between male and female adolescent DS individuals with respect to BMI status following 6-weeks aerobic activities training in Therapeutic Inclusive secondary school Abakpa-Nike, Enugu East LGA.

Hypothesis 2: There is no significant effect of aerobic activities on static balance of adolescents with Down syndrome based on sex.

Table 4

Extract of Analysis of Covariance (ANCOVA) Test of Difference on Effect of Aerobic Activities on Participants' Status.

Dependent variable	Type 11 sum of square	df	mean square	F	Sig
STAT BAL	.402	1	.402	.065	.801

From the data presented in Table 10 regarding effect of aerobic activities on static balance has a significance value of .801. This means that the calculated value of the significance is greater than the probability value set for the study. Hence the null hypothesis was not rejected. Therefore, there is no significant difference between male and female adolescent DS individuals with respect to static balance status following 6-weeks aerobic activities training in Therapeutic Inclusive secondary school Abakpa-Nike, Enugu East LGA.

Discussion: The findings showed that male and female adolescent DS individuals had reduced body weight status following 6-weeks aerobic activities participation in Therapeutic Inclusive Secondary School, Abakpa-Nike, Enugu East L.G.A. The hypothesis states that there is no significant effect of aerobic activities on BMI status of adolescents with Down syndrome based on sex. The findings agrees with the report of Patel, Alkhawan and Vittovio (2017), which observed gradual weight loss among the participants as among the benefits of aerobic exercise participation. The findings is also in line with a recent study by Knips et al (2019), which observed that aerobic activities tend to increase blood volume of blood reaching the muscle tissues and as such tend to improve the ability of muscles to lose fats during exercise hence preserving intramuscular glycogen. Despite the agreement with previous findings, Kent (2007), presented a contrary opinion regarding the efficacy of aerobic activities with

respect to weight loss. The author submitted that it may not be an effective form of fat loss except when practiced regularly.

Despite the contrast report, the study findings fall in line with Sobngwi (2011), which affirmed that aerobic dance classes on 3-5 days of the week reduces an individual's BMI.

On gender influence with respect to aerobic participation and improvement of BMI status, the findings of the study agrees with Maruf et al (2012), in which significant differences in the post exercise BMI among male and female participants following weeks of training. In addition, Skypnik et al (2015), observed significant relationship between aerobic activities participation and abdominal obesity reduction after 3 months of aerobic exercise.

The agreement of the study findings with authors' findings could be as a result of consistencies in the conduct of the aerobic activities among the adolescent DS individuals in the school during the period. The exercise was conducted 3 times per week on every other day which allowed for adequate muscle rest and recovery and probably accounted for body weight reduction in them. Perhaps, the tutoring of the participants on the eating habits during the training periods must have also accounted for the weight loss. This is because when exercise is combined with dietary control weight loss may occur.

The disagreement with other findings could be on account of intensity and duration of exercise. It could probably be that the aerobic intensities in those studies did not simulate the muscles well enough to lose fat. It could also be that the training duration was short or poor dietary control during the period which made the participants not to lose weight in the process. The female adolescent DS individuals recording more improvement in BMI values could be due to greater compliance to dietary guidelines given to them, their low metabolic rate notwithstanding.

The findings of the study also revealed that the static balance of adolescent DS individuals utilized in the study area was found to be low. The hypothesis states that there is no significant effect of aerobic activities on static balance of adolescents with Down syndrome based on sex. The finding follows the recommendations of Jankowicz et al (2017), which recognized the importance of maintaining good balance in them in order to decrease the fear of falling or getting hurt which also requires that they be regularly engaged in exercises such as aerobics.

This findings however, contradicts Palomba et al (2020), reports which observed that physical activity engagement could contribute to balance and postural enhancement in people with DS. This submission also received the approval of Wiley (2020), which found DS individuals recording improved balance following 8 weeks of exercise training.

The disagreement with previous author's report could be that the participants in those studies trained for more than 6 weeks. In addition, the exercise they engaged in may not be dance aerobic only which may have resulted in higher muscle stimulation. The agreement with previous reports is obvious. Individuals with DS generally find it difficult to maintain balance which makes it a congenital issue. Perhaps, with well structured and administered programme of exercise alongside with aerobic activities, they may record improvement in balance especially in static balance.

Conclusion: DS individuals' exposure to physical regimen exposes their deficits in physical indices and poses greater risks of cardiovascular diseases in them.

Recommendations: Based on the findings of the study, the following recommendations were made:

1. The management of the school should immediately source for facilities and equipment to support balance development in DS individuals in the school. This is due to low deficits recorded following 6-weeks aerobic activities. Such facilities and equipment should be properly laid outside the confines of classroom and qualified

Physical Therapists employed to manage them during recreation hours.

2. Parents should be sensitized through the organs of Parents Teachers' Association (PTA) to monitor their eating habits at home in order to avoid high energy intake which may hinder weight loss sustenance already recorded. A dietary guide by a nutritionist could be provided to parents to ensure proper eating habits at home and school.

3. Other aspects of aerobic trainings such as step aerobics or kick boxing aerobics should be introduced in their physical fitness programmes in order to address the balance deficits recorded after the aerobic training.

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