The comparison of six weeks of aerobics and running on women’s bone density exercising at Ahvaz Naft club

M. Seyfi\textsuperscript{a,}\textsuperscript{b}, M. Nikbakht\textsuperscript{b}

\textsuperscript{a}Msc in physical training and sport sciences, Islamic Azad University of Shoushtar.
\textsuperscript{b}Associated Professor at Shahid Chamran University of Ahvaz.

*Corresponding author; Msc in physical training and sport sciences, Islamic Azad University of Shoushtar.

\textbf{ARTICLE INFO}

\begin{itemize}
  \item Article history:
  \begin{itemize}
    \item Received 11 April 2014
    \item Accepted 22 May 2014
    \item Available online 29 May 2014
  \end{itemize}
  \item Keywords:
  \begin{itemize}
    \item Density of bone
    \item Aerobics
    \item Running
  \end{itemize}
\end{itemize}

\textbf{ABSTRACT}

The purpose of this survey has been the comparison of the effect of aerobics and running on the density of active women’s bone in Ahvaz Naft cultural and sportive gym in the period of 6 weeks. This research is one type of usage researches and this way of study is quasi-experimental and is done using a pretest-posttest Model. The sample of this survey is established with 32 active women having average and standard deviation (23.06±2.167), length (162.48±5.02) and weight (61.54±3.91). The subjects were divided in two groups including aerobic exercise (aerobic exercise during the six weeks with 50 up to 75 percent heartbeat, three sessions a week and 30 minutes every session) and running exercise (running exercise during the 6 weeks with 50 up to 75 per cent hear beat, three sessions a week and 30 minutes every session). Measuring of density of hip bone was carried out before and after the period of exercise using of DEXA machine. Firstly in terms of the statistic data analysis the natural of data distribution and homogeneity of variance were studied by Colmogrof, Smironof and Lyons test. Then for the study of changes and data analysis the dependent and independent test were used to determine the average difference of intergroup and also to determine the average difference of intergroup in significant level (p=0.05). The results of this survey showed a significant difference between the two exercise groups related to the samples of hip bone. As a result, we recommend the use of running exercise with
1. Introduction

Nowadays, the main problem of public health is related to bones injuries and osteoporosis. Osteoporosis is a metabolic disease. In this situation, the density of bone tissue reduces so much that the bones break easily as the result of even a little pressure (Andreoli et al, 1383). The world health organization has defined osteoporosis as a decrease of bone density as 2.5 standard deviation less than the average maximum of bone density of juvenile population in the society (WHO, 1994). One of the important factors in reducing bone mineral density is immobility. In this case, non-athlete individuals compared to athletes having less bone density (Zanaker et al, 2003). Osteoporosis is one of the disasters in the last century. In 1997, the world health organization has announced that Osteoporosis, cancer, heart failure, and brain failure are the four main enemies of humankind. This disease is the most widespread metabolic bone disease starting with the depletion of bone mass and the destruction of bone tissue, and as a result, the bones get fragile and prone to fragility. The risk of death from osteoporosis in longevity of women is equal to the possibility of death risk as the result of breast cancer, and is four times upper than the possibility of death as the result of uterus cancer. The importance of osteoporosis is risen the danger of break. The most cases of break are related to osteoporosis of basin, spine, and the end of radius (Larijani et al, 2005). In these days, around 25 million Americans people suffering from osteoporosis. In addition, 80 percent of this population are allocated to the women that including 30 per cent 60 aged women and 70 percent 80 aged and upper. The mortality from effects of this disease is 20 percent (Bayat et al, 2008). Every year in all parts of the world more than 5 million break case from osteoporosis that involving hip break with 300000 cases and spine break with 500000 cases. 30-40 percent of 50 aged women in their longevity are exposure to the break danger from osteoporosis (Zamani et al, 2010). The annual expenditure from this breaks in England and United States are estimated around 7.1-milliard dollar and 18-milliard pound respectively (Majibiyani et al, 2006). In addition, treatments and bone rehabilitation that related to osteoporosis are accomplished with large economic damages. For examples in a survey done in some west countries the treatment cost of a broken hip was estimated around 20000 dollar (Yazdani et al, 2006). Some prevention factors from osteoporosis are the creation of good manners in life, avoiding alcohol, cigarette and grueling bone dugs, the use of alternative hormone remedy, do the weight tolerance and non weight sports and the use of preventive factors such as adequate calcium and vitamin D against this disease. In addition, some factors including menopause which is usually followed by decrease of estrogen hormone, blood, body mass index (BMI) (Perilazia et al, 2009), diet with less mobility, positive historical family, Hyperthyroidism, overactive parathyroid, mis absorption of nutrients and stress are the causers of osteoporosis (Yazdani et. al. (2006); Rahimiyani et. al. (2006)). In recent years, there has been accomplished so many researchers on the strength of bones. The studies on human shown that, the high intensity exercise may lead to the increase of bone density. In this regard, the researchers conducted a survey with the aim of comparing the effect of severity and type of sport activity on the bone mineral density and shown that swimmers have less amount of mass bone compare to other groups of athletes and control group. In addition, the results shown that endurance athletes compare to the control group have significantly less amount of bone mineral density (Magcos et al, 2007). The other survey have reported that eruptive and powerful exercise such as weight lifting, gymnastic, and wrestling compare to endurance exercise like distance medley may have positive effect on mass bone (Rahimiyani et al, 1382). Similarly, in other study on distance medley of men and women was shown that, there is an inversion correlation between the distance that men and women running in a week and the amount of bone mineral density between tow genders. In addition, this survey has reported the jogger women are exposure to the threat of the decrease of bone mineral density a little more (Hind et al, 2009). Many efforts have been done in terms of prevention or stop the process of osteoporosis in women. The last studies have shown that this issue will be increased in the long run. Today, body activity and exercise are the cheap way to treatment of osteoporosis that researchers may attention to this subject (Nevil et al, 2009). In this research, the effect of two popular way of exercise on density of hip bone was checked and compared.
2. Sample of the study

Sample of the present study includes active women in Ahvaz Naft Cultural Club. After referring to the mentioned club, out of 52 qualified women, 43 volunteered for the study and 32 were selected randomly, and they divided in to two groups. Table 1 shows the General characteristics of the samples.

Table 1
General characteristics of testees

<table>
<thead>
<tr>
<th></th>
<th>mean</th>
<th>Standard deviation</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (year)</td>
<td>23/66</td>
<td>2/167</td>
<td>18</td>
<td>25</td>
</tr>
<tr>
<td>Height (centimeter)</td>
<td>162/54</td>
<td>5/03</td>
<td>154/4</td>
<td>168/6</td>
</tr>
<tr>
<td>Weight (kilogram)</td>
<td>61/54</td>
<td>3/92</td>
<td>54/35</td>
<td>69/65</td>
</tr>
</tbody>
</table>

3. Research methodology

The present study’s design is quasi-experimental, which is carried out using two experimental groups. The data are gathered based on measuring dependent variable of hips’ bone density in pretest and posttest. Then the effects of aerobics and running on the dependent variable were analyzed for testees in the two experimental groups (16 testees in aerobic group and 16 testees in running group). When testees were going to be selected, the necessary instructions about the research were given to them (such as the measuring method and test repeating, staying on a diet, constant presence in all the phases and so on). Also, an instruction sheet was given to them to inform about the study and its executive phases. An interview was carried out too. None of them used medicine, alcohol and cigarette and they didn’t suffer from any irregularity in menstruation.

In a density-measuring clinic, the density and mineral content in all the testees’ bones were measured through DEXA (Dual Energy X-ray Absorptiometry). DEXA scan is a fast, non-attacking and painless way, and its amount of radiation is one thirtieth of scanning with X-ray. In this method, the absorptiometry base is the use of resource with two levels of high and low energy. Which have different levels of absorption in soft and boney tissues. The source of energy in this device is x-ray, resulting in an increase in the device’s accuracy up to 99%. The testees were assessed again at the end of the 6-week program in the posttest and the obtained data was analyzed statistically.

3.1. The exercise protocol

The first experimental group (n=16) carried out the running program, including 30 minutes of constant running, with a 50-75 heart beat, 3 sessions a week, three sessions a week, for six weeks. In every session, the exercise severity was controlled by the Polar Heart rate Monitor (made in Finland) (Table 2).

Table 2
The exercise protocol

<table>
<thead>
<tr>
<th>No. of weeks</th>
<th>Exercise duration</th>
<th>Exercise severity</th>
</tr>
</thead>
<tbody>
<tr>
<td>First week</td>
<td>10 minutes of warming, 30 min of main exercise</td>
<td>50</td>
</tr>
<tr>
<td>second week</td>
<td>10 minutes of warming, 30 min of main exercise</td>
<td>55</td>
</tr>
<tr>
<td>third week</td>
<td>10 minutes of warming, 30 min of main exercise</td>
<td>60</td>
</tr>
<tr>
<td>fourth week</td>
<td>10 minutes of warming, 30 min of main exercise</td>
<td>65</td>
</tr>
<tr>
<td>fifth week</td>
<td>10 minutes of warming, 30 min of main exercise</td>
<td>70</td>
</tr>
<tr>
<td>sixth week</td>
<td>10 minutes of warming, 30 min of main exercise</td>
<td>75</td>
</tr>
</tbody>
</table>
3.2. Statistical method

In order to analyze the statistical data, firstly, the Kolmogrov-Smirnov test and ionz were used to insure the normality of data distribution and variance homogeneity. To assess changes and analyze data, the dependent T-test was used to determine the intergroup mean deviation, and the independent T-test was used to determine the mean difference between groups. The significance level in this study is p<0.05.

4. Research findings

Figure 1 shows the comparison of values of hip bone density in pretest-posttest for running and aerobic group. To answer the question whether the two types of aerobics and running have the same effect on bone density, at first the difference between each testees’ bone density in pretest and posttest was obtained. In order to do this, the amounts of bone density in pretest were subtracted from the same in posttest. Then the statistical dependent T-test on the scores of bone density change amounts was used to get the meant results for both groups. Table 3 shows difference between scores in pretest-posttest for both groups of running and aerobics. As the findings showed, there is a significant difference between the effect of six weeks of doing aerobics and running on women’s bone density (p=0.003). Moreover, next analyses indicated not only both exercises have meaningful and positive effect on the women’s hips’ bone density, but also this effect is increased in the running group than in aerobics group.

<table>
<thead>
<tr>
<th></th>
<th>Aerobics experimental group</th>
<th>Running experimental group</th>
<th>The amount of difference(running-aerobics)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hips’ bone density in pretest</td>
<td>0/82±0/06</td>
<td>0/78±0/07</td>
<td>-0/04±0/01</td>
</tr>
<tr>
<td>Hips’ bone density in posttest</td>
<td>1/01±0/1</td>
<td>1/11±0/19</td>
<td>0/1±0/18</td>
</tr>
<tr>
<td>The amount of change</td>
<td>0/19±0/07</td>
<td>0/33±0/15</td>
<td>*./14±0/08</td>
</tr>
</tbody>
</table>

* is meaningful at the level of 0.05.

Fig. 1. The comparison of hip bone density in pretest-posttest for running and aerobic group

5. Discussion and conclusion

The main objective of this study was comparison of aerobics’ effect with running effect on active women’s bone density in Ahvaz Naft Cultural and Sporting club.
The effect of different aerobics programs and exercises for weight-bearing on the prevention from osteoporosis have been studied by many researchers and different results have been obtained. The results of the present study showed that although six weeks of aerobics and running have a good effect on women’s bone density in Ahvaz Naft Club, but running had a better effect. So according to this study’s findings, doing running exercise has a better effect on the increase of women’s bone density. These findings are in line with Bizheet. al. (2008), Bally et. al. (1999), Kelly et. al. (2001), DabidiRoshan et.al. (2013), Habibzadeet. al. (2010), Hemayattalabet. al. (2010), Hejaziet. al. (2009), Pouzeshet. al. (2009), Saremiet. al. (2009), Laura et. al. (2007),Bouret. al. (2007), Hemayattalab, R. (2010), Anieet. al. (2009) and Hind et. al. (2006). On the other hand, in some of the previous researches, aerobics exercises are stated to be ineffective. For instance, the studies by Gyroisi et al. (2006), Cohrplanin (2006), Broukvowell(2001) and Shah Ebrahim(1997) reported meaningful ineffectiveness of aerobic exercises on bone density. In Gyroisi’s study, the exercise program included 30 minutes of jogging in the open space, three times a week for two months, which had no effect on bone density of hips and vertebral column (L2-L4) on fat and menopause women, but their weight decreased meaningfully. In addition to this, the findings of Cohrplanin (2006), don’t support the present study’s findings. In the mentioned study, 35 minutes of walking, three times a week for three months by the middle age thin women didn’t lead to a meaningful change in hips’ bone density and their estrogen serum. In another study, Broukvowell (2001) reported that in spite of determining severity and dedicating enough time, walking had no effect on hips bone density and vertebral column(L2-L4) for thin and fat menopause women.

The exercise program of this study included 120 minutes of walking each week, with 70% maximum oxygen consumption, three times a week for two months which was carried out in a self-controlled manner. Moreover, the weight changes weren’t meaningful. It’s probable that the mentioned parameters weren’t influenced at the result of being self-controlled. As Shah Ebrahim(1997)reports, 40 minutes of jogging, three times a week during four months lead to the increase of hips’ bone density in both fat and thin menopause women who suffered from fractures in their upper organs. It’s possible that the exercise wasn’t severe enough to have effects. It seems that positive changes in the bones’ mineral is a function of entering load and the number of times the bones are stressed.

The suitable exercise weight for increasing bone density should be controlled. If it’s less or more than the sufficient one, the meant results won’t be achieved. In this regard, Zankeret. al.(2003)showed that the minimum necessary pressure and force to make the least stimulation in bones, is 2.5 times greater than the body weight, and in the activities such as running and jogging, the entering force to the bones should be the same as the body weight or a little heavier in order to stimulate the bone cells. So, the severity of body activity should be enough to cause mechanical stimulation for the bones. It has been indicated that the bones respond to mechanical stresses and loads (Warden et.al.(2004), Sehmisch et al.(2009), Warmer et.al(2006), Roubin et al.(2002).Bones’ mechanical loading through reaction and muscle stretch forces, is known as the necessary stimulation to achieve the apex of bone mass and keeping its homeostasis (Wammer et. al.2006).

In some researchers’ idea, using mechanical signals or vibration is the cause of bone metabolism stimulation in both dense and spongy bone tissues. (Sehmisch et. al.2009) and Rubin et. al. (2002). Based on a mechanical theory, the bones respond to the entering load through adding minerals. The entered load to the bone is stated using micro strain, and 1000 micro strain is a force which absorbs minerals and leads to a 0/1% length change. The entering pressure to the bone will have four positions, when the entering load is very insignificant (between 50 to 200 micro strain), there will be no stimulation. It leads to a decrease in the bone minerals and can be easily seen in the patient who stay long in the hospital or who rest long. A load pressure between 200 to 2000 microstrains is enough to preserve bones. If the entered pressure in the area is sufficient (more than 2000 to 30000 microstrains), bone forming is stimulated and leads to an increase in bone density and its growth. Finally, if the pressure in the area is more than suitable or leads to a disease, (more than 4000m.s.), reforming will be stimulated and it leads to displacement of bones (Dianne et. al.2007) and Winzenberget. al. (2006). Weight-bearing exercises are the ones with a lot of jumping and leaping.

On the other hand, some other variables such as heredity and nutrition aren’t ineffective on bone-forming. There are a number of studies showing that a number of mechanical characteristics of bones such as firmness and final power, are determined with spongy and dense bone microstructures (Force et. al. (2008), Howard et. al. (2000) & Williams & Wilkins (2003). After doing some researches on young women, they declared that in order to keep bones’ health, having physical activity accomplished to a good diet including of calories, calcium and vitamin D, and keeping a regular menstruation is necessary. After doing a research on the girls in puberty period for 6
years, Kerry et al. (2000) reported enough calcium absorption with physical activity is the two necessary factors to obtain the maximum of bone mass in teen years. Because calcium forms 40 percent of bone weight, it will start to decrease in the case of insufficient consumption. Having physical activity and a balanced nutrition, a 50% decrease is expected for each 0/5 gram in a centimeter increase in hip bone density.

Considering different studies have shown, in order to have effective exercises on different body organs’ variables, several factors such as duration, severity, speed, age, nutrition and so on should be considered. This study demonstrated that running exercises enter more pressure to stimulate hip’s bone density for active women in a six-week period.

References


