

Regarding physical effects from walking with weight shoes (tentative name: healthy shoes)

Reporter: Research Unit of Health Engineering at Osaka University of Health and Sport Sciences

Professor: Mitsuhiko Masuhara

Associate professor: Kaoru Umebayashi

<Objective>

Study on effects on energy metabolism and respiratory/circulatory responses from walking with healthy shoes (Sh., around 1.2kgs of weight) comparing with walking with regular shoes (no-Sh.)

<Method>

1. Examinee

Three healthy females (average age: 39.7 years, Table 1)

2. Experiment method

The experiment was carried out under ambient temperature of 20°C and humidity degree of 50% in an environment-controlled room.

The examinees who put on training pants and T-shirts did treadmill walking with 3% incline and at the speed of 80m/min for 30 minutes after 20 minutes of rest sitting, followed by collecting data of recovering period by 20 minutes of rest sitting.

The experiment used two kinds of shoes: relatively light jogging shoes (no-Sh., regular shoes) and healthy shoes (Sh., 1.2kgs of weight).

Its measurement items are as follows;

a. Cardiac rate

Logged the cardiac rate every minute using a heart rate monitor (made by Canon).

b. Oxygen intake amount

Using Respiro Monitor RM200 (made by Minato Medical Science Co., Ltd.), analyzed expired gas every minute for measurements of respiratory responses and energy metabolism.

c. Others

Impressions of each examinee every 10 minutes during walking were also logged.

d. Statistics treatment

t-test of Student was adopted as its statistics treatment.

<Result>

(1) Effects on respiratory response and energy metabolism

Figures 1-3 show changes in the oxygen intake amount during walking of each individual. During walking with healthy shoes, the examinees Y.S. and T.S. showed constantly higher oxygen intake amounts compared to with regular shoes. On the other hand, the examinee T.U. indicated little difference in it, although pointing to a slightly higher level with healthy shoes. Among these three

examinees, Y.S., who is 46 years old, the oldest in these three, and showed the biggest difference, has a lifestyle centered on sitting tasks in her daily life instead of habitual exercise, suggesting an individual whose lifestyle is lacking exercise mostly. And the examinee T.U., who is 33 years old, the youngest, and showed the second biggest difference, also currently has a lifestyle centered on sitting tasks in her daily life instead of habitual exercise, although she was enjoying competitive sports including handball about 10 years ago. Meanwhile, the examinee T.U., who is 40 years old, the second oldest, and showed little difference, is now serving as a physical-education teacher at a junior high school, thereby suggesting an individual with habitual exercise in her daily life. Therefore, the effects of the healthy shoes appear to be seen in individuals lacking daily exercise and physical strength.

The averaged oxygen consumption amount during walking with healthy shoes of the three (Figure 4) turned out to be constantly higher. Figure 5, which represents the averaged oxygen demand amount of the three for walking, also indicates the higher oxygen demand amount of walking with healthy shoes.

The results supports higher energy consumption and physical loads in walking with healthy shoes. 1-liter oxygen consumption is equivalent to around 5-kcal energy consumption. Accordingly, the average oxygen demand amount in walking with healthy shoes of 20.06 liters and with regular shoes of 16.09 liters imply 100.3 kcal and 80.45 kcal respectively, suggesting higher energy consumption of walking with healthy shoes by around 24.7% than walking with regular shoes. That means walking with the healthy shoes is believed to boost the energy consumption amount and resulting consumption of excess energy sources (especially body fat), leading to effects on obesity prevention, better shape and the like. In particular, it appears to have bigger effects on healthy young and old who suffer from a lack of daily exercise.

(2) Circulatory response (cardiac rate), effects on others

Figures 6-8 represent changes in the cardiac rate of each examinee during walking.

All three examinees showed constantly higher cardiac rates during walking with healthy shoes. Particularly, the examinee T.U. pointed to a significant difference in the cardiac rate, but showed little difference in the oxygen intake amount. As the examinee T.U. had the highest physical strength, her oxygen demand amount was the lowest and her cardiac rate with regular shoes was also the lowest. However, a remarkable increase can be seen in her walking with healthy shoes. Its reason is believed to be that she was a competitive sports woman, which makes her sensitive even now to conditions close to it, and far more perceptive to shoes' weight than other two. Therefore, the sensitive response is believed to boost the cardiac rate level. That can be considered to be a result from activated sympathetic nerve responses due to sensitive stimulation. Compared to that, the cardiac rate of the examinee Y.S., who showed the same increase in it, is believed to be a result from a metabolism change due to a lack of physical strength. The cardiac rate of the examinee T.S. is also believed to be a result from a change in metabolism response because of the nearly matched

responses of the oxygen intake amount etc.

Looking at the average of the three in effects on the cardiac rate response (Figure 9), a constantly higher figure can be seen for the cardiac rate during walking with healthy shoes. It is not significant statistically, but the assumption for the figure can be an involvement of difference in age. Because of the same exercise amount for both conditions, the load degree to the body in healthy shoes is assumed to be bigger similar to the oxygen intake amount.

Putting on the healthy shoes is assumed to make the oxygen demand amount and the cardiac rate higher, leading to more energy consumption and more use of a crop of muscle.

In impressions of all the three about the load degree to the body during walking, their comments are that during the initial walking period with healthy shoes, they felt the shoes were heavy and had to pay slight attention to their feet lifting movement, but the feeling faded and no feeling of the shoes' weight in the end as the walking went on. In addition, they commented they felt no particular pain or fatigue when they were asked about fatigue feeling of their feet the following day. That can lead to a judgment that the load degree of the healthy shoes to muscle is not so big.

The modern society is incorporating more machines and much less opportunities for exercise. Accordingly, walking has caught on among middle-aged people as handy exercise. The current experiment suggests the bigger load degree to the body in the same work amount by putting on the healthy shoes, leading to a notion that proper stimulation is given to respiratory/circulatory organs and muscle. The healthy shoes are believed to be a product with sufficient hopes for better health including effective training of lower body and respiratory/circulatory organs by walking as relatively low-strength exercise.