ZIBELINE INTERNATIONAL PUBLISHING

Science Heritage Journal (GWS)
DOI: *http://doi.org/10.26480/gws.01.2019.20.23*

ISSN: 2521-0858 (Print)
ISSN: 2521-0866 (Online)
CODEN: SHJCAS

RESEARCH ARTICLE

THE DAMPING LOSS PREVENTION RESEARCH ON AEROBICS SPECIAL SHOE MATERIALS BASED ON INTELLIGENT ANALYSIS

Shi Qian

Xi'an Physical Education University, China
****Corresponding Author Email: wanxi.peng@qq.com***

ARTICLE DETAILS

Article History:

Received 1 February 2019
Accepted 19 March 2018
Available online 22 March 2019

ABSTRACT

In recent years, with the people's awareness of the changes in the fitness movement, aerobics has become one of the most popular sports. Although it is only a moderate intensity of sports items, but there are still likely to be injured in aerobics, therefore, the study of different materials for the special purpose of the shock absorption properties of aerobics has a very important significance. Selected rubber, EVA, TPU these three different materials made of Aerobics special shoes for shock absorption loss prevention test, the structural design of three kinds of shoes. Through the analysis of parameters in the process of the experiment can be seen, TPU materials damping loss prevention effect is the most ideal rubber anti vibration effect of the worst.

KEYWORDS

Aerobics, special shoes, damping material damage

1. INTRODUCTION

Shoes are very important to human beings, not only to protect their feet from the damage of hard objects, but also to play a full role in keeping warm. With the changing of social science and technology and the development of human social behavior, people demand on shoes also in the event of a major change has gradually become a kind of personality is the fashion show, it is people's health movement an important tool. Further shoes design need to consider to meet more function, both to comfortable and beautiful, but also to meet the different temperament demand, for the special needs of shoes, more consideration of is light and damping [1]. In previous studies, it is often more important to study the structure design, research on the seismic performance, flexibility, comfort, friction and so on. With the progress of science and technology, all kinds of new materials used in production, the common sports shoes material with rubber, TPU, EVA. These materials have advantages and disadvantages, in price, friction, light resistance, shock absorption and other aspects were different. And in all kinds of sports. In recent years new aerobics sports shoes is less, so the aerobics special shoes material shock loss prevention research has a very important significance.

2. STATE OF THE ART

2.1 Aerobic exercise

Aerobics originated from traditional aerobic exercise, is in music accompaniment, through exercise to the body reach on the effects of physical exercise, in order to obtain a healthy body and aesthetic form, in the process of exercise, achieve the purpose of entertainment and fitness [2]. The characteristic of aerobics is the low and medium intensity of the whole-body movement, which is mainly to exercise the heart and lung function of the human body. In recent years, with the deepening of understanding of the fitness movement, people pay more attention to scientific and healthy fitness, and also more and more popular for aerobics [3]. Long term aerobic exercise not only can improve the health of the human body, but also can effectively control the body weight, improve the body, improve the overall coordination of the body.

Nowadays, aerobics has developed into a simple exercise, and in the promotion of the development of the national movement.

Figure 1: Aerobic exercise

2.2 Special shoes for body-building exercise

Although the development of aerobics sports history is short, but now the majority of the people's love, the body language arts and sports did not study integration, so that it has become a highly ornamental sports activity. Even if it is a low intensity exercise, in the process of movement is

still widespread in the case of foot injury [4]. In foreign countries, it has already established a perfect aerobics training system, which can effectively prevent the damage of Aerobics Athletes in the course of the movement. In the study abroad that to prevent in the aerobics movement can effectively reduce the impact movement to the feet of the impact, on the one hand, need to strengthen the training on the ankle and other parts, on the other hand to choose a certain damping loss prevention effect of a dedicated sports shoes [5].In international competition, the International Gymnastics Federation economy aerobics scoring rules stipulates the athletes must be appropriate damping function of Aerobics shoes. But no use ballet shoes, running shoes and other sports special shoes. Nowadays, the structure design of the special shoes is not quite different, which has great difference to the material selection. Now the most common way is to choose a high elastic foam material in the shoe, so as to play a better cushioning effect, the upper with a pure leather upper layer, the sole use of specially designed rubber [6]. This combination of design, can give full play to the performance of different materials, integrated to achieve the effect of non-slip, shock absorption, etc.

3. METHODOLOGY

The main for three different materials aerobics special shoes for seismic performance test, three kinds of materials are TPU, EVA and rubber, in order to ensure the test results can be controlled, the shoes structure, size consistent and in one and the same instrument tested, shoes for the new shoes. So, in the test of shock absorber, can effectively eliminate the effects of human factors, in the structure consistent to avoid the effect of structure on the seismic performance and the results of the test can reflect the influence of different materials on the seismic performance. Test with the shoes in accordance with the "competitive aerobics competition rules" in the provisions of the aerobics shoes to make, the thickness of 0.1cm, the entire shoe as a whole, there is no distinction between the specific structure. Test equipment for shock testing machine, the seismic performance of the test, the falling weight specific 8.5Kg and 11.9Kg both. The specific parameters see Table 1.

Table 1: Text mining in different personalized recommendation services

Entry name	*Content*
Drop weight	8.5kg (5J), 11.9kg (7J)
Impact head specification	R=1.0±0.25mm, D=45mm, m≤0.2kg
Drop height	Height of each test 50mm
Impact energy requirement	5J, 7J
Test speed	2+1 seconds per cycle
Load cell capacity	5000Ibf, sampling frequency>1000HZ
Displacement transducer	0～100mm, sampling frequency>1000HZ
Power Supply	AC220V, 50HZ

Through the test of different materials, the reference is British SATRA standard Zhongce test method, through 8.5 kg and 11.9kg these two different weight levels drop from the different heights of the fall, to achieve different output energy 5J, 7J on three kinds of sole material impact, after obtain ram movement acceleration and the impact process of different parameters recorded and calculated to three materials aerobics special shoe cushioning performance evaluation. The ram diameter is 4.5cm, head of radius 3.75cm. The parameters that need to be recorded mainly have the G value that is the maximum impact force peak, and then carry on the contrast between various materials.

First, by the test instrument of the ram shoes impact, the impact energy increased gradually from low to high, every time the impact energy of the record three times the effective collision data, each two-impact test between time intervals respectively 1min, after completion of 2 times the energy impact tests, replace the shoes under a set of tests. Finally, the parameters of the impact process were recorded, including displacement, force and impact energy, etc. With the increase of impact force, the deformation displacement of the material becomes larger. When the impact energy reaches the preset maximum impact energy 5J and 7J, the force value and the energy decrease gradually, and the material begins to recover slowly.

In accordance with the established test methods and, ultimately, the impact test process parameters, and according to the parameters of the different impact energy of the impact force peak value and the value of G, where g values for the impact generated by the maximum acceleration and the weight of the acceleration ratio. If the material has a good damping performance, then the production of shoes can effectively reduce the impact force peak value and G value. When the peak value of the impact force and the G value is less, the seismic performance of the tested material is better.

4. RESULT ANALYSIS AND DISCUSSION

With the impact energy and shoes as independent variables, to the maximum impact force peak and g value as variables, you can draw the shoes of different materials under different impact energy of impact force peak, details see Table 2.

Table 2: Table of the maximum peak value and G value of different impact energy

Material classification	*Impact energy (N)*			
	G value comparison		*Peak comparison*	
	5J	*7J*	*5J*	*7J*
Rubber	28	37	2174.54	2876.46
EVA	24	33	2135.25	2756.91
TPU	20	30	1870.52	2634.52

Through the absorption of shock performance test results can be seen: (1) the impact energy is 7J, 5J impact energy with respect to a, the maximum impact force peak and g values, indicating that the under relatively high impact energy, the shoes produced by the maximum impact force peak and g value is larger; (2) under the same impact energy can be seen, the seismic performance from low to high were rubber, EVA, TPU.

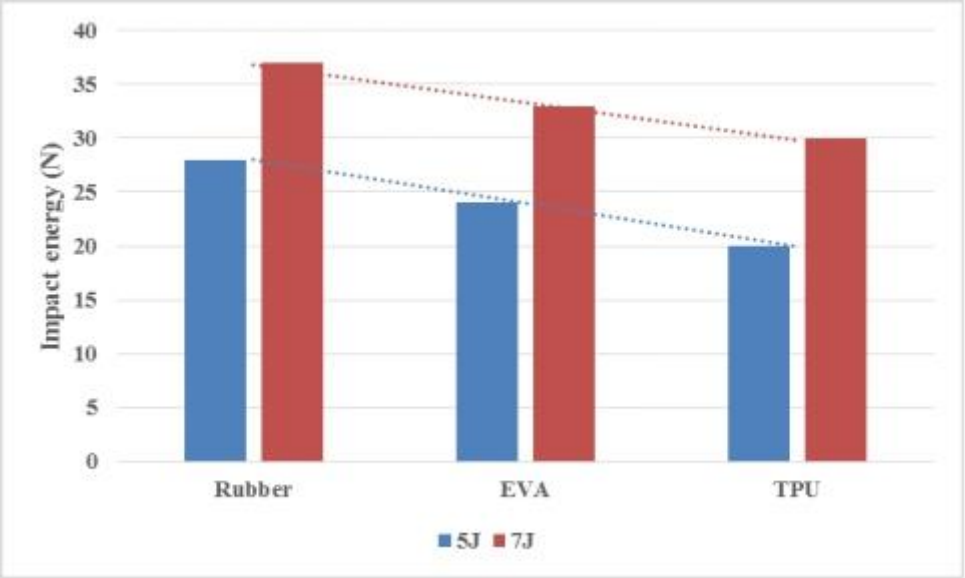

Figure 2: Comparison of G value under different impact energy

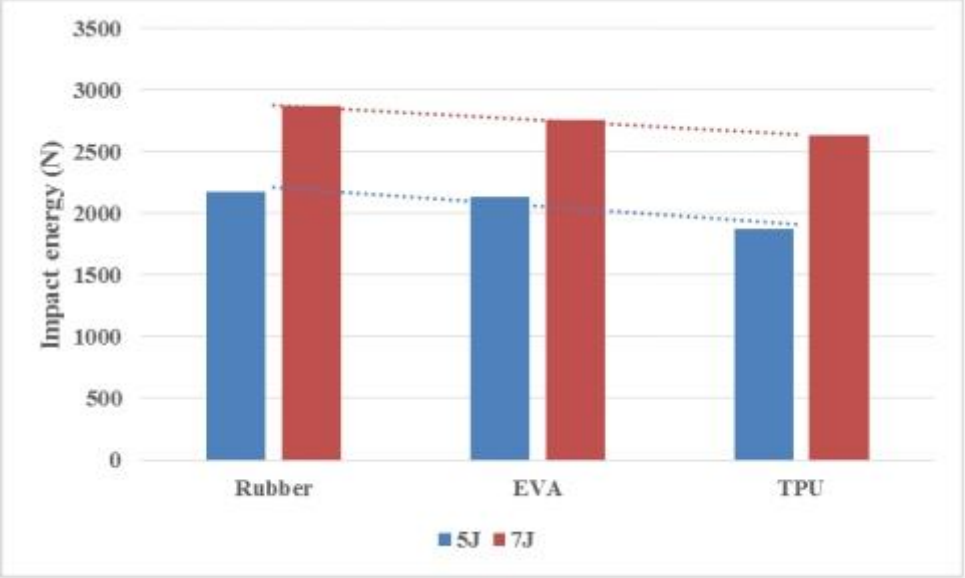

Figure 3: Peak contrast of different impact energy

Thus, we can see that, TPU materials collision impact force peak and g value minimum. It indicates that the the seismic performance of the best, to have a more intuitive observation of the relationship among the different materials of the maximum impact force peak value and the value of G, of three different materials between attenuation coefficient are analyzed.

Table 2: Decay rate of different materials under different impact energy

Maximum impact force	*5J*		*7J*	
	TPU with respect to rubber	*EVA with respect to rubber*	*TPU with respect to rubber*	*EVA with respect to rubber*
Peak comparison	-14.0%	-1.8%	-8.4%	-4.2%
G value comparison	-28.6%	-14.3%	-18.9%	-10.8%

See from the TPU and EVA materials in 5J and 7J hit the maximum impact force peak and G energy values of the attenuation coefficient can be at the maximum impact force peak contrast, TPU relative to the rubber in the impact energy under 7J 5J, 14%, 8.4% respectively attenuation, EVA relative to 5J, 7J rubber in the impact energy. The attenuation of the 1.8%, 4.2%; the G value comparison, TPU relative to the rubber in the impact energy under 7J 5J, 28.6%, 18.9% respectively decrease, compared with EVA in 5J, 7J rubber impact energy under 14.3% attenuation and 10.8%. can be seen with respect to the rubber material, the decay rate of TPU and EVA decreased significantly that is, the seismic effect is obvious, but the percentage of two decrease, TPU attenuation is more obvious, also shows that the damping effect of TPU material is good.

Is the maximum impact force peak, EVA in the impact energy 5J, 7J phase compared with rubber although there are decaying, but the attenuation is not obvious, explained the EVA in the seismic effect although the rubber, but the performance difference between the two. And the rubber itself is more emphasis on the friction, the seismic performance is relatively poor. Although the EVA material has a good portability and flexibility, but the seismic effect of TPU compared with the lack of a large.

5. CONCLUSIONS

In this paper, we mainly study the rubber, EVA, TPU these three kinds of different materials in the aerobics special shoes damping loss prevention

performance of, mainly through to three kinds of different materials but structural design consistent fitness for seismic performance test of special shoes, respectively in 5J and 7J impact energy under different G value and the peak impact force. It can be seen from the test that the seismic performance of the three materials from high to low are TPU, EVA and rubber. Therefore, in the specific design and manufacture process of Aerobics special shoes, the choice of materials should be given priority to TPU. But because aerobics special shoes not only consider the seismic effect, also need to consider anti slide, and comfortable degree of cost. Therefore, it is necessary to carry on a comprehensive consideration of, choose all aspects of performance are better able to meet.

REFERENCES

[1] Febriana, S.A., Soebono, H., Coenraads, P.J. 2015. Contact allergy in Indonesian patients with foot eczema attributed to shoes[J]. Journal of the European Academy of Dermatology & Venereology, 29(8).

[2] Zhang, Y. 2016. Construction on Multivariate Evaluation System for Aerobics in Teaching mode of Rotational Classroom[C]. International Conference on Education, Sports, Arts and Management Engineering.

[3] Machado, F.C.M.D., Cielo, C.A., Lessa, M.M. 2015. Vocal Characteristics of Elderly Women Engaged in Aerobics in Private Institutions of Salvador, Bahia[J]. Journal of Voice, 30(1), 127.e9-127.e19.

[4] Antunes, A.H., Alberton, C.L., Finatto P. 2015. Active Female Maximal and Anaerobic Threshold Cardiorespiratory Responses to Six Different Water Aerobics Exercises[J]. Research Quarterly for Exercise & Sport, 86, 1-7.

[5] Wang, S. 2015. AHP-Based College Students Aerobics Teaching Method Reformation Development Research[J]. Open Cybernetics & Systemics Journal, 9(1), 2194-2199.

[6] Yang, X.L. 2012. The Influence of Professional Shoe Materials for Aerobics on Bounce Action of Athletes[J]. Applied Mechanics & Materials, 155-156, 979-983.