Plantar Fasciitis Prevention Technique based on Data Aggregation from Computer Diagnostics

Vladislav Bakayev and Alexander Bolotin
Institute of Physical Education, Sports and Tourism, Peter the Great St. Petersburg Polytechnic University, St. Petersburg, Russian Federation

Keywords: Adaptation to Load, Plantar Fasciitis, Foot Functions, Prevention Technique, Data Aggregation from Computer Diagnostics.

Abstract: In this paper, we discuss the solution of the task on justification of plantar fasciitis prevention technique based on data aggregation from computer diagnostics. It is found that the assessment of the degree of damages in a condition of the plantar surface of the trial subject's foot that was made based on data aggregation from computer diagnostics in 3D format may be a basis for not only determining the disease extent but also for determining the necessary means, for special training, as well as for regulating a load on feet during the recovery of the foot functions. When using the plantar fasciitis prevention technique based on data aggregation from computer diagnostics, it is revealed that in conditions of its occurrence in an athlete, the two-phase dynamics of change of the foot condition indicators had been registered: the initial decline in functions followed by their increase to the original positions. This evidences the high efficiency of plantar fasciitis prevention technique based on data aggregation from computer diagnostics.

1 INTRODUCTION

Plantar (foot) fasciitis is a quite common disease. It is frequently encountered in the athletes who are involved in the long distances running (Ammann and Wyss, 2015, Bakaev et al., 2015, Bolotin and Bakayev, 2017, Kuznetsova et al., 2015, Zakharova and Mekhdieva, 2016, Bakaev et al., 2016) It can be inferred on the status of this disease in the runners by indicators of computer studies in 3D format. At the same time, the modern prevention strategies for plantar fasciitis in athletes are based primarily on assessing their subjective feelings, without taking into account the objective data. The existing diagnosing methods of the condition of the plantar surface of the foot in the long distance runners do not allow evaluating in a qualitative manner the functional status of its muscular-ligamentous apparatus. This affects adversely the functional condition of the runners-stayers (Bakayev et al., 2018, Bolotin and Bakaev, 2015, Bolotin and Bakayev, 2016, Bolotin and Bakayev, 2017).

Purpose of Research is to develop the prevention technique for plantar fasciitis in the runners-stayers based on data aggregation from computer diagnostics in 3D format.

2 ORGANIZATION AND METHODS

Research Objectives.

1) To evaluate the athlete's condition at the initial stage of plantar fasciitis.

2) To explore the plantar fasciitis in an athlete using data aggregation from computer diagnostics in 3D format.

3) To identify the most effective means of prevention for plantar fasciitis in runners-stayers that are based on data aggregation from computer diagnostics in 3D format.

The study involved a long-distance runner at the initial stage of the emergence of plantar fasciitis at the age of 34 years, with a normal type of foot. Experience running for about 20 years.

During research, the athlete's condition at the initial stage of plantar fasciitis was evaluated. (Figure 1).

A complex of prevention measures for plantar fasciitis in runners-stayers that was based on data aggregation from computer diagnostics in 3D format has been developed by taking into account the results of diagnostic. The plantar fasciitis was examined

Bakayev, V. and Bolotin, A.
Plantar Fasciitis Prevention Technique based on Data Aggregation from Computer Diagnostics.
DOI: 10.5220/0006892601060110
In *Proceedings of the 6th International Congress on Sport Sciences Research and Technology Support (icSPORTS 2018)*, pages 106-110
ISBN: 978-989-758-325-4

using the gait analysis system (Zebris Medical GmbH, FDM-T system, Germany). The indicators of the runner's feet alignment were evaluated in the trial subject that were based on indicators derived from Zebris system. Using the Zebris system, a distribution of resting static and dynamic pressure was measured, as well as the same in motion mode. To assess the plantar fasciitis severity, the coefficient of uniformity distribution of load on the feet during treadmill (track) running was used. The value of the load on the feet in dynamics and statics was measured.

3 RESULTS

An uneven load distribution was observed in the trial subject during the research. (Figure 2).

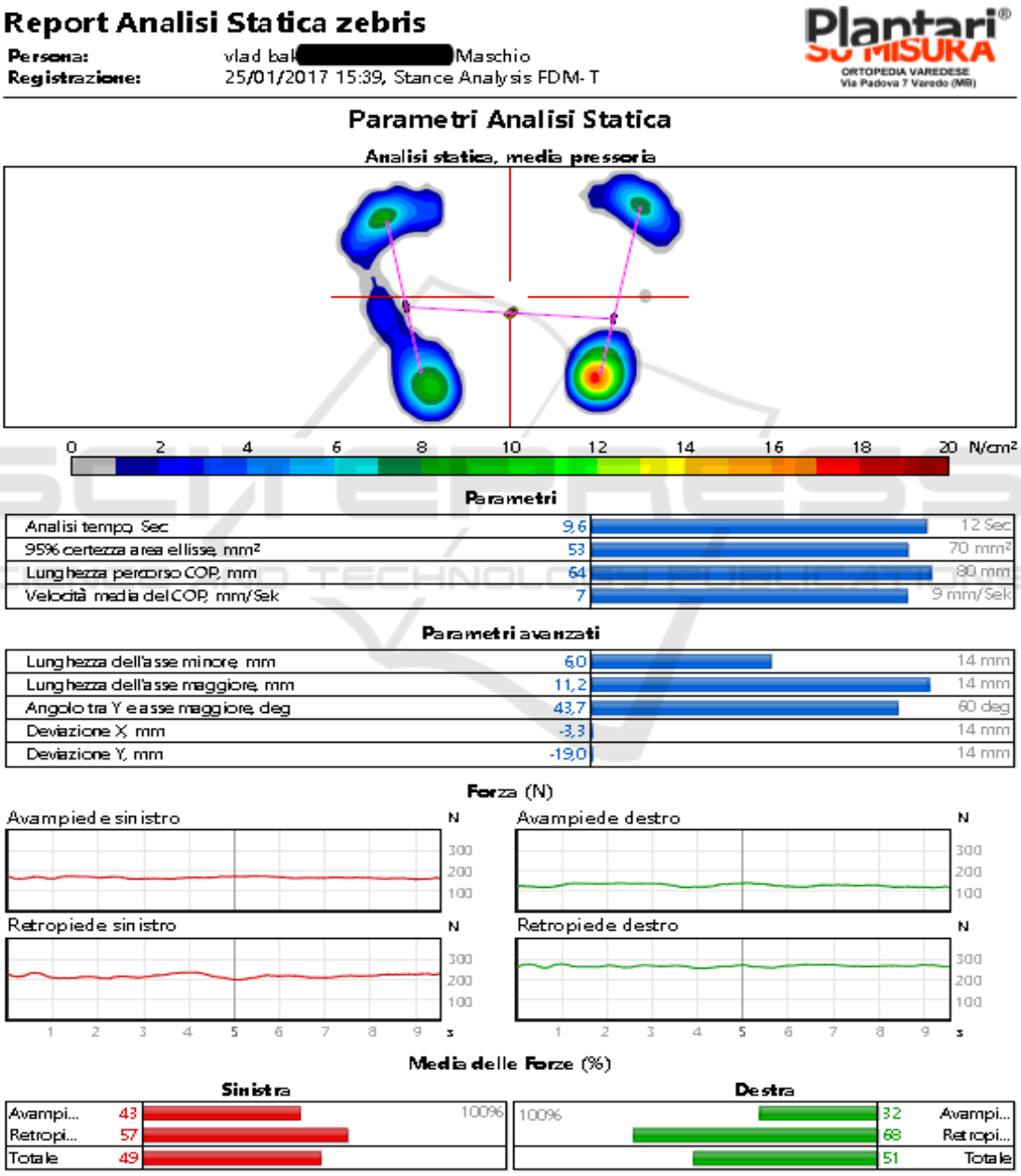

Figure 1: Static analysis of the athlete's feet at the initial stage of research.

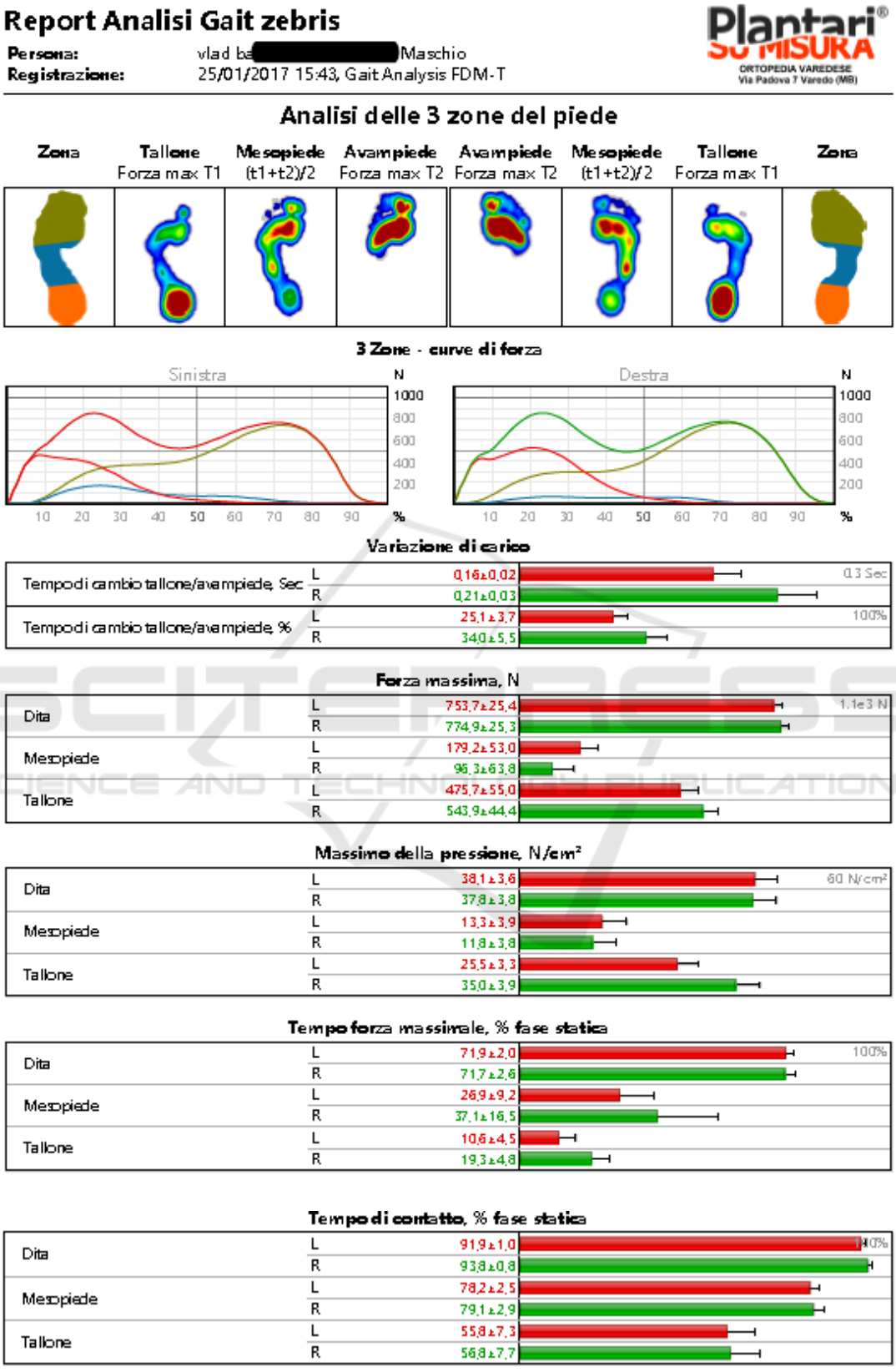

Figure 2: The analysis of the load in 3 zones of the foot during moving on the treadmill.

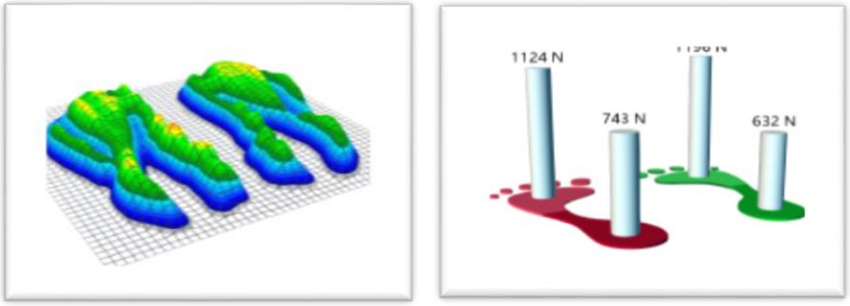

Figure 3: 3D model of the static feet position in the trial subject at the beginning of the research.

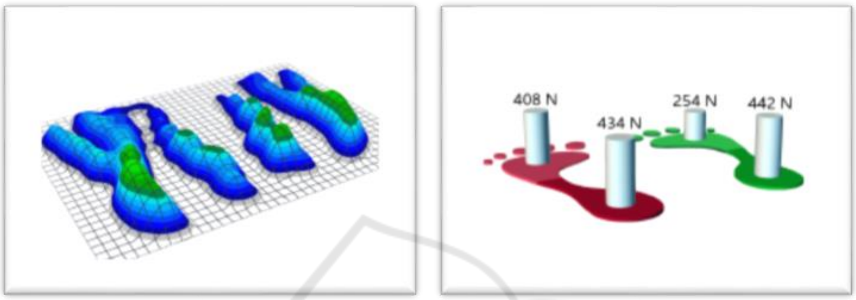

Figure 4: Analysis of the static condition of the trial subject's feet at the end of the experiment.

The source data, which characterizes the uneven distribution of load on the feet, was obtained from data aggregation from computer diagnostics in 3D format. (Figure 3).

4 DISCUSSION

After identifying the degree of damages in a condition of the plantar surface of the trial subject's foot, a range of preventive means have been offered to him in the form of special exercises, massage, and changing the shoes insole thickness. It is found that the most effective means of preventive training are the following: exercises on the foot flexion and extension under the controlled load; exercises with a massage ball; lifting and lowering to the tiptoes when sitting and standing; foot flexion and extension using hands, etc. (Bolotin and Bakayev, 2016, Kalmykova et al., 2017, Kuznetsova et al., 2015, Gorshova et al., 2017, Ivashchenko et al., 2017). The complex of these exercises was performed in the morning and evening for 40 minutes. Then a foot massage was made. During the day, the trial subject was walking in shoes with shoe insoles selected specially for him. The remeasurement of the degree of damages in a condition of the plantar surface of the trial subject's foot was made after three months of special training on the plantar fasciitis prevention based on data aggregation from computer diagnostics in 3D format. Figure 4 shows the results of this research.

5 CONCLUSIONS

Under the conditions of the plantar fasciitis in an athlete, the two-phase dynamics of change in the foot condition indicators had been registered: the initial decline in functions followed by their increase to the original positions. This indicates that the assessment of the degree of damages in a condition of the plantar surface of the trial subject's foot that was based on data aggregation from computer diagnostics in 3D format may be a basis for not only determining the disease extent but also for establishing the necessary means for special training, as well as to regulate a load on feet during the recovery of the feet functions.

REFERENCES

Ammann R. and Wyss T. (2015). Running Asymmetries during a 5-Km Time Trial and their Changes over Time. In *Proceedings of the 3rd International Congress on Sport Sciences Research and Technology Support*, pp.161-164.

Bakaev, V.V.,Bolotin, A.E.,Vasil'eva, V.S. (2015). Factors determining sports specialization of cross country skiers. *Teoriya i Praktika Fizicheskoy Kultury, (2),* pp.40-41.

Bakaev, V.V.,Bolotin, A.E.,Aganov, S.S. (2016). Physical training complex application technology to prepare rescuers for highland operations. *Teoriya i Praktika Fizicheskoy Kultury, (6),* pp.6-8.

Bakayev V., Vasilyeva V., Kalmykova S., & Razinkina E. (2018). Theory of physical culture - a massive open online course in educational process. *Journal of Physical Education and Sport,* 18(1), pp.293-297. DOI: 10.7752/jpes.2018.01039

Bolotin, A. E. Bakaev V. V. (2015). Structure and content of the educational technology of managing students' healthy lifestyle. *Journal of Physical Education and Sport,* 15(3), pp.362-364.

Bolotin, A., & Bakayev, V. (2017). Pedagogical conditions necessary for effective speed-strength training of young football players (15-17 years old). *Journal of Human Sport and Exercise, 12*(2), pp. 405-413.

Bolotin A, Bakayev V. (2017). Peripheral circulation indicators in veteran trail runners. *Journal of Physical Therapy Science,* 29, pp. 1092–1094.

Bolotin A., Bakayev V. (2016). Factors that determine high efficiency in developing speed and strength abilities of female hurdlers. *Journal of Physical Education and Sport,* 16(3), pp.910-913.

Bolotin A., Bakayev V. (2017). Method for Training of Long Distance Runners Taking into Account Bioenergetic Types of Energy Provision for Muscular Activity. In *Proceedings of the 5th International Congress on Sport Sciences Research and Technology Support*, pp. 126-131.

Bolotin A., Bakayev V. (2017). The differences in response of the respiratory system of long and middle-distance runners and their influence on recovery rate. *Journal of Physical Education and Sport,* 17(4), pp.2443-2446. DOI: 10.7752/jpes.2017.04272

Gorshova I., Bohuslavska V., Furman Y., Galan Y., Nakonechnyi I., Pityn M. (2017). Improvement of adolescents adaptation to the adverse meteorological situationby means of physical education. *Journal of Physical Education and Sport*, 17(2), 892-898. DOI:10.7752/jpes.2017.02136

Ivashchenko O., Yarmak O., Galan Y., Nakonechnyi I., & Zoriy Y. (2017). Leadership as a fundamental aspect of the performance of student-athletes in university men's sports teams. *Journal of Physical Education and Sport*, 17, Supplement issue 2, 472– 480. DOI:10.7752/jpes.2017.s2071

Kalmykova, S.V.,Pustylnik, P.N., & Razinkina, E.M. (2017). Role scientometric researches' results in management of forming the educational trajectories in the electronic educational environment. *Advances in Intelligent Systems and Computing*, Vol. 545, pp.427-432.

Kuznetsova Z., Kuznetsov A., Mutaeva I., Khalikov G. and Zakharova A. (2015). Athletes Preparation based on a Complex Assessment of Functional State. In *Proceedings of the 3rd International Congress on Sport Sciences Research and Technology Support*, pp. 156-160.