Individual orthotic insoles applying walking endurance building model for 60-plus year-olds with musculoskeletal disorders

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Abstract

Objective of the study was to develop and test benefits of individual orthotic insoles applying walking endurance building model for senior people with musculoskeletal disorders.
Methods and structure of the study. We sampled for the study the 60+ year-olds (n=35) with musculoskeletal disorders including foot deformities. Based on prior computerized podometric tests, every subject was offered individual orthotic insoles for a monthly endurance-building walking therapeutic model. The group was trained on a self-reliant daily basis with progress self-test data fixed in the individual logbooks. The individual progress in the model testing 30-day experiment was rated by the pre- versus post-experimental questionnaire surveys and interviews under the Healthy Foot and Active Longevity Project sponsored by the Presidential Grant Foundation. We used the following study methods: theoretical and practical literature analysis; questionnaire surveys, interviews; clinical examinations; computerized podometry, progress tests, and a standard mathematical statistics toolkit.
Results and discussion. The individual orthotic insoles applying walking endurance-building model for senior people with musculoskeletal disorders was tested beneficial as verified by the significant progress of the sample in the model testing experiment on the pain tolerance and endurance test scales.

Keywords: *musculoskeletal disorders, endurance, seniors, walking therapy, individual orthotic insoles, physical training, pains, foot deformities.*

Background. It is quite common that morphological and functional regresses with age result in multiple musculoskeletal disorders including arthritis, arthrosis, joint stiffness, joint pains, ligament ruptures, skeletal muscle atrophy, associated with regresses in the muscular strength and contractions [6]. Modern study reports recommend walking as the most accessible and effective physical training method for senior people with musculoskeletal disorders even in clinical rehabilitation periods [1].

Walking with its natural movements and physical training benefits due to the rehabilitative movement structure driven by the striding reflexes is commonly recommended as adaptable for the self-reliant trainings of senior people. One of the special benefits of walking practices is that they do not need daily supervision from physical training specialists or special equipment, facilities and financial investments. Walking is known to improve functionality of the cardiovascular, respiratory and nervous systems, develop and improve the trainees' musculoskeletal system and build up general endurance [5].

It should be mentioned, however, that the rehabilitative benefits of walking practices may be overshadowed by further MS regresses [3] in case of foot deformities diagnosed, as reported by statis-

tics, in more than 90% of senior people and dominated by flat footedness [2]. Modern individual orthotic insoles are recommended as the effective foot deformities correcting, biomechanical function rehabilitating and joint pain mitigation tool [4]. We used a variety of individual orthotic insoles in our foot biomechanics rehabilitation model with a special priority to endurance and motor activity of the seniors.

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Results and discussion. The prior questionnaire survey, interviews and clinical examinations found foot deformities in every subject as demonstrated by the computerized podometric test data dominated by the uneven static load distribution in the legs and feet, with compensatory body mass center (BMC) shifts diagnosed in 100% of the sample. The interviews revealed, that despite the obvious varus (81%) and hallux valgus (41%) deformities, many in the sample still believed having no musculoskeletal disorders and had no idea of their walking-related pains being due to the foot deformities. Being unaware of the modern foot biomechanics restoration methods for further physical activation, they tended to limit their physical activity to avoid pains.

The walking pains were rated by the sample on a 10-point scale, with the maximal 10 points meaning unbearable pains in either of the following three sole and three MS areas: sole under toes 2-3, under the big toe, in the heel, knees, hips and lower back. For 94% of the sample, 100m endurance test found the endurance being correlated with the pain strength, i.e. the higher is the pain the lower is the endurance (see Figure 1), with the actual physical activity limited by the painless walking distance.

Given on Figure 2 hereunder are the pre- versus post-experimental test data that show that the pre-experimental endurance of 37% and 56% of the sample was limited by 300m and 500m painless walking distances, respectively.

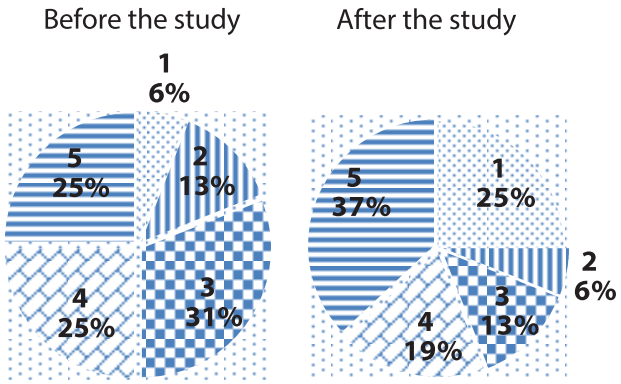

Figure 1. *Pre- versus post-experimental endurance test data*

1 – 300m maximum; 2 – 500m maximum; 3 – 1000m maximum;

4 – 2000m maximum; 5 – 3000m-plus

The pre- versus post-experimental survey data found benefits of the individual orthotic insoles applying walking endurance building model as verified by the statistically significant growth of the painless walking distances (see Table 1), with the virtually double distance growth as a result of the monthly experiment.

Table 1. *Pre- versus post-experimental endurance test data in the individual orthotic insoles application walking therapeutic model testing experiment*

Tests	Pre-experimental, X±m	Post-experimental, X±m
Distance, m	1200±30	1600±35
Pain, points	19,3±2,9	9±1,4

Conclusion. The individual orthotic insoles applying walking endurance building model for senior people with musculoskeletal disorders was tested beneficial as verified by the significant progress of the sample in the model testing experiment on the pain tolerance and endurance test scales.

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