

*The Research Center of Resources Saving Problems  
of the National Academy of Sciences of Belarus*



# BIOMECHANICAL RESEARCHES OF SPORTS MOVEMENTS AND WALKING EFFICIENCY OF PEOPLE WITH LOCOMOTORIUM'S DYSFUNCTION

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NARODOWA STRATEGIA SPÓJNOŚCI

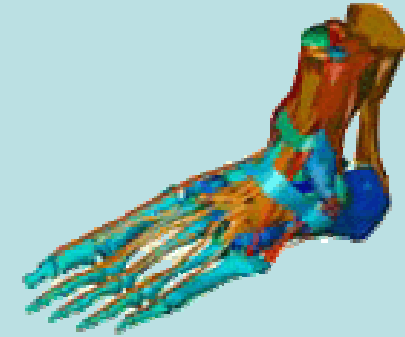
**UNIA EUROPEJSKA**  
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FUNDUSZ SPOŁECZNY



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## PROBLEM'S RELEVANCE

The project is aimed at developing the human capital by the joint researches and investigation of different factors influence at the man's locomotorium dysfunction.



The organization of the scientists and doctors collaboration and partnership, the smoothing of diagnostic and effective rehabilitation of locomotorium quality.



It is very important to use the new biomechanical methods and equipments for helping the people with the locomotorium's dysfunction to acquire a habit of efficiency of walking and sports movements.



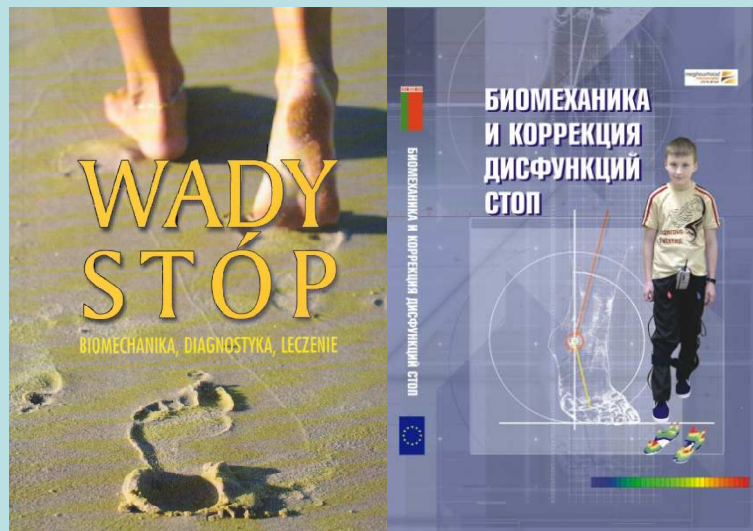
neighbourhood  
PROGRAMME  
JTS PL-BY-UA



## KNOWLEDGE TRANSFER

The First International Biomechanical Conference 2008 held in the region has promoted further progress in this scientific trend within the scientific communities of Belarussian & Poland, and intensified relations with the colleagues from Belgium, Canada, Russia and Ukraine.

The subjects of the conference: biomechanics and diagnostics of foot dysfunctions, conservative methods of correction and rehabilitation, surgical methods of correction of a foot pathology.



Two monographies are published:

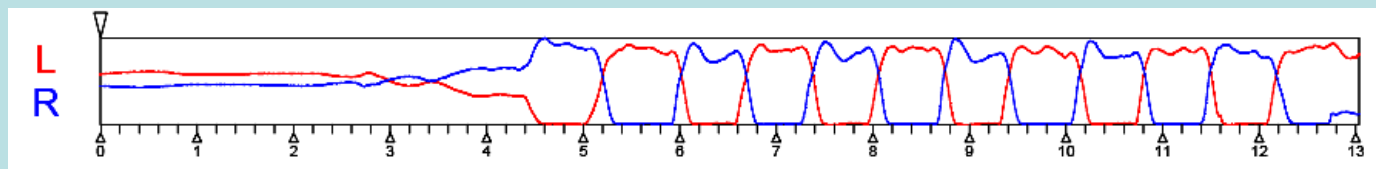
1. Foot dysfunction - biomechanics, diagnostics and treatment. Editor B. Krupicz. [et al.]. – Bialystok: Bialystok Technical University, 2008. – 108 p.
2. Derlatka, M. Ihnatouski M., Lahkovski V. Biomechanics and correction of the foot's dysfunctions / M. Derlatka, M. Ihnatouski, V. Lahkovski [et al.]. Editor A.I. Sviridenok & V.V. Lahkovski. – Grodno: Grodno State University, 2009. – 276 p.

# METHODOLOGY OF PEDOBAROMETRY

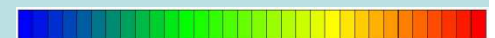
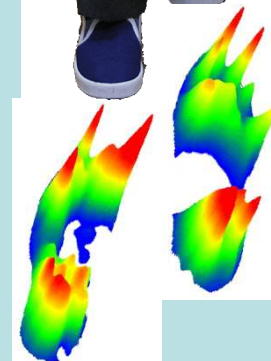
The parameters of human plantar contact with a surface and characteristics of his gait are studied on the base of barometric insoles imparted a function of measuring local pressure values.

The methods of representing barometric information obtained by the pressure measuring instruments of the human plantar onto the contact surface during walking have been developed.

The presentation of barometric data in terms of time and phase variables along with the patterns of data elements makes grounds for analyzing independently of of the type of the barometric instrument.

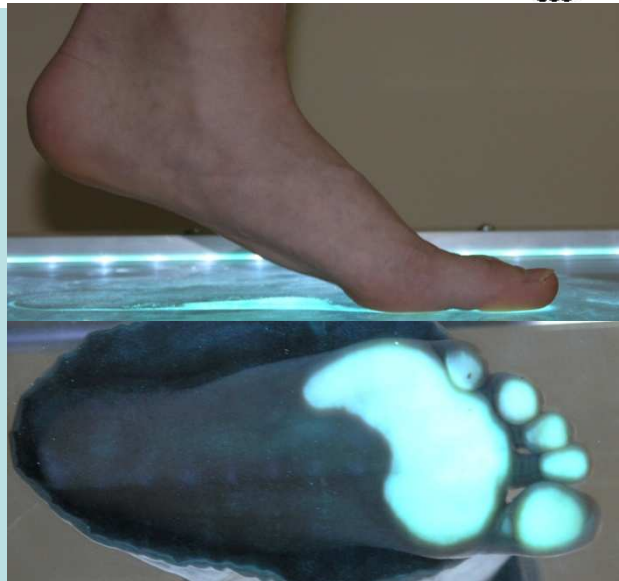
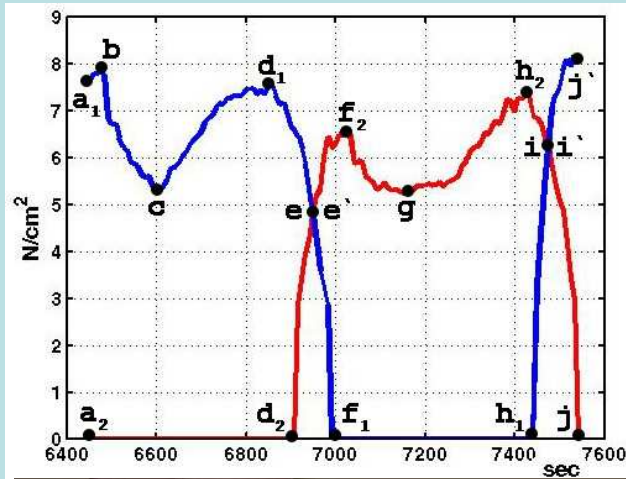


**A combination of a set of instant values of the left and right measuring insoles reflecting immobility during 4.5 s and steps approximately 2.5 s**



# METHODOLOGY OF PEDOBAROMETRY

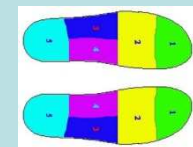
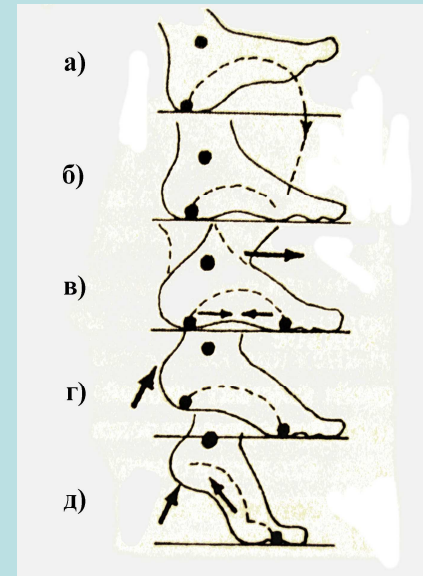
A model has been developed to describe the biped gait in a phase space of step parameters based on the analysis of pedobarometric information.



The anatomic phases of a step are presented as both the sequences of instantaneous value sets and the statistics of these sets.

The analysis of the trajectory gives us its spatial characteristics, namely, length and rocking in response to dimensions of a rectangle circumscribing the considered line, and the dominant displacement angle.

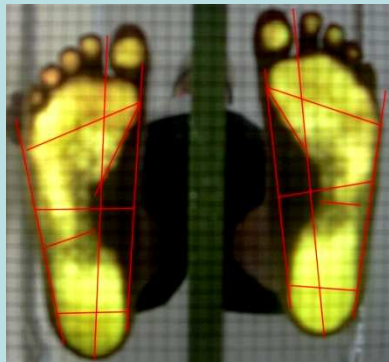
The analysis of the averaged values of the elements and the comparison to the parameters of time sequences is made to evaluate the stability factor within the frames of non-anatomic phase sequences.



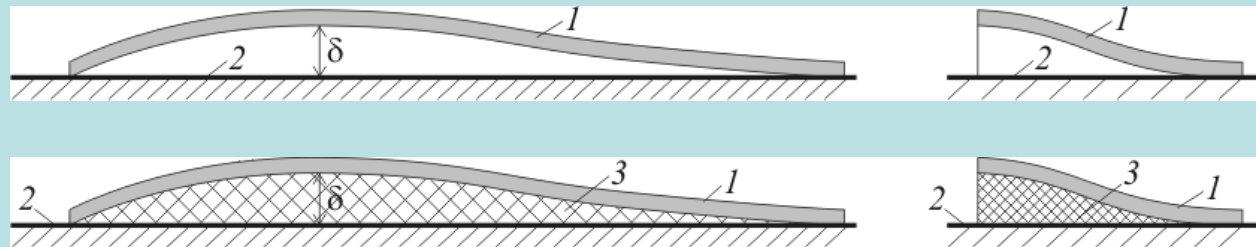
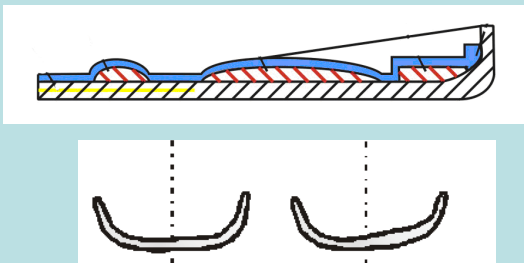
# INDIVIDUAL ORTHOPEDIC INSOLES



Individual orthopedic insoles are the complex, multipurpose and multilayered construction consisting of different materials, distinguished by physicomechanical, organoleptic and hygienic properties.



A problem has been solved on the elastic deformation of the bearing damping part in area of longitudinal arch of the orthopedic insole propping against edges without a support.



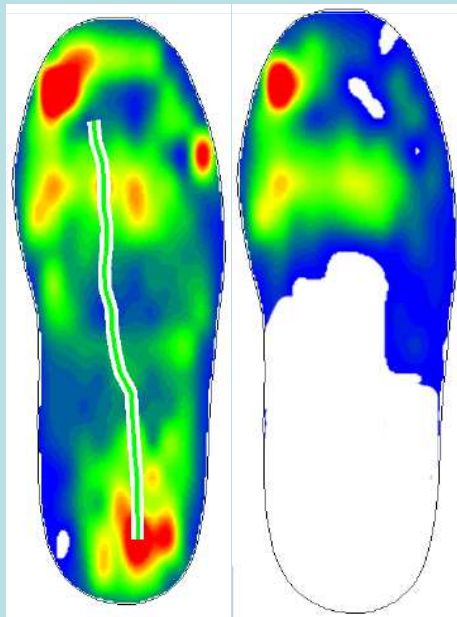
# INDIVIDUAL GAIT CORRECTION AND SPORT MOVEMENTS TRAINING



Through a detailed knowledge of normal function and the types of gait errors that the various pathologic conditions can introduce, the clinician becomes able to define the significant deficits and plan appropriate corrective measures.

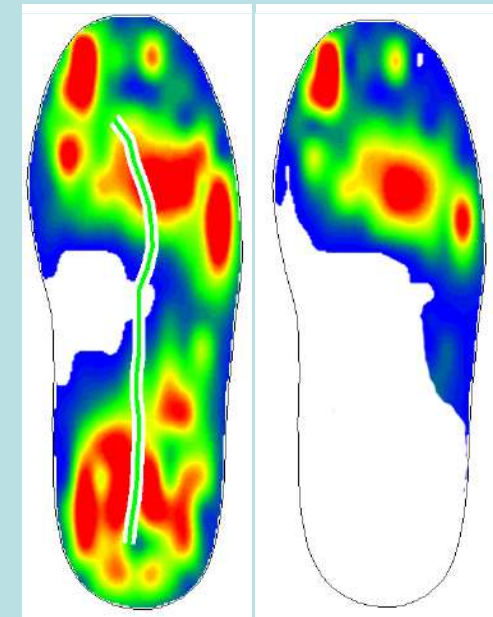


The components of walking-progression, standing stability, and energy conservation-involve distinct functional patterns. These need to be understood for an appropriate interpretation of some of the limitations displayed by patients.



a)

b)



a)

b)

Fig. pedobarogram:

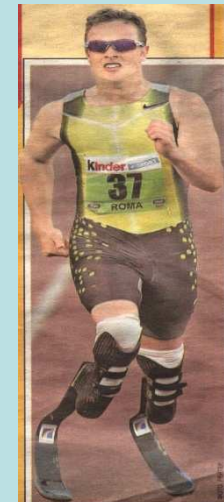
a) integral representation; b) snapshot

# CONCLUSION

The technique of the helping for people with locomotorium's dysfunction to acquire a habit of efficiency of walking and sports movements will be elaborated and tried out.

The pedobarometric devices and a special CAD access system will be used for:

- selection and designing of orthopedic insoles or footwear;
- acquisition of skill of efficiency of walking and sports movements.



# Thank you for Your attention !



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