

### TEST FLEXE PRSTŮ K ROZPOZNÁNÍ PATOLOGIE NOHY. KLINICKÉ PŘÍZNAKY. PROFYLAXE. TERAPIE

### FLEXIONS TOES TEST TO RECOGNIZE THE PATHOLOGY OF THE FOOT. CLINICAL SYMPTOMS. PROPHYLAXIS. THERAPY

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### ABSTRACT

The feet of infants and children go through different developmental stages during life. Sometimes we can see incorrect anatomy, sometimes various deformities – congenital, neurological, connected with “Syndrome of Contracture and Deformities” according Prof. Hans Mau and other disorders. In adults – foot deformities and pain syndromes can be a result of restricted movement of the foot joints. In the article we present the deficit of the toes flexion in metatarsal – phalangeal joint and examples of the “pain syndromes” as the result of this pathology. The problem was discovered in 1971 and from this time many cases have been observed throughout the many years of all the author’s professional activities. The first publication about this problem was in the Polish Orthopedic Journal in 1971, the next in the German Orthopedic Journal in 1985.

**Key words:** foot anatomy, foot physiology, foot pathology, toes flexion test

### INTRODUCTION

The feet – part of the human body – which are important for standing, walking, running, jumping and other activities, at work and in sports (**References 1–29**). Due to the specific anatomical structure of the bones of the feet and the full range of motion in all parts of the foot – we can function without difficulty, in every situation and in every period of our lives.

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The correct and unrestricted movement of the ankle joint, the subtalar joint and the metatarsal – phalangeal joints is particularly important. The latter is very important when walking, running or jumping.

## Functional anatomy of the foot

Proper foot anatomy and full, unrestricted movement at each joint of the foot is a prerequisite for normal function. Especially important is the correct range of motion at the ankle joint - dorsal flexion, in other words “extension” and plantar flexion – when walking up stairs, climbing a mountain and jumping. Any rotational movement in this joint is pathological and can cause instability, swelling and pain. We have described these disorders in articles in the USA (3 publications), India (1 publication), and Czech Republic (1 publication) in 2017–2021 (**References 19–29**).

Other, important joints in the feet are the metatarsal – phalangeal joints of all the toes. Proper of plantar flexion range of the toes is crucial for daily activities. Proper, pain free walking is only possible when the plantar flexion of the toes is unlimited. Every limitation of plantar flexion of the toes is the cause of “foot pathology” and this problem is described on many cases in this paper (**Fig. 3a, 3b, 3c, 4a, 4b, 5a, 5b, 5c, 6a, 6b, 6c, 7a, 7b**).

**Toe flexion test to identify the state of foot function.** The first publication about this problem was in the Polish Orthopedic Journal (**Chirurgia Narządów Ruchu i Ortopedia Polska**) in 1971 and next in the German Orthopedic Journal (**Beiträge zur Orthopädie und Traumatologie**) in 1985 (**Fig. 1**) as well as in many others publications (**References 4–26**). The foot has two important parts – tarsus – “standing part” and forefoot – “active part” – important in walking (**Fig. 2**). We have found, that “plantar flexion” of the toes in metatarsal – phalange joints is different in children, different in youth and specially in adults. (**Fig. 3a, 3b, 3c, 4a, 4b, 5a, 5b, 5c, 6a, 6b, 6c, 7a, 7b**). We observed in the following years of our life, that the range of this movement is more and more restricted and in many patients significantly small. The range of this movement is age related – bigger in children, smaller in adults.

In the paper we inform also about two other forms of feet pathology connected with limitation of the plantar flexion of the toes. There are patients with the Friedreich syndrome and patients with the Köhler II disease. The Köhler II disease is an aseptic necrosis of the metatarsal bone head – mostly second, and mostly connected with using of improper shoes, which disturb the blood circulation in the frontal part of the feet (**Fig. 8, 9a, 9b**).

## MATERIAL

In our orthopedic activity – T. Karski since 1961 and J. Karski since 1989, J. Pyrc since 1996 we have treated many thousands of people of various age – children, youth and adults with feet problems. In this paper we present examples of the cases of feet pathology connected with limited toe flexion.

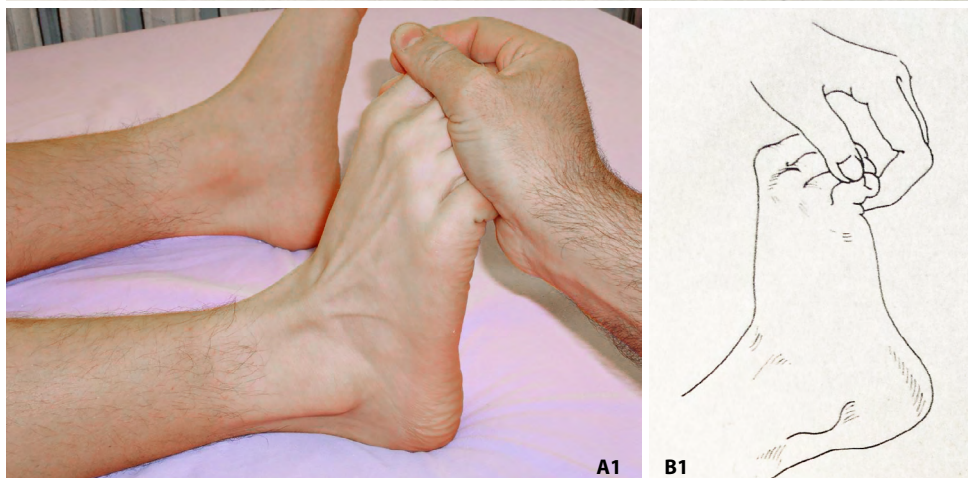
TOMASZ KARSKI

PRZYDATNOŚĆ TESTU ZGIĘCIA PODESZWOWEGO PALCÓW  
W OCENIE NIETYDOLNOŚCI STOP

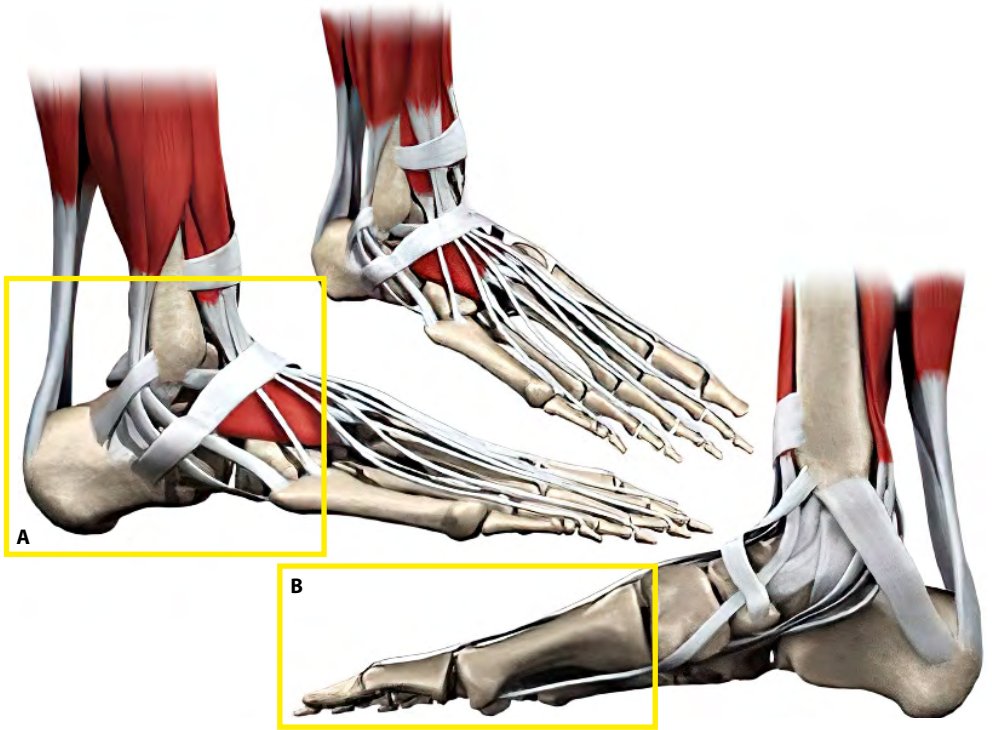
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Der Zehenflexionstest  
zur Erkennung frühzeitiger Stadien von Funktionsstörungen  
und Deformitäten des Vorfußes<sup>1</sup>

B Von T. KARSKI



**Fig. 1.** History of the discovery of the 'toe flexion test'. Exercises in the therapy of 'painful feet'. (A) – publication in Poland (1971), (B) – publication in Germany (1985 – with the help of Dr F. Lettow, Neuruppin), (A1) (B1) Example of exercises performed by a physiotherapist.



**Fig. 2.** Foot anatomy (picture from the Internet): 26 bones, 33 joints, over 100 muscles and tendons. Part (A) important for standing. Part (B) important for walking. Full flexion in metatarsal – phalangeal joints allow normal activity – walking, running, jumping, working, every kind of sport.



**Fig. 3a, b, c.**

**a:** Full flexion in metatarsal – toe joints. No problems with walking.

**b:** Limited flexion in metatarsal – toe joints. Problems with walking. Pain.

**c:** Maximally limited flexion in metatarsal – toe joints. Extremely big problems with walking. Pain in every step.



**Fig. 4a, b.** Female, 19. Student. Toe flexion test – fully physiological. Active flexion of toes of both feet till 50°. No problems with walking and with daily activities. No pain.



**Fig. 5a, b, c.** Female, 54, gardener. Problem with feet. Difficulties in walking. Pain after walking longer distances. Partially limited plantar flexion of the toes Flexion test – 30° flexion in metatarsal – phalanges joints. Additionally, valgus of knees and so-called idiopathic scoliosis in the new classification – 2A group – left convex lumbar curve. In therapy – flexion exercises for the toes.



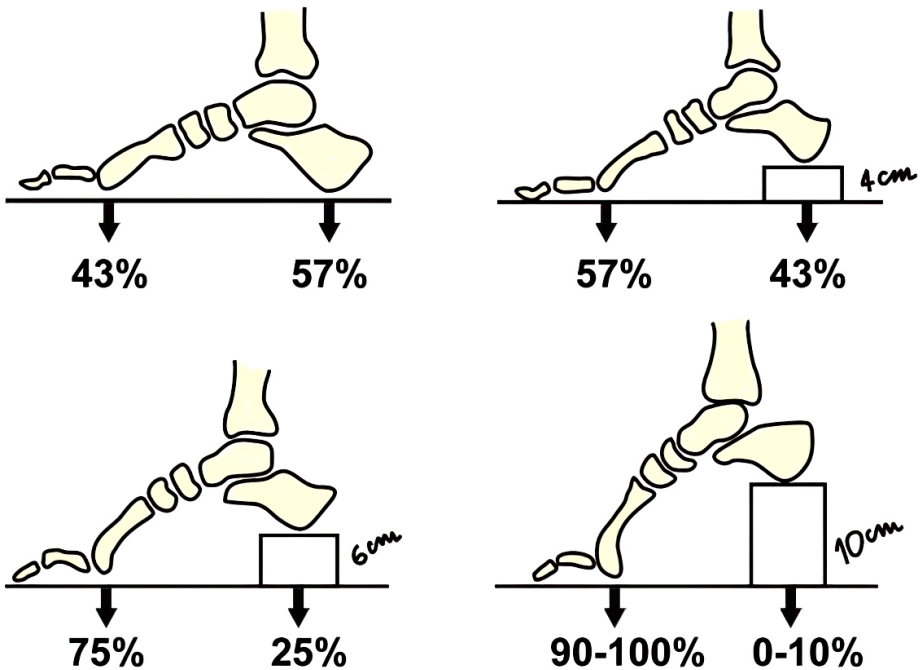
**Fig. 6a, b, c.** Man, 66, architecture engineer. Problem with feet. Difficulties in walking. Pain in every step. Maximally limited plantar flexion of the toes. Flexion test – maximal pathology – zero flexion in metatarsal – phalanges joints. Additionally, varus of shanks and so-called idiopathic scoliosis – in the new classification – 3<sup>rd</sup> group. Totally stiff spine. No curves. In therapy – flexion exercises for the toes.



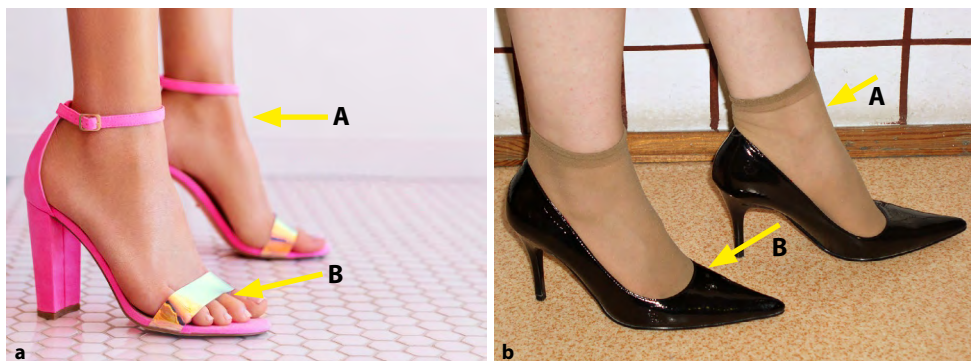


**Fig. 7a, b.** Female, 70. Maximal deformation of the feet. Pedes plani. Halluces valgi. The cause of hallux valgus on both sides and full hyperextension position of toes – wearing improper shoes in the youth. Flexion test – maximal pathology. Extensive pain in feet.

Fully unable to walk. Range of flexion of toes in metatarsal – phalange joints – hyperextension of toes 50°.



**Fig. 8.** Picture from the Internet. Loading of the foot depending on the type of shoes. Pathologic role of high heels. In result – disturbing of the gait, toe deformity, disturbing of blood circulation and in result – Morbus Köhler II or Morton metatarsalgia.



**Fig. 9a, b.** Improper shoes (Fig 9a – picture taken from the Internet). Heels too high. (A) Feet in plantar flexion. With the time limited dorsal flexion. (B) Toes in dorsal flexion. Normal propulsion in gait is impossible, walking disturbed.

## PHYSIOTHERAPY

Good experience in this therapy have co-authors of this paper – Mgr. B. Slowinska and Mgr. B. Boryga – both physiotherapists. When a patient come to us with a problem of pain in the front part of one foot or both feet, we should check the range of plantar flexion of the toes. When the plantar flexion of the toes is small – for example only 5 or 10 degrees, or 0 degree or even “contracture in hyperextension” this mean – the pain is connected with “disturbed function of the front part of the foot or feet” and additionally with deformities of the foot. When plantar flexion of the toes is limited, kinesiotherapy (**Fig. 10**), i.e., toe flexion exercises in warm water, or another form of therapy should be recommended. Exercises should be passive, performed with the help of physiotherapists, and also active, performed by the patient alone over a long period of time, even many months or years. Physiotherapists should also inform the patients about using the proper shoes. The treatment is long-term, it can take months or even years, but a positive effect we have to see in all patients. Good results have been observed also in patients with deformities like hallux valgus, “hammer toes”, valgus of the feet (**Fig. 7a, 7b**) – because the “first problem” is not connected with deformity but with “insufficiency of function”.

## DISCUSSION

**Knowledge for physiotherapists, rehabilitation doctors and general physicians.** People suffer, mostly because of pain syndromes of spine, of the hips, knees and shoulder. Nonetheless, many suffer because of feet deformities (**References 1–19, 28, 29**). This group of patients come to the doctor because of “pain syndromes” in the frontal part of the feet and difficulties in waking. This pathology is related with “restriction of the toes flexion” in the metatarsal – phalangeal joints. Limited flexion movement of toes disturb walking and other forms of daily activities. Very often in these patient groups the skin on the plantar surface of the feet is “pathologically changed” in the form of “thickness”, “corn”, footprint”, “toe prints”. In any form of deformity, such as hallux valgus, pain is the first



**Fig. 10.** Kinesiotherapy. Methods of the therapy – on the basis of publications from 1971 and 1985. Thermotherapy increases the effectiveness of exercises considerably.

priority. In the opinion of the patients, it is not the deformity but the limited plantar flexion of the toes that causes the difficulty. Passive and active plantar flexion exercises of the toes are important in therapy.

Another group of patients with foot problems are young girls with symptoms of “necrosis of the metatarsal head”, the so-called Köhler II disease. Also in this group – physiotherapy, toe flexion exercises and thermotherapy bring good results. Over the years – in observation of all the authors (see Literature) – the methods of therapy – to receive full flexion of toes is sole proper treatment.

## **CONCLUSION**

1. For proper function and normal activity of everyone it is necessary to have the proper anatomy of the bones, muscles and joints, full range of movements of joints and good blood circulation, nerve system function, as well proper function of all internal organs.



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2. Every limitation of joint movement is the cause of pain syndromes. These “pain symptoms” we observe in the spine, in the hips, knees, shoulders and also in the feet.
  3. The problem of instability of the ankle joints with symptoms of pain, or swelling in the tarsus region, disturbances of walking is described in articles in the USA, India, Czech Republic in 2017 – 2021 (see references).
  4. The limited plantar flexion in the metatarsal – phalangeal joints of the feet is the cause of pain, disturbance when walking and in other daily activities.
  5. The limitation of plantar flexion of the toes is caused by wearing a “too narrow improper shoes” in the early period of life.
  6. Too “narrow improper shoes” are also the causes of deformities like hallux valgus, “hammer toes”, necrosis of the head of metatarsal bones (Köhler II disease) and various skin pathologies.
  7. In the paper we present the “toe flexion test”, examples of pathology and we give advice for physiotherapy.

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