

# Aplikovaná kineziologie - Skolióza -

Mgr. Pavlína Bazalová



„Ze skoliózy dítě vyroste.“

„Skolióza je způsobená tím, že například nosíme batoh na jednom rameni.“

„Skolióze lze předejít.“

„Děti, které mají skoliózu, nemohou sportovat.“

„Skolióza může způsobit poruchu orgánů.“



**CO JE TO SKOLIÓZA?**

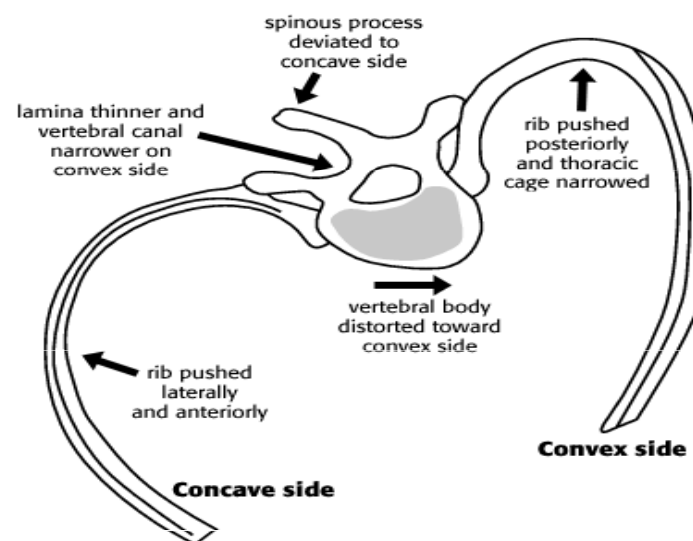
**KDY HOVOŘÍME O SKOLIÓZE  
A KDY O SKOLIOTICKÉM  
DRŽENÍ?**

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# Skolióza

= 3D deformita páteře

Skolióza představuje patologické zakřivení ve frontální rovině nad 10 stupňů, je většinou spojena s rotací obratlových těl (ev. deformita žeber) a pravidelně doprovázená porušením fyziologických zakřivení v sagitální rovině (nejčastěji hrudní hypo- či hyper- kyfóza).



Zdroj: <https://rad.washington.edu/about-us/academic-sections/musculoskeletal-radiology/teaching-materials/online-musculoskeletal-radiology-book/scoliosis/>





# Skolióza x skoliotické držení

- Skolióza
  - 3D deformita
  - Potvrzení RTG snímkem
  - gibus
- Skoliotické držení (funkční skolióza)
  - Změna ve frontální rovině
  - Na RTG - není deformita obratlů



# Rizikové faktory

- Mladší věk
- Pohlaví
- Rodinná zátěž
- Hypermobilita

## Riziko progrese

- RF
- Křivka - oblast TH
- Dekompenzovaná křivka
- Kostní věk (Risserovo znamení 0,1)
- Tíže křivky (20° a více)
- Růstové spurty (Peak height Velocity)

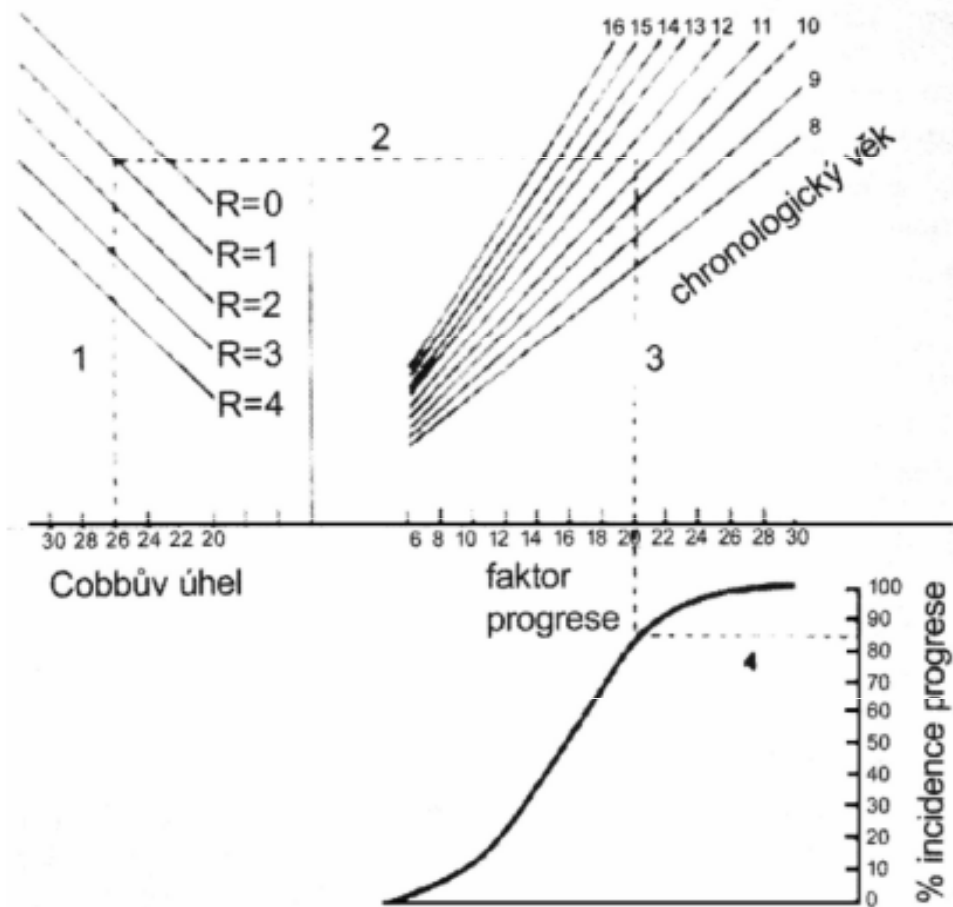
## Faktor progrese

Přímo závisí na velikosti křivky, Risserově znamení

Nepřímo na věku pacienta

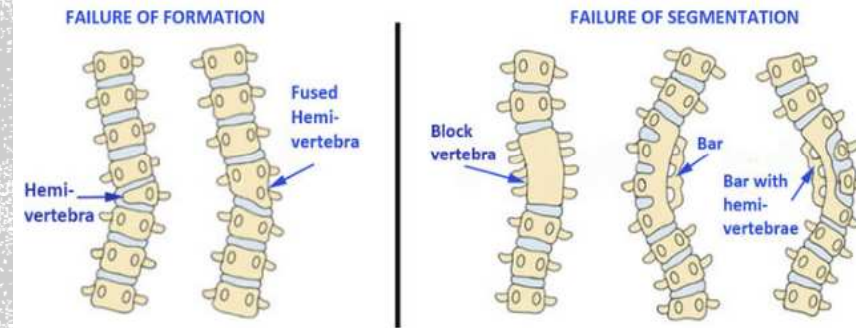


Obr. č. 6) Nomogram podle Lonsteina.



# Klasifikace skoliózy → dle etiologie

- Kongenitální (poruchy segmentace, poruchy formace)
- Idiopatická
  - Infantilní, juvenilní, adolescentní
- Neuromuskulární (DMO)
- Při neurofibromatóze
- Sekundární
  - Posturální, jiná onemocnění (+traumata, tumory), hysterická, reflexní, kompenzační



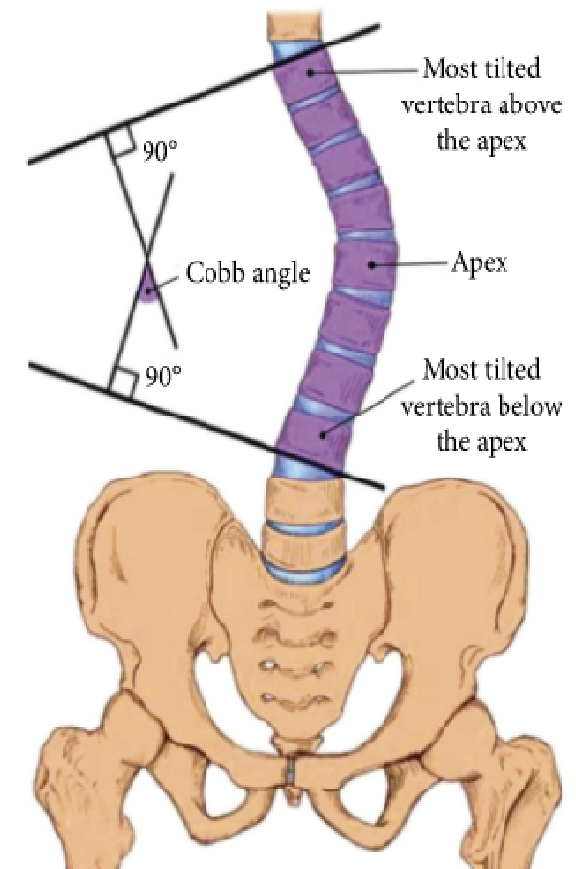
Zdroj: <https://www.srs.org/patients-and-families/conditions-and-treatments/parents/scoliosis/congenital-scoliosis>





# Klasifikace skoliózy → dle tíže křivky

- Do 10° (nepovažuje se za patologii)
- 11° - 30°
- 31° - 60°
- 61° - 90°
- Nad 90°

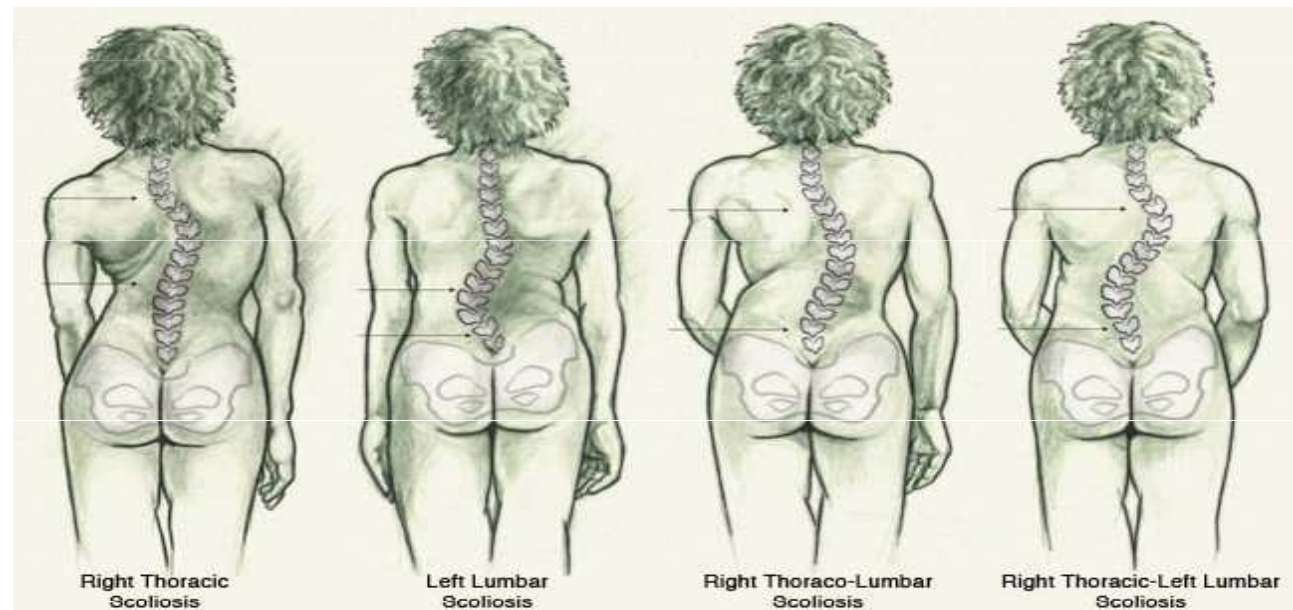


Zdroj: <https://www.hindawi.com/journals/cmmm/2019/6357171/>



# Klasifikace skoliózy → dle lokace křivky

- C, CTh, Th, ThL, L, LS
- „C“ křivka
- „S“ křivka

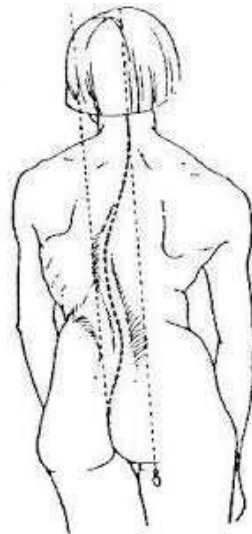


Zdroj: <https://www.vondt.net/cs/kde-jsi-zranil/bol%C3%AD-v-z%C3%A1dech/skolios-do/>

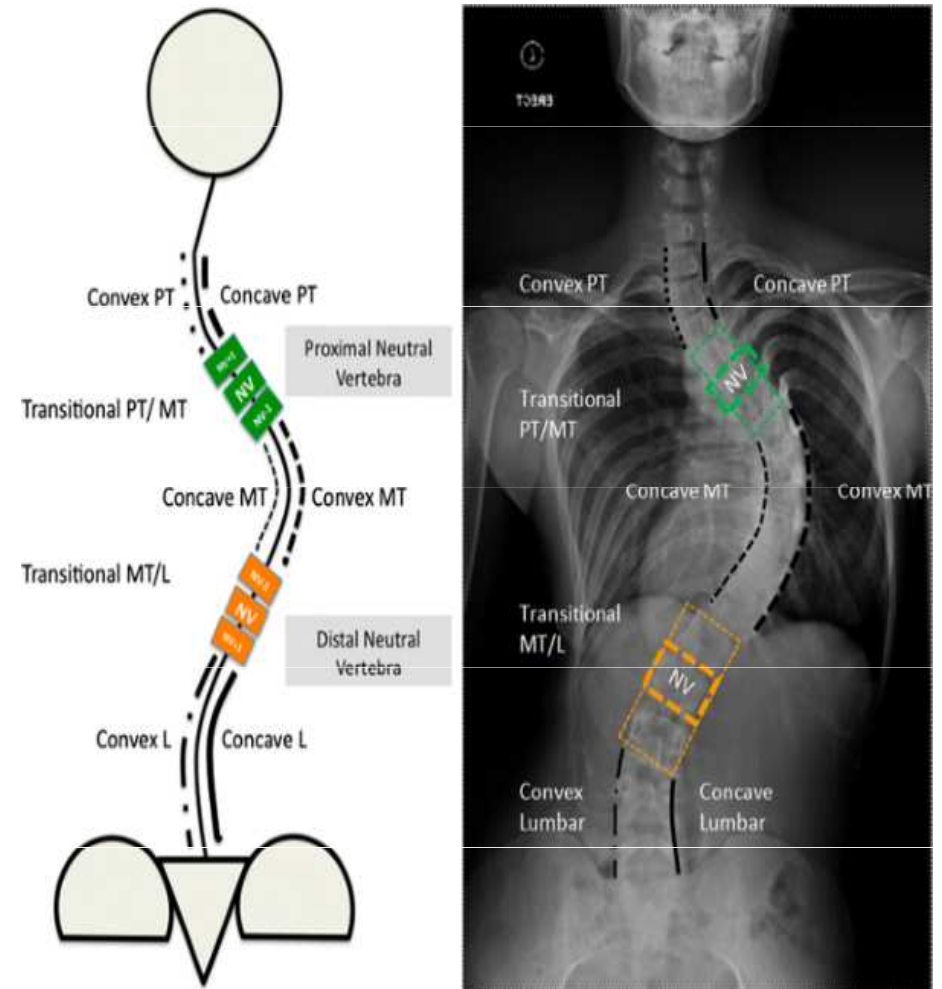


# Pojmy

- Hlavní křivka
- Vedlejší křivka
- Kompenzovaná a dekompenzovaná skolióza
- Koncový obratel
- Vrcholový obratel



<https://dspace.cuni.cz/bitstream/handle/20.500.11956/30835/130005592.pdf?sequence=1&isAllowed=y>



Zdroj: <https://link.springer.com/article/10.1007/s00586-017-5350-x>



# Vyšetření

1. Klinické vyšetření
  - Statické vyšetření
  - Dynamické vyšetření
  - Dech, respirační vlna, antropometrie
  - Hypermobilita
  - Neurologické vyšetření
2. Zobrazovací metody
  - RTG, CT, MRI, UZ
3. Funkční / přístrojová diagnostika
  - Spirometrie
  - Kardiologické vyšetření (těžké křivky)



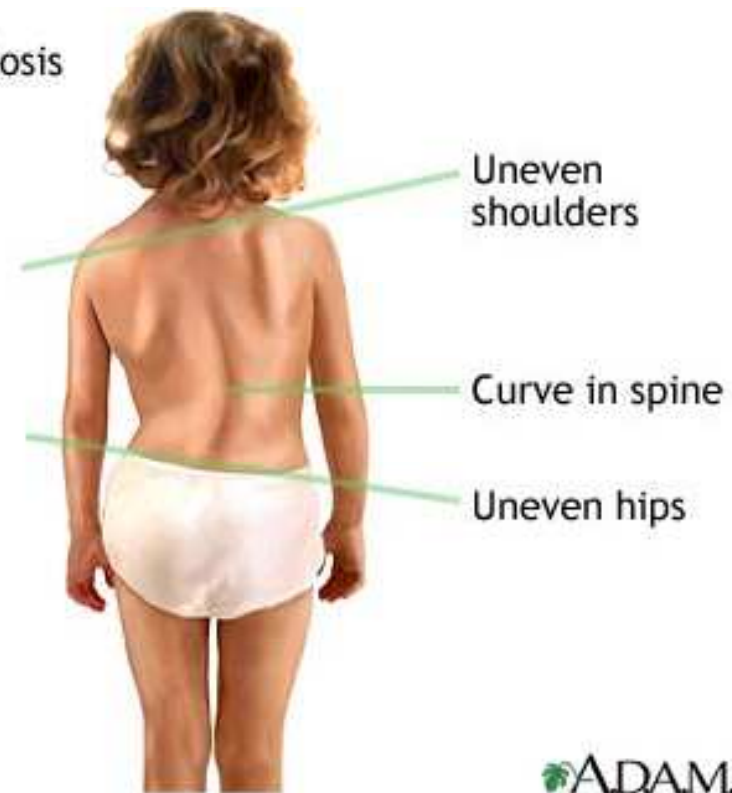


# 1) vyšetření – statika

STOJ



Signs of scoliosis



ADAM

Převzato z: BP - Možnost fyzioterapie u idiopatické skoliózy v období adolescence, Holečková 2022

<https://www.hudsonvalleyscoliosis.com/what-is-scoliosis/overview/>

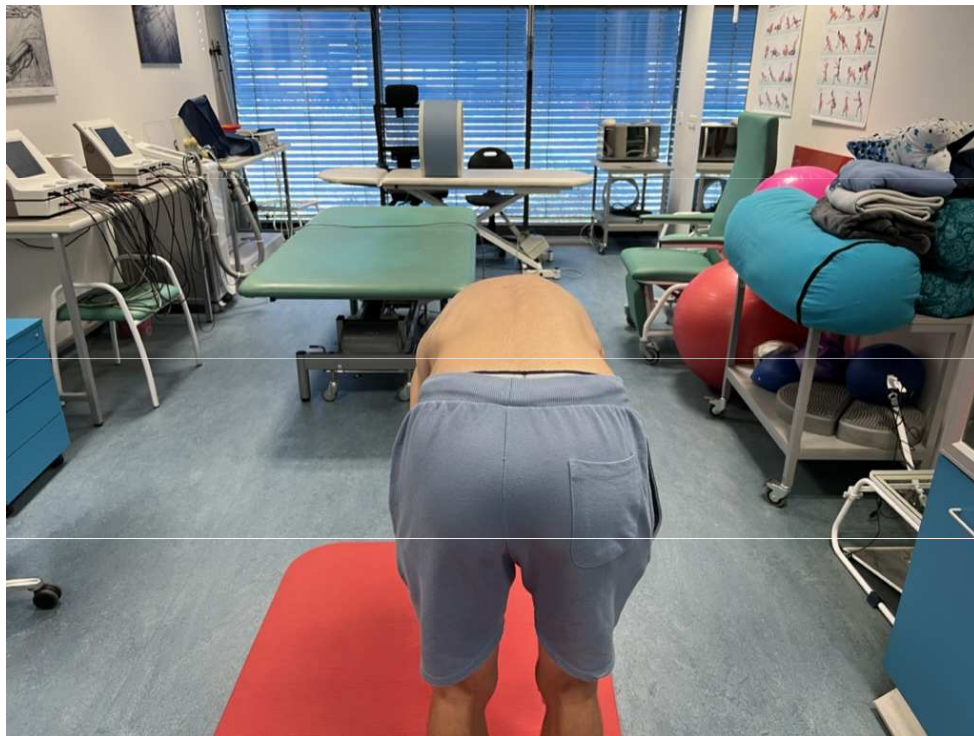








# 1) vyšetření – statika



Předklon - Adamsův test





[https://www.researchgate.net/figure/Measurement-of-the-rib-hump-on-a-a-plaster-model-and-a-b-scoliosis-patient-using-the\\_fig3\\_230588077](https://www.researchgate.net/figure/Measurement-of-the-rib-hump-on-a-a-plaster-model-and-a-b-scoliosis-patient-using-the_fig3_230588077)



<https://www.scoliosissos.com/blog/scoliometer-apps-are-they-worth-trying>



Zdroj: <https://rad.washington.edu/about-us/academic-sections/musculoskeletal-radiology/teaching-materials/online-musculoskeletal-radiology-book/scoliosis/>

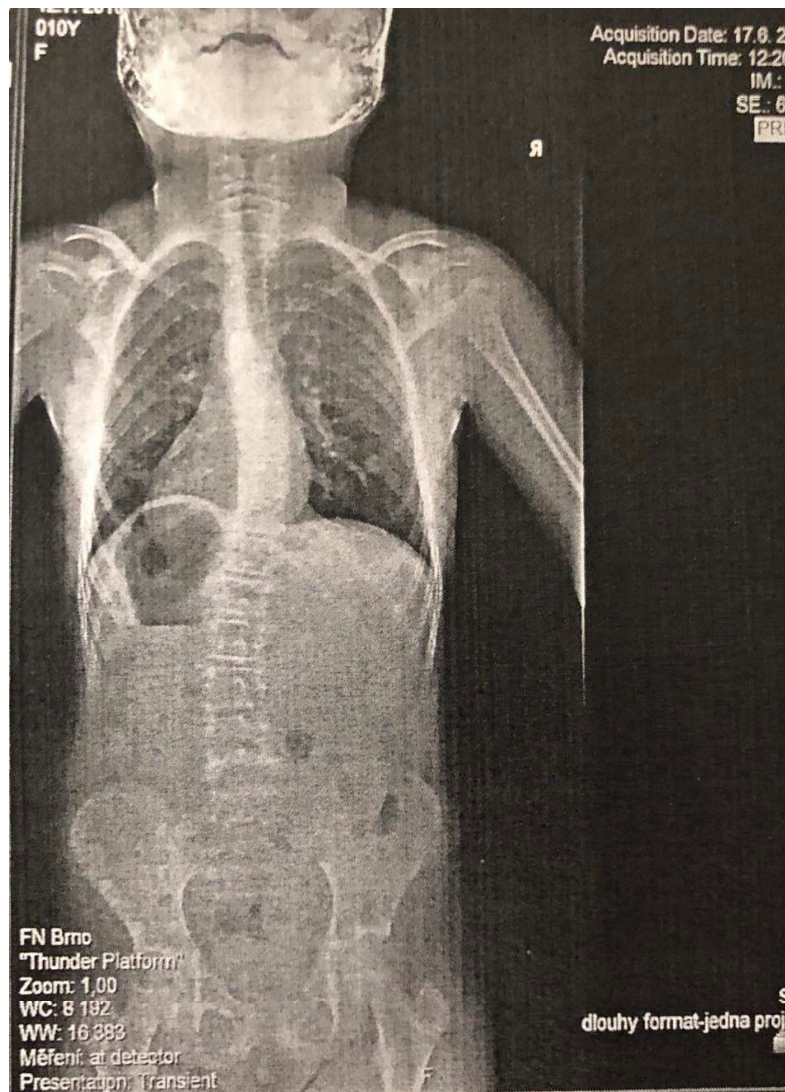
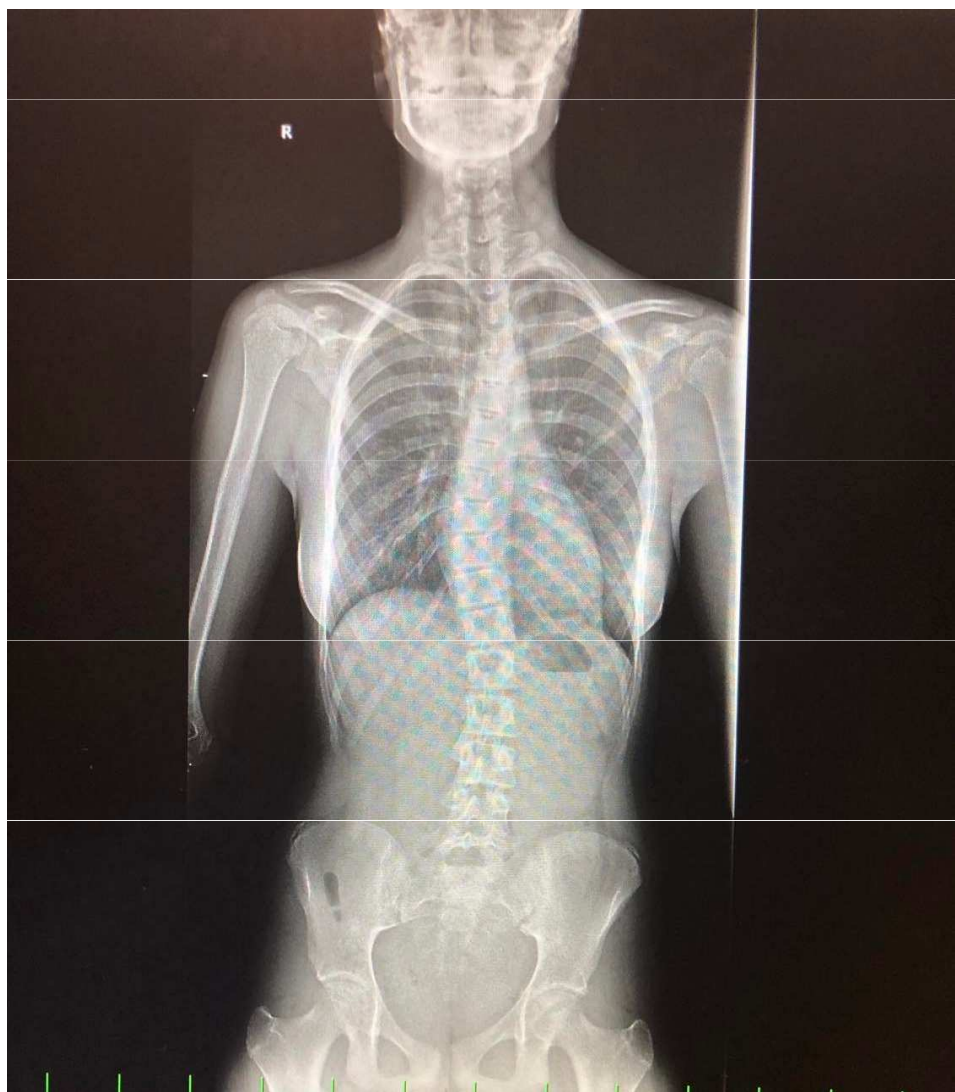
Zdroj: [https://www.researchgate.net/figure/Abbildung-2-Adams-Vorbeuetest-15-jaehriges-Maedchen-mit-einer-rechts-konvexen\\_fig2\\_220020884](https://www.researchgate.net/figure/Abbildung-2-Adams-Vorbeuetest-15-jaehriges-Maedchen-mit-einer-rechts-konvexen_fig2_220020884)

# Dynamické zkoušky páteře

- Schoberova vzdálenost - Lp, L5 + 10 cm kraniálně (předklon + 3-4 cm)
- Stiborova vzdálenost - Lp + Thp, L5- C7 (předklon + 7-10 cm)
- Forestierova fleche - Cp, protuberantia occipitalis
- Čepojevova vzdálenost - Cp, C7 + 8 cm kraniálně (anteflexe + 2,5-3 cm)
- Ottova inkliniční vzdálenost - Thp, C7 + 30 cm kaudálně (anteflexe + min 3,5 cm)
- Ottova rekliniční vzdálenost - Thp, C7 + 30 cm kaudálně (retroflexe - 2,5 cm)
- Thomayerova vzdálenost - 10 cm (30 cm)
- Lateroflexe







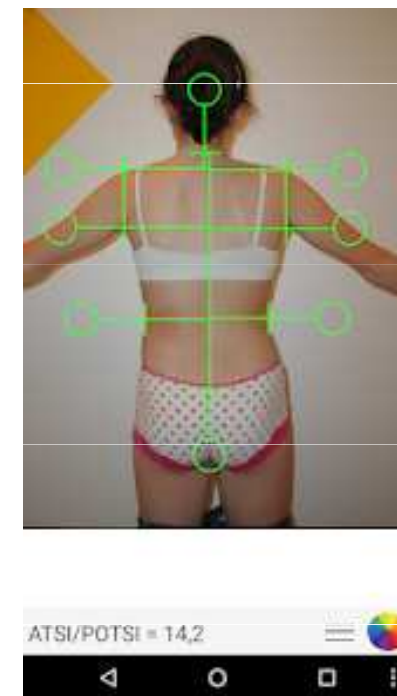
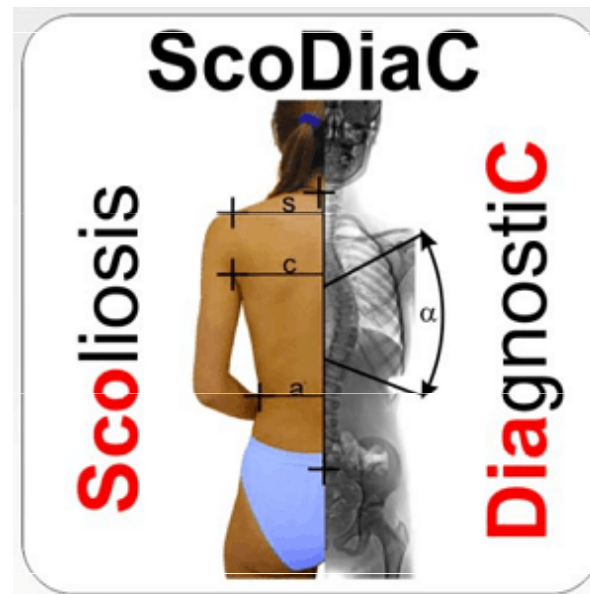
# Vyšetření – další možnosti

## ▪ Aplikace:

- ScoDiaC
- PotsiApp

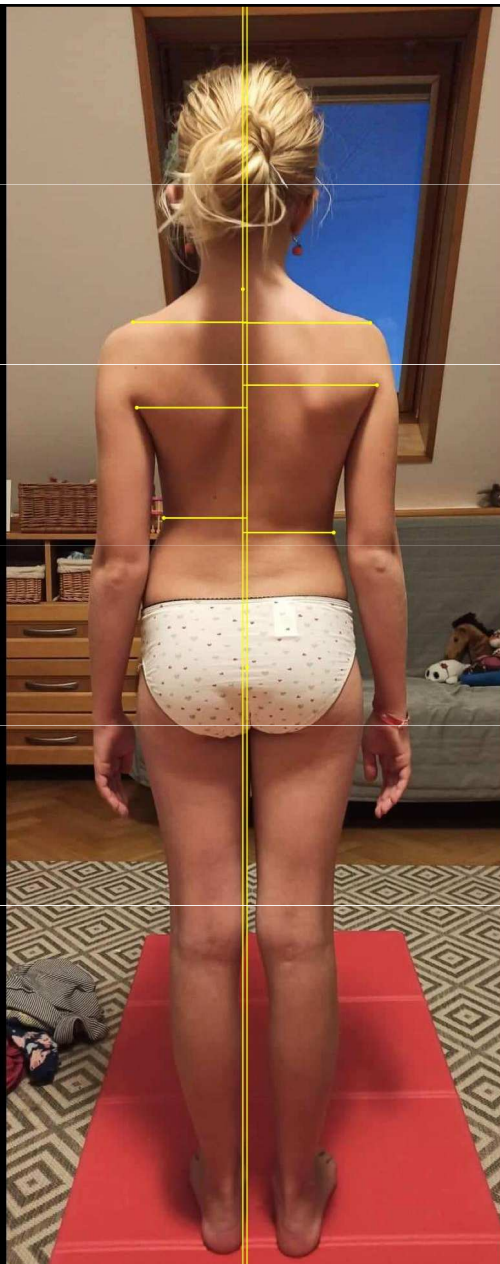
## ▪ Přístroje:

- Diers -rastrový obrázek
- Kombinace - termokamera

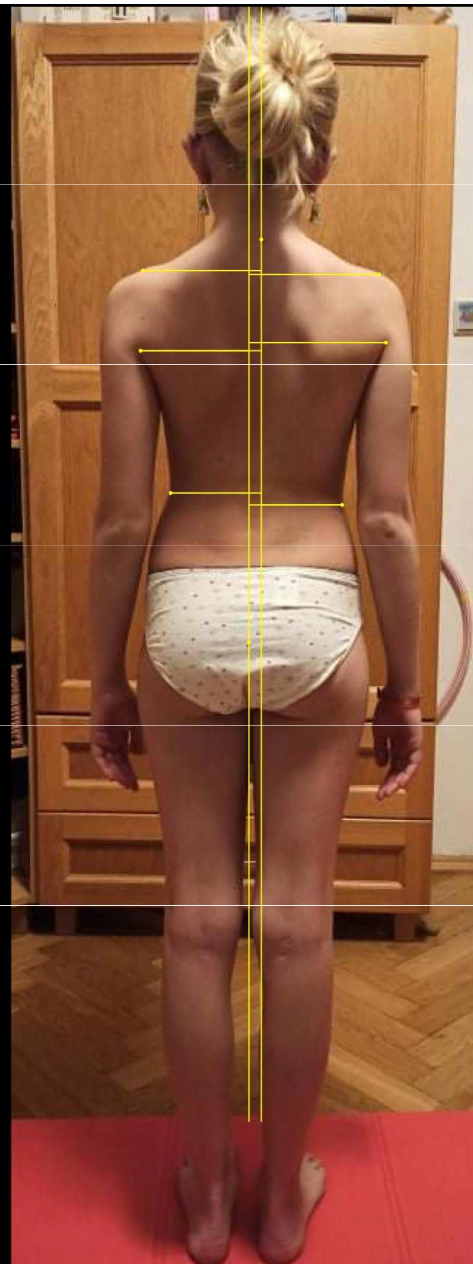


<https://institutoescoliose.com.br/wp-content/uploads/2019/09/SCODIAC-300x300.png>

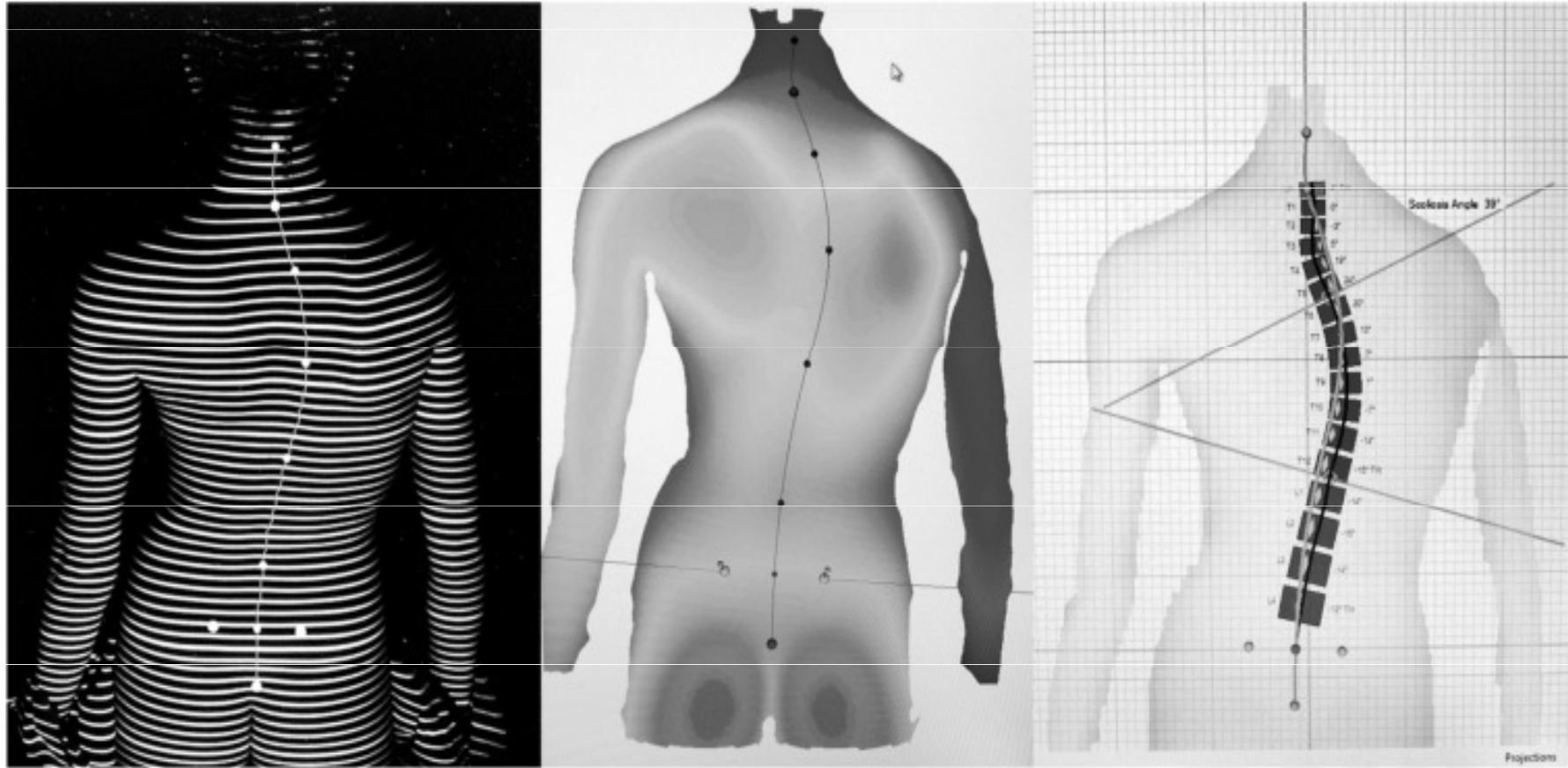
FAI=11.67  
HAI=9.96  
POTSI=21.64 pathologic



FAI=6.47  
HAI=5.92  
POTSI=12.39 pathologic







Zdroj: [https://www.researchgate.net/figure/Topographic-analysis-and-software-output-from-the-Formetric-4D-device\\_fig1\\_230659261](https://www.researchgate.net/figure/Topographic-analysis-and-software-output-from-the-Formetric-4D-device_fig1_230659261)





# Skolióza a sport?



# Skolióza a sport

Rekreační sport

x

Vrcholový sport



<https://www.hudsonvalleyscoliosis.com/celebrities-scoliosis/usain-bolt/>

Vhodné sporty ?

x

Nevhodné sporty





## Is physical activity contraindicated for individuals with scoliosis? A systematic literature review<sup>☆</sup>

[Bart N. Green](#),<sup>a,b,\*</sup> [Claire Johnson](#),<sup>c</sup> and [William Moreau](#)<sup>d</sup>

▶ [Author information](#) ▶ [Article notes](#) ▶ [Copyright and License information](#) ▶ [PMC Disclaimer](#)

### Recommendations:

- (1) brace-treated and surgically treated scoliosis patients have demonstrated that they can physically participate in physical activities at the same level as nonsurgical patients (grade C recommendation);
- (2) nonsurgically treated patients are encouraged to participate in sports and physical activity and scoliosis is not a contraindication to participation in most sports (grade D recommendation);
- (3) brace-treated scoliosis patients are encouraged to exercise with their brace on; however, exercise may also be done outside of the brace (grade D recommendation)
- (4) A potential association between elite-level competition in specific sports at an early age and an increased prevalence of scoliosis has been reported (grade C recommendation).

*„Most importantly, a causal association between participation in a specific sport and an increase in the prevalence of scoliosis in that sport should not be made without substantial investigation using prospective research designs, such as cohort studies.“*



[Eur J Phys Rehabil Med.](#) 2023 Apr; 59(2): 222–227.

PMCID: PMC10167700

Published online 2023 Mar 9. doi: [10.23736/S1973-9087.23.07489-0](https://doi.org/10.23736/S1973-9087.23.07489-0)

PMID: [36892518](https://pubmed.ncbi.nlm.nih.gov/36892518/)

## Sports participation reduces the progression of idiopathic scoliosis and the need for bracing

An observational study of 511 adolescents with Risser 0-2 maturation stage

[Alessandra NEGRINI](#),<sup>1,\*</sup> [Sabrina DONZELLI](#),<sup>1</sup> [Massimiliano VANOSI](#),<sup>1</sup> [Martina POGGIO](#),<sup>1</sup> [Claudio CORDANI](#),<sup>2</sup>  
[Fabio ZAINA](#),<sup>1</sup> and [Stefano NEGRINI](#)<sup>3</sup>

**Results:** We included 511 patients (mean age  $11.9 \pm 1.2$ , 415 females). Participants in the NO-SPORTS group showed a higher risk of progression (RR=1.57, 95% CI: 1.16-2.12, P=0.004) and failure (RR=1.85, 95% CI: 1.19-2.86, P=0.007) than participants in SPORTS. Logistic regression confirmed that the more frequent the sports activities, the less probable progression (P=0.0004) and failure (P=0.004) were.

**Conclusions:** This study shows that sports activities have a protective role against progression at 12-month follow-up in adolescents with milder forms of IS. Excluding high-level sports activities, the risks of progression and failure decrease with the increase in sports frequency per week.



Review > Arch Phys Med Rehabil. 2023 Aug;104(8):1314-1330.

doi: 10.1016/j.apmr.2023.01.019. Epub 2023 Feb 9.

# Associations Between Physical Activity and Adolescent Idiopathic Scoliosis: A Systematic Review and Meta-analysis

Meredith Newman <sup>1</sup>, Erin Hannink <sup>2</sup>, Karen L Barker <sup>3</sup>

Affiliations + expand

PMID: 36764428 DOI: [10.1016/j.apmr.2023.01.019](https://doi.org/10.1016/j.apmr.2023.01.019)

**Conclusion:** Adolescents who participate in more vigorous PA are less likely to be diagnosed with AIS. Ballet and gymnastics are associated with AIS diagnosis, but the direction of this association is uncertain. People with AIS are likely to do less vigorous physical and sporting activity compared with those without AIS, which could negatively affect health and quality of life. Further research is warranted into the inter-relations between PA and AIS, studies need to be of sufficient size, include men, and evaluate vigorous including higher-impact PA compared with moderate or light PA.



# Prevalence of idiopathic scoliosis in athletes: a systematic review and meta-analysis

Author affiliations • [Leila Mousavi](#)<sup>1</sup> , [Foad Seidi](#)<sup>1</sup> , [Hooman Minoonejad](#)<sup>1</sup>, [Farshad Nikouei](#)<sup>2</sup>.

## What is already known on this topic:

- Although precise idiopathic scoliosis (IS) prediction is impossible, there is a need to prevent the curve progression.
- The prevalence of IS is higher among females.
- IS can cause postural changes, standing instability and gait variations, as well as pain, poor quality of life and negative self-image.
- The prevalence of IS in athletes can be associated with sports injuries.

## What this study adds:

- The prevalence of IS in athletes was similar or higher to that as seen in other studies of the general population.
- **The prevalence of IS among ballet dancers (0.35) is significantly high.**
- This review showed a U-shaped curve of IS prevalence in athletic sports levels. Recreational and elite athletes exhibited a higher prevalence of IS.
- **Current literature does not provide enough information about all sports to determine which sport causes the highest prevalence of IS.**
- For more strong conclusions, we need high-quality epidemiological studies on male athletes as well as child athletes.



Wong AYL, Chan C, Hiller C, et al. Is Scoliosis Associated with Dance Injury in Young Recreational Dancers? A Large-Scale Cross-Sectional Epidemiological Study. *Journal of Dance Medicine & Science*. 2022;26(1):42-50. doi:10.12678/1089-313X.031522f

*Scoliosis was an independent risk factor for lumbar spine injury (Odds ratio, OR = 2.7), knee injury (OR = 2.6), and multi-site dance-related injury (OR = 1.9).*

Supartono B, Gamma R, Wiyono S, et al

P-3 The influence of scoliosis towards secondary osteoarthritis of the knee joint in athletes  
*British Journal of Sports Medicine* 2016;50:A33.

**Results:** The risk factors of secondary osteoarthritis in scoliosis athletes were not age, gender and type of sport, but Cobb's angle and curve shape of scoliosis. Scoliosis may lead asymmetrical shape of the spine and malalignment. Asymmetrical load distribution on the cartilage could be the underlying factor that may lead to osteoarthritis of the knee joint. Higher degree of scoliosis may increase the risk of cartilage damage and osteoarthritis. S-curve may increase the risk of osteoarthritis in the knee joint.

**Conclusion:** Secondary osteoarthritis among athletes may be caused by scoliosis that were characterised by Cobb's angle and curve shape of scoliosis. Athletes with moderate Cobb's angle degree have 7.5 times increased risk for secondary osteoarthritis compared with mild Cobb's angle. In addition, athletes with "S" curve of scoliosis have 3.2 times increased risk for secondary osteoarthritis compared with athletes with "C" curve of scoliosis





# Jak se skolióza řeší?

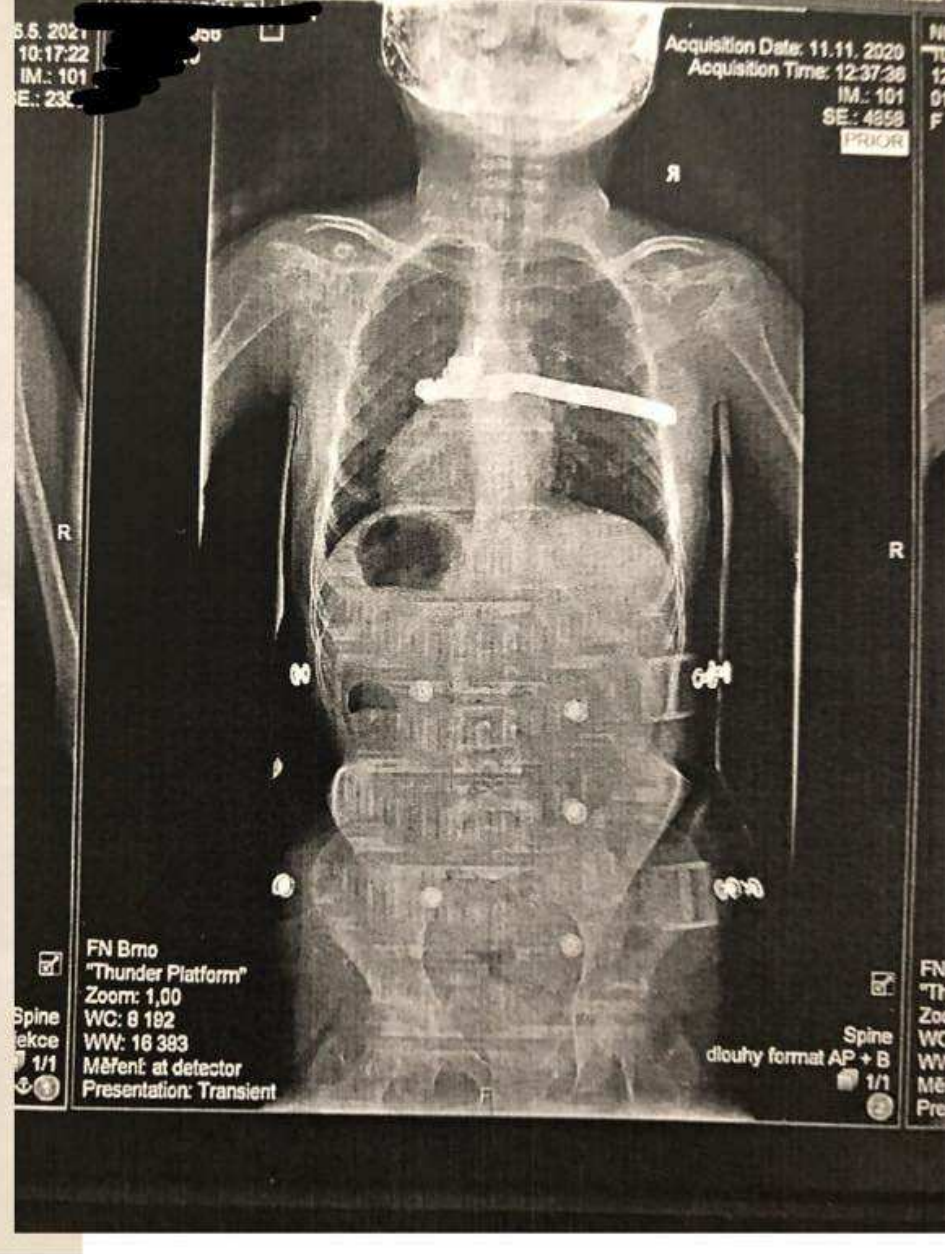
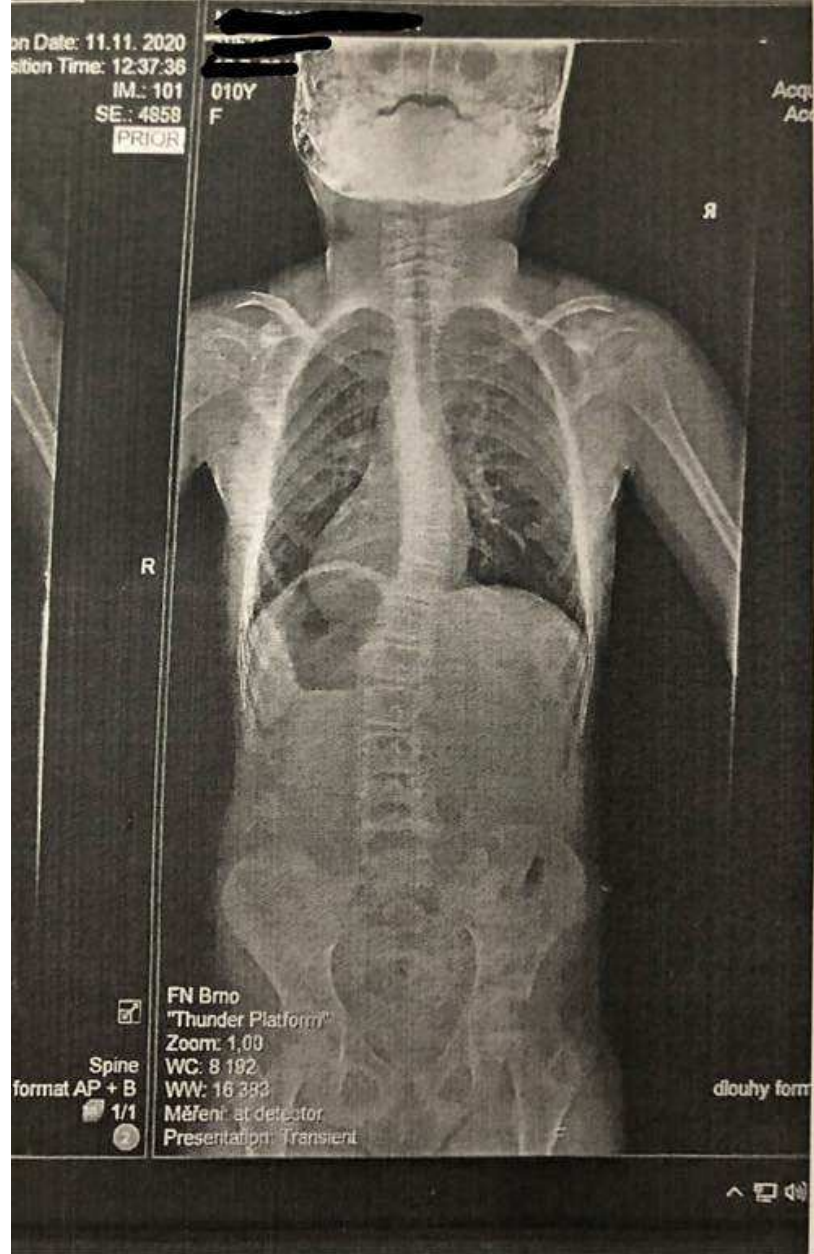
## V závislosti na tíži křivky:

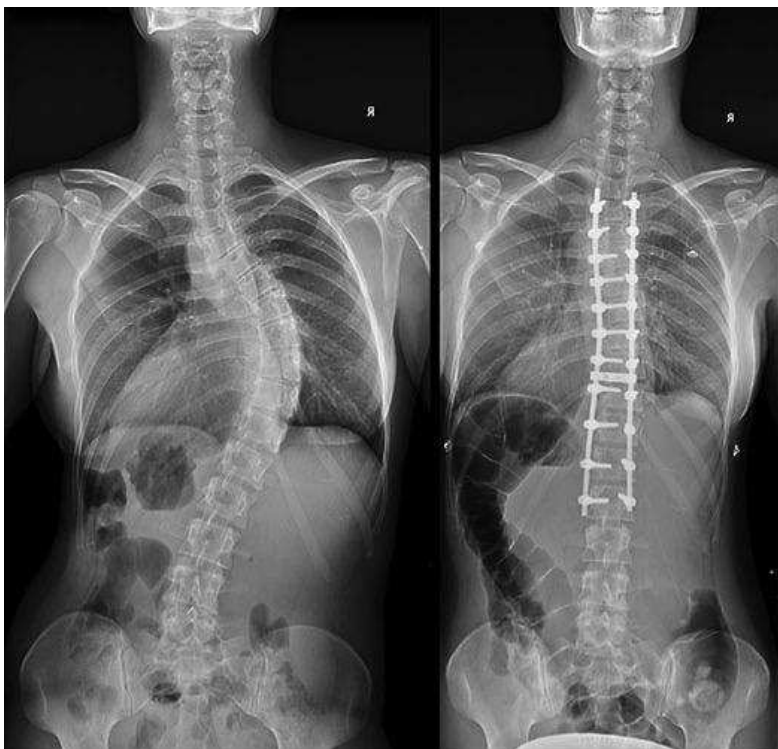
- Sledování
- Cílené cvičení na skoliózu
- Cílené cvičení + korzetoterapie
- Operace

## Společné cíle:

- Snížit Cobbův úhel
- Zmírnit asymetrii zad
- Zmírnit svalovou asymetrii a přidruženou bolest







<https://www.modrykonik.cz/zdravi/skolioza/>



<https://zdravi.euro.cz/leky/skolioza-patere-priznaky-a-cviky/galerie-87022-1/>



# Jak se skolióza řeší u nás?

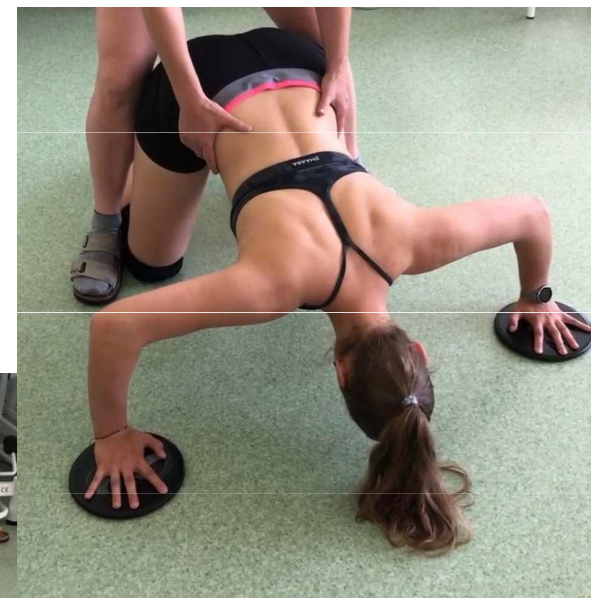
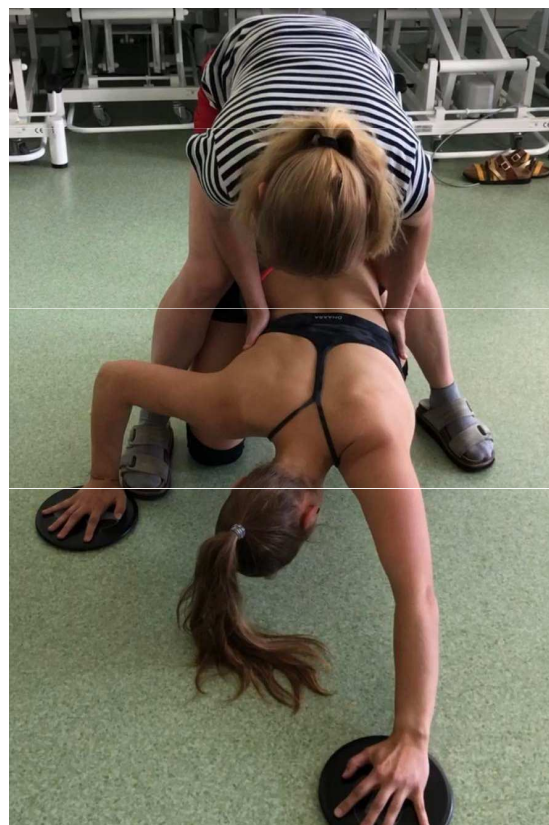
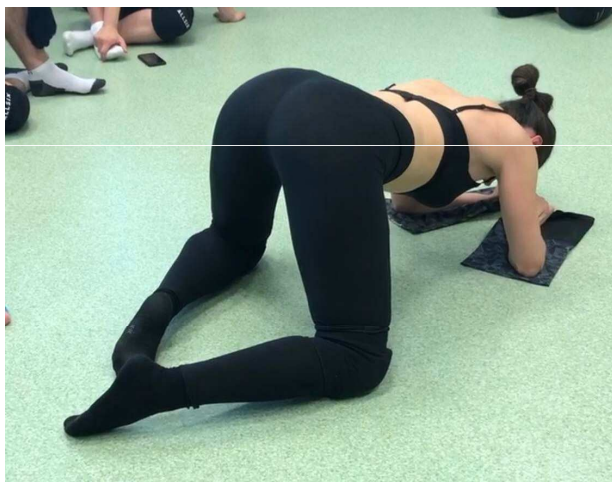
- Klapovo lezení, Metoda Schrottové
- DNS
- Spiraldynamik
- SM systém
- Jóga - Yoga therapy - Kreutzman, Meredith Weiss
- Vojtova metoda - dominantně batolata, kojenci





# Klappovo lezení

- Lezení
- Sunutí
- Homolaterální vzory
- Kontralaterální vzory
- Oblouky
- přechody



# Jóga - Yoga therapy – Kreutzman

- Uvolnění a protažení celého těla
- Pozice hory
- Posílení konvexní strany - šikmý sed -> pozice půlměsíce -> boční prkno
- Protažení konkávní strany - pozice dítěte s rotací -> pozice trojúhelníku -> pozice bočního úkolu
- Prodloužení - poloviční předklon, brána
- Trakce - vis
- Dýchání
- Relaxace

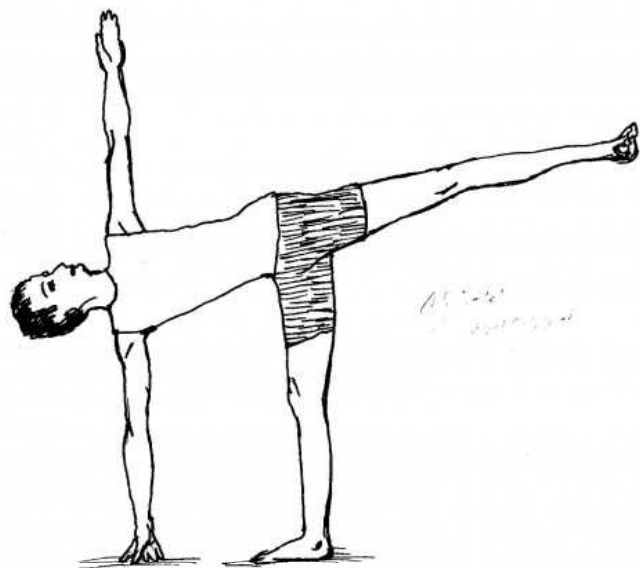


# Jóga – posílení konvexní strany

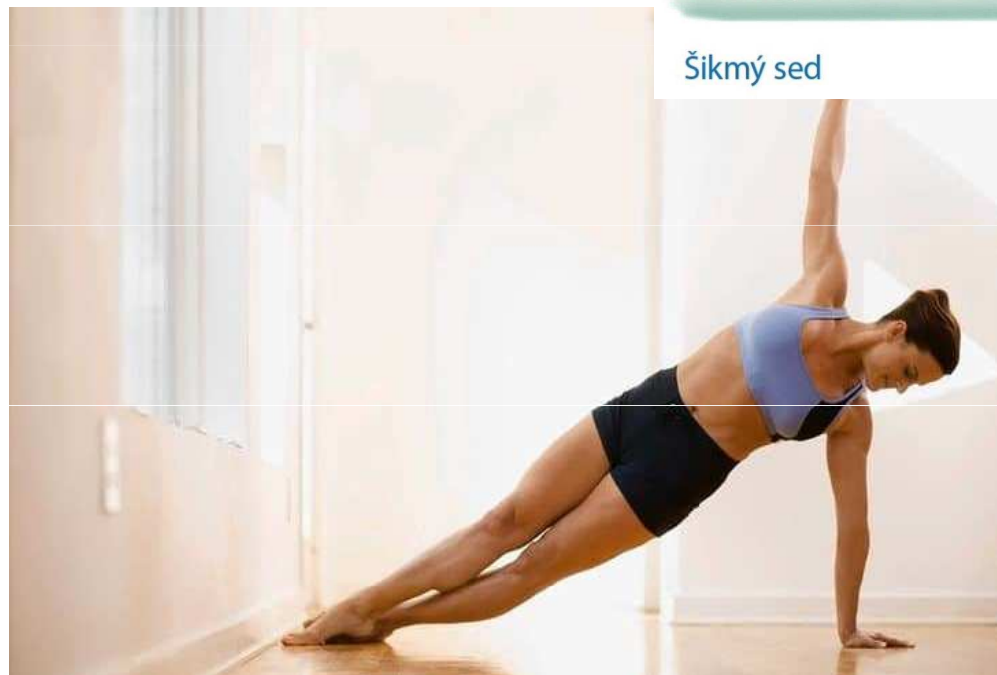


www.rehabps.com

Šikmý sed



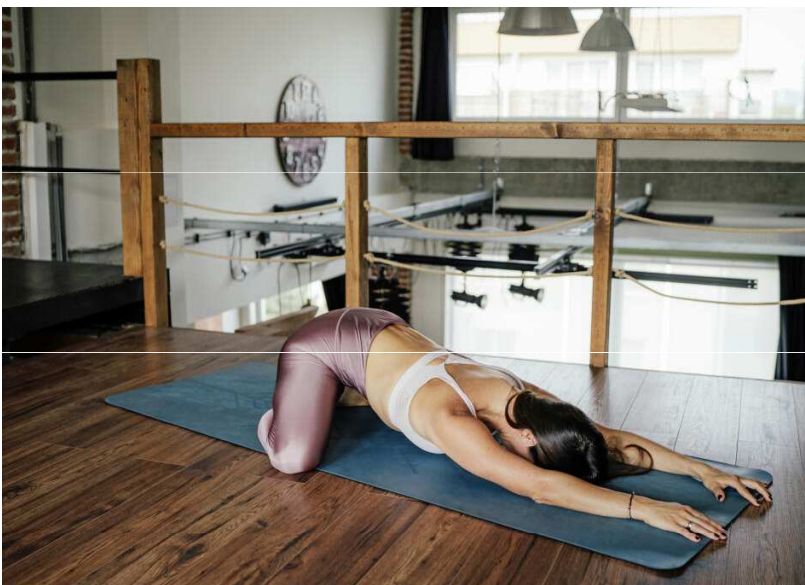
<https://yoga4yogi.cz/asany/?id=44>



<https://www.spojujenasjoga.cz/pozice-bocniho-prkna-neboli-vasisthasana-otestujte-si-sve-svaly/>



# Jóga – protažení konkávní strany

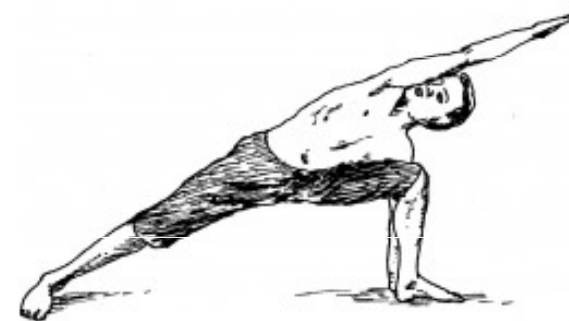


<https://casprezeny.pluska.sk/zdrava-a-stihla/odbornicka-trapi-vas-bolestiva-menstruacia-kaslite-lieky-toto-zazracne-ulahci-vase-dni>



*The Yoga Journal*

<https://yoga4yogi.cz/asany/?id=59>

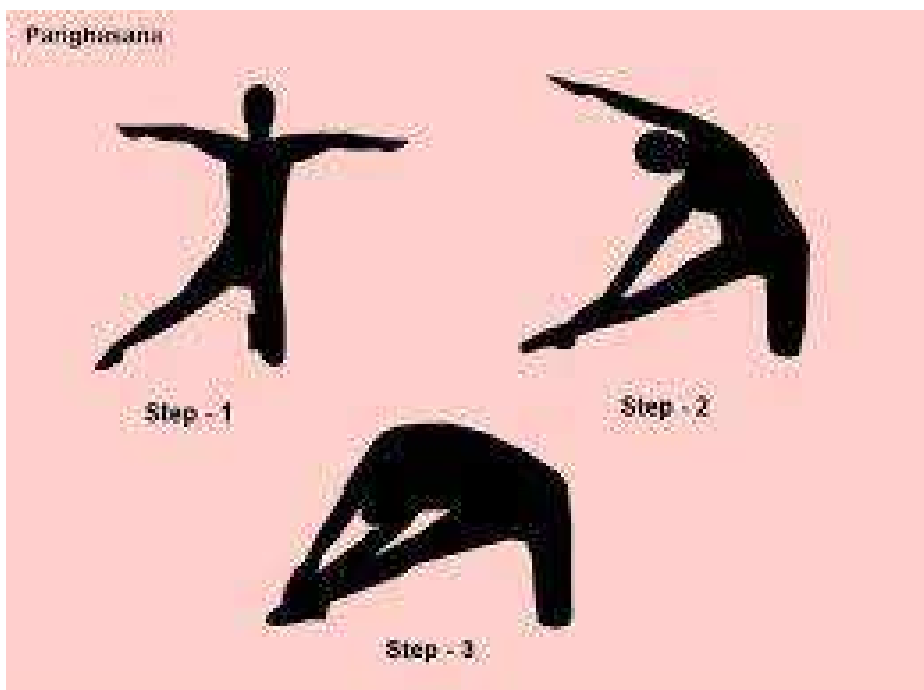


<https://yoga4yogi.cz/asany/?id=34>





# Jóga – protažení



<http://yoga-iq.com/Yogas/Details/62/Parighasana-Yoga-For-Side-Fat>



<https://yoga4yogi.cz/asany/?id=47>



# SM systém

- Spirální stabilizace
- Trakce - elevace segmentu
- Práce se svalovými řetězci



<https://spiralstabilization.com/cz/>



# Zdroje:

- <https://www.pediatriepropraxi.cz/pdfs/ped/2010/04/02.pdf>
- [Materiály ke kurzu: Klappovo lezení - kurz posturální korekce nejen idiopatické skoliózy](#)
- [Materiály ke kurzu: Jógové pozice u skolióz a VDT](#)
- [Kolář – Rehabilitace v klinické praxi \(2009\)](#)
- <https://spiralstabilization.com/cz/>

