

Section 1: Introduction and functional anatomy

1. Historical perspective on spine biomechanics research
2. Anatomy, development and evolution of the human spine
3. General biomechanics of the spine
4. The cervical spine
5. The thoracic spine and the rib cage
6. The lumbar spine
7. Sacrum and pelvis

Section 2: Biomechanics of Spinal Tissues

8. Vertebral bone
9. Intervertebral disc
10. Vertebral endplates
11. Spinal muscles
12. Cell biomechanics and mechanobiology

Section 3: Methods in Spine Biomechanics Research

13. Spinal imaging
14. Motion analysis
15. In vitro testing of cadaveric specimens
16. Standard testing
17. Mathematical and finite element modeling
18. Musculoskeletal modeling
19. Animal models for spine biomechanics
20. Machine learning and artificial intelligence

Section 4: Spinal Disorders and Spine Surgery Degenerative disorders

21. Intervertebral disc degeneration
22. Biomechanics of low back pain
23. Disc herniation
24. Biomechanics of physical therapy and rehabilitation Spinal implants
25. Fixation and fusion
26. Motion preservation
27. Nucleus replacement and regenerative therapies Spinal deformities
28. Pediatric and adolescent scoliosis
29. Sagittal imbalance
30. Adult spine deformities
31. Neuromuscular spine disorders Trauma, osteoporosis and tumors
32. Spinal fractures
33. Whiplash
34. Osteoporosis and osteoporotic fractures
35. Spine tumors

36. Biomechanics of spinal cord injuries

37. Glossary