

Musculoskeletal Disorders II, Spinal Cord Injury, and Commercial Motor Vehicle Driver Safety

Findings of Evidence Report

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Musculoskeletal Disorders and Potential Crash Risk

- Potential risk of a motor vehicle crash among individuals with the following musculoskeletal disorders:
 - Nerve compression syndromes (carpal tunnel, ulnar neuropathies, radial neuropathies, tarsal tunnel)
 - Tendinitis/tenosynovitis
 - Bursitis
 - Plantar fasciitis



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Spinal Cord Injury and Potential Crash Risk

- Potential risk of a motor vehicle crash among individuals with the following SCI-related conditions:
 - Paraplegia (complete or incomplete)
 - Tetraplegia (complete or incomplete)



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Key Questions

- Key Question 1: Do musculoskeletal disorders of the hand, wrist, elbow, or shoulder (specifically carpal tunnel syndrome, ulnar neuropathies, radial neuropathies, tendonitis/tenosynovitis, and bursitis) increase crash risk and/or affect driving ability?

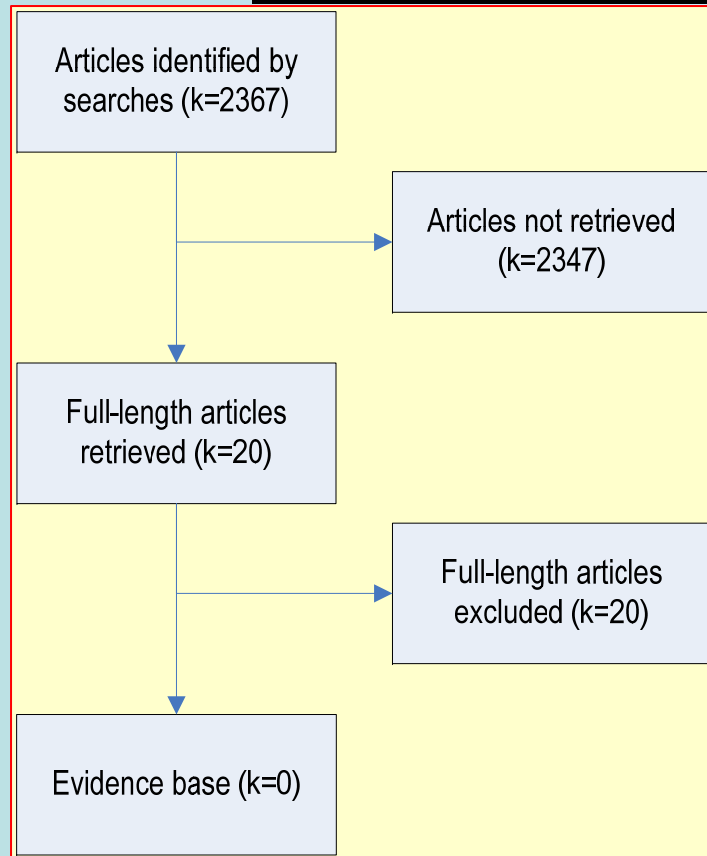


Key Questions

- Key Question 2: Do musculoskeletal disorders of the foot, ankle, or knee (specifically plantar fasciitis, tarsal tunnel syndrome, tendonitis/tenosynovitis, and bursitis) increase crash risk and/or affect driving ability?
- Key Question 3: Does reduced limb mobility and/or control resulting from spinal cord injury increase crash risk and/or affect driving ability?

Key Question 1:

Upper Extremity Musculoskeletal Disorders and Crash Risk



- No studies included

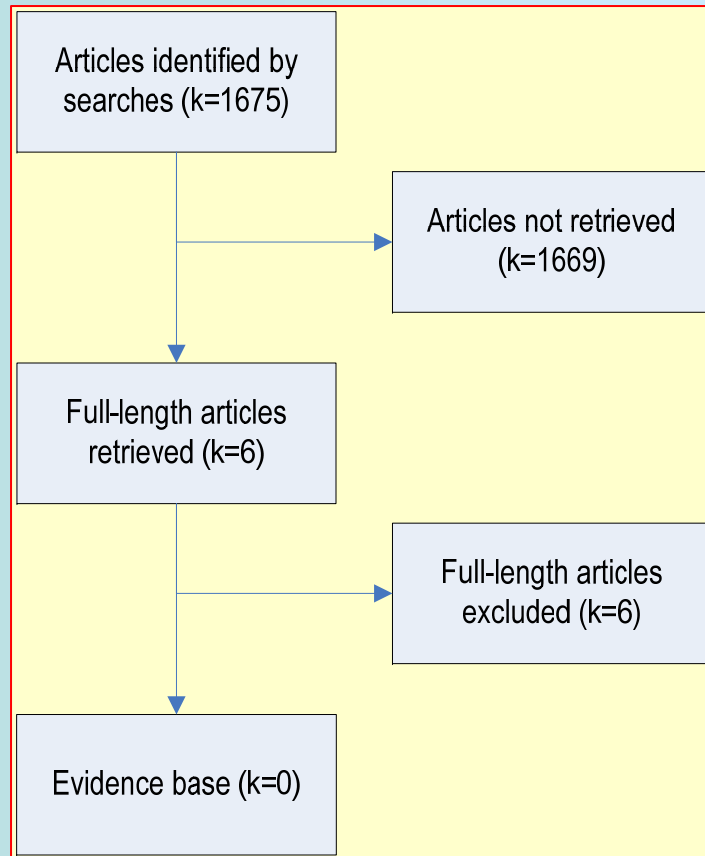
Key Question 1: Upper Extremity Musculoskeletal Disorders and Crash Risk - Summary

- **There is insufficient evidence to determine whether any musculoskeletal disorders of the upper extremities assessed in this report increase crash risk and/or decrease driving performance.**



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Key Question 2: Lower Extremity Musculoskeletal Disorders and Crash Risk



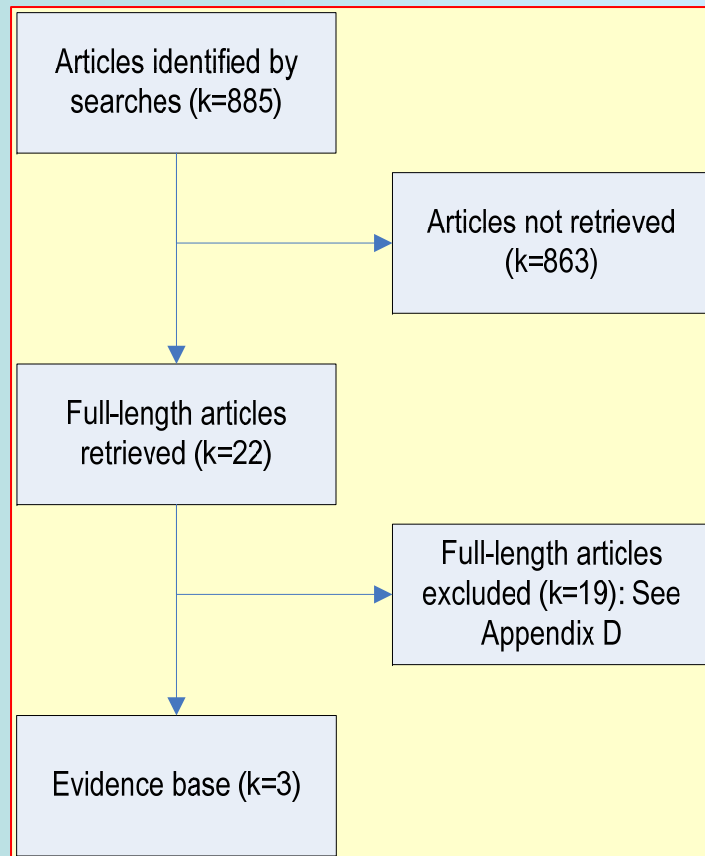
- No studies included

Key Question 2: Lower Extremity Musculoskeletal Disorders and Crash Risk - Summary

- **There is insufficient evidence to determine whether any musculoskeletal disorders of the lower extremities assessed in this report increase crash risk and/or decrease driving performance.**



Key Question 3: Spinal Cord Injury and Crash Risk



- 3 cohort studies included
- No CMV drivers
- Quality = 2 Moderate, 1 Low

Key Question 3: Spinal Cord Injury and Crash Risk – Study Population

Reference	Year	Comparison	Risk Factors Assessed	Primary outcome	Adapted device used
Ku et al.(105)	2002	Paraplegia (thoracic or lumbar cord injury) vs. normal drivers	NR	Driving performance (simulated)	Hand controls for braking and accelerating
Peters(103)	2001	Tetraplegia vs. able-bodied drivers	NR	Driving performance (simulated)	Two hand controls for braking and accelerating
Sivak et al.(106)	1981	Spinal cord injury (undefined) vs. able-bodied drivers	NR	Driving performance (closed and open road driving)	Hand controls for braking and accelerating and (if desired) a steering knob



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Key Question 2: Spinal Cord Injury and Crash Risk – Indirect Evidence

- Driving ability/performance (simulator)
 - One moderate-quality study assessed simulated driving ability of 15 individuals with paraplegia (thoracic or lumbar cord injury)
 - Individuals with paraplegia drove at significantly slower speeds than able-bodied individuals. However, no significant differences found for steering stability, centerline violations, traffic signal violations, and driving time.
 - Slower speed is not a surrogate for unsafe driving.



Key Question 3: Spinal Cord Injury and Crash Risk – Indirect Evidence

- Driving ability/performance (simulator)
 - One moderate-quality study assessed simulated driving performance of 26 individuals with tetraplegia (complete or incomplete)
 - This study found significantly slower brake reaction times and workload factors (time pressure, effort) among tetraplegic individuals compared to able-bodied individuals.
 - Whether these differences in simulated driving outcomes have any relationship to safe driving ability remains unclear.



Key Question 3: Spinal Cord Injury and Crash Risk – Indirect Evidence

- Driving ability/performance (on-road driving)
 - One low-quality study assessed closed-course and open-road driving performance of 8 individuals with SCI (type not defined)
 - This study found no statistically significant difference in driving performance measures during closed-course or open-road driving with a specially-modified car between individuals with SCI (type not reported) and able-bodied individuals.



Key Question 3: Spinal Cord Injury and Crash Risk

- Caveats
 - Driving a large truck may require greater functional abilities than driving smaller vehicles
 - Whether the magnitude of difficulty of large truck driving would make the task impractical for individuals with SCI has not been addressed



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Key Question 3: Spinal Cord Injury and Crash Risk – Indirect Evidence

- Caveats
 - The requirement to check and adjust loads during a long trip may be beyond the ability of a lone driver with SCI (the exception would be a sealed vehicle that did not require inspection during a trip)
 - Driving a modified CMV with a partner might be a possible option to overcome this problem



Key Question 3: Spinal Cord Injury and Crash Risk – Summary

- **Certain individuals with SCI appear to have adequate driving ability in specially-modified cars. Individuals with paraplegia are less likely to have limitations that decrease driving ability than individuals with tetraplegia.**



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Key Question 3: Spinal Cord Injury **and Crash Risk – Summary**

- However, certain requirements that CMV drivers must meet (e.g., inspecting and adjusting loads during a long trip) may exceed the capabilities of a lone individual with SCI (the possible exception might be a sealed vehicle that did not require inspection during a trip).



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