Trunk and neck movements are reduced in people with chronic neck pain when walking along a curved trajectory.
Background

- Why is gait typically studied along a straight path as daily life activities imply well-controlled gait manoeuvrability\(^{(1,2)}\) ?
- Neck sensorimotor control is pivotal in managing gait direction\(^{(3)}\) and posture\(^{(4)}\)

Purpose

- Chronic neck pain (CNP) is one of the most common musculoskeletal disorders presenting disturbances in physical functioning as decreased range of motion (ROM) and difficulties in head-eye coordination\(^{(1,2)}\).

- Neck pain may impose neuromuscular and biomechanical disturbances affecting gait maneuverability.

- Walking navigation represents a challenge for people with musculoskeletal disorders and the higher motor/cognitive demand leads to an increased risk of fall\(^{(3)}\).

- **This study examined the control of trunk and neck motion during walking along rectilinear and curvilinear trajectories in people with chronic neck pain versus asymptomatic control subjects**

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Methods

- 15 healthy (Control, 31.4 ± 11.4 years) and 15 chronic neck pain (CNP, 33.3 ± 12.1 years, average pain intensity 4.9 ± 1.7) – 3 WAD (#2 grade I, #1 grade III)

- Inclusion Criteria:
  ✓ painful symptoms for at least three months
  ✓ neck pain intensity over the last four weeks as at least 3 (VAS-10)
  ✓ Whiplash Associated Disorders (WAD), grades I - III according to the Quebec Task Force Classification (Spitzer WO, 1995. Spine 20, 1S-73S)

- Gait @ natural speed along:
  ✓ Rectlinear (5 m)

- Curvilinear (1 m radius) :
  ✓ ClockWise
  ✓ CounterClockWise

Acquired data
1.  Kinematics of the body (Davis Protocol + Head tracking)
2.  Bilateral sEMG acquisition: i. Sternocleidomastoid, ii. Splenius capitis, iii. Erector Spinae longissimus
Results

- CNP Head movements are reduced along all the three axes of movement ($p < 0.01$) while only Trunk movements in the frontal plane are affected by CNP.

- Lateral trunk speed in CNP is reduced during Curvilinear Gait ($p < 0.01$)\(^{(1)}\)

- No significant differences for the RMS of the neck and trunk sEMG between the groups

- Mean Time-varying Multi-muscle Co-activation Index (TMC)\(^{(2)}\) of Splenius is higher in CNP only during curvilinear gait ($p < 0.01$)

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Conclusions

- The presence of CNP is associated with altered control of trunk and head movements in the frontal plane.
- Turning is accomplished by trunk inclination to the inner part of the trajectory to counteract the centrifugal acceleration on the body and it is reduced in extension and speed in CNP.
- A higher level of co-activation at the neck is present in CNP only during change of gait direction.
THANK YOU
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