



Dissecting gait alterations in patients with adult spinal deformity through 3D gait analysis

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Background

Adult spinal deformity (ASD) influences posture and gait. Different gait patterns may exist between idiopathic ASD patients (ID-ASD) and degenerative 'de novo' ASD patients (DN-ASD) due to variations in deformity nature [1-5]. This study compares gait characteristics of ID-ASD and DN-ASD to controls.

Methods

ASD patients scheduled for spinal fusion surgery were matched with healthy controls based on age, gender, leg length, and BMI. Spatiotemporal parameters (SPT) and 3D joint kinematics were measured with treadmill based 3D gait analysis. Group values of 3D joint kinematics were compared using independent t-test or Mann-Whitney U test, and Statistical Parametric Mapping (SPM; independent t-test).

Results

Of fifty ASD patients included, the ID-ASD patients (n=24, median(Q1-Q3) age 20.0(19-27)y) showed similar SPT compared to controls, while DN-ASD patients (n=26, age 60.5(55-66)y) walked significantly slower (0.99(0.73-1.14) vs 1.30(1.13-1.39)m/s) with decreased cadence (108(102-113) vs 118(111-123)steps/minute) and increased step width (0.20(0.18-0.24) vs 0.16(0.14-0.20)m). Furthermore, ID-ASD showed decreased trunk lateroflexion, while DN-ASD exhibited increased anterior trunk tilt, decreased pelvic obliquity and rotation, decreased knee extension, and increased ankle dorsiflexion compared to controls (Figure 1).

Discussion

Despite limited trunk lateroflexion, ID-ASD patients maintained normal gait characteristics, emphasizing the preserved sagittal balance. Conversely, DN-ASD patients demonstrated sagittal imbalance and to compensate, adopted a slower gait with increased step width, suggesting an adaptive strategy for enhanced stability during walking [6, 7]. In conclusion, understanding these distinctive gait alterations in ID-ASD and DN-ASD patients contributes valuable insights for tailored rehabilitation strategies and informs the broader understanding of adult spinal deformities.

Disclosure

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this abstract.

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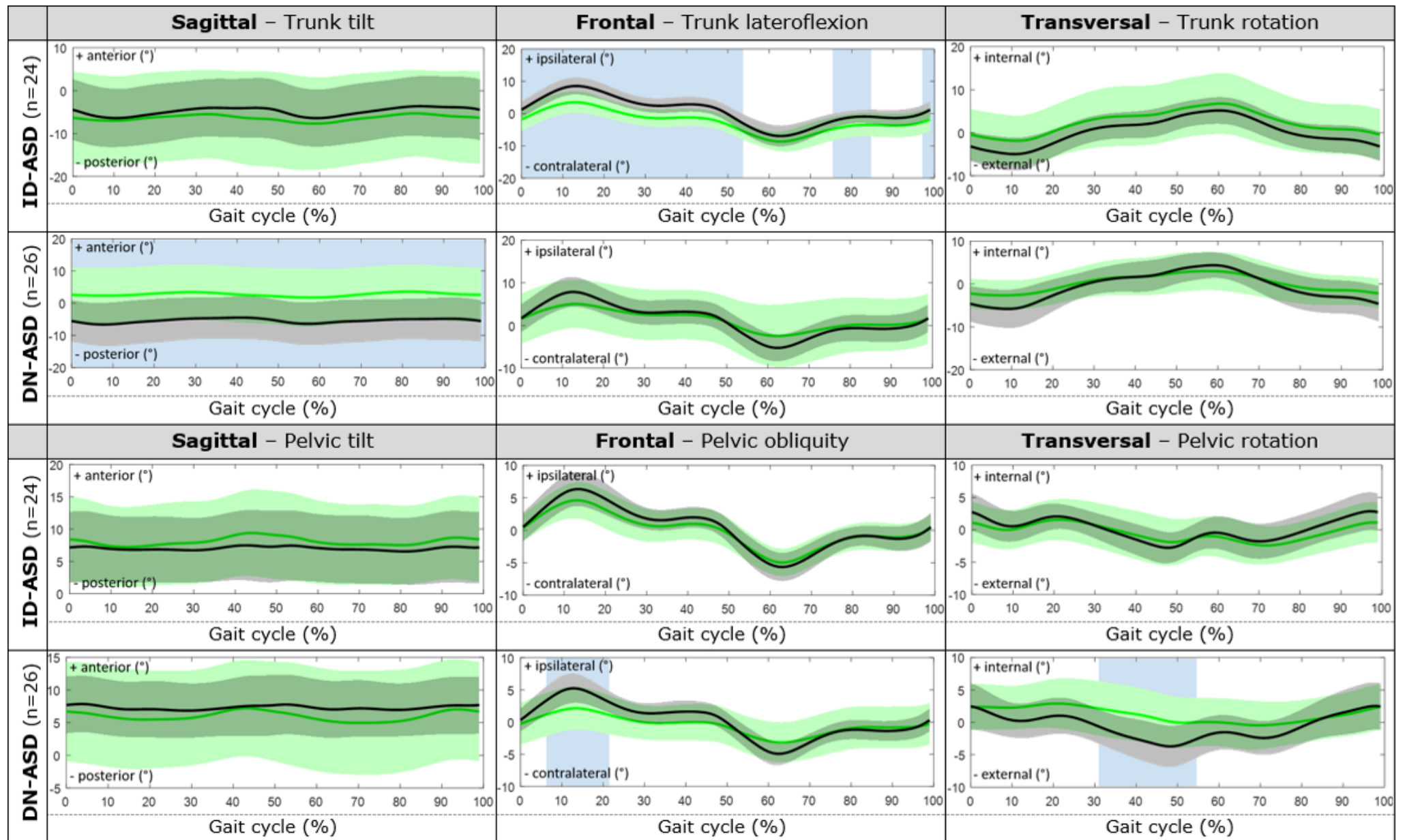


Figure 1. 3D Trunk and pelvic kinematic waveforms presented as group average with standard deviations during complete gait cycle (0-100%). Comparison of ID-ASD (green) or DN-ASD (green) compared to controls (black). Blue shaded areas indicates significant difference between groups ($p < 0.05$).