Generalized Joint Hypermobility and Neck Pain: Community-Based Prevalence and Functional Correlates in Females

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INTRODUCTION: Generalized joint hypermobility (GJH) is associated with musculoskeletal pain, disability, and hypermobility spectrum disorders. Neck pain is particularly disruptive but underexplored in relation to GJH. The objective was to determine prevalence of GJH and neck pain in the general population and examine the relationships between GJH, neck pain burden, and neck function in females.

METHODS: Adults ≥18 years were recruited at the Minnesota State Fair. All participants underwent GJH assessment (Beighton Score, Five-Part Questionnaire) and provided neck pain information. A subset of females (n=182; 71 with GJH, 111 non-GJH) completed neck range of motion (ROM), strength testing, and the Neck Disability Index (NDI). Multivariable regression assessed relationships between GJH, pain, and function, controlling for age and BMI. The study was approved by the University of Minnesota IRB, and informed consent was obtained.

RESULTS: Among 555 participants (336 females, 219 males), GJH prevalence was higher in females (23.5%) than males (6.8%). Neck pain prevalence in females with GJH was 24.1% versus 16.0% in non-GJH, and 29.3% among females with GJH under 40 years. Regression analyses in females showed that, controlling for age, BMI, and pain burden, GJH was associated with increased ROM (extension, sidebending, axial rotation) and strength (flexion, extension, sidebending). Neck pain burden was associated with decreased ROM and strength.

DISCUSSION: Findings demonstrate that GJH is associated with both higher neck pain prevalence and distinct functional profiles in females. Unlike other joints where hypermobility is often linked to weakness, females with GJH exhibited greater cervical ROM and strength despite higher neck pain burden. This suggests the cervical spine may behave differently than peripheral joints, potentially due to its role as an inverted pendulum supporting the head and its importance for sensory integration and daily activities. However, these findings are based on a cross-sectional, relatively healthy sample. More longitudinal studies and inclusion of individuals with greater disability or systemic conditions are needed to clarify long-term consequences and clinical trajectories.

SIGNIFICANCE / CLINICAL RELEVANCE: Nearly 30% of young females with GJH reported neck pain. Clinicians should consider GJH when evaluating and treating neck pain, as these patients may present with preserved or increased function compared to typical neck pain populations. The unique demands of the cervical spine may underlie differences from other joints, highlighting the need for future longitudinal and more clinically diverse investigations.

ROM outcomes (top)

GJH Predictor / Pain Predictor	Has NP	NDI	BS	BS Has NP	BS NDI	Has GJH	Has GJH Has NP	Has GJH NDI
Flexion ROM — GJH Effect			↑	↑	↑			
Pain Effect	▼	▼			▼			
GJH×Pain Effect								
adjusted R²	0.007	0.018	0.023	0.022	0.030	0.007	0.002	0.014
Extension ROM — GJH Effect			↑	↑	↑	↑		⬆
Pain Effect					▼			⬇
GJH×Pain Effect					⬆		⬆	⬆
adjusted R²	0.154	0.162	0.208	0.207	0.231	0.191	0.200	0.211
Sidebending ROM — GJH Effect			↑	↑	↑	⬆	↑	⬆
Pain Effect	⬇	⬇		⬇	⬇		⬇	⬇
GJH×Pain Effect				▲	⬆		⬆	⬆
adjusted R²	0.308	0.322	0.344	0.373	0.387	0.363	0.389	0.407
Axial Rotation ROM — GJH Effect			▲			⬆	⬆	⬆
Pain Effect	▼	⬇		⬇	⬇		▼	⬇
GJH×Pain Effect					⬆			
adjusted R²	0.143	0.218	0.142	0.159	0.269	0.152	0.162	0.247

Strength outcomes (bottom)

GJH Predictor / Pain Predictor	Has NP	NDI	BS	BS Has NP	BS NDI	Has GJH	Has GJH Has NP	Has GJH NDI
Flexion Strength — GJH Effect								
Pain Effect	⬇	⬇		⬇	⬇		⬇	⬇
GJH×Pain Effect					⬆			▲
adjusted R²	0.230	0.283	0.217	0.248	0.312	0.216	0.239	0.300
Extension Strength — GJH Effect			▲		▲	⬆		⬆
Pain Effect	⬇	⬇		⬇	⬇		⬇	⬇
GJH×Pain Effect					⬆			▲
adjusted R²	0.145	0.231	0.133	0.166	0.261	0.137	0.163	0.258
Sidebending Strength — GJH Effect			⬆	▲	⬆	⬆	⬆	⬆
Pain Effect	⬇	⬇		⬇	⬇		⬇	⬇
GJH×Pain Effect								
adjusted R²	0.191	0.255	0.163	0.236	0.288	0.173	0.228	0.290

Linear regression models for ROM (top) and Strength (bottom) outcomes.

Separate models were generated for each cervical ROM (flexion, extension, sidebending, axial rotation) and strength (flexion, extension, sidebending) outcome. Models included generalized joint hypermobility (GJH) predictors (Beighton Score [BS], Has GJH) and pain burden predictors (Has Neck Pain [NP], Neck Disability Index [NDI]) individually, as well as combined models including GJH × Pain interaction terms. Age and BMI were included as covariates in all models, and predictor variables were centered and scaled prior to analysis. Cell color shading reflects the direction and relative magnitude of regression coefficients (green = positive, red = negative), with greater intensity indicating larger coefficients. Symbols denote significance levels: arrows indicate significant predictors (p < 0.05), triangles indicate trends (0.05 ≤ p < 0.10), and blank cells indicate non-significant predictors. Adjusted R² values are reported for each model to reflect variance explained after accounting for model complexity.