

Sex- and Age-Related Variation in Somatic Symptom Systems Among Patients With First-Episode Anxiety Disorders: A Cross-Sectional Study and Exploratory Latent Class Analysis

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Research Article

Keywords: anxiety disorders, somatic symptoms, sex differences, age, prevalence ratio, latent class analysis

Posted Date: September 14th, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-10623755/v1>

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Additional Declarations: No competing interests reported.

Abstract

Background

Somatic symptoms are common in anxiety disorders, but it remains unclear whether sex differences reflect greater overall burden or distinct system distributions, and whether these associations vary with age.

Methods

This cross-sectional study included 2,557 first-episode anxiety disorder patients. Eight symptom systems were assessed. For six common systems, adjusted prevalence ratios were estimated using modified Poisson regression with nonlinear age modeling. Sex-by-age interactions were tested with Holm adjustment. Rare reproductive/endocrine symptoms were analyzed with bias-reduced logistic regression. Latent class analysis was applied to the six common systems.

Results

Mean age was 48.2 years, 69.5% were female, and 82.4% had at least one somatic symptom. In primary models, females showed higher prevalence of circulatory, respiratory, and digestive symptoms, and lower prevalence of urinary, neurological, and motor symptoms (all Holm-adjusted $P < 0.001$). Sex-by-age interactions were significant for all six systems. In expanded models, there was no clear association between sex and overall symptom presence or multisystem involvement. Latent class analysis identified four classes (circulatory-dominant, respiratory-dominant, digestive-dominant, and neurological/low-common-system), with residual dependence between urinary and motor symptoms.

Conclusions

Sex was associated primarily with the distribution of somatic symptom systems rather than with overall multisystem burden, and these associations varied nonlinearly with age. The latent classes should be interpreted as exploratory system-level patterns requiring external validation rather than as established clinical subtypes.

Introduction

Anxiety disorders are a major contributor to global disability and are frequently accompanied by bodily complaints that may dominate the initial clinical presentation[1, 2]. Somatic manifestations can involve cardiopulmonary, gastrointestinal, neurological, genitourinary, musculoskeletal, and other systems. Their clinical importance extends beyond symptom distress: prominent bodily complaints may shape help-seeking, complicate differential diagnosis, and contribute to repeated health-care use[2, 3].

Somatic symptom reporting differs between females and males in both community and clinical samples[4]. Anxiety disorders are also more prevalent in females, but sex differences in the bodily expression of anxiety may not be captured adequately by total symptom counts[5]. A similar total burden could arise through different combinations of systems, and system-specific associations could vary in direction. Distinguishing overall burden from symptom distribution is therefore important for interpretation.

Age adds further complexity. Anxiety in later life may coexist with medical illness, changes in interoception, and cohort-specific patterns of symptom recognition and disclosure[6–9]. Treating age as a set of broad categories may obscure nonlinear associations, whereas interpreting cross-sectional age differences as within-person aging can be misleading. An analysis that models age continuously and explicitly tests whether sex differences vary with age may provide a more faithful description of the observed data.

Previous analyses of somatic symptoms in anxiety have often been limited by aggregation across systems, restriction to symptom-positive participants, use of odds ratios for common cross-sectional outcomes, unstable estimation for rare events, or insufficient evaluation of latent class solutions. Conditioning system-specific analyses on the presence of at least one symptom changes the target population and may distort associations. In addition, latent classes derived from system-level binary indicators require careful assessment of model fit, classification quality, local independence, and substantive interpretability.

Using a large hospital-based sample of patients with first-episode anxiety disorders, we therefore aimed to: (1) describe sex-specific prevalence across eight somatic symptom systems in all eligible participants; (2) estimate sex associations for common systems while allowing nonlinear age relationships; (3) test sex-by-age interactions; (4) distinguish the presence of any symptom and multisystem involvement from system-specific distributions; and (5) explore system-level symptom patterns using latent class analysis. Because the study was cross-sectional and the latent classes were data driven, all findings were interpreted as descriptive associations rather than causal or diagnostic effects.

Methods

Study design and reporting

This single-center, hospital-based cross-sectional study was conducted at the Affiliated Hospital of Southwest Medical University between January 2019 and December 2024. Reporting was guided by the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement[10].

Participants

Initially, 2,873 patients diagnosed with first-episode anxiety disorder according to the DSM-5 criteria were screened. After excluding 316 patients who met the exclusion criteria, 2,557 eligible participants were ultimately included in the final analysis. Of these, 451 patients presented without any physical symptoms; this deliberate inclusion was intended to ensure that the primary systematic analysis was not confined solely to those with positive symptoms.

Diagnoses were established by trained psychiatrists and confirmed using the Mini-International Neuropsychiatric Interview version (MINI)[11] and MINI-KID[12]. The first-episode designation required no previous adequate course of anti-anxiety treatment, operationalized in the source protocol as fewer than 4 weeks of a therapeutic-dose selective serotonin reuptake inhibitor or serotonin-norepinephrine reuptake inhibitor and fewer than 6 sessions of structured psychotherapy. Major exclusion criteria were an organic disease considered sufficient to account for the somatic presentation, another major psychiatric disorder, recent psychotropic medication use inconsistent with the first-episode definition, alcohol or substance use disorder, and pregnancy or breastfeeding.

The study was approved by the institutional review board of the Affiliated Hospital of Southwest Medical University. Written informed consent was obtained from participants or their legal representatives.

Somatic symptom assessment

Somatic symptoms were assessed at admission using a structured checklist adapted from the Screening for Somatoform Symptoms-7 (SOMS-7) and an expert consensus instrument[13]. Symptoms were mapped to eight systems: circulatory, respiratory, digestive, urinary, reproductive, neurological, endocrine, and motor. Each system was coded as present if at least one symptom assigned to that system was recorded and absent otherwise. The number of affected systems was calculated as the sum of the eight binary indicators (observed range, 0–5).

Variables and outcomes

Sex was recorded in the clinical database as male or female. Age was analyzed in years. Current smoking and current drinking were coded as binary variables. Body mass index (BMI) was calculated as weight in kilograms divided by height in meters squared.

The primary system-specific outcomes were the six common systems: circulatory, respiratory, digestive, urinary, neurological, and motor. Reproductive and endocrine symptoms were considered rare because each occurred in fewer than 2% of participants. Additional outcomes were the presence of any somatic symptom in all eligible participants and, among symptom-positive participants, involvement of two or more systems and three or more systems.

Statistical analysis

Continuous variables are summarized as means with standard deviations or medians with interquartile ranges, and categorical variables as counts and percentages. Descriptive comparisons used Welch t tests for age and BMI, Pearson chi-square tests for categorical variables, and the Wilcoxon rank-sum test for the number of affected systems.

For each of the six common symptom systems, modified Poisson regression with HC3 robust covariance was used to estimate prevalence ratios directly[14]. The prespecified primary model included sex and age modeled with a natural spline with 3 degrees of freedom. An expanded model additionally included current smoking, current drinking, and BMI to examine robustness to lifestyle and anthropometric adjustment. Sex associations were summarized as female-versus-male aPRs with 95% confidence intervals. The overall contribution of nonlinear age was assessed jointly. Sex-by-age interaction models included interactions between sex and all spline basis terms; joint robust Wald tests were used to evaluate interaction. P values were adjusted across the six common systems using the Holm method.

Because reproductive and endocrine symptoms were very rare, these outcomes were analyzed exploratorily using mean bias-reduced logistic regression, which provides finite and less biased estimates under sparse data and separation[15]. These models included sex and age per 10-year increase; expanded models additionally included smoking, drinking, and BMI. No sex-by-age interaction was fitted for rare outcomes, and no multiplicity-adjusted confirmatory claim was made.

Overall symptom burden was evaluated using a two-part strategy. First, the presence of any somatic symptom was modeled in all 2,557 participants. Second, among the 2,106 symptom-positive participants, modified Poisson models evaluated involvement of at least two systems and at least three systems. This approach replaced an ordinary Poisson count model that would have been inappropriate after excluding all zero counts.

Sensitivity analyses repeated the expanded common-system models among participants aged 18 years or older.

Latent class analysis used all 2,557 participants and the six common binary system indicators. Reproductive and endocrine indicators were excluded because of their very low prevalence. Models with one to seven classes were fitted using poLCA[16]. The screening stage used 100 random starts per class solution and a maximum of 5,000 iterations. Class number was selected using the Bayesian information criterion (BIC), sample-size-adjusted BIC, entropy, minimum class size, posterior classification quality, convergence, stability of the best log-likelihood, and clinical interpretability[17, 18]. The selected four-class model was re-estimated after a batched search of 1,000 random starts with a maximum of 10,000 iterations. Class-specific demographic summaries were weighted by posterior class probabilities. Local independence was evaluated using pairwise bivariate residual chi-square statistics with Holm adjustment across the 15 indicator pairs[19].

All required analysis variables were complete in the eligible sample. Analyses were conducted in R version 4.5.1. Modified Poisson models used the sandwich, lme4, and car packages; bias-reduced logistic models used brglm2; and LCA used poLCA. Tests were two sided.

Results

Participant characteristics

Among the 2,557 eligible participants, 1,778 (69.5%) were female. Mean age was 48.2 years (SD 17.0), and mean BMI was 23.6 kg/m² (SD 3.8). Females were older and had a lower mean BMI than males; smoking and drinking were substantially more frequent among males (Table 1). A total of 2,106 participants (82.4%) had at least one recorded somatic symptom, whereas 451 (17.6%) had none. Compared with symptom-negative participants, symptom-positive participants were older and more often female (Table S2).

Table 1
Characteristics of all eligible participants, overall and by sex

Characteristic	Overall (N = 2,557)	Male (N = 779)	Female (N = 1,778)	P value
Age, years	48.2 (17.0)	45.6 (17.6)	49.3 (16.6)	< 0.001
BMI, kg/m ²	23.6 (3.8)	24.5 (3.4)	23.2 (3.9)	< 0.001
Current smoker, n (%)	501 (19.6)	395 (50.7)	106 (6.0)	< 0.001
Current drinker, n (%)	598 (23.4)	426 (54.7)	172 (9.7)	< 0.001
Any somatic symptom, n (%)	2106 (82.4)	612 (78.6)	1494 (84.0)	< 0.001
Affected systems, median (IQR)	1 (1–1)	1 (1–1)	1 (1–1)	0.005
0 systems, n (%)	451 (17.6)	167 (21.4)	284 (16.0)	
1 system, n (%)	1557 (60.9)	459 (58.9)	1098 (61.8)	
2 systems, n (%)	415 (16.2)	108 (13.9)	307 (17.3)	
≥ 3 systems, n (%)	134 (5.2)	45 (5.8)	89 (5.0)	
Note: Values are mean (SD), median (IQR), or n (%). P values were calculated using Welch t tests for age and BMI, Pearson chi-square tests for categorical variables, and the Wilcoxon rank-sum test for number of affected systems. BMI, body mass index; IQR, interquartile range; SD, standard deviation.				

The most frequent systems in the full sample were respiratory (25.1%), circulatory (25.1%), digestive (24.3%), and neurological (23.9%). Motor (6.4%) and urinary (3.2%) symptoms were less frequent; reproductive (1.0%) and endocrine (0.7%) symptoms were rare.

Sex-specific prevalence and adjusted associations

Crude prevalence differed markedly by sex (Table 2). Circulatory symptoms were present in 28.7% of females and 16.9% of males, respiratory symptoms in 29.7% and 14.8%, and digestive symptoms in 26.5% and 19.1%, respectively. Conversely, urinary symptoms were present in 1.3% of females and 7.3% of males, neurological symptoms in 21.3% and 29.8%, and motor symptoms in 3.6% and 12.7%.

Table 2
Sex-specific prevalence and adjusted associations for six common symptom systems

System	Male, n/N (%)	Female, n/N (%)	Minimal model aPR (95% CI)	Holm P	Full model aPR (95% CI)	Holm P	Sex×age interaction Holm P
Circulatory	132 (16.9)	510 (28.7)	1.67 (1.41– 1.99)	< 0.001	1.74 (1.38– 2.18)	< 0.001	0.002
Respiratory	115 (14.8)	528 (29.7)	1.96 (1.63– 2.35)	< 0.001	2.22 (1.77– 2.80)	< 0.001	0.018
Digestive	149 (19.1)	472 (26.5)	1.38 (1.17– 1.62)	< 0.001	1.25 (1.01– 1.54)	0.036	0.002
Urinary	57 (7.3)	24 (1.3)	0.19 (0.12– 0.30)	< 0.001	0.16 (0.09– 0.28)	< 0.001	0.022
Neurological	232 (29.8)	378 (21.3)	0.67 (0.59– 0.77)	< 0.001	0.68 (0.57– 0.82)	< 0.001	0.002
Motor	99 (12.7)	64 (3.6)	0.29 (0.21– 0.40)	< 0.001	0.28 (0.19– 0.40)	< 0.001	0.002

Note: Adjusted prevalence ratios compare females with males and were estimated using modified Poisson regression with HC3 robust standard errors. The primary model included sex and age modeled using a natural spline with 3 degrees of freedom. The expanded model additionally included current smoking, current drinking, and BMI. The sex-by-age interaction P value is from the expanded model and is a joint test of all spline interaction terms. P values were adjusted across the six systems using the Holm method. aPR, adjusted prevalence ratio; BMI, body mass index; CI, confidence interval.

In the primary modified Poisson models, females had higher adjusted prevalence of circulatory symptoms (aPR 1.67, 95% CI 1.41–1.99), respiratory symptoms (1.96, 1.63–2.35), and digestive symptoms (1.38, 1.17–1.62). Females had lower adjusted prevalence of urinary symptoms (0.19, 0.12–0.30), neurological symptoms (0.67, 0.59–0.77), and motor symptoms (0.29, 0.21–0.40). All six associations remained significant after Holm adjustment (Table 2; Fig. 1).

The expanded models yielded the same directions. Adjustment for smoking, drinking, and BMI strengthened the circulatory and respiratory associations and modestly attenuated the digestive association; the expanded-model aPR for digestive symptoms was 1.25 (95% CI 1.01–1.54). Adult-only analyses were also directionally consistent (Table S6).

Modification by age

Joint tests of the nonlinear sex-by-age interaction were significant after Holm adjustment for circulatory (adjusted $P = 0.002$), respiratory ($P = 0.018$), digestive ($P = 0.002$), urinary ($P = 0.022$), neurological ($P = 0.002$), and motor symptoms ($P = 0.002$). Thus, the magnitude, and for some systems the direction, of the female-versus-male difference was not constant across age. Descriptive prevalence by four age groups is shown in Table S3. Because age was observed cross-sectionally, these findings describe age-patterned heterogeneity and should not be interpreted as within-person life-course change.

Overall symptom burden and rare outcomes

Females were somewhat more likely than males to have any recorded somatic symptom in the primary model (aPR 1.05, 95% CI 1.01–1.10; $P = 0.012$), but this association was attenuated after expanded adjustment (aPR 1.04, 95% CI 0.98–1.09; $P = 0.209$). Among symptom-positive participants, sex was not associated with involvement of two or more systems

(expanded-model aPR 1.08, 95% CI 0.87–1.35) or three or more systems (0.88, 0.53–1.46) (Table S5). These findings suggest that the principal sex differences concerned symptom distribution rather than overall multisystem burden.

Exploratory bias-reduced logistic models indicated lower odds of reproductive symptoms in females than males (expanded-model OR 0.15, 95% CI 0.05–0.42) and lower odds of endocrine symptoms (OR 0.18, 95% CI 0.06–0.57). Age was not associated with reproductive symptoms, whereas endocrine symptoms showed a modest positive association per 10 years (OR 1.37, 95% CI 1.02–1.84). These estimates were based on only 26 and 17 events, respectively, and should be interpreted cautiously (Table S4).

Observed symptom combinations

The observed number of affected systems ranged from 0 to 5. Among symptom-positive participants, 1,557 (73.9%) had exactly one affected system, 415 (19.7%) had two, and 134 (6.4%) had three or more. The four most frequent symptom patterns were neurological only (19.6% of symptom-positive participants), respiratory only (17.0%), digestive only (16.8%), and circulatory only (16.0%) (Table S8; Figure S3). Pairwise Phi correlations were generally modest; negative coefficients among symptom-positive participants partly reflected conditioning on the presence of at least one symptom (Table S9; Figure S2).

Latent class analysis

Among models with one to seven classes, the four-class solution had the lowest BIC (12,983.29) and sample-size-adjusted BIC (12,897.51), entropy of 0.886, a minimum class proportion of 12.9%, and favorable posterior classification quality. Models with six and seven classes did not converge before the maximum number of iterations (Table S7; Figure S1). The final four-class model was refitted after 1,000 random starts and had log-likelihood – 6385.718, mean maximum posterior probability 0.950, and class-specific average posterior probabilities from 0.887 to 0.996.

For presentation, classes were reordered and labeled according to their conditional profiles (Table 3; Fig. 2). The circulatory-dominant class comprised 23.4% of the sample and had a conditional probability of 1.00 for circulatory symptoms, with respiratory probability 0.27 and digestive probability 0.22. The respiratory-dominant class comprised 12.9% and had respiratory probability 1.00 with near-zero probabilities for other systems. The digestive-dominant class comprised 15.4% and had digestive probability 1.00 and respiratory probability 0.17. The neurological/low-common-system class comprised 48.2% and had a neurological probability of 0.45, motor probability 0.11, and low probabilities for the other common systems.

Table 3
Four-class latent class solution Panel A. Conditional symptom probabilities and classification quality

Class	Model-estimated n (%)	Circulatory	Respiratory	Digestive	Urinary	Neurological	Motor	AvePP
1. Circulatory-dominant	599 (23.4)	1.00	0.27	0.22	0.02	0.09	0.03	0.941
2. Respiratory-dominant	330 (12.9)	< 0.01	1.00	< 0.01	0.01	< 0.01	< 0.01	0.900
3. Digestive-dominant	395 (15.4)	< 0.01	0.17	1.00	0.02	< 0.01	0.02	0.887
4. Neurological/low-common-system	1233 (48.2)	0.03	0.07	0.08	0.05	0.45	0.11	0.996

Panel B. Posterior-probability-weighted demographics and modal classification

Class	Female, %	Age, mean (SD), years	BMI, mean (SD), kg/m ²	Current smoker, %	Current drinker, %	Modal-classified n (%)
1. Circulatory-dominant	79.4	49.6 (16.3)	23.5 (4.0)	15.2	20.0	634 (24.8)
2. Respiratory-dominant	79.7	49.3 (16.1)	23.5 (3.8)	15.6	21.1	365 (14.3)
3. Digestive-dominant	75.2	47.1 (14.3)	23.5 (3.8)	15.6	17.0	444 (17.4)
4. Neurological/low-common-system	60.2	47.5 (18.3)	23.7 (3.7)	24.1	27.7	1114 (43.6)

Note: The model used six binary indicators: circulatory, respiratory, digestive, urinary, neurological, and motor symptoms. Reproductive and endocrine symptoms were excluded because of very low prevalence. Model-estimated class proportions and demographic summaries are posterior-probability weighted; modal-classified n (%) uses each participant's highest posterior probability. Classes were reordered for presentation and correspond to raw model classes 3, 1, 2, and 4. The fourth class contains both participants with neurological symptoms and participants with low probabilities across the six common symptom systems. The final model was refitted after 1,000 random starts (log-likelihood -6385.718; BIC 12983.294; sample-size-adjusted BIC 12897.508; entropy 0.886; mean maximum posterior probability 0.950). Urinary-motor residual dependence remained after Holm correction. AvePP, average posterior probability; BIC, Bayesian information criterion; BMI, body mass index; SD, standard deviation.

The neurological/low-common-system label reflects the composition of the indicator set: 467 participants had an all-zero pattern on the six LCA indicators, including 451 participants without any of the eight symptoms and 16 with only reproductive or endocrine symptoms. The class therefore should not be interpreted as a pure neurological subtype. Posterior-weighted female proportions were 79.4%, 79.7%, and 75.2% in the circulatory-, respiratory-, and digestive-dominant classes, respectively, compared with 60.2% in the neurological/low-common-system class (Table 3).

Local-independence diagnostics were satisfactory for most indicator pairs. Residual dependence remained between urinary and motor symptoms after Holm adjustment (bivariate residual chi-square 13.14; adjusted $P = 0.004$), whereas the urinary-neurological residual did not remain significant after adjustment ($P = 0.079$) (Table S10).

Discussion

Principal findings

In this reanalysis of all 2,557 eligible participants, sex was associated strongly with the distribution of somatic symptoms across systems. Females had higher prevalence of circulatory, respiratory, and digestive symptoms and lower prevalence of urinary, neurological, and motor symptoms. These differences were not explained simply by a higher global symptom burden: the expanded models showed no clear sex association with any symptom overall or with multisystem involvement[20]. In addition, sex associations varied nonlinearly with age for all six common systems[21]. Exploratory LCA identified four system-level patterns with good classification quality, although one residual urinary-motor association and the large all-zero response pattern limit a subtype interpretation[22].

Sex differences concerned symptom distribution more than burden

Previous work has often reported more numerous or intense bodily symptoms among women[2, 4]. The present results refine that general observation. Although females had a slightly higher crude prevalence of any somatic symptom, the association was not robust to expanded adjustment, and the number of affected systems did not differ materially by sex. Instead, sex differences were system specific and bidirectional. This distinction is clinically and conceptually important: an apparent female predominance in selected systems should not be generalized to a uniformly greater somatic burden.

Several mechanisms could contribute to the observed distribution, including sex-related differences in autonomic or visceral physiology, symptom perception, socialization, reporting thresholds, health-care contact, and the prevalence or phenomenology of specific anxiety disorders[4, 5]. The current data cannot distinguish among these possibilities. The strong male predominance in urinary and motor symptoms also warrants attention to the content and applicability of the underlying checklist items. System-level comparisons are most interpretable when item counts, sex-specific applicability, and ascertainment procedures are transparent.

Age-patterned heterogeneity

All six common systems showed evidence that the sex association varied with age. This supports modeling age continuously rather than relying solely on broad age strata. Reviews of anxiety in older adults emphasize differences in comorbidity, symptom recognition, and presentation across age groups[6–9]. However, the current interactions should not be described as developmental or hormonal effects because the data were cross-sectional. Cohort effects, referral patterns, age-related medical context, and differential reporting may all contribute. Longitudinal studies are needed to determine whether within-person symptom expression changes with aging.

Interpretation of the latent classes

The four-class solution was statistically preferable to the alternatives considered and showed favorable entropy and posterior probabilities[18]. Nevertheless, its substantive meaning requires caution. Three classes were dominated by a single system, consistent with the observed data in which nearly three quarters of symptom-positive participants had only one affected system. The largest class combined a moderate probability of neurological symptoms with low probabilities across the remaining common systems and absorbed the all-zero pattern on the six indicators. Accordingly, the LCA primarily summarized dominant system patterns rather than revealing complex multisystem syndromes[22].

The residual association between urinary and motor symptoms indicates incomplete local independence. Such dependence does not invalidate the entire model, but it signals that the four classes do not capture all pairwise structure[19]. Replication should examine individual symptom items, alternative indicator groupings, direct effects between selected indicators, and external validators such as diagnosis subtype, severity, course, treatment response, and functional outcomes. Until then, the classes should be regarded as exploratory descriptive patterns, not biological entities or diagnostic categories.

Clinical and research implications

The findings may help clinicians anticipate heterogeneous bodily presentations in patients already being evaluated for anxiety disorders. They do not establish that a particular symptom pattern is caused by anxiety, nor do they provide diagnostic sensitivity or specificity. Appropriate medical evaluation remains essential, especially for cardiopulmonary, neurological, urinary, and other potentially organic complaints. The value of the results lies in broadening symptom inquiry and avoiding a one-size-fits-all conception of somatic presentation, not in reducing indicated diagnostic testing.

Future studies should use multicenter prospective designs, validated and fully documented symptom instruments, diagnosis-specific analyses, and measures of anxiety severity, depression, duration, and treatment exposure. External validation of the four-class structure and assessment of its association with clinically meaningful outcomes are priorities.

Strengths and limitations

Strengths include the large sample, inclusion of all eligible participants in the primary analyses, direct estimation of prevalence ratios for common cross-sectional outcomes, nonlinear modeling of age, correction for sparse-data bias in rare outcomes, multiplicity adjustment, adult-only sensitivity analyses, and a more extensive LCA search with 1,000 final random starts and local-independence diagnostics.

Several limitations should be considered. First, the single-center cross-sectional design limits generalizability and precludes causal or within-person aging inferences. Second, the analysis lacked specific anxiety disorder diagnoses, anxiety severity, depressive symptoms, illness duration, socioeconomic variables, and other potential confounders or effect modifiers. Third,

the symptom checklist was adapted from existing sources, but the full item content, recall period, mapping, and psychometric performance require detailed reporting; system-level binary indicators also ignore symptom number and severity within each system. Fourth, raw BMI was used across a sample that included children and adolescents, although adult-only analyses were consistent. Fifth, 316 screened patients were excluded and could not be compared with the analytic sample using the available extract. Sixth, reproductive and endocrine results were based on very few events. Finally, the LCA used only six system-level indicators, included a large all-zero pattern, showed one residual dependence signal, and has not been externally validated.

Conclusions

In patients with first-episode anxiety disorders, sex appeared to be primarily associated with the specific somatic systems involved, rather than with a consistent difference in overall multisystem burden. Females showed a higher prevalence of circulatory, respiratory, and digestive symptoms, but a lower prevalence of urinary, neurological, and motor symptoms; all six associations seemed to vary with age. Four exploratory system-level patterns were tentatively identified; however, their interpretation was constrained by dominant single-system presentations, the all-zero indicator pattern, and residual dependence between urinary and motor symptoms. These findings may suggest the value of comprehensive symptom assessment that takes sex and age into account, while also pointing to the need for further clinical evaluation and external validation before drawing firm conclusions.

Declarations

Consent for publication

Not applicable.

Ethics approval and consent to participate

This retrospective study was conducted in accordance with the Declaration of Helsinki. The study protocol was reviewed and approved by the Ethics Committee of Southwest Medical University (Approval No.:20240301-003). Given the retrospective nature of the study and the use of anonymized medical records, the Ethics Committee granted a waiver of informed consent for all participants. All patient data were handled in compliance with relevant data protection regulations and institutional guidelines.

Funding

This study was supported in part by a grant from Sichuan Provincial Department of Science and Technology (2023NSFSC0124), High quality development project of Zigong City Hospital (ZG-KY-2023-047, ZG-PT-2023-026), Youth Project of Southwest Medical University (LXWQ-2022QN084), Clinical Medicine Special Project of Southwest Medical University (2025LCYXZX71), The scientific and technological strategic cooperation project between Hejiang County People's Hospital and Southwest Medical University (2025HJXNYD02).

Conflict of Interest declaration

No conflict of interest

Acknowledgments

We thank the staff of the technical platform for their assistance.

Data available

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Authors' contributions

Yunyao He: Investigation; Data curation; Writing - original draft. Tingting Wang: Conceptualization; Formal analysis; Methodology; Data curation; Funding acquisition; Writing - original draft. Yang Lu: Investigation. Hao Yu: Investigation. Yi Wang: Investigation. Jin Zhang: Investigation. Lanyang Gao: visualization, funding acquisition. Bo Xiang: Conceptualization, funding acquisition, writing - review & editing. Kezhi Liu: Conceptualization; Funding acquisition; Supervision; Project administration; Writing - review & editing.

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Figures

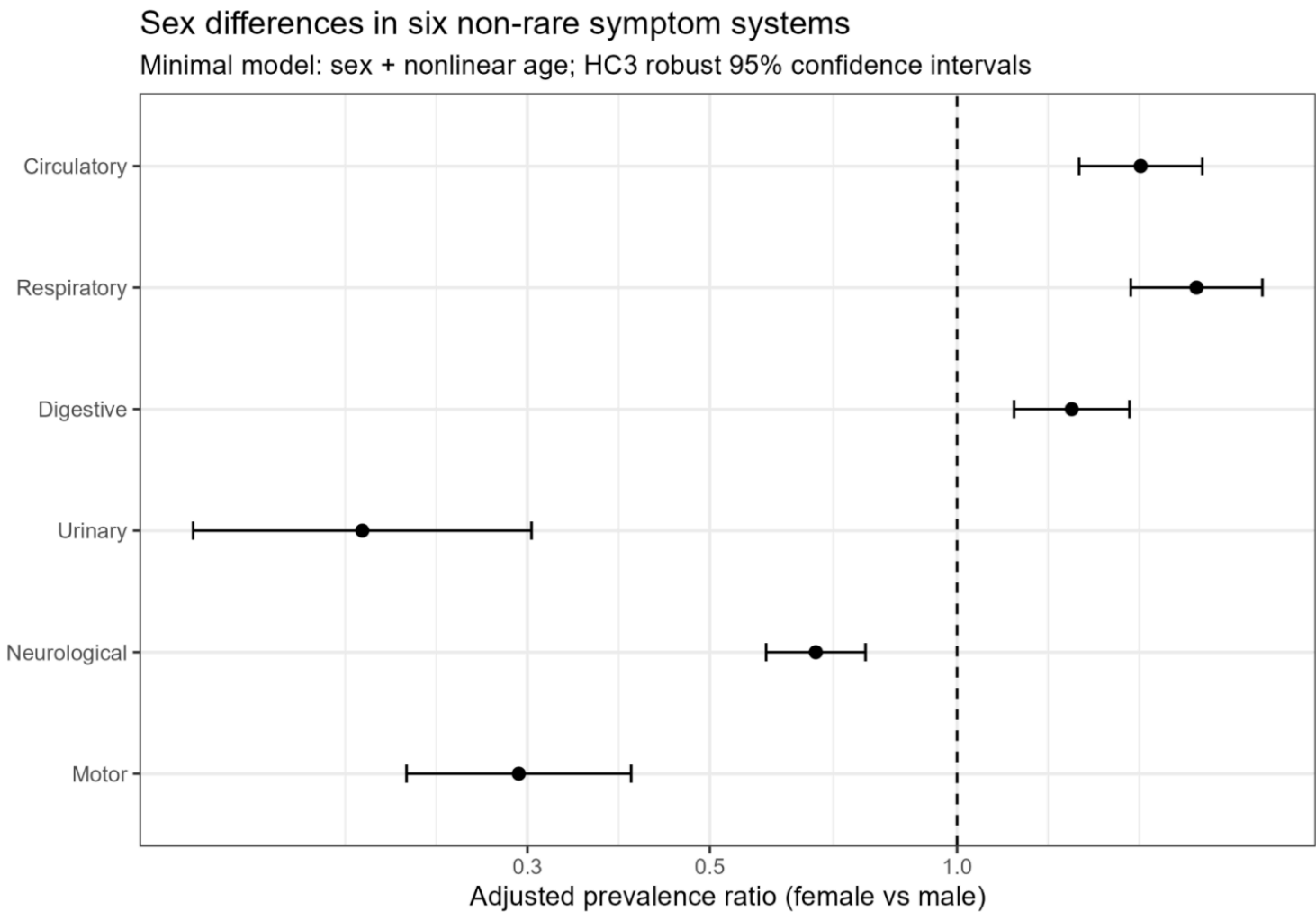


Figure 1

Adjusted prevalence ratios comparing females with males for six common symptom systems. Estimates are from separate modified Poisson models including sex and age modeled with a natural spline with 3 degrees of freedom. Error bars show HC3 robust 95% confidence intervals. The dashed vertical line indicates no association (aPR=1).

Sex differences in six non-rare symptom systems

Minimal model: sex + nonlinear age; HC3 robust 95% confidence intervals

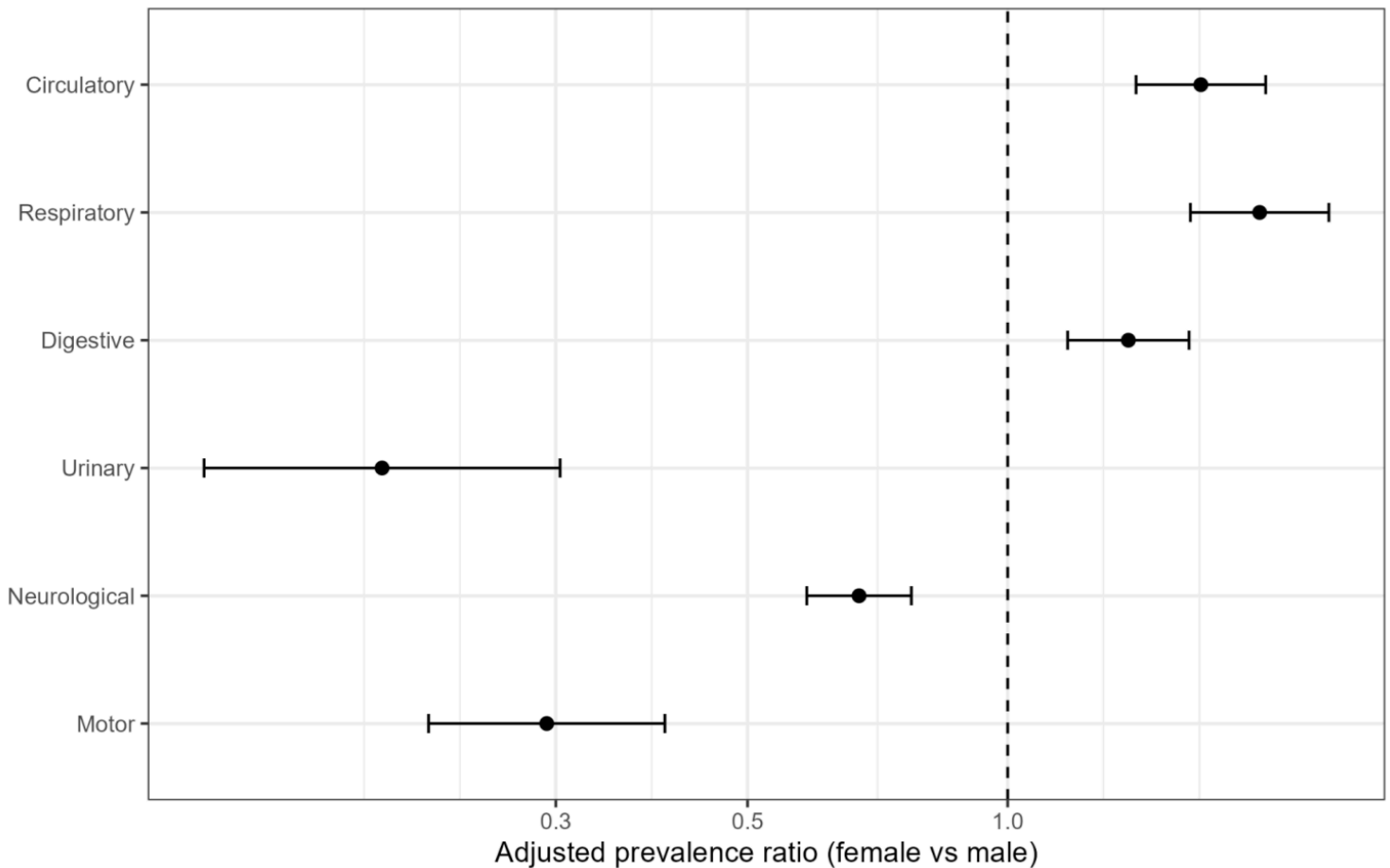


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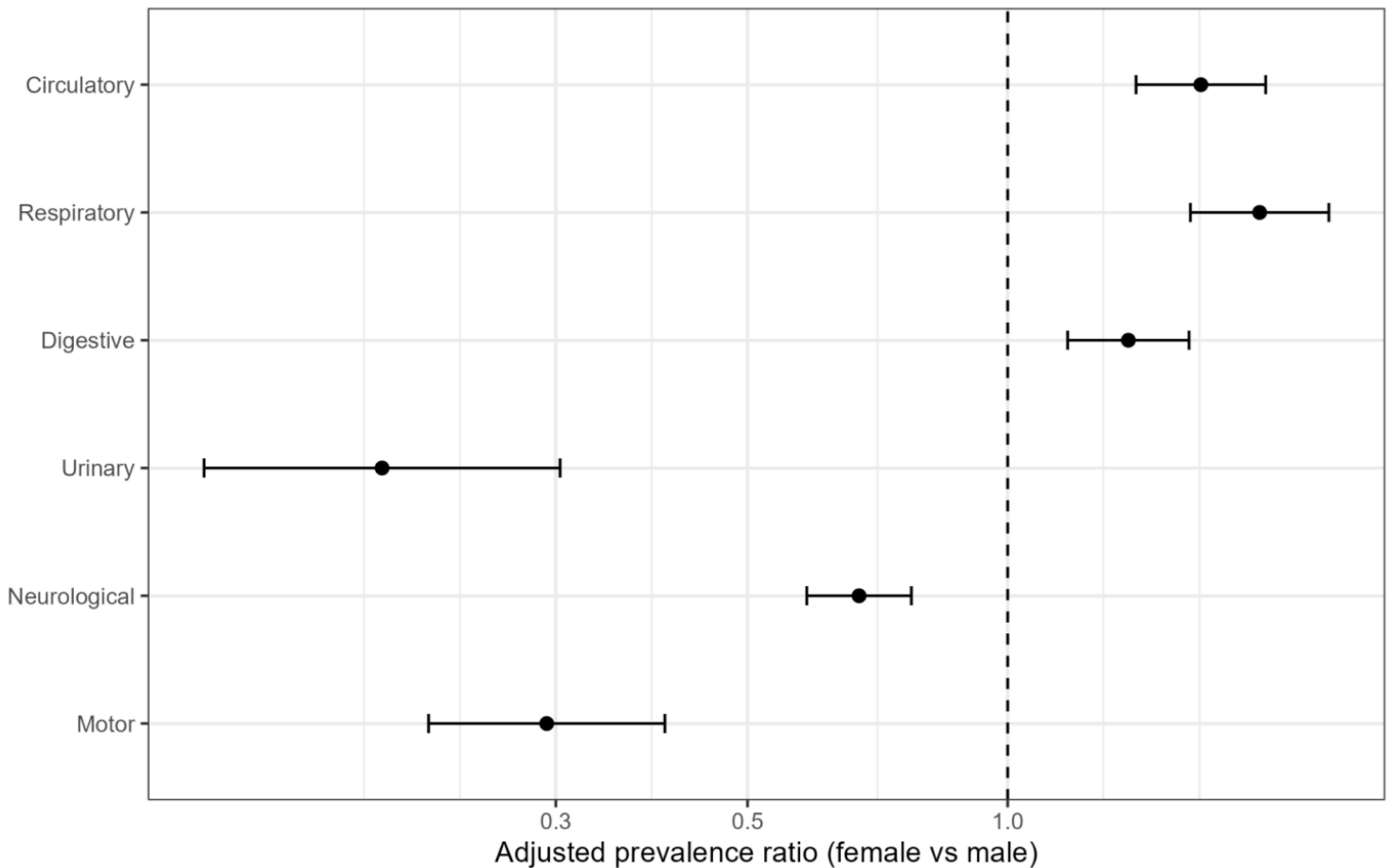


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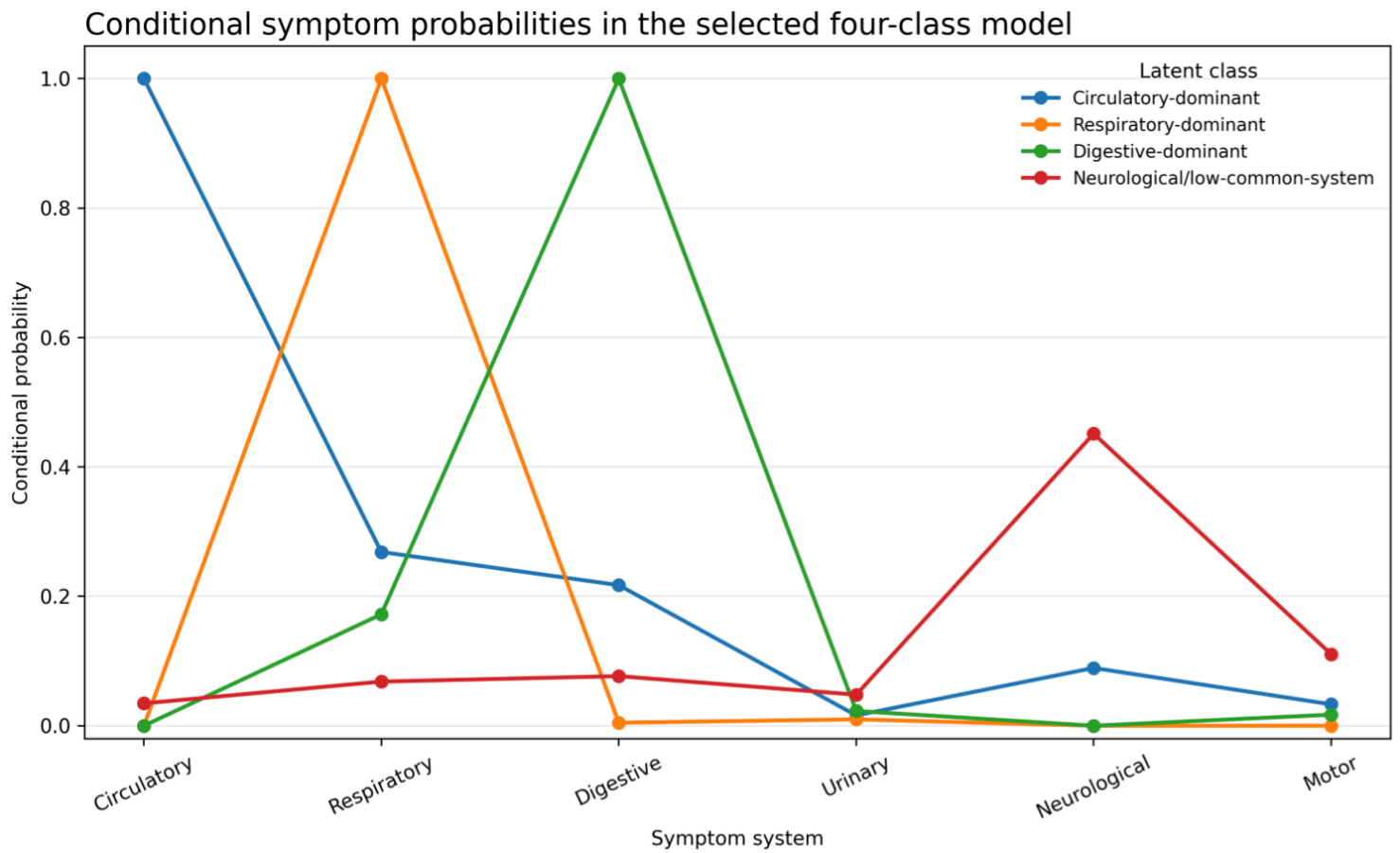


Figure 2

Conditional symptom probabilities in the selected four-class latent class model. The model included circulatory, respiratory, digestive, urinary, neurological, and motor indicators in all 2,557 eligible participants. Classes were reordered and labeled for presentation. Reproductive and endocrine systems were excluded because of very low prevalence.

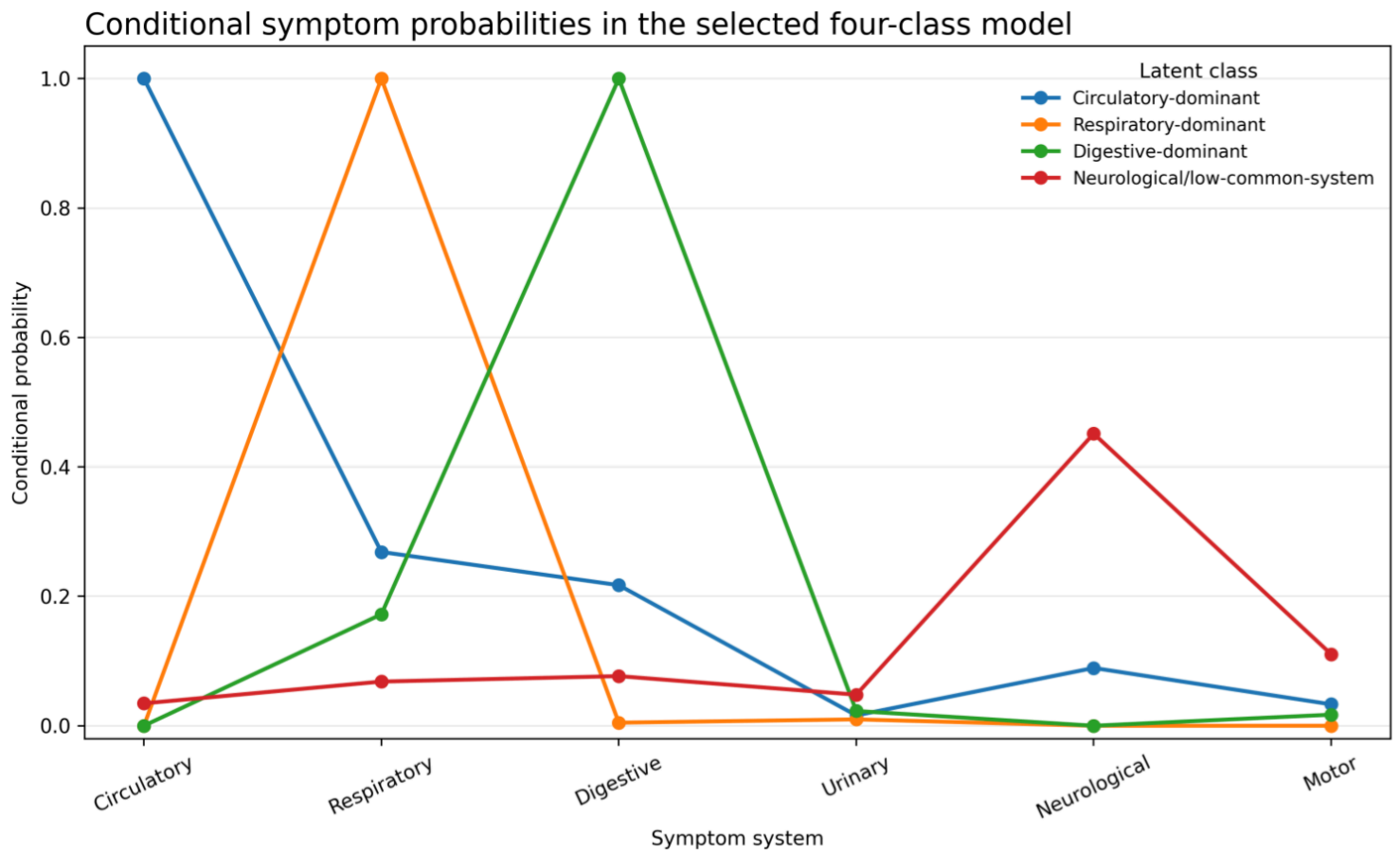


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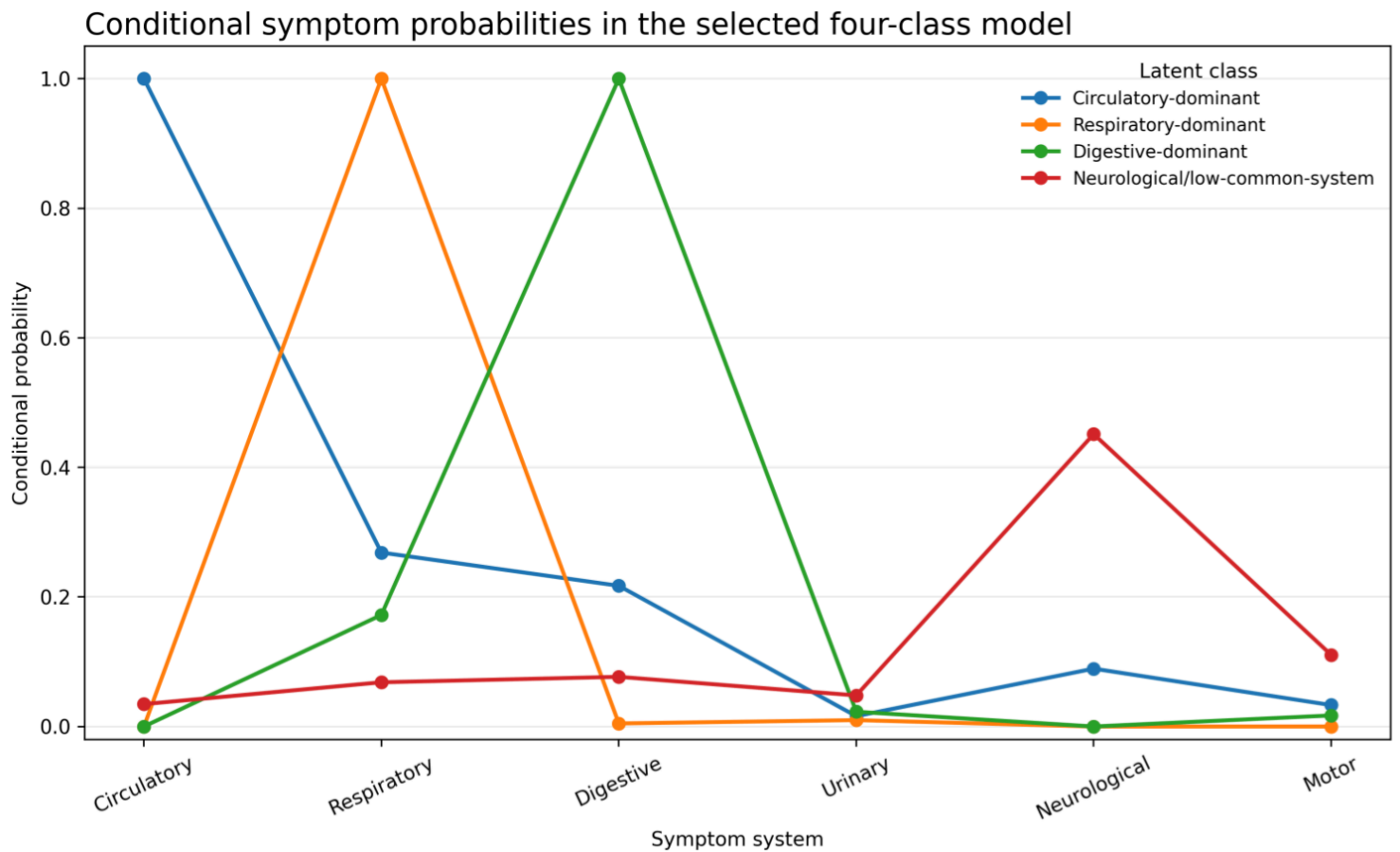


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