

Physical and Psychological Symptom Burden Across Age Groups: A Biopsychosocial Analysis of Hormone-Related Health Experiences

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Abstract

Hormonal and hormone-related health experiences often involve physical symptoms, emotional changes, sleep disturbance, cognitive complaints, and concerns about everyday functioning. Yet physical and psychological manifestations are frequently examined separately, and observational symptom data are sometimes interpreted more causally than the measurements permit. This study examined the association between self-reported physical and psychological symptom burden and compared psychological symptoms across age groups, diagnosis status, and gender.

A quantitative, cross-sectional, correlational and comparative framework was applied to a supplied 400-case analytical dataset containing 100 cases in each of four age groups: adolescents aged 13–19 years, young adults aged 20–39 years, middle-aged adults aged 40–60 years, and seniors aged 61 years and above. The questionnaire included six psychological symptom items, six physical symptom items, four biopsychosocial interconnection items, a 1–10 physical-health effect on mood rating, demographic variables, and self-reported hormonal or hormone-related diagnosis status. Internal consistency, correlations, analysis of variance, independent-samples comparisons, non-parametric robustness tests, effect sizes, and multivariable regression were examined.

The Psychological and Physical Symptom Scales showed good internal consistency ($\alpha = .809$ and $.828$). Physical symptom burden was positively associated with psychological symptom burden ($r = .318$, 95% CI $[.227, .403]$, $p < .001$; Spearman $\rho = .328$, $p < .001$). Psychological symptoms differed across age groups, $F(3, 396) = 11.98$, $p < .001$, $\eta^2 = .083$, with middle-aged

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adults reporting the highest mean score. Participants reporting a confirmed hormonal or hormone-related diagnosis had higher psychological symptom scores than those without a confirmed diagnosis (Hedges' $g = .45$, $p < .001$). Female and male participants did not differ significantly ($p = .609$, $g = -.05$). In adjusted analysis, physical symptom burden, confirmed diagnosis, and middle-aged group membership remained associated with psychological symptoms.

The pattern supports a biopsychosocial interpretation in which physical and psychological symptom burdens are interconnected, while age and diagnosis status provide additional context. Because hormone concentrations were not measured and the design is cross-sectional, the findings do not establish endocrine causation. In addition, the project documentation identifies the supplied analytical dataset as synthetic/simulated; therefore, the numerical findings should be treated as methodology-validation results unless provenance is independently verified before empirical publication.

Keywords: Hormonal Health | Psychological Symptoms | Physical Symptoms | Age Groups | Diagnosis Status | Biopsychosocial Model | Cross-Sectional Analysis

I. INTRODUCTION

Hormonal health sits at the intersection of biological regulation, subjective symptom experience, and social functioning. Endocrine systems contribute to metabolism, reproductive functioning, energy regulation, sleep, appetite, thermoregulation, and stress responses. Changes in these systems can therefore coexist with symptoms that people experience as both physical and psychological. Fatigue, altered weight, skin problems, hair changes, appetite disturbance, and temperature sensitivity may occur alongside anxiety, irritability, disturbed sleep, reduced interest, concentration problems, and perceived "brain fog." The clinical meaning of these experiences, however, cannot be inferred from symptom presence alone. Many of the same complaints occur in non-endocrine medical conditions and in periods of psychological or social

strain. A defensible research approach must therefore distinguish hormone-related context from direct measurement of hormonal mechanisms.

The biopsychosocial model provides a useful framework for this distinction. Engel (1977) argued that health cannot be understood adequately when biological processes are isolated from psychological experience and social context. In hormone-related health research, this perspective is particularly relevant because the consequences of a physical symptom may extend beyond its physiological origin. Persistent fatigue can affect work, education, exercise, and social participation. Sleep disruption may coincide with irritability and difficulty concentrating. Changes in weight, skin, or hair may influence self-image and interpersonal confidence. Uncertainty about unexplained symptoms can itself become psychologically burdensome. Conversely, stress,

disrupted routines, social pressures, and emotional difficulties may influence sleep, appetite, energy, and the subjective salience of physical symptoms. The resulting pattern is one of interaction rather than a simple one-way pathway. Evidence from developmental and endocrine research supports such caution. During adolescence, puberty is accompanied by rapid biological and psychosocial change, but the relationship between pubertal hormones and mental health is heterogeneous. Stumper and Alloy (2023) found evidence linking pubertal stage with depression, particularly among girls, while emphasizing variability across studies. Luo et al. (2024), in a systematic review of pubertal hormones and mental-health problems, identified associations involving testosterone, estradiol, and selected psychological outcomes but concluded that causal inference remained limited by confounding, measurement error, selection processes, and short-term hormonal variability. Earlier work on testosterone and male adolescent mood similarly showed that hormonal development cannot be reduced to a deterministic account of behaviour or emotional state (Duke et al., 2014). These findings support examining adolescent symptom patterns while avoiding claims that self-reported psychological symptoms are direct markers of hormone concentration.

Young adulthood introduces a different set of biological and psychosocial circumstances. Education, employment, intimate relationships, fertility concerns, financial responsibilities, and identity development can coincide with reproductive and endocrine-health conditions. Polycystic ovary syndrome (PCOS) is especially informative because it demonstrates how physical manifestations and psychological wellbeing may converge. Depression and anxiety are important concerns among adolescents and young women with PCOS (Nasiri-Amiri et al., 2023). Quality-of-life research has also shown that PCOS can affect multiple domains of wellbeing rather than functioning only as a reproductive disorder (Behboodi Moghadam et al., 2018). Visible manifestations may be psychologically salient: a systematic review and meta-analysis reported

greater body-image concerns among women with PCOS compared with women without the condition (Davitadze et al., 2023). These findings do not imply that every visible symptom has an endocrine origin, but they establish a plausible biopsychosocial route through which physical appearance and psychological experience may become connected.

Middle adulthood is particularly relevant to lifespan comparisons because biological transitions may coincide with substantial occupational, caregiving, relationship, and health demands. The menopausal transition illustrates this complexity. Santoro et al. (2021) describe menopause as a multidimensional transition involving reproductive endocrine change and a range of possible symptoms whose severity varies considerably between individuals. Sleep disturbance, mood changes, and cognitive complaints have received increasing attention. Metcalf et al. (2023) reviewed evidence on cognitive problems during perimenopause and emphasized the influence of menopausal symptoms, stress exposures, and demographic context. Maki and Jaff (2024) similarly discuss subjective brain fog as a meaningful concern in midlife women, while Williams and Maki (2025) review cognitive, sleep, and mood changes across the menopausal transition. These studies make middle adulthood a reasonable period in which to investigate psychological symptom burden, but they also underline a crucial limitation: an age category of 40–60 years is not equivalent to measured menopausal or andropausal status. Age-group differences must therefore be described as developmental patterns unless reproductive stage or hormone concentrations are directly assessed.

Later adulthood presents another distinctive context. Older adults may experience changes in sleep, energy, physical health, cognition, medication exposure, social roles, and daily functioning. Subjective cognitive complaints such as forgetfulness, reduced mental clarity, or brain fog can be important to the individual, yet they should not be equated with objectively

established cognitive impairment. This distinction is especially relevant when a questionnaire asks participants to connect low physical energy with reduced mental clarity. Such an item captures perceived experience, not neuropsychological diagnosis. A lifespan study can usefully compare the prominence of cognitive-oriented and emotional complaints among seniors, provided the interpretation remains at the level of self-reported symptoms.

Diagnosis status adds another layer. A clinically recognized endocrine or reproductive condition may involve persistent symptoms, repeated medical consultations, treatment, uncertainty, reproductive concerns, and changes in daily functioning. Research on PCOS demonstrates elevated psychological concerns in diagnosed populations (Nasiri-Amiri et al., 2023; Davitadze et al., 2023). Thyroid-related research likewise illustrates that endocrine conditions may coexist with psychological symptoms. Wang et al. (2024) reported greater anxiety and depressive symptom burden among individuals with euthyroid Hashimoto's thyroiditis than comparison groups, although heterogeneity and methodological limitations require careful interpretation. Diagnosis may therefore identify a group with greater symptom burden without proving that a specific endocrine mechanism caused the psychological outcome.

A further complication is the distinction between confirmed and suspected diagnosis. Individuals who believe they have a hormone-related condition but have not received medical confirmation may nevertheless experience substantial physical symptoms, uncertainty, and distress. Collapsing these individuals into a broad "no confirmed diagnosis" category may conceal meaningful variation. At the same time, self-suspicion cannot be treated as clinical evidence of endocrine disease. Analyses that preserve all three categories—no diagnosis, suspected but unconfirmed, and confirmed—can therefore add useful context to a primary confirmed-versus-unconfirmed comparison.

Gender is theoretically relevant but should not be treated as a predetermined explanation. Reproductive endocrine experiences differ between females and males, and some hormone-related conditions are sex-specific. However, overall psychological symptom burden is shaped by biological, developmental, social, behavioural, and environmental influences. Pubertal research suggests that associations between developmental stage and affective outcomes can differ by sex (Stumper & Alloy, 2023), while broader developmental neuroscience emphasizes multidimensional pathways to sex differences in affective disorders (Ladouceur, 2026). Hormonal exposures can also show substantial individual variability in psychological response; for example, Mu and Kulkarni (2022) discuss the importance of temporal relationships when considering hormonal contraception and mood. These observations justify testing gender differences rather than assuming their direction.

Despite a growing literature on puberty, PCOS, thyroid conditions, menopause, and later-life symptoms, several gaps remain relevant to symptom-based research. First, many studies focus on a single life stage or diagnosis, making direct lifespan comparison difficult. Second, physical and psychological symptoms are often examined with different instruments across populations. Third, suspected but unconfirmed hormone-related concerns receive less attention than clinically diagnosed conditions. Fourth, visible physical symptoms and body-image distress are often discussed within particular disorders rather than within a broader age-comparative framework. Finally, observational symptom data are vulnerable to causal overinterpretation when hormone concentrations are not measured.

The present analysis addresses these issues by applying a common symptom framework across four age groups and by separating physical, psychological, and biopsychosocial domains. Four primary questions were examined: whether physical symptom burden is positively associated with psychological symptom burden; whether

psychological symptom burden differs across adolescents, young adults, middle-aged adults, and seniors; whether psychological symptoms differ according to hormonal or hormone-related diagnosis status; and whether psychological symptom burden differs between female and male participants. Supplementary analyses examined perceived physical-health effects on mood, biopsychosocial interconnection, age-specific sleep and irritability patterns, visible physical symptoms and body-image distress among young adults, subjective cognitive versus emotional symptoms among seniors, and an adjusted regression model.

The study is intentionally framed around measured variables. It does not test whether estrogen, progesterone, testosterone, cortisol, thyroid hormones, or other biomarkers cause psychological symptoms because these biological measures were not collected. The primary contribution is therefore methodological and biopsychosocial: to determine whether self-reported physical and psychological symptom burdens covary and whether this pattern differs across age, diagnosis, and gender categories within a consistent analytical framework.

II. MATERIALS AND METHODS

The study used a quantitative, cross-sectional, correlational and comparative design. The correlational component evaluated the association between composite physical and psychological symptom scores. Comparative analyses examined psychological symptom burden across age groups, diagnosis categories, and gender. No intervention was administered and no variable was experimentally manipulated. The design is therefore observational, and all coefficients and group differences are interpreted as associations rather than causal effects.

The analytical dataset contained 400 cases, with equal representation across four predefined age groups: adolescents aged 13–19 years ($n = 100$), young adults aged 20–39 years ($n = 100$), middle-aged adults aged 40–60 years ($n = 100$), and

seniors aged 61 years and above ($n = 100$). Ages ranged from 13 to 80 years. The balanced age-group structure facilitated direct comparison because each group contributed the same number of observations. The available project documentation does not establish the exact field-recruitment procedure sufficiently to support a claim of probability sampling. Accordingly, the sample is described as an age-stratified analytical structure rather than as a verified random population sample.

The gender distribution comprised 218 female participants (54.5%), 169 male participants (42.3%), four non-binary participants (1.0%), and nine participants who preferred not to state gender (2.3%). Self-reported hormonal or hormone-related diagnosis status comprised 214 cases reporting no diagnosis (53.5%), 63 reporting a suspected but medically unconfirmed condition (15.8%), and 123 reporting a confirmed diagnosis (30.8%). For the primary diagnosis comparison, confirmed cases were contrasted with 277 cases without a confirmed diagnosis; the latter category therefore included both no-diagnosis and suspected-but-unconfirmed cases. A supplementary three-category analysis was retained because these two unconfirmed groups may not be psychologically equivalent.

Measure

The study used a structured self-report questionnaire consisting of demographic and health-related items, a 1–10 rating of the perceived effect of physical health on mood, 16 Likert-type items, and an open-ended response item. The 16 symptom/interconnection items were rated for frequency using a five-point scale: 1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Often, and 5 = Always.

Psychological symptom burden was operationalized as the sum of six items assessing mood swings, anxiety or restlessness, difficulty concentrating or brain fog, disturbed sleep, loss of interest in regular activities, and irritability or low patience. Scores could range from 6 to 30, with higher values indicating greater psychological

symptom burden. Physical symptom burden was calculated from six items assessing hair thinning or hair fall, unexplained weight fluctuation or difficulty managing weight, persistent skin problems, chronic fatigue, abnormal temperature sensitivity, and appetite change or food cravings. This score also ranged from 6 to 30.

Four additional items formed a biopsychosocial interconnection score. They assessed whether physical or hormonal changes lowered mood or increased anxiety, whether physical symptoms generated body-image concerns, whether social, academic, or occupational pressures worsened physical wellbeing, and whether low physical energy was associated with reduced mental clarity or memory. The theoretical range was 4–20. An overall 16-item score, ranging from 16 to 80, was calculated for descriptive purposes but was not used as the primary outcome because the study sought to preserve the conceptual distinction between physical and psychological symptom domains.

Participants also rated the perceived effect of their physical health on mood from 1 to 10. This single item was treated as a supplementary measure because it overlaps conceptually with the psychological outcome. The open-ended item invited participants to describe how bodily changes affected mental health. It contained no usable responses in the analytical dataset, so no qualitative or thematic analysis was undertaken.

Data screening and scale assessment

Data were screened for duplicate identifiers, missing quantitative values, invalid response ranges, and consistency between numerical age and age-group coding. No duplicate participant IDs were identified, and no missing values were present for the quantitative variables required for the principal analyses. All Q1–Q16 responses were within the permitted 1–5 range, and all mood-impact responses were valid. Age-group coding was fully consistent with numerical age.

Internal consistency was evaluated using Cronbach's alpha (Cronbach, 1951). Corrected

item-total correlations and alpha-if-item-deleted values were examined to identify items that might materially weaken the psychological or physical scales. Exploratory factorability was assessed using the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's test of sphericity. The dimensional analysis was treated as exploratory rather than confirmatory because the questionnaire was not originally administered as an established psychometric instrument with a prespecified confirmatory factor model.

Statistical analysis

Analyses followed the hypothesis structure specified in the dissertation. Statistical significance was evaluated at $\alpha = .05$, but effect sizes, confidence intervals, and robustness procedures were considered alongside p values (Cohen, 1988; Field, 2018). Descriptive statistics included means, standard deviations, medians, minima, maxima, frequencies, and percentages.

For the first hypothesis, Pearson's product-moment correlation was used to assess the association between Physical Symptom Score and Psychological Symptom Score. A 95% confidence interval was calculated for Pearson's r . Spearman's rank-order correlation was used as a robustness check because the composite scores were derived from ordinal Likert-type items.

For the second hypothesis, a one-way analysis of variance compared Psychological Symptom Scores across the four age groups. Homogeneity of variance was examined with Levene's test. When the omnibus ANOVA was significant, Tukey's honestly significant difference procedure was used for pairwise comparisons. Eta squared and omega squared quantified the magnitude of the age-group effect. Welch ANOVA and the Kruskal-Wallis test were used as robustness checks.

For the third hypothesis, Psychological Symptom Scores were compared between participants with and without a confirmed hormonal or hormone-related diagnosis. Levene's test assessed variance equality, and the Welch independent-samples t test was reported as a robust comparison. Hedges'

g quantified standardized mean difference. A Mann-Whitney U test provided a non-parametric robustness analysis. The original three diagnosis categories were additionally compared using one-way ANOVA and Tukey post-hoc tests.

For the fourth hypothesis, the primary inferential gender comparison was restricted to female and male participants because the non-binary and prefer-not-to-say subgroups were too small for stable group inference. Welch's t test, Hedges' g, and Mann-Whitney U were used. The smaller gender categories remained in descriptive summaries.

Supplementary analyses examined correlations of the biopsychosocial and mood-impact measures with the main symptom scales; age-group differences in disturbed sleep, irritability, and perceived mood impact; correlations between visible physical symptoms and body-image distress among young adults; a young-adult regression model for body-image distress; a paired comparison of cognitive-oriented and emotional symptom indicators among seniors; and the association between age group and confirmed diagnosis prevalence. A multiple linear regression with HC3 robust standard errors examined whether physical symptom burden remained associated with psychological symptoms after adjustment for confirmed diagnosis, age group, and female gender.

Research integrity and interpretive boundary

The numerical analyses reported here reproduce the supplied 400-case analytical dataset. A separate project analysis document identifies this dataset as synthetic/simulated for methodology validation. This provenance issue is material to publication ethics. The results are therefore presented in this manuscript as methodology-validation findings and must not be represented as observations from genuine field participants unless the researcher independently verifies the provenance of the dataset or replaces it with authenticated collected responses. The same caution applies to references to consent and recruitment: the questionnaire and research plan

describe intended procedures, but the available documentation is insufficient to verify all operational details of actual field recruitment.

Because the dataset contains adolescents, any future empirical version based on real participants would also require clear documentation of ethics approval, informed consent, and age-appropriate guardian consent/assent procedures. No such details are invented here. This approach preserves the distinction between the study design described in the research materials and what can be verified from the available analytical files.

III. RESULTS

Data quality, descriptive profile and reliability

The 400-case dataset was complete for the quantitative variables used in the principal analyses. Each age group contained 100 cases. Psychological Symptom Scores had a mean of 18.98 (SD = 3.98), median of 19, and observed range of 7–30. Physical Symptom Scores averaged 18.11 (SD = 4.15), with a median of 18 and range of 8–30. The Biopsychosocial Interconnection Score averaged 12.58 (SD = 2.41), and the overall 16-item score averaged 49.66 (SD = 8.60). The mean perceived physical-health effect on mood was 5.79 (SD = 1.30) on the 1–10 scale. Similarity between means and medians and the observed score distributions did not suggest major distortion by extreme skewness.

Table 1. *Sample Characteristics and Descriptive Statistics*

Characteristic / Measure	Value
Age group: Adolescents, n (%)	100 (25.0)
Age group: Young adults, n (%)	100 (25.0)
Age group: Middle-aged adults, n (%)	100 (25.0)
Age group: Seniors, n (%)	100 (25.0)
Female, n (%)	218 (54.5)
Male, n (%)	169 (42.3)
Non-binary, n (%)	4 (1.0)
Prefer not to say, n (%)	9 (2.3)
No diagnosis, n (%)	214 (53.5)
Suspected/unconfirmed diagnosis, n (%)	63 (15.8)

Confirmed diagnosis, n (%)	123 (30.8)
Psychological Symptom Score, M (SD)	18.98 (3.98)
Physical Symptom Score, M (SD)	18.11 (4.15)
Biopsychosocial Score, M (SD)	12.58 (2.41)
Overall Q1–Q16 Score, M (SD)	49.66 (8.60)
Physical-health effect on mood, M (SD)	5.79 (1.30)

Note. N = 400. Age groups each contained 100 cases. Percentages may not total 100 because of rounding.

The Psychological Symptom Scale demonstrated good internal consistency ($\alpha = .809$), as did the Physical Symptom Scale ($\alpha = .828$). The four-item Biopsychosocial Interconnection Scale had lower internal consistency ($\alpha = .654$), warranting more cautious interpretation. Across all 16 items, α was .873. Corrected item-total correlations were approximately .53–.61 for psychological items and .56–.64 for physical items, and deletion of individual items did not materially improve either scale. Factorability was strong (KMO = .917), and Bartlett's test was significant, $\chi^2(120) = 2137.31$, $p < .001$. Exploratory structure suggested two dominant dimensions broadly corresponding to psychological and physical symptoms, while the biopsychosocial items showed cross-loading rather than a clean independent third dimension.

Table 2. Reliability and Construct Assessment

Measure	Items	Statistic	Interpretation
Psychological symptoms (Q1–Q6)	6	.809	Good
Physical symptoms (Q7–Q12)	6	.828	Good
Biopsychosocial interconnection (Q13–Q16)	4	.654	Moderate
All Q1–Q16 items	16	.873	Very good
KMO measure	—	.917	Strong factorability

Bartlett's test	—	$\chi^2(120) = 2137.31$, $p < .001$	Significant
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Note. Cronbach's α is reported for scale reliability. KMO = Kaiser–Meyer–Olkin measure.

Physical and psychological symptom burden

Physical Symptom Score was positively correlated with Psychological Symptom Score, $r = .318$, 95% CI [.227, .403], $p < .001$. Spearman's rank correlation produced a closely similar result, $p = .328$, $p < .001$. The convergence of parametric and rank-based estimates indicates that the association was not dependent on a single distributional assumption. The magnitude is best described as moderate rather than strong: greater physical symptom burden tended to accompany greater psychological symptom burden, but the two constructs were not interchangeable.

Age-group differences

Psychological symptom burden differed significantly by age group. Adolescents had a mean Psychological Symptom Score of 18.08 (SD = 3.56), young adults 18.47 (SD = 3.91), middle-aged adults 20.95 (SD = 4.19), and seniors 18.43 (SD = 3.61). Levene's test was non-significant ($p = .101$), supporting the standard ANOVA variance assumption. The omnibus difference was significant, $F(3, 396) = 11.98$, $p < .001$, $\eta^2 = .083$, $\omega^2 = .076$. Thus, approximately 8% of variance in psychological symptom scores was associated with age-group membership.

Table 4. Psychological Symptom Scores Across Age Groups

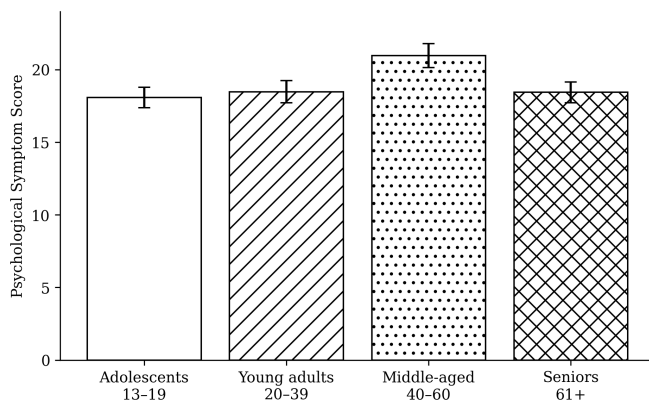
Age group	n	M	SD	Tukey HSD summary
Adolescents (13–19)	100	18.08	3.56	—
Young adults (20–39)	100	18.47	3.91	—
Middle-aged adults (40–60)	100	20.95	4.19	Higher than adolescents, young

				adults, and seniors (all $p < .001$)
Seniors (61+)	100	18.43	3.61	—

Note. Overall ANOVA: $F(3, 396) = 11.98, p < .001, \eta^2 = .083, \omega^2 = .076$. Other pairwise comparisons were not significant.

Tukey comparisons showed that middle-aged adults scored significantly higher than adolescents (mean difference = 2.87, $p < .001$), young adults (mean difference = 2.48, $p < .001$), and seniors (mean difference = 2.52, $p < .001$). Adolescents, young adults, and seniors did not differ significantly from one another. Both Welch ANOVA and the Kruskal-Wallis test were significant ($p < .001$), confirming that the overall conclusion was robust to alternative procedures.

Figure 1. Mean Psychological Symptom Scores Across Age Groups



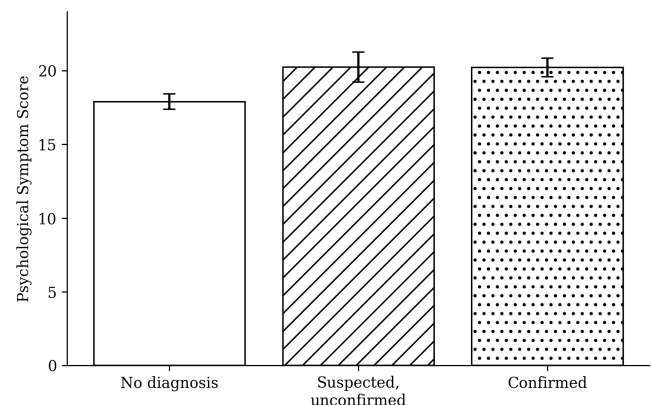
Note. Error bars represent 95% confidence intervals calculated from the reported group SDs and $n = 100$ per group. Higher scores indicate greater psychological symptom burden.

Diagnosis status

Participants reporting a confirmed hormonal or hormone-related diagnosis ($n = 123$) had a mean Psychological Symptom Score of 20.21 ($SD = 3.56$), compared with 18.44 ($SD = 4.04$) among those without a confirmed diagnosis ($n = 277$). Levene's test was non-significant ($p = .112$). The Welch comparison was significant, $t \approx 4.41, df \approx 263.21, p < .001$, with Hedges' $g = .45$, indicating a moderate standardized difference. The Mann-Whitney U analysis was also significant ($p < .001$).

The three-category analysis clarified the pattern. Participants reporting no diagnosis ($n = 214$) had the lowest psychological symptom mean, 17.90 ($SD = 3.86$). Those reporting a suspected but medically unconfirmed condition ($n = 63$) had a mean of 20.25 ($SD = 4.12$), and those reporting a confirmed diagnosis ($n = 123$) had a mean of 20.21 ($SD = 3.56$). The overall ANOVA was significant, $F \approx 18.47, p < .001$. Tukey tests indicated that the no-diagnosis group scored significantly lower than both the suspected and confirmed groups, whereas suspected and confirmed groups did not differ significantly. This result shows why the binary confirmed-versus-unconfirmed analysis should be supplemented by the original diagnosis categories: combining suspected cases with the no-diagnosis group obscures a subgroup with comparatively high psychological symptom burden.

Figure 2. Mean Psychological Symptom Scores by Diagnosis Status



Note. Error bars represent 95% confidence intervals calculated from the reported SDs and group sample sizes. Diagnosis status was self-reported; suspected diagnosis was not medically confirmed.

Gender

Female participants ($n = 218$) had a mean Psychological Symptom Score of 18.95 ($SD = 4.06$), while male participants ($n = 169$) had a mean of 19.15 ($SD = 3.77$). Levene's test was non-significant ($p = .399$). The Welch test showed no significant difference ($p = .609$), and Hedges' g was $-.05$, indicating a negligible standardized effect. The Mann-Whitney U test was likewise non-significant ($p = .558$). The data therefore did not support a general female–male difference in total

psychological symptom burden. The non-binary and prefer-not-to-say groups were retained descriptively but were not subjected to strong inferential interpretation because of their small sample sizes.

Table 3. Summary of Primary Hypothesis Tests

Hypotheses	Primary test	Effect / Test statistic	p	Decision
H1: Physical–psychological association	Pearson correlation	$r = .318$, 95% CI [.227, .403]	$< .001$	Supported
H2: Age-group differences	One-way ANOVA	$F(3, 396) = 11.98$; $\eta^2 = .083$	$< .001$	Supported
H3: Confirmed diagnosis difference	Welch t test	$t \approx 4.41$; Hedge's $g = .45$	$< .001$	Supported
H4: Female–male difference	Welch t test	Hedge's $g = -.05$	.609	Not supported

Note. Decisions refer to the prespecified analytical hypotheses; statistical significance was evaluated at $\alpha = .05$.

Supplementary biopsychosocial findings

Perceived physical-health effect on mood showed a strong positive association with Psychological Symptom Score, $r = .718$, 95% CI [.667, .763], $p < .001$; Spearman $\rho = .696$, $p < .001$. This finding indicates substantial convergence between participants' direct perception that physical health affects mood and their responses to the six psychological symptom items. The association should not be interpreted as an independent causal predictor because the constructs overlap conceptually.

The Biopsychosocial Interconnection Score correlated with Physical Symptom Score at $r = .557$, $p < .001$, and with Psychological Symptom Score at $r = .704$, $p < .001$. Participants reporting greater symptom burden therefore also tended to endorse stronger perceived links among physical changes, mood, body image, social or occupational pressure, low energy, and mental clarity. Because the biopsychosocial scale had only moderate reliability, these coefficients are treated as supplementary rather than as definitive evidence of a separate latent construct.

Age-specific item patterns provided additional context for the middle-aged group effect. Mean disturbed-sleep scores were 2.92 among adolescents, 3.20 among young adults, 3.64 among middle-aged adults, and 3.14 among seniors. The difference was significant, $F \approx 10.35$, $p < .001$; approximately 59% of middle-aged cases endorsed disturbed sleep as occurring often or always. Irritability showed a similar pattern: means were 3.28, 3.12, 3.65, and 2.84 across the four age groups, respectively, $F \approx 13.60$, $p < .001$. Approximately 55% of middle-aged cases endorsed irritability often or always. Perceived physical-health effect on mood was also highest in the middle-aged group ($M = 6.39$), compared with adolescents ($M = 5.25$), young adults ($M = 5.66$), and seniors ($M = 5.87$), $F \approx 14.74$, $p < .001$.

Within young adults, body-image distress correlated positively with hair thinning ($r = .198$, $p = .049$), weight fluctuation ($r = .307$, $p = .002$), and skin problems ($r = .416$, $p < .001$). In a supplementary multiple regression including these visible symptoms, confirmed diagnosis, and female gender, the model explained approximately 18.8% of variance in body-image distress. Skin problems remained the clearest independent predictor ($B \approx .327$, $p = .002$), whereas hair thinning was no longer significant after adjustment. The finding concerns self-reported body-image distress and should not be interpreted as evidence of body dysmorphic disorder.

Among seniors, a cognitive-oriented indicator based on brain fog and reduced mental clarity averaged approximately 3.36, while an emotional indicator based on mood swings, anxiety, loss of interest, and irritability averaged approximately 2.98. The paired difference was significant, $t(99) \approx 6.56$, $p < .001$. This suggests that subjective cognitive complaints were relatively more prominent than the selected emotional symptoms within the senior group. It does not establish objective cognitive impairment or a hormonal mechanism.

Confirmed diagnosis prevalence also varied by age group: approximately 15% among adolescents, 31% among young adults, 35% among middle-aged adults, and 42% among seniors. The association between age group and confirmed diagnosis status was significant, $\chi^2(3) = 18.44$, $p < .001$. This pattern provides contextual information for age comparisons but does not demonstrate that ageing caused diagnosis or psychological symptoms.

Adjusted regression

The HC3-robust multiple linear regression explained 16.9% of variance in Psychological Symptom Score (adjusted $R^2 = .156$). Physical Symptom Score remained significant after adjustment for confirmed diagnosis, age group, and female gender ($B = .243$, robust $SE = .048$, $p < .001$). Holding the other predictors constant, each one-point increase in Physical Symptom Score was associated with an estimated .24-point increase in Psychological Symptom Score.

Table 5. HC3-Robust Multiple Linear Regression Predicting Psychological Symptom Score

Predictor	B	Robust SE	p
Intercept	14.301	.785	< .001
Physical Symptom Score	.243	.048	< .001
Confirmed diagnosis	1.244	.410	.002

Young adults vs adolescents	-.569	—	.279
Middle-aged vs adolescents	1.469	—	.011
Seniors vs adolescents	-.928	—	.087
Female gender	-.174	—	.635

Note. $R^2 = .169$; adjusted $R^2 = .156$. Adolescents are the age-group reference category. Robust SE values shown where available from the supplied analysis summary.

Confirmed diagnosis also remained independently associated with psychological symptom burden ($B = 1.244$, robust $SE = .410$, $p = .002$). Middle-aged adults scored higher than adolescents after adjustment ($B = 1.469$, $p = .011$). Young-adult and senior contrasts with adolescents were not significant, and female gender remained non-significant ($B = -.174$, $p = .635$). The adjusted model therefore reinforced the principal bivariate findings: physical symptom burden, confirmed diagnosis status, and the middle-aged age category retained statistical relevance, while gender did not.

IV. DISCUSSION

The analysis produced four principal findings. First, physical and psychological symptom burdens were positively associated. Second, psychological symptom scores differed across age groups, with the middle-aged group showing the highest burden. Third, participants reporting a confirmed hormonal or hormone-related diagnosis had higher psychological symptom scores than those without a confirmed diagnosis, while the suspected-diagnosis group showed a symptom level remarkably similar to the confirmed group. Fourth, female and male participants did not differ meaningfully in total psychological symptom burden. Supplementary findings further suggested strong perceived links between physical health and mood, age-specific sleep and irritability patterns, visible-symptom/body-image associations among young adults, and relatively

greater subjective cognitive complaints among seniors.

The physical–psychological correlation is consistent with a biopsychosocial account of symptom experience. An r of .318 is large enough to be meaningful but not large enough to support the idea that physical symptom burden determines psychological wellbeing. Approximately 10% of variance is shared at the bivariate level, leaving substantial variation associated with other biological, psychological, social, and measurement factors. This is important because the physical items were deliberately broad: fatigue, temperature sensitivity, appetite change, weight fluctuation, skin problems, and hair thinning can occur in endocrine conditions, but they are not endocrine-specific. Likewise, mood swings, anxiety, sleep disturbance, reduced interest, irritability, and concentration problems have multiple possible causes. The observed association is therefore best understood as co-occurrence across symptom domains.

This interpretation is aligned with evidence from endocrine and reproductive-health populations. PCOS research demonstrates that psychological concerns may accompany physical, metabolic, reproductive, and appearance-related manifestations (Nasiri-Amiri et al., 2023). Body-image evidence further suggests that visible changes can have psychological meaning beyond their biological origin (Davitadze et al., 2023). Thyroid-related research similarly indicates that psychological symptoms may be elevated in affected populations (Wang et al., 2024). None of these literatures supports a simple claim that one physical symptom causes a particular psychological outcome. Rather, they show why integrated assessment is clinically and psychologically relevant.

The strong correlation between the direct mood-impact rating and psychological symptoms adds another perspective. Participants who perceived physical health as strongly affecting mood also reported more psychological symptoms. At face value, this reinforces the subjective

interconnection between physical and emotional wellbeing. Yet the coefficient of .718 must be interpreted carefully because the single mood-impact item and the psychological scale share conceptual content. The result may partly reflect common-method and construct-overlap effects. It is therefore more useful as evidence that participants experienced these domains as interconnected than as evidence that physical health independently predicts mood.

The biopsychosocial score showed a similar pattern. Its correlations with physical symptoms (.557) and psychological symptoms (.704) suggest that people with greater symptom burden were more likely to endorse connections involving mood, body image, social pressure, energy, and mental clarity. This is conceptually coherent with Engel's (1977) framework, but the scale's alpha of .654 and cross-loading pattern indicate that it should not be treated as a highly homogeneous independent construct. In fact, the cross-loadings may be theoretically informative. Items about body image, social pressure, mood, and mental clarity are expected to bridge domains rather than form a sharply isolated factor. Future instrument development could treat these items as contextual mechanisms or distinct subdomains instead of forcing them into a single scale.

The age-group result was one of the clearest findings. Middle-aged adults had higher psychological symptom scores than all three other age groups, while adolescents, young adults, and seniors did not differ significantly from one another. The effect size, $\eta^2 = .083$, suggests a meaningful but not dominant contribution of age-group membership. The item-level results provide some explanation: middle-aged cases reported the highest disturbed sleep and irritability scores, and they also reported the strongest perceived effect of physical health on mood.

This pattern is compatible with, but does not prove, literature on the menopausal transition. Santoro et al. (2021) emphasize that menopause is a multidimensional process whose manifestations vary widely. Metcalf et al. (2023), Maki and Jaff

(2024), and Williams and Maki (2025) highlight sleep, mood, and subjective cognitive concerns during midlife. These literatures make the observed elevation in the 40–60 group plausible. However, the present age group included both women and men and did not measure menopausal stage, andropausal status, reproductive hormones, or endocrine biomarkers. It would therefore be methodologically incorrect to label the age effect a “menopause effect” or “hormonal decline effect.” A more defensible interpretation is that the middle-aged category in this analytical dataset displayed a distinctive psychological symptom profile that included elevated sleep disturbance and irritability.

The absence of an adolescent elevation is also noteworthy. Puberty is often discussed as a period of emotional volatility, but population evidence does not support a uniform hormonal explanation. Stumper and Alloy (2023) found that pubertal stage and depression were associated in particular groups, while Luo et al. (2024) concluded that causal evidence linking pubertal hormones to mental-health problems remains limited. Duke et al. (2014) likewise showed that testosterone-related mood and behaviour findings in male adolescents are complex. The current results therefore illustrate why developmental assumptions should be tested rather than imported into the data. Adolescents may experience meaningful emotional symptoms without necessarily having the highest overall score on a broad psychological symptom index. Young adults also did not show elevated total psychological symptom burden relative to adolescents or seniors, but the supplementary body-image findings reveal a more specific pattern. Hair thinning, weight fluctuation, and skin problems were all positively related to body-image distress, with skin problems showing the strongest association and remaining significant in the adjusted young-adult model. This is consistent with research emphasizing body-image concerns in PCOS and other appearance-relevant hormone-related contexts (Davitadze et al., 2023). It also illustrates the value of moving beyond total scores. A group can have an average overall

psychological symptom level while still showing meaningful associations within a specific psychosocial domain.

The skin/body-image relationship should nevertheless be interpreted narrowly. The questionnaire assessed distress or concern about body image, not body dysmorphic disorder, and it did not establish the clinical origin of skin symptoms. Visible symptoms may influence self-consciousness through social evaluation, perceived attractiveness, stigma, or reduced confidence, but reverse and reciprocal processes are also possible. Future research should use validated body-image measures and collect information on dermatological diagnosis, symptom severity, social media exposure, and appearance-related avoidance to clarify the pathway.

The senior analysis also illustrates the importance of domain-specific interpretation. Seniors reported a higher cognitive-oriented indicator than the selected emotional indicator. This suggests a relative prominence of subjective brain fog and reduced mental clarity within this group. It does not show objective cognitive decline. Subjective cognitive complaints can be influenced by sleep, fatigue, medication, stress, mood, physical illness, and expectations about ageing. In hormone-related research, Maki and Jaff (2024) and Metcalf et al. (2023) similarly emphasize that cognitive complaints require careful characterization. A future study of older adults should combine subjective ratings with validated cognitive screening or neuropsychological measures before drawing conclusions about impairment.

Diagnosis status was another robust finding. Confirmed diagnosis was associated with higher psychological symptom burden in both the primary comparison and adjusted regression. The standardized difference of $g = .45$ is moderate, suggesting that diagnosis status has practical as well as statistical relevance within the analytical dataset. This finding is consistent with literature documenting psychological concerns in diagnosed

endocrine or reproductive-health populations (Nasiri-Amiri et al., 2023; Wang et al., 2024). A diagnosis can be psychologically relevant through several pathways: persistent symptoms, treatment burden, uncertainty, concerns about fertility or long-term health, visible manifestations, and the social consequences of chronic illness.

The three-category analysis provides an important qualification. The suspected-but-unconfirmed group had almost the same psychological symptom mean as the confirmed group, and both scored higher than the no-diagnosis group. This does not validate the suspected cases as having endocrine disease. Instead, it suggests that diagnostic uncertainty or persistent unexplained symptoms may coexist with psychological burden. From a clinical perspective, this group should not be dismissed simply because a formal diagnosis is absent; from a research perspective, it should not be merged uncritically with asymptomatic or no-diagnosis participants. Future studies could distinguish symptom severity, healthcare-seeking, time since symptom onset, access to medical evaluation, and reasons for diagnostic uncertainty. The gender result challenges a simple expectation that female participants would necessarily report greater overall psychological symptom burden. Female and male means were almost identical, the *p* value was non-significant, and the standardized effect was negligible. This result should not be interpreted as evidence that females and males have identical hormonal-health experiences. Rather, it indicates that gender did not differentiate the particular six-item psychological symptom composite used here. Biological sex, reproductive status, gender roles, social exposures, and condition-specific risks may still matter for particular outcomes.

The finding is compatible with a multidimensional view of sex and gender effects. Pubertal research suggests that some developmental associations differ by sex (Stumper & Alloy, 2023), while Ladouceur (2026) situates sex differences in affective disorders within a developmental neuroscience framework rather than a single-

hormone explanation. Mu and Kulkarni (2022) similarly show that psychological responses to hormonal contraception require individual and temporal context. The present null result therefore has substantive value: it demonstrates that theoretical relevance does not guarantee a difference in a broad total symptom score. Non-significant findings should be reported rather than reframed as trends when the evidence does not support them.

The adjusted regression strengthens several conclusions while also showing the limits of the measured predictors. Physical symptom burden remained associated with psychological symptoms after controlling for diagnosis, age group, and gender. Confirmed diagnosis and middle-aged group membership also remained significant. Yet the model explained only 16.9% of variance. Most variation in psychological symptom burden therefore remained outside the measured predictors. This is consistent with a biopsychosocial framework, in which psychological wellbeing is expected to reflect multiple influences such as stress, socioeconomic circumstances, sleep, relationships, health behaviours, pre-existing mental health, medication, chronic illness, and social support. The regression coefficient for physical symptoms should not be interpreted as a causal effect. Cross-sectional adjustment cannot establish temporal order, and controlling for a limited set of covariates does not eliminate unmeasured confounding. Psychological distress may heighten attention to bodily sensations; physical symptoms may affect mood; both may arise from a common health condition; or social stress may contribute to both. Longitudinal designs are needed to clarify directionality. Repeated measurement would also be especially valuable in hormonal research because hormone concentrations and symptoms can vary over short time intervals.

Several methodological features strengthen the analytical framework. The age groups were balanced, reducing complications from highly unequal group sizes. The principal psychological and physical scales had good internal consistency.

Parametric findings were checked with non-parametric or robust alternatives, and effect sizes were reported rather than relying solely on statistical significance. The factorability indices were strong, and the exploratory structure broadly distinguished physical and psychological domains. The analysis also preserved the original three-category diagnosis variable as a sensitivity analysis rather than relying exclusively on a potentially misleading binary recode.

At the same time, the limitations are substantial and central to interpretation. The first is measurement. The questionnaire was developed for the study and is not equivalent to a validated diagnostic instrument. Cronbach's alpha indicates internal consistency, not clinical validity. The psychological items capture common symptoms but cannot establish depression, anxiety disorder, cognitive impairment, or another psychiatric diagnosis. The physical items capture experiences relevant to hormone-related health but cannot diagnose PCOS, thyroid disease, endometriosis, cortisol abnormalities, menopause, or any other endocrine condition.

Second, no hormone concentrations were measured. The study therefore cannot test relationships involving estrogen, progesterone, testosterone, cortisol, thyroid hormones, or rates of hormonal change. This is particularly important because the original research topic uses the language of "hormonal imbalance." In a publication, that phrase should be used cautiously and preferably qualified as "hormonal or hormone-related health experiences" unless endocrine status is clinically established. Symptom burden is not a proxy for laboratory hormone concentration.

Third, diagnosis status was self-reported and not independently verified against clinical records. Even the "confirmed" category therefore represents reported diagnosis status within the dataset. The suspected category is still more uncertain. Future empirical research should record the specific diagnosis, diagnostic method, duration, treatment status, medication, and

relevant clinical measures. Pooling heterogeneous conditions into a single diagnosis variable may obscure condition-specific patterns.

Fourth, the cross-sectional design precludes causal and temporal inference. Fifth, the exact recruitment process is not sufficiently documented in the available materials to establish representativeness. Equal age-group sizes are analytically convenient but may not reflect the population distribution. Sixth, the smaller gender categories were too small for meaningful inferential comparison, limiting inclusiveness. Seventh, the open-ended item contained no responses, so the study could not use qualitative accounts to explain why participants perceived physical and psychological symptoms as connected.

Finally, and most importantly for publication, the provenance of the analytical dataset must be addressed transparently. Project documentation identifies the 400-case dataset as synthetic/simulated. Consequently, the numerical results are suitable for demonstrating the proposed statistical framework, testing the coherence of hypotheses, and preparing an analysis plan, but they should not be presented to a journal as empirical findings from recruited human participants unless genuine data provenance is verified. This limitation is not a minor disclosure; it determines the type of manuscript that can ethically be submitted.

Within that boundary, the present analysis has methodological value. It demonstrates a coherent way to operationalize physical and psychological symptom domains, test age and diagnosis differences, retain suspected diagnosis as a sensitivity category, use robustness procedures, and integrate effect-size interpretation. It also identifies where the questionnaire could be improved before genuine field use. The biopsychosocial items require refinement, the open-response strategy needs better implementation, validated mental-health and body-image measures would strengthen construct validity, and direct clinical/endocrine information

is necessary if the research question is to move from symptom association to hormonal mechanisms.

Strengths, Reporting Considerations and Reproducibility

Several principal results were reproduced with alternative procedures: Pearson and Spearman correlations converged for the physical–psychological association; standard, Welch, and rank-based group tests supported the age-group conclusion; and parametric and non-parametric comparisons supported the diagnosis result. This convergence reduces the likelihood that the principal conclusions are artifacts of a single test assumption. Reporting confidence intervals and effect sizes also helps separate statistical significance from practical magnitude, which is particularly important with a sample of 400 cases. The balanced age structure is another analytical strength because comparisons are not dominated by one age category. At the same time, artificial balance may reduce population representativeness if the underlying target population does not contain equal proportions of these age groups. In a future empirical paper, authors should report how age strata were constructed, how participants were approached, response rates, exclusions, and whether weighting is needed for population inference. A STROBE-style reporting approach would improve transparency for a cross-sectional observational study.

Reproducibility should also be prioritized. The scoring rules are straightforward: Q1–Q6 form the Psychological Symptom Score, Q7–Q12 form the Physical Symptom Score, and Q13–Q16 form the Biopsychosocial Interconnection Score. A future submission should provide an analysis supplement containing variable definitions, missing-data rules, assumption checks, and syntax for the primary and sensitivity analyses. The four primary hypotheses should be clearly distinguished from exploratory analyses so that readers can separate confirmatory conclusions from post hoc pattern exploration.

The distinction between statistical and clinical significance also deserves emphasis. A mean difference of roughly two to three points on a six-item psychological symptom scale may be statistically reliable without defining a clinical threshold. The instrument has no established diagnostic cut-off, and higher scores should therefore be described as greater symptom burden rather than “clinical psychological disorder.” The same principle applies to body-image and cognitive findings. Body-image distress is not body dysmorphic disorder, and subjective brain fog is not neurocognitive impairment.

Finally, the manuscript should avoid stigmatizing language around hormonal health. Terms such as “hormonal imbalance” are common in public discourse but can imply a laboratory-confirmed abnormality that is not present in symptom-only data. “Hormonal or hormone-related health experiences,” “reported diagnosis status,” and “physical symptom burden” are more precise for this design. This wording also supports a person-centred interpretation: participants are not reduced to an endocrine label, and psychological experiences are not portrayed as inevitable consequences of reproductive or hormonal change.

V. IMPLICATIONS AND DIRECTIONS FOR FUTURE RESEARCH

For psychological and health practice, the analytical pattern supports integrated screening rather than isolated interpretation of symptoms. When individuals present with persistent fatigue, sleep disturbance, weight or skin changes, hair concerns, appetite changes, or temperature sensitivity, it may be useful to ask how those experiences affect mood, concentration, body image, and daily functioning. This does not mean that psychological symptoms should be attributed to hormones, nor that physical complaints should be psychologized. The practical implication is that both domains can be relevant to a person’s wellbeing and may warrant appropriate medical and psychological assessment.

The middle-aged symptom pattern suggests particular attention to sleep, irritability, perceived

mood effects of physical health, and subjective cognitive concerns during midlife. Menopause-related evidence supports attention to these domains (Santoro et al., 2021; Metcalf et al., 2023; Williams & Maki, 2025), but assessment should remain individualized. Age alone should not be used to infer reproductive stage or endocrine cause.

The suspected-diagnosis group may also deserve attention in future service research. Their psychological symptom burden was comparable to that of the confirmed group in the analytical dataset. In genuine clinical samples, researchers should investigate whether this pattern reflects diagnostic delay, barriers to healthcare, symptom severity, health anxiety, prior inconclusive testing, or other factors. A clinically sensitive approach can acknowledge distress without validating an unconfirmed diagnosis.

Future empirical studies should recruit a clearly documented sample and preregister primary hypotheses. Direct endocrine measures should be added when the research question concerns hormonal mechanisms. Repeated hormone sampling may be required for hormones with substantial temporal variability. Specific diagnoses should be recorded rather than combined into a broad “hormonal imbalance” category. Menopausal stage, menstrual/reproductive status, medication and hormonal contraceptive use, chronic illness, sleep, stress, and mental-health history are likely to be important covariates.

Longitudinal designs would be especially valuable. Repeated symptom assessment could establish whether changes in physical symptoms precede, follow, or co-occur with changes in psychological wellbeing. Multilevel models could separate within-person change from between-person differences. Where biological measures are available, temporal coupling between biomarkers and symptoms could be examined without assuming that a single measurement represents a stable hormonal state.

Measurement should also be strengthened. Validated scales for depression, anxiety, sleep, body image, and subjective cognition would permit comparison with established clinical literature. The current physical symptom scale could be retained as a screening construct after psychometric refinement, but it should be validated against relevant clinical information. The biopsychosocial items may be better modeled as distinct contextual indicators rather than one homogeneous scale. Cognitive complaints among seniors should be paired with objective cognitive measures, while body-image research among young adults should include validated body-image instruments.

Finally, future studies should aim for inclusive gender analysis. Adequate recruitment of non-binary and gender-diverse participants would allow meaningful analysis rather than descriptive reporting only. Researchers should also distinguish biological sex variables from gender identity when both are relevant to endocrine and psychological questions, with careful attention to respectful measurement and participant privacy.

VI. CONCLUSION

This analysis examined physical and psychological symptom burden across four age groups within a biopsychosocial framework. Physical symptom burden was moderately and positively associated with psychological symptom burden, and this relationship remained statistically significant after adjustment for diagnosis status, age group, and gender. Psychological symptoms differed across age groups, with the middle-aged group showing the highest mean burden. Confirmed hormonal or hormone-related diagnosis status was associated with higher psychological symptom scores, while the suspected-but-unconfirmed group showed a similarly elevated pattern in supplementary analysis. Female and male participants did not differ meaningfully in overall psychological symptom burden.

The findings reinforce a central methodological point: physical and psychological symptoms can be interconnected without establishing that one

causes the other. Age and diagnosis status provide relevant context, but they do not substitute for direct measurement of reproductive stage, endocrine function, clinical diagnosis, or temporal change. The observed middle-aged elevation, young-adult body-image pattern, and senior cognitive-oriented complaints are therefore best treated as symptom profiles that generate more specific questions for future research.

For publication, the provenance of the analytical dataset is decisive. The supplied project documentation identifies the 400-case dataset as synthetic/simulated. The present manuscript consequently serves as a methodology-validation manuscript and a publication-ready analytical template, not as evidence from verified field participants. Once genuine participant data and ethics/recruitment documentation are available, the same prespecified framework can be rerun and the numerical results replaced. With that verification, the study could make a useful contribution to lifespan research on the biopsychosocial relationship between physical health experiences and psychological wellbeing.

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