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Physiological and Psychological Predictors of Mood and Behavioral Functioning in Patients with Anxiety-Related Disorders

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Abstract

Background: Anxiety disorders involve psychological symptoms, physiological arousal, and functional disruption, yet these domains are often examined separately. This study evaluated physiological and psychological predictors of mood disturbance and behavioral functioning in adults with anxiety-related disorders.

Methods: A simulation-based analytical cross-sectional dataset comprising 220 adult patient records was analysed. Physiological indicators included resting heart rate (HR), heart-rate variability indexed by RMSSD (HRV-RMSSD), blood pressure, sleep duration, and daily steps. Psychological variables included anxiety severity (GAD-7), intolerance of uncertainty (IUS-12), and emotion-regulation difficulties (DERS-16). Mood disturbance was indexed by the PHQ-9 and behavioral functioning by the WSAS. Pearson correlations, hierarchical multiple regression, and one-way analysis of variance were used.

Results: GAD-7 was strongly associated with PHQ-9 ($r = .692$, $p < .001$) and WSAS ($r = .727$, $p < .001$). Lower HRV and shorter sleep duration were also associated with higher anxiety, mood disturbance, and functional impairment. In the fully adjusted mood model, shorter sleep ($\beta = -.144$, $p = .013$), GAD-7 ($\beta = .369$, $p < .001$), and DERS-16 ($\beta = .239$, $p < .001$) remained significant; the model explained 55.4% of PHQ-9 variance. For WSAS, GAD-7 was the only significant independent predictor ($\beta = .540$, $p < .001$), and the final model explained 55.8% of variance. Resting HR was highest in panic disorder, while IUS-12 scores were highest in generalized anxiety disorder.

Keywords: anxiety disorders; physiological arousal; heart-rate variability; mood; behavioral functioning; sleep; emotion regulation

Introduction

Anxiety disorders are among the most common mental disorders worldwide. The World Health Organization estimated that 359 million people were living with an anxiety disorder in 2021, and these conditions remain an important source of distress and functional impairment (World Health Organization [WHO], 2025). Although anxiety-related disorders are clinically heterogeneous,

excessive fear or worry, physiological arousal, avoidance, and difficulty maintaining everyday roles are common features (Craske et al., 2017). Their burden is therefore not captured fully by symptom severity alone (Rapaport et al., 2005).

Physiological arousal is a prominent component of anxiety. Palpitations, sweating, trembling, respiratory discomfort, gastrointestinal symptoms, and muscular tension can accompany acute or sustained anxiety. At the autonomic level, anxiety is often discussed in terms of increased sympathetic activation and reduced parasympathetic flexibility (Chalmers et al., 2014). Heart-rate variability (HRV) provides one way of characterising beat-to-beat cardiac variation. Cheng et al. (2022), in a systematic review and meta-analysis of 99 studies, found lower resting parasympathetic HRV among patients with anxiety disorders than among healthy controls, including patients with panic disorder, generalized anxiety disorder, and social anxiety disorder. HRV is not a diagnostic biomarker, but these findings support the relevance of autonomic regulation to anxiety.

Sleep is another physiological and behavioral process closely related to anxiety. Persistent worry and hyperarousal may interfere with sleep, while insufficient sleep can increase emotional reactivity and reduce cognitive control. Cox and Olatunji (2020) reported substantial subjective sleep disturbance across anxiety-related disorders, together with reductions in total sleep time and sleep continuity. Sleep disruption may therefore amplify mood symptoms and daytime impairment (Alvaro et al., 2013; Hertenstein et al., 2019).

Psychological mechanisms may explain why physiological sensations become distressing or functionally disruptive. Intolerance of uncertainty reflects difficulty tolerating situations in which important outcomes are unknown or unpredictable (Carleton, 2016). Carleton et al. (2007) developed the 12-item Intolerance of Uncertainty Scale (IUS-12), and a later meta-analysis found moderate associations between intolerance of uncertainty and symptoms across generalized anxiety, social anxiety, panic-related problems, depression, and other forms of psychopathology (McEvoy et al., 2019).

Emotion regulation is similarly transdiagnostic (Sloan et al., 2017). Persistent reliance on avoidance, rumination, suppression, or other maladaptive strategies may intensify distress. Aldao et al. (2010) found robust associations between maladaptive emotion-regulation strategies and psychopathology across a large meta-analytic literature. The DERS-16 provides a brief measure of difficulties in emotional awareness, acceptance, impulse control, goal-directed behavior, and access to regulation strategies (Bjureberg et al., 2016; Gratz & Roemer, 2004). These difficulties may contribute not only to anxiety severity but also to low mood and impaired daily functioning.

Mood disturbance warrants separate attention because anxiety and depressive symptoms commonly overlap (Kessler et al., 2005). The Patient Health Questionnaire-9 (PHQ-9) is a well-established measure of depressive symptom severity (Kroenke et al., 2001). Behavioral functioning is equally important. Anxiety can restrict work, social activity, travel, relationships, and routine responsibilities. The Work and Social Adjustment Scale (WSAS) measures impairment across work, home management, leisure activities, and close relationships (Mundt et al., 2002). The original GAD-7 validation also showed a graded relationship between increasing anxiety severity and functional disability (Spitzer et al., 2006).

Most studies examine only selected physiological or psychological mechanisms. Fewer models consider resting cardiovascular activity, HRV, sleep, anxiety severity, intolerance of uncertainty, emotion-regulation difficulties, mood, and functioning together. The present analytical cross-sectional study therefore examined the relative contribution of physiological and psychological factors to mood disturbance and behavioral functioning among adults with anxiety-related disorders. Because the dataset was simulated for quantitative modelling, the analyses are interpreted as internally consistent statistical demonstrations rather than population estimates.

Hypotheses

H1. Greater anxiety severity will be associated with greater mood disturbance and poorer behavioral functioning.

H2. Less favorable physiological regulation, reflected by higher resting HR, lower HRV-RMSSD, and shorter sleep duration, will be associated with higher anxiety severity, greater mood disturbance, and poorer functioning.

H3. Psychological factors, particularly anxiety severity, intolerance of uncertainty, and emotion-regulation difficulties, will explain additional variance in mood disturbance beyond demographic and physiological variables.

H4. Psychological factors will explain additional variance in behavioral functioning beyond demographic, physiological, and activity-related variables.

H5. Physiological and psychological profiles will differ across generalized anxiety disorder, panic disorder, social anxiety disorder, and other anxiety-related diagnoses.

Methods

Study Design and Analytical Dataset

A simulation-based analytical cross-sectional design was used. The dataset contained 220 synthetic adult patient records representing individuals aged 18–60 years with generalized anxiety disorder, panic disorder, social anxiety disorder, or another anxiety-related diagnosis. Each record included demographic, clinical, physiological, psychological, mood, and functioning variables. Because the observations were generated rather than collected from recruited patients, no claims are made regarding prevalence, incidence, treatment response, or causal effects.

Analytical Sample Size

The analytical sample was fixed at 220 observations. This size was selected to provide sufficient information for the planned hierarchical regression models and four-group comparisons while avoiding an unnecessarily large simulated dataset. Because the study did not recruit participants and did not estimate an unknown population parameter from sampling, a conventional recruitment-based power calculation was not used to justify the number of records. The emphasis was instead on generating a dataset large enough to support stable multivariable estimation and clear demonstration of the planned analyses.

Participant Characteristics

Variables included age, sex, primary anxiety-related diagnosis, illness duration, body mass index (BMI), psychotropic medication status, and current smoking. Physiological indicators were resting HR, HRV-RMSSD, systolic blood pressure (SBP), diastolic blood pressure (DBP), sleep duration, and average daily steps.

Measures

Anxiety Severity

The Generalized Anxiety Disorder-7 (GAD-7; Spitzer et al., 2006) contains seven items scored from 0 to 3, producing a total score from 0 to 21. Higher scores indicate greater anxiety severity. Internal consistency in the present dataset was high (Cronbach's $\alpha = .897$).

Intolerance of Uncertainty

The 12-item Intolerance of Uncertainty Scale (IUS-12; Carleton et al., 2007) was used to represent difficulty tolerating uncertain situations and outcomes. Higher scores indicate greater intolerance of uncertainty.

Emotion-Regulation Difficulties

The Difficulties in Emotion Regulation Scale-16 (DERS-16; Bjureberg et al., 2016) assesses difficulties involving emotional clarity, acceptance, impulse control, goal-directed behavior, and access to regulation strategies. Higher scores indicate greater difficulty.

Mood Disturbance

The Patient Health Questionnaire-9 (PHQ-9; Kroenke et al., 2001) was used as the principal mood outcome. Its nine items are scored from 0 to 3 and summed to a total from 0 to 27. Internal consistency was high (α = .891).

Behavioral Functioning

The Work and Social Adjustment Scale (WSAS; Mundt et al., 2002) represented functional impairment. Higher scores indicate poorer functioning across work, home management, leisure, and relationships.

Physiological Indicators

Resting HR was expressed in beats per minute, HRV as RMSSD in milliseconds, SBP and DBP in mmHg, sleep as average hours per night, and physical activity as average steps per day. These variables were analysed continuously.

Statistical Analysis

Continuous variables were summarized using means, standard deviations, medians, and ranges, and categorical variables using frequencies and percentages. Pearson correlations examined associations among resting HR, HRV-RMSSD, SBP, DBP, sleep duration, GAD-7, IUS-12, DERS-16, PHQ-9, and WSAS.

Hierarchical multiple regression examined independent predictors of PHQ-9 and WSAS. For PHQ-9, Block 1 contained age, sex, BMI, psychotropic medication, and smoking; Block 2 added resting HR, HRV-RMSSD, and sleep duration; Block 3 added GAD-7, IUS-12, and DERS-16. For WSAS, Block 1 contained the same covariates; Block 2 added resting HR, HRV-RMSSD, sleep duration, and daily steps; and Block 3 added the three psychological variables. Results are reported using B, SE, β, 95% confidence intervals, p values, R^2, adjusted R^2, and ΔR^2.

One-way ANOVA compared the four diagnostic groups on physiological and psychological variables. Eta squared (η^2) was used as the effect-size estimate and Tukey HSD for significant pairwise comparisons. Findings were interpreted as cross-sectional associations rather than causal effects.

Results

Participant Characteristics

The analytical sample comprised 220 observations with a mean age of 37.10 years (SD = 10.01); 113 (51.4%) were female. Generalized anxiety disorder was the most common diagnosis (n = 85, 38.6%), followed by panic disorder (n = 53, 24.1%), social anxiety disorder (n = 50, 22.7%), and other anxiety disorders (n = 32, 14.5%). Mean illness duration was 4.19 years (SD = 2.66), mean BMI was 25.10 kg/m² (SD = 4.16), 111 (50.5%) were coded as using psychotropic medication, and 26 (11.8%) were current smokers.

Descriptive Statistics

Mean GAD-7 score was 11.25 (SD = 6.38), PHQ-9 score was 12.76 (SD = 7.52), and WSAS score was 16.80 (SD = 8.94). Mean resting HR was 78.20 bpm (SD = 7.51), HRV-RMSSD was 37.44 ms (SD = 10.80), and sleep duration was 6.91 hours (SD = 0.90). The GAD-7 and PHQ-9 showed high internal consistency (α = .897 and .891, respectively).

Table 1

Participant Characteristics (N = 220)

Characteristic	Value
Age, years	37.10 (10.01)
Female	113 (51.4)
Male	107 (48.6)
Generalized anxiety disorder	85 (38.6)
Panic disorder	53 (24.1)
Social anxiety disorder	50 (22.7)

Other anxiety disorder	32 (14.5)
Illness duration, years	4.19 (2.66)
BMI, kg/m²	25.10 (4.16)
Psychotropic medication, yes	111 (50.5)
Current smoker, yes	26 (11.8)

Note. Values are M (SD) for continuous variables and n (%) for categorical variables.

Table 2

Descriptive Statistics and Internal Consistency of Study Variables

Variable	M	SD	Median	Minimum	Maximum	α
Resting HR, bpm	78.20	7.51	78.0	59.0	100.0	—
HRV-RMSSD, ms	37.44	10.80	37.0	10.0	69.4	—
SBP, mmHg	118.56	9.53	119.0	92.0	150.0	—
DBP, mmHg	76.23	6.49	76.0	60.0	96.0	—
Sleep duration, h	6.91	0.90	7.0	4.7	9.1	—
Steps/day	6741	1799.31	6640	2010	11500	—
GAD-7	11.25	6.38	12.0	0.0	21.0	.897
PHQ-9	12.76	7.52	12.0	0.0	27.0	.891
IUS-12	33.72	9.50	33.0	12.0	60.0	—
DERS-16	44.93	10.49	45.0	16.0	72.0	—
WSAS	16.80	8.94	16.5	0.0	40.0	—

Note. M = mean; SD = standard deviation; α = Cronbach's alpha. Internal consistency was calculated only where item-level data were available.

Bivariate Associations

GAD-7 was strongly correlated with PHQ-9 ($r = .692$, $p < .001$) and WSAS ($r = .727$, $p < .001$). IUS-12 was associated with PHQ-9 ($r = .500$, $p < .001$) and WSAS ($r = .514$, $p < .001$), while DERS-16 correlated with PHQ-9 ($r = .535$, $p < .001$) and WSAS ($r = .439$, $p < .001$). Higher resting HR was associated with higher GAD-7, PHQ-9, and WSAS scores. Lower HRV-RMSSD was associated with higher GAD-7 ($r = -.514$, $p < .001$), PHQ-9 ($r = -.437$, $p < .001$), and WSAS ($r = -.416$, $p < .001$). Shorter sleep duration was associated with greater anxiety ($r = -.529$, $p < .001$), mood disturbance ($r = -.482$, $p < .001$), and poorer functioning ($r = -.456$, $p < .001$). PHQ-9 and WSAS were strongly correlated ($r = .708$, $p < .001$).

Table 3

Pearson Correlations Among Physiological, Psychological, Mood, and Behavioral Variables

Variable	1	2	3	4	5	6	7	8	9	10
1. Resting HR	—									
2. HRV-RMSSD	.363***	—								
3. SBP	.153*	-.202**	—							
4. DBP	.174**	-.201**	.211**	—						
5. Sleep-duration	.380***	.361***	-.147*	-.077	—					
6. GAD-7	.453***	-.514***	.262***	.194**	-.529***	—				

7. IUS-12	.242***	-.291***	.236***	.149*	-.353***	.668***	—			
8. DERS-16	.257***	-.265***	.154*	.065	-.256***	.532***	.387***	—		
9. PHQ-9	.387***	-.437***	.212**	.197**	-.482***	.692***	.500***	.535***	—	
10. WSAS	.309***	-.416***	.175**	.099	-.456***	.727***	.514***	.439***	.708***	—

Note. * p < .05. ** p < .01. *** p < .001. N = 220.

Predictors of Mood Disturbance

Covariates in Block 1 explained 2.1% of PHQ-9 variance. Adding resting HR, HRV-RMSSD, and sleep duration increased explained variance by 33.1% (p < .001), and the psychological variables added a further 20.2% (p < .001). The final model explained 55.4% of PHQ-9 variance (adjusted R^2 = .531). Significant independent predictors were shorter sleep duration (B = -1.197, β = -.144, 95% CI [-2.143, -0.250], p = .013), higher GAD-7 (B = 0.436, β = .369, 95% CI [0.245, 0.627], p < .001), and greater DERS-16 scores (B = 0.172, β = .239, 95% CI [0.094, 0.250], p < .001).

Table 4

Hierarchical Multiple Regression Predicting Mood Disturbance (PHQ-9)

Predictor	B	SE	β	95% CI	t	p
Constant	2.194	7.271	—	[-12.141, 16.529]	0.30	.763
Age	0.036	0.036	.048	[-0.035, 0.108]	1.00	.319
Female	0.250	0.712	.017	[-1.155, 1.654]	0.35	.726
BMI	0.027	0.087	.015	[-0.145, 0.198]	0.31	.758
Psychotropic medication	0.647	0.711	.043	[-0.754, 2.048]	0.91	.363
Current smoker	0.326	1.112	.014	[-1.867, 2.519]	0.29	.770
Resting HR	0.055	0.054	.055	[-0.052, 0.162]	1.02	.311
HRV-RMSSD	-0.062	0.040	-.089	[-0.141, 0.017]	-1.56	.121
Sleep duration	-1.197	0.480	-.144	[-2.143, 0.250]	-2.49	.013
GAD-7	0.436	0.097	.369	[0.245, 0.627]	4.50	< .001
IUS-12	0.052	0.050	.066	[-0.047, 0.151]	1.04	.301
DERS-16	0.172	0.040	.239	[0.094, 0.250]	4.33	< .001

Note. Block 1 included age, sex, BMI, psychotropic medication, and smoking. Final R^2 = .554, adjusted R^2 = .531. Block 2 ΔR^2 = .331, F change(3, 211) = 35.97, p < .001; Block 3 ΔR^2 = .202, F change(3, 208) = 31.34, p < .001. Female = 1; medication and smoking: Yes = 1.

Predictors of Behavioral Functioning

For WSAS, covariates explained 2.6% of variance. Physiological and activity indicators added 38.2% ($p < .001$), and psychological variables added a further 15.1% ($p < .001$). The final model explained 55.8% of WSAS variance (adjusted $R^2 = .533$). GAD-7 was the only statistically significant independent predictor (B = 0.757, β = .540, 95% CI [0.518, 0.995], $p < .001$). Shorter sleep duration (β = -.105, p = .068) and fewer daily steps (β = -.106, p = .070) approached but did not reach $p < .05$.

Table 5

Hierarchical Multiple Regression Predicting Behavioral Functioning (WSAS)

Predictor	B	SE	β	95% CI	t	p
Constant	20.901	8.919	—	[3.318, 38.484]	2.34	.020
Age	0.033	0.043	.036	[-0.052, 0.117]	0.76	.450
Female	-0.829	0.844	-.046	[-2.493, 0.836]	-0.98	.327
BMI	-0.047	0.103	-.022	[-0.250, 0.156]	-0.46	.648
Psychotropic medication	0.460	0.842	.026	[-1.201, 2.121]	0.55	.586
Current smoker	0.965	1.318	.035	[-1.634, 3.564]	0.73	.465
Resting HR	-0.047	0.064	-.040	[-0.174, 0.079]	-0.74	.462
HRV-RMSSD	-0.042	0.047	-.050	[-0.135, 0.052]	-0.87	.383
Sleep duration	-1.044	0.569	-.105	[-2.166, 0.078]	-1.83	.068
Steps/day	-0.001	0.000	-.106	[-0.001, 0.000]	-1.82	.070
GAD-7	0.757	0.121	.540	[0.518, 0.995]	6.26	< .001
IUS-12	0.025	0.059	.027	[-0.092, 0.143]	0.42	.671
DERS-16	0.058	0.047	.069	[-0.034, 0.151]	1.24	.216

Note. Block 1 included age, sex, BMI, psychotropic medication, and smoking. Final $R^2 = .558$, adjusted $R^2 = .533$. Block 2 $\Delta R^2 = .382$, F change(4, 210) = 33.84, $p < .001$; Block 3 $\Delta R^2 = .151$, F change(3, 207) = 23.52, $p < .001$. Female = 1; medication and smoking: Yes = 1.

Diagnostic-Group Differences

Resting HR differed significantly across diagnostic groups, F(3, 216) = 5.17, p = .002, $\eta^2 = .067$, and was highest in panic disorder (M = 81.55, SD = 7.38). Tukey comparisons indicated higher HR in panic disorder than in each other group. IUS-12 also differed, F(3, 216) = 3.86, p = .010, $\eta^2 = .051$; generalized anxiety disorder had the highest mean score (M = 36.12, SD = 10.11) and differed significantly from social anxiety disorder. No significant group differences were found for sleep duration, GAD-7, DERS-16, PHQ-9, or WSAS.

Table 6
Diagnostic-Group Differences in Physiological and Psychological Variables

Variable	GAD	Panic	Social anxiety	Other anxiety	F	p	η^2
Resting HR	77.40 (7.46)	81.55 (7.38)	77.42 (7.25)	76.03 (6.86)	5.17	.002	.067
HRV-RMSSD	36.75 (10.51)	34.91 (10.67)	39.22 (10.42)	40.72 (11.56)	2.58	.055	.035
Sleep duration	6.91 (0.85)	6.74 (0.90)	6.93 (0.99)	7.18 (0.87)	1.60	.189	.022
GAD-7	12.01 (6.65)	11.89 (5.83)	10.66 (6.53)	9.09 (6.00)	1.97	.120	.027
IUS-12	36.12 (10.11)	33.74 (8.40)	31.06 (9.50)	31.47 (8.18)	3.86	.010	.051
DERS-16	45.16 (9.48)	46.51 (9.46)	43.42 (12.08)	44.06 (12.02)	0.83	.478	.011
PHQ-9	13.47 (7.49)	12.30 (7.21)	12.80 (8.31)	11.56 (6.96)	0.59	.625	.008
WSAS	17.49 (8.79)	15.77 (8.86)	18.62 (8.69)	13.84 (9.31)	2.30	.078	.031

Note. Values are M (SD). One-way ANOVA compared four diagnosis groups. η^2 = eta squared. Tukey HSD indicated that resting HR was higher in panic disorder than GAD, social anxiety disorder, and other anxiety disorders; IUS-12 was higher in GAD than social anxiety disorder.

Discussion

The present analysis examined physiological and psychological predictors of mood disturbance and behavioral functioning in a structured sample representing adults with anxiety-related disorders. The clearest finding was the close relationship between anxiety severity and both outcomes. GAD-7 was strongly associated with PHQ-9 and WSAS at the bivariate level and remained important after adjustment. Physiological indicators, particularly HRV and sleep, were also related to anxiety, mood, and functioning, but much of their apparent contribution was reduced once psychological variables were entered into multivariable models.

The strong association between anxiety severity and functional impairment is consistent with the original GAD-7 validation study. Spitzer et al. (2006) reported a graded relationship between higher GAD-7 scores and poorer functional status, greater disability, and more symptom-related difficulty (Rapaport et al., 2005). In the present model, GAD-7 was the only independent predictor of WSAS after demographic, physiological, sleep, activity, intolerance-of-uncertainty, and emotion-regulation variables were considered together. This suggests that current anxiety symptoms captured a large proportion of the variance related to everyday impairment.

Mood disturbance showed a somewhat different pattern. Anxiety severity remained the strongest psychological predictor of PHQ-9, but DERS-16 and sleep duration also contributed independently. The contribution of emotion-regulation difficulty is consistent with broader evidence linking maladaptive regulation patterns to psychopathology. Aldao et al. (2010) found that avoidance, rumination, and suppression were associated with symptoms across anxiety and depressive disorders. The DERS-16 captures several dimensions of regulation difficulty rather than one strategy (Bjureberg et al., 2016; Gratz & Roemer, 2004). Its independent association with PHQ-9 suggests that difficulty managing emotional states may be particularly relevant to mood burden even after anxiety severity is considered. Emotion regulation has also been supported as a transdiagnostic construct across anxiety and depressive disorders (Sloan et al., 2017).

Intolerance of uncertainty was strongly related to anxiety, mood, and functioning in bivariate analyses but did not remain independently significant in the final models. This is understandable given its overlap with GAD-7. McEvoy et al. (2019) showed that intolerance of uncertainty is associated with symptoms across several diagnostic domains. When IUS-12 and GAD-7 were entered together, current anxiety severity may have accounted for much of their shared variance. The result does not make intolerance of uncertainty clinically irrelevant; rather, it shows that its unique statistical contribution depends on the other variables in the model (Carleton, 2016).

Physiological findings were also informative. Lower HRV-RMSSD correlated with greater anxiety severity, mood disturbance, and functional impairment. Cheng et al. (2022) similarly found lower resting parasympathetic HRV among patients with anxiety disorders than among healthy controls (Chalmers et al., 2014). HRV did not, however, remain independently associated with PHQ-9 or WSAS after adjustment. Resting HR showed a comparable pattern. These results illustrate the difference between a correlate and an independent predictor: autonomic measures may track anxiety-related arousal without explaining additional variance once psychological symptoms are included.

Sleep duration was the physiological variable with the clearest independent relationship to mood. Shorter sleep remained associated with higher PHQ-9 scores after full adjustment, while its association with WSAS approached but did not reach statistical significance. Cox and Olatunji (2020) reported substantial sleep disturbance across anxiety-related disorders (Alvaro et al., 2013; Hertenstein et al., 2019). Sleep may influence mood through increased emotional reactivity, fatigue, and reduced attentional control, but the reverse pathway is equally plausible because anxiety and depressed mood can also disrupt sleep.

Blood pressure contributed less consistently than HRV or sleep. SBP and DBP showed small positive correlations with several psychological variables, but neither measure emerged as a principal independent predictor in the final mood or functioning models. This pattern is clinically plausible because resting blood pressure is influenced by age, adiposity, cardiovascular history, medication, posture, recent activity, and measurement conditions in addition to psychological state. A single resting measurement may therefore be less sensitive to anxiety-related variation than momentary arousal or autonomic flexibility. Previous epidemiological evidence has nevertheless identified an association between anxiety and hypertension (Pan et al., 2015).

Daily steps were included only in the functioning model because activity level can reflect both behavioral restriction and general health behavior. Fewer steps showed the expected negative association with WSAS, although the fully adjusted coefficient narrowly missed conventional statistical significance. This near-threshold result should not be treated as evidence of an effect, but it suggests a useful direction for future studies using objective actigraphy and repeated functional assessment. Prospective evidence has also linked higher physical activity with a lower risk of anxiety (Schuch et al., 2019).

The diagnostic-group findings were broadly consistent with expected clinical differences. Resting HR was highest in panic disorder, a condition characterised by episodes of intense fear accompanied by prominent bodily symptoms (Craske et al., 2017). IUS-12 scores were highest in generalized anxiety disorder and significantly exceeded those in social anxiety disorder. This is compatible with the central role of persistent worry and uncertainty in GAD, although intolerance of uncertainty is clearly transdiagnostic rather than disorder-specific (McEvoy et al., 2019). The absence of group differences in GAD-7, PHQ-9, DERS-16, sleep, and WSAS also illustrates substantial overlap across anxiety-related diagnoses (Kessler et al., 2005).

Clinically, the findings support multidimensional assessment. Recording sleep, autonomic indicators, emotion-regulation difficulties, intolerance of uncertainty, mood, and functioning alongside anxiety severity may provide a fuller picture of the patient's difficulties. At the same time, measuring many domains does not guarantee that each adds unique predictive information.

In this analysis, GAD-7 was especially informative for functioning, whereas sleep and DERS-16 added information for mood.

The results should not be interpreted causally. Statistical prediction in a cross-sectional regression model refers to explained variance, not temporal precedence. It cannot establish that anxiety causes impairment, that short sleep causes depressed mood, or that altered HRV produces anxiety. Longitudinal and experimental designs are required to test directionality and mechanisms.

The principal limitation is that the dataset was simulated. The observations were generated to produce an internally coherent quantitative model and therefore do not represent recruited patients or population estimates. The results are useful for demonstrating analytic relationships and hypothesis testing, but the effect sizes should not be generalized to clinical populations. In addition, HRV, resting HR, blood pressure, sleep, and activity are affected by medication, fitness, caffeine, nicotine, medical illness, respiration, and measurement conditions. Only broad medication and smoking indicators were available. Future empirical work should test the same model in a prospectively recruited clinical sample using standardized diagnoses, controlled physiological assessment, repeated HRV recording, and objective sleep or actigraphy data.

In conclusion, the analysis demonstrated a coherent relationship among physiological regulation, psychological symptoms, mood disturbance, and behavioral functioning. Anxiety severity showed the strongest independent relationship with functional impairment, whereas anxiety severity, emotion-regulation difficulties, and shorter sleep independently predicted mood disturbance. Lower HRV and higher resting HR were meaningful bivariate correlates but did not retain independent effects after broader adjustment. These patterns support integrated assessment while emphasizing that physiological and psychological indicators provide overlapping rather than completely separate information.

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