·应激与心身疾病专题·

伴焦虑抑郁症患者的睡眠质量及心率变异性的初步研究

刘颖 王卓言 张坤 程月红 王学义 于鲁璐
050031 石家庄，河北医科大学第一医院精神卫生中心 河北省精神卫生研究所 河北省精神心理疾病临床医学研究中心 河北省精神心理健康评估与干预技术创新中心
通信作者：于鲁璐，Email：luluyu@hebmu.edu.cn
DOI：10.3969/j.issn.1009-6574.2024.09.003

【摘要】 目的 探讨伴焦虑抑郁症患者睡眠质量与心率变异性(HRV)的特征。**方法** 选取2021年11月—2022年6月于河北医科大学第一医院精神卫生中心住院和门诊就诊的80例抑郁症患者为研究对象。采用汉密尔顿焦虑量表(HAMA)评估患者焦虑症状的严重程度，将HAMA评分＞14分设为伴焦虑抑郁症组(n=50)，将HAMA评分≤14分设为不伴焦虑抑郁症组(n=30)。采用匹兹堡睡眠质量指数量表(PSQI)评估患者的睡眠质量。采用HRV测量仪测量HRV，分析两组患者的低频(LF)、高频(HF)、低频/高频(LF/HF)、心搏中RR间期的标准差(SDNN)和相邻RR间期差值均方根(RMSSD)。采用汉密尔顿抑郁量表(HAMD)评估患者抑郁症状的严重程度。采用独立样本t检验比较两组睡眠质量和HRV的差异，采用二项Logistic回归分析抑郁症患者伴发焦虑的影响因素。**结果** 伴焦虑抑郁症组和不伴焦虑抑郁症组的年龄、性别、吸烟饮酒史和体重指数(BMI)比较，差异无统计学意义(P＞0.05)；伴焦虑抑郁症组的PSQI-Ⅴ(睡眠节律紊乱)、PSQI-Ⅶ(日间功能障碍)因子得分为(1.3±0.6)、(2.3±0.7)分，高于不伴焦虑抑郁症组的(1.0±0.6)、(1.8±1.0)分，差异有统计学意义(P＜0.05)；伴焦虑抑郁症组的HAMD总分、焦虑躯体化因子得分、认知障碍因子得分、迟滞因子得分、睡眠障碍因子得分为(19.6±3.6)、(6.5±2.2)、(5.0±2.1)、(7.3±1.9)、(3.5±1.8)分，高于不伴焦虑抑郁症组的(14.7±4.2)、(5.0±2.1)、(3.7±2.4)、(5.4±2.1)、(2.6±1.9)分，差异有统计学意义(P＜0.05)。HRV分析结果显示，伴焦虑抑郁症组的LF为(5.2±1.2)ms，高于不伴焦虑抑郁症组的(4.5±1.4)ms，差异有统计学意义(P=0.011)，伴焦虑抑郁症组的HF和RMSSD为(4.0±1.1)、(22.8±10.5)ms，低于不伴焦虑抑郁症组的(5.4±1.2)、(28.3±9.7)ms，差异有统计学意义(P＜0.05)。二项Logistic回归分析显示，HAMD总分高(OR=1.439，95%CI：1.157～1.789)、LF高(OR=2.640，95%CI：1.275～5.467)与抑郁症患者焦虑风险增加有关，而HF高与抑郁症伴焦虑症状风险降低有关(OR=0.286，95%CI：0.142～0.577)。**结论** 伴焦虑症状的抑郁症患者的抑郁情绪更重，存在睡眠质量及自主神经功能紊乱。

【关键词】 抑郁症； 焦虑； 睡眠质量； 心率变异性； 自主神经功能

基金项目： 河北省省级科技计划资助项目(21377711D)；河北省卫生健康委医学科学研究课题(20200119)；河北省卫生健康委医学科学研究课题(20230161)；河北省医学适用技术跟踪项目(GZ2020062)；河北省卫生健康委政府资助临床医学优秀人才项目(LS201903)

Preliminary study of sleep quality and heart rate variability in patients with anxiety and depressive disorder

Liu Ying, Wang Zhuoyan, Zhang Kun, Cheng Yuehong, Wang Xueyi, Yu Lulu
Mental Health Center, the First Hospital of Hebei Medical University & Hebei Institute of Mental Health & Hebei Clinical Research Center for Mental Disorders & Hebei Technology Innovation Center for Mental and Psychological Health Assessment and Intervention, Shijiazhuang 050031, China
Corresponding author: Yu Lulu, Email: luluyu@hebmu.edu.cn

【Abstract】 Objective To explore the characteristics of sleep quality and heart rate variability (HRV) in patients with anxiety and depressive disorder. **Methods** From November 2021 to June 2022, 80 patients with depressive disorder were selected as participants at the Mental Health Center of the First Hospital of Hebei Medical University. Hamilton Anxiety Scale (HAMA) was used to assess the severity of anxiety symptoms in patients. A HAMA score greater than 14 was assigned to depressive disorder group with anxiety (n=50), while a

HAMA score ≤ 14 was assigned to depressive disorder group without anxiety (n=30). Pittsburgh Sleep Quality Index (PSQI) was used to assess the sleep quality of patients. HRV was measured using an HRV measuring instrument to analyze the low frequency (LF), high frequency (HF), low frequency/high frequency (LF/HF), standard deviation of RR intervals (SDNN), and root mean square of successive RR interval differences (RMSSD) of two groups of patients. Hamilton Depression Scale (HAMD) was used to assess the severity of depressive symptoms in patients. Independent sample t-test was used to compare the differences in sleep quality and HRV between two groups, and binomial Logistic regression was used to analyze the influencing factors of anxiety in patients with depressive disorder. **Results** There was no statistically significant difference in age, gender, smoking and drinking history, and body mass index (BMI) between the depressive disorder group with and without anxiety ($P > 0.05$). The PSQI-Ⅴ and PSQI-Ⅶ factor scores of depressive disorder group with anxiety were (1.3 ± 0.6) and (2.3 ± 0.7), respectively, which were higher than those of depressive disorder group without anxiety (1.0 ± 0.6) and (1.8 ± 1.0), and the difference was statistically significant ($P < 0.05$). The HAMD total score, anxiety somatization factor score, cognitive impairment factor score, delay factor score, and sleep disorder factor score in depressive disorder group with anxiety were (19.6 ± 3.6), (6.5 ± 2.2), (5.0 ± 2.1), (7.3 ± 1.9), and (3.5 ± 1.8), which were higher than those in depressive disorder group without anxiety (14.7 ± 4.2), (5.0 ± 2.1), (3.7 ± 2.4), (5.4 ± 2.1), and (2.6 ± 1.9), and the difference was statistically significant ($P < 0.05$). HRV analysis showed that the LF of depressive disorder group with anxiety was (5.2 ± 1.2) ms, which was higher than that of depressive disorder group without anxiety (4.5 ± 1.4) ms, and the difference was statistically significant (P=0.011). The HF and RMSSD of depressive disorder group with anxiety were (4.0 ± 1.1) ms and (22.8 ± 10.5) ms, which were lower than those of depressive disorder group without anxiety (5.4 ± 1.2) and (28.3 ± 9.7) ms, and the difference was statistically significant ($P < 0.05$). Binomial Logistic regression analysis showed that high HAMD total score [OR=1.439, 95%CI (1.157, 1.789)] and high LF [OR=2.640, 95%CI (1.275, 5.467)] were associated with increased anxiety risk in patients with depressive disorder, while high HF was associated with decreased risk of depressive disorder accompanied by anxiety [OR=0.286, 95%CI (0.142, 0.577)]. **Conclusions** Patients with depressive disorder accompanied by anxiety tend to have severe depressive emotions, as well as sleep quality and autonomic nervous system dysfunction.

【**Key words**】 Depressive disorder; Anxiety; Sleep quality; Heart rate variability; Autonomic nervous system function

Fund programs: Science and Technology Planning Project of Hebei Province (21377711D); Medical Science Research Project of Health Commission of Hebei Province (20200119); Medical Science Research Project of Health Commission of Hebei Province (20230161); Medical Application Technology Tracking Project of Hebei Province (GZ2020062); Government-funded Clinical Medicine Excellent Talent Project of Health Commission of Hebei Province (LS201903)

抑郁症是以情绪低落、快感缺失为核心症状的一种心境障碍。在抑郁症患者中，伴焦虑症状者往往疾病更严重，且治疗效果和预后欠佳[1-3]。抑郁和焦虑情绪相关障碍均与自主神经系统功能改变有关[4]，抑郁症以副交感神经活性下降和(或)交感神经兴奋性增强为主要特点；而焦虑则主要表现为交感神经显著激活[5-7]。心率变异性(heart rate variability，HRV)是指心脏电生理活动RR间期的动态性变异现象，可反映自主神经系统活性及目前的平衡状态。既往研究表明，与健康人群相比，抑郁症患者的各项HRV指标普遍呈下降趋势[8]，但关于伴焦虑症状的抑郁症患者中HRV相关指标如何变化的研究较少，且结果不一致[9-12]。本研究旨在探讨伴焦虑的抑郁症患者的睡眠质量及HRV的特征变化。

一、对象与方法

1.研究对象：选取2021年11月—2022年6月于河北医科大学第一医院精神卫生中心门诊和住院的80例抑郁症患者为研究对象。纳入标准：(1)符合ICD-10中抑郁发作的诊断标准[13]；(2)年龄18～50岁；(3)入组前2周未更换抗抑郁药种类；(4)精神病家族史阴性；(5)能理解量表的内容并能配合评估；(6)患者本人或其法定监护人对研究目的、研究内容及可能出现的问题知情同意。排除标准：(1)精神发育迟滞、心血管疾病、糖尿病及严重的躯体疾病或合并其他精神疾病；(2)酒精和物质使用障碍；(3)妊娠期或哺乳期女性；(4)入组前3个月内进行过电休克治疗。采用HAMA评估患者的焦虑严重程度，根据评分将患者分为伴焦虑抑郁症组(n=50，HAMA评分＞14分)和不伴焦虑抑郁症组(n=30，HAMA评分≤14分)[14]。本研究通过河北医科大学第一医院医学伦理委员会批准(批准号：20210354)，所有受试者本人或监护人均签署知情同意书。

2.研究工具：(1)自编一般情况调查问卷。收集患者的年龄、性别、吸烟史、饮酒史及体重指数(body

mass index, BMI)。(2)HAMD[15]。用于评估患者的抑郁症状严重程度,包括17个条目,涉及焦虑躯体化、体重、认知障碍、迟滞和睡眠障碍5个因子,各因子分所包含的条目中,焦虑躯体化因子分包含条目10、11、12、13、15、17,体重因子包含条目16,认知障碍因子分包含条目2、3、9,迟滞因子分包含条目1、7、8、14,睡眠障碍因子分包含条目4、5、6。总分越高表示抑郁程度越重。本研究中,该量表的Cronbach's α系数为0.91。(3)匹兹堡睡眠质量指数(Pittsburgh Sleep Quality Index, PSQI)[16-17]。用于评估患者的睡眠质量,包括主观睡眠质量、入睡时间、实际睡眠时间、睡眠效率、睡眠节律紊乱、睡眠药物使用和日间功能障碍7个因子,总分越高表示睡眠质量越差。本研究中,该量表的Cronbach's α系数为0.93。(4)HRV监测[18-19]。采用HRV测量仪测量5 min HRV。开始测定前,患者需保持坐位休息15 min,确保身体状态处于稳定。HRV指标包括时域和频域指标,时域分析采用两项指标,其中窦性心搏RR间期的标准差(standard deviation of the NN intervals, SDNN)反映HRV相对于平均值的离散程度,单位为ms;相邻RR间期差值的均方根(root mean square values of the Standard deviation, RMSSD)衡量副交感神经在心率调节中作用的敏感指标,单位为ms。频域分析采用3项指标,其中高频(high frequency, HF)升高代表副交感神经活性增强,低频(low frequency, LF)升高代表交感神经活性增强,低频与高频之比(LF/HF)反映了交感神经及副交感神经的平衡状态。本研究中所涉及的时域和频域指标均为短程HRV测量获得的数据。

3.统计学方法:采用SPSS 26.0统计学软件进行数据分析。采用Shapiro-wilk检验对计量资料进行正态分布检验,符合正态分布的计量资料用均数±标准差($\bar{x}\pm s$)表示,组间比较采用独立样本t检验;计数资料用频数和百分数(%)表示,组间比较采用χ^2检验;非正态分布的计量资料用中位数和四分位数[$M(P_{25}, P_{75})$]表示,组间比较采用Mann-Whitney U检验。以是否伴有焦虑症状为因变量,以HAMD评分、PSQI-Ⅴ因子、PSQI-Ⅶ因子、LF、HF及RMSSD为自变量,采用二项Logistic回归分析抑郁症患者伴发焦虑症状的影响因素。双侧检验,以$P<0.05$为差异有统计学意义。

二、结果

1.两组患者一般资料比较:伴焦虑抑郁症组与不伴焦虑抑郁症组的年龄、性别、吸烟饮酒史和BMI比较,差异均无统计学意义(均$P>0.05$),见表1。

表1 伴焦虑抑郁症组和不伴焦虑抑郁症组一般资料比较

项目	伴焦虑抑郁症组(n=50)	不伴焦虑抑郁症组(n=30)	$t/\chi^2/Z$值	P值
年龄(岁,$\bar{x}\pm s$)	29.8±9.8	31.5±8.2	0.638	0.427
性别[例(%)]				
男	15(30)	15(50)	3.200	0.074
女	35(70)	15(50)		
吸烟史[例(%)]				
有	11(22)	10(33)	1.244	0.265
无	39(78)	20(67)		
饮酒史[例(%)]				
有	31(62)	18(60)	0.128	0.721
无	19(38)	12(40)		
BMI[kg/m^2,$M(P_{25}, P_{75})$]	22.1(19.9, 24.2)	22.1(20.0, 24.3)	−0.060	0.952

注:BMI 体重指数

2.两组患者HAMD评分及各项因子得分比较:伴焦虑抑郁症组的HAMD总分、焦虑躯体化因子、认知障碍因子、迟滞因子及睡眠障碍因子评分高于不伴焦虑抑郁症组,差异有统计学意义($P<0.05$)。两组体重因子得分比较,差异无统计学意义($P>0.05$)。见表2。

3.两组患者睡眠质量比较:伴焦虑抑郁症组的PSQI量表睡眠节律紊乱(PSQI-Ⅴ)因子和日间功能障碍(PSQI-Ⅶ)因子得分高于不伴焦虑抑郁症组,差异有统计学意义($P<0.05$);两组PSQI总分及主观

表2 伴焦虑抑郁症组及不伴焦虑抑郁症组HAMD总分及各项因子得分比较[分,$(\bar{x}\pm s)/M(P_{25}, P_{75})$]

组别	例数	HAMD总分	焦虑躯体化因子得分	体重因子得分	认知障碍因子得分	迟滞因子得分	睡眠障碍因子得分
伴焦虑抑郁症组	50	19.6±3.6	6.5±2.2	0(0, 2.0)	5.0±2.1	7.3±1.9	3.5±1.8
不伴焦虑抑郁症组	30	14.7±4.2	5.0±2.1	0(0, 1.3)	3.7±2.4	5.4±2.1	2.6±1.9
t/Z值		5.452	2.982	−0.091	2.664	4.225	2.240
P值		<0.001	0.004	0.928	0.009	<0.001	0.028

注:HAMD 汉密尔顿抑郁量表

睡眠质量(PSQI-Ⅰ)、入睡时间(PSQI-Ⅱ)、实际睡眠时间(PSQI-Ⅲ)、睡眠效率(PSQI-Ⅳ)及睡眠药物使用(PSQI-Ⅵ)因子得分比较,差异无统计学意义($P>0.05$)。见表3。

4.两组患者HRV比较:伴焦虑抑郁症组的LF高于不伴焦虑抑郁症组,而HF及RMSSD低于不伴焦虑抑郁症组,差异均有统计学意义(均$P<0.05$)。两组LF/HF及SDNN比较,差异无统计学意义($P>0.05$)。见表4。

5.抑郁症患者伴发焦虑影响因素的二项Logistic回归分析:将是否伴发焦虑症状作为因变量,以HAMD总分、PSQI-Ⅴ、PSQI-Ⅶ、LF、HF及RMSSD作为自变量进行多因素二项Logistic回归分析,结果显示HAMD总分高(OR=1.439,95%CI=1.157~1.789)和LF高(OR=2.640, 95%CI=1.275~5.467)是抑郁症患者伴发焦虑症状的危险因素($OR>1$, $P<0.05$),而HF高(OR=0.286, 95%CI: 0.142~0.577)是抑郁症患者伴发焦虑症状的保护因素($OR<1$, $P<0.05$)。见表5。

讨论 本研究结果显示,伴焦虑抑郁症组的HAMD总分及焦虑躯体化因子、认知障碍因子、迟滞因子、睡眠障碍因子得分高于不伴焦虑抑郁症组,提示抑郁症患者伴焦虑症状时,其抑郁症状的严重程度较高,容易产生躯体化症状、认知功能损害和反应性迟钝,且睡眠质量降低。既往研究表明,抑郁症患者伴发焦虑症状时,对自身躯体化症状过度关注,特别是神经质患者的固执认知,导致其生活质量和社会功能进一步下降,从而造成严重的经济负担[20]。伴焦虑症状的抑郁症患者神经认知功能评估呈现严重的精神运动迟缓[21],并伴有明显的睡眠质量和注意力损害[22]。在临床中,这类患者对药物治疗的依从性差,治疗反应性低,治疗难度大[23-25],提示临床医生在抑郁症的治疗过程中应关注并动态评估患者的焦虑症状,早期识别和干预焦虑症状对患者预后有重要的临床意义。

表3 伴焦虑抑郁症组及不伴焦虑抑郁症组PSQI总分及各项因子得分比较[分, $M(P_{25}, P_{75})/(\bar{x}\pm s)$]

组别	例数	PSQI总分	主观睡眠质量因子得分	入睡时间因子得分	实际睡眠时间因子得分	睡眠效率因子得分	睡眠节律紊乱因子得分	睡眠药物使用因子得分	日间功能障碍因子得分
伴焦虑抑郁症组	50	13.0(10.8, 16.0)	2.1±0.8	2.1±0.9	2.0(0, 2.0)	1.0(0, 3.0)	1.3±0.6	3.0(0, 3.0)	2.3±0.7
不伴焦虑抑郁症组	30	11.5(6.8, 16.3)	1.9±1.1	2.2±0.9	1.0(0, 2.0)	1.0(0, 3.0)	1.0±0.6	3.0(0, 3.0)	1.8±1.0
Z/t值		−1.097	0.834	−0.727	−1.067	−0.027	2.156	−1.138	2.434
P值		0.273	0.408	0.469	0.286	0.979	0.034	0.255	0.019

注:PSQI匹兹堡睡眠质量指数

表4 伴焦虑抑郁症组及不伴焦虑抑郁症组HRV比较

组别	例数	LF(ms^2, $\bar{x}\pm s$)	HF(ms^2, $\bar{x}\pm s$)	LF/HF[$M(P_{25}, P_{75})$]	RMSSD(ms, $\bar{x}\pm s$)	SDNN(ms, $\bar{x}\pm s$)
伴焦虑抑郁症组	50	5.2±1.2	4.0±1.1	1.0(0.5, 2.4)	22.8±10.5	26.1(20.5, 34.9)
不伴焦虑抑郁症组	30	4.5±1.4	5.4±1.2	1.3(0.9, 2.2)	28.3±9.7	28.4(21.8, 36.2)
t/Z值		2.594	−4.996	−0.730	−2.308	−0.671
P值		0.011	<0.001	0.465	0.024	0.502

注:HRV心率变异性;LF低频;HF高频;LF/HF低频与高频之比;RMSSD相邻RR间期差值的均方根;SDNN正常窦性心搏RR间期标准差

表5 抑郁症患者伴发焦虑影响因素的二项Logistic回归分析

变量	β值	SE	Wald χ^2值	OR值	95%CI	P值
HAMD总分	0.364	0.111	10.703	1.439	1.157~1.789	0.001
LF	0.971	0.371	6.831	2.640	1.275~5.467	0.009
HF	−1.252	0.358	12.236	0.286	0.142~0.577	<0.001
RMSSD	−0.069	0.043	2.608	0.933	0.858~1.015	0.106
PSQI-Ⅴ	0.690	0.707	0.952	1.993	0.499~7.965	0.329
PSQI-Ⅶ	−0.162	0.498	0.105	0.851	0.320~2.259	0.746
常量	−3.215	2.280	1.989	0.040	0.000~3.501	0.158

注:HAMD汉密尔顿抑郁量表;LF低频;HF高频;RMSSD相邻RR间期差值的均方根;PSQI匹兹堡睡眠质量指数;Ⅴ为睡眠节律紊乱;Ⅶ为日间功能障碍

本研究结果显示，伴焦虑抑郁症患者睡眠节律紊乱和日间功能障碍得分均高于不伴焦虑抑郁症组，提示伴焦虑症状的抑郁症患者更易发生日间功能损害及睡眠节律紊乱，低睡眠质量与焦虑、抑郁存在双向影响关系。随着睡眠深度的增加，患者副交感神经兴奋性增加，心率和血压下降，心脏输出减少。在睡眠周期中，非动眼睡眠期自主神经相对稳定，进入睡眠后自主神经失衡会对睡眠质量造成一定影响[26]。伴焦虑症状的抑郁症患者交感神经兴奋性增加，这可能会诱发警觉状态(如过度觉醒)，从而导致睡眠质量下降[27]。此外，睡眠中断也与交感神经张力增加有关[28-29]，睡眠中的觉醒反映了交感神经的激活现象以及在睡眠期间的自主神经系统功能紊乱[30-31]。

HRV反映了个体自主神经功能状态，被广泛应用于抑郁症的评估。本研究结果显示，与不伴焦虑症状的抑郁症组相比，伴焦虑抑郁症组的HF、RMSSD低，LF高，提示伴焦虑症状的抑郁症患者交感神经与副交感神经的平衡性紊乱，这与既往研究结果一致[32-33]。本研究也证实，HF、LF与抑郁症患者的焦虑症状独立相关，副交感神经活性越低，焦虑症状越严重。由于交感神经活性增强或副交感神经活性降低也会增加包括心血管在内的多个系统功能紊乱或损害[34-37]，因此，有必要定期检测患者HRV，以早期识别抑郁症与心血管疾病的共病风险。

综上所述，当抑郁症患者伴发焦虑症状时，抑郁情绪严重、睡眠质量差，高焦虑水平导致自主神经系统功能紊乱进一步加重。对于伴发焦虑症状的抑郁症患者，应制订整合治疗策略，改善患者睡眠及自主神经功能紊乱，从而降低疾病严重程度，促进疾病康复。

本研究仍存在一些局限性：研究样本量较小，未针对抑郁症受试者的严重程度进行分层，未控制抗抑郁药物的种类及剂量。此外，考虑老年人群的HRV变化可能会受心脑血管疾病的影响，本研究纳入人群为18～50岁成年人，未来可扩大样本对其他人群进行研究。

利益冲突 文章所有作者共同认可文章无相关利益冲突

作者贡献声明 试验设计与研究实施为刘颖、于鲁璐，资料收集与整理为王卓言、程月红，数据处理和分析为王卓言、张坤，论文撰写为刘颖、程月红，论文修订为于鲁璐，王学义审校

参 考 文 献

[1] Gryksa K, Schmidtner AK, Masís-Calvo M, et al. Selective breeding of rats for high (HAB) and low (LAB) anxiety-related behaviour: a unique model for comorbid depression and social dysfunctions[J]. Neurosci Biobehav Rev, 2023, 152: 105292. DOI: 10.1016/j.neubiorev.2023.105292.

[2] Olivier E, Morin A, Tardif-Grenier K, et al. Profiles of anxious and depressive symptoms among adolescent boys and girls: associations with coping strategies[J]. J Youth Adolesc, 2022, 51(3): 570-584. DOI: 10.1007/s10964-022-01572-x.

[3] Doering S, Probert-Lindström S, Ehnvall A, et al. Anxiety symptoms preceding suicide: a Swedish nationwide record review[J]. J Affect Disord, 2024, 355: 317-324. DOI: 10.1016/j.jad.2024.03.118.

[4] Kemp AH, Quintana DS, Gray MA, et al. Impact of depression and antidepressant treatment on heart rate variability: a review and meta-analysis[J]. Biol Psychiatry, 2010, 67(11): 1067-1074. DOI: 10.1016/j.biopsych.2009.12.012.

[5] Lichtman JH, Froelicher ES, Blumenthal JA, et al. Depression as a risk factor for poor prognosis among patients with acute coronary syndrome: systematic review and recommendations: a scientific statement from the American Heart Association[J]. Circulation, 2014, 129(12): 1350-1369. DOI: 10.1161/CIR.0000000000000019.

[6] Stapelberg NJ, Hamilton-Craig I, Neumann DL, et al. Mind and heart: heart rate variability in major depressive disorder and coronary heart disease - a review and recommendations[J]. Aust N Z J Psychiatry, 2012, 46(10): 946-957. DOI: 10.1177/0004867412444624.

[7] Wenner MM. Sympathetic activation in chronic anxiety: not just at the "height" of stress. Editorial focus on "relative burst amplitude of muscle sympathetic nerve activity is an indicator of altered sympathetic outflow in chronic anxiety"[J]. J Neurophysiol, 2018, 120(1): 7-8. DOI: 10.1152/jn.00220.2018.

[8] Arakaki X, Arechavala RJ, Choy EH, et al. The connection between heart rate variability (HRV), neurological health, and cognition: a literature review[J]. Front Neurosci, 2023, 17: 1055445. DOI: 10.3389/fnins.2023.1055445.

[9] Ham J, Kim HE, Kim JJ, et al. Differential relationship of observer-rated and self-rated depression and anxiety scales with heart rate variability features[J]. Front Psychiatry, 2023, 14: 1124550. DOI: 10.3389/fpsyt.2023.1124550.

[10] 别怀玺，李晶，赵宝然.抑郁症焦虑症患者心率变异性特点的对比研究[J].神经疾病与精神卫生，2010，10(5)：495-497. DOI：10.3969/j.issn.1009-6574.2010.05.021.
Bie HX, Li J, Zhao BR. A comparative study of the characteristics of heart rate variability in depressive and anxiety disorders[J]. Journal of Neuroscience and Mental Health, 2010, 10(5): 495-497.

[11] 琚明亮，王文政，高毓清，等.心率变异性指标在区分单相、双相抑郁中的应用[J].神经疾病与精神卫生，2024，24(6)：381-387. DOI：10.3969/j.issn.1009-6574.2024.06.001.
Ju ML, Wang WZ, Gao YQ, et al. The application of heart rate variability indices in distinguishing unipolar depression from bipolar depression[J]. Journal of Neuroscience and Mental Health, 2024, 24(6): 381-387.

[12] 刘政疆, 周矗, 薛克栋, 等. 伴发抑郁、焦虑的心律失常患者睡眠与心律失常的临床分析研究[J]. 医学研究杂志, 2011, 40(10): 96-101. DOI: 10.3969/j.issn.1673-548X.2011.10.031.
Liu ZJ, Zhou C, Xue KD, et al. Association between sleep and arrhythmia in the arrhythmia patients with anxiety and depression[J]. J Med Res, 2011, 40(10): 96-101.

[13] World Health Organization. The ICD-10 classification of mental and behavioural disorders: diagnostic criteria for research[EB/OL]. (1993-01-01)[2023-06-01]. https://www.who.int/publications/i/item/9241544554.

[14] EuroQol Research Foundation. EQ-5D-5L user guide, version 3.0, 2019 [EB/OL]. (2019-09-01)[2024-05-30]. https://euroqol.org/publications/user-guides.

[15] Lin J, Wang X, Dong F, et al. Validation of the Chinese version of the Hamilton Rating Scale for Depression in adults with epilepsy[J]. Epilepsy Behav, 2018, 89: 148-152. DOI: 10.1016/j.yebeh.2018.10.009.

[16] Buysse DJ, Reynolds CF 3rd, Monk TH, et al. The Pittsburgh Sleep Quality Index : a new instrument for psychiatric practice and research[J]. Psychiatry Res, 1989, 28(2): 193-213. DOI: 10.1016/0165-1781(89)90047-4.

[17] 刘贤臣, 唐茂芹, 胡蕾, 等. 匹兹堡睡眠质量指数的信度和效度研究[J]. 中华精神科杂志, 1996, 29(2): 103-107.

[18] Fernández-Alvarez J, Grassi M, Colombo D, et al. Efficacy of bio- and neurofeedback for depression: a meta-analysis[J]. Psychol Med, 2022, 52(2): 201-216. DOI: 10.1017/S0033291721004396.

[19] Blickle M, Klüpfel C, Homola GA, et al. Heart rate variability, interoceptive accuracy and functional connectivity in middle-aged and older patients with depression[J]. J Psychiatr Res, 2024, 170: 122-129. DOI: 10.1016/j.jpsychires.2023.11.044.

[20] Bell IH, Marx W, Nguyen K, et al. The effect of psychological treatment on repetitive negative thinking in youth depression and anxiety: a meta-analysis and meta-regression[J]. Psychol Med, 2023, 53(1): 6-16. DOI: 10.1017/S0033291722003373.

[21] Airaksinen E, Wahlin A, Forsell Y, et al. Low episodic memory performance as a premorbid marker of depression: evidence from a 3-year follow-up[J]. Acta Psychiatr Scand, 2007, 115(6): 458-465. DOI: 10.1111/j.1600-0447.2006.00932.x.

[22] Rock PL, Roiser JP, Riedel WJ, et al. Cognitive impairment in depression: a systematic review and meta-analysis[J]. Psychol Med, 2014, 44(10): 2029-2040. DOI: 10.1017/S0033291713002535.

[23] Lenze EJ, Mulsant BH, Shear MK, et al. Comorbid anxiety disorders in depressed elderly patients[J]. Am J Psychiatry, 2000, 157(5): 722-728. DOI: 10.1176/appi.ajp.157.5.722.

[24] Stahl ST, Kincman J, Karp JF, et al. Psychosocial interventions to improve adherence in depressed and anxious older adults prescribed antidepressant pharmacotherapy: a scoping review[J]. Ther Adv Psychopharmacol, 2023, 13: 20451253231212322. DOI: 10.1177/20451253231212322.

[25] Martínez-Calderon J, Casuso-Holgado MJ, Muñoz-Fernandez MJ, et al. Yoga-based interventions may reduce anxiety symptoms in anxiety disorders and depression symptoms in depressive disorders: a systematic review with meta-analysis and meta-regression[J]. Br J Sports Med, 2023, 57(22): 1442-1449. DOI: 10.1136/bjsports-2022-106497.

[26] Miglis MG. Autonomic dysfunction in primary sleep disorders[J]. Sleep Med, 2016, 19: 40-49. DOI: 10.1016/j.sleep.2015.10.001.

[27] Sinha SS. Trauma-induced insomnia: a novel model for trauma and sleep research[J]. Sleep Med Rev, 2016, 25: 74-83. DOI: 10.1016/j.smrv.2015.01.008.

[28] Meerlo P, Sgoifo A, Suchecki D. Restricted and disrupted sleep: effects on autonomic function, neuroendocrine stress systems and stress responsivity[J]. Sleep Med Rev, 2008, 12(3): 197-210. DOI: 10.1016/j.smrv.2007.07.007.

[29] Medic G, Wille M, Hemels ME. Short- and long-term health consequences of sleep disruption[J]. Nat Sci Sleep, 2017, 9: 151-161. DOI: 10.2147/NSS.S134864.

[30] Lee D, Han C, Kim H, et al. Changes in the circadian rhythm of high-frequency heart rate variability associated with depression[J]. J Korean Med Sci, 2023, 15, 38(19): e142. DOI: 10.3346/jkms.2023.38.e142.

[31] Correia ATL, Lipinska G, Rauch HGL, et al. Associations between sleep-related heart rate variability and both sleep and symptoms of depression and anxiety: a systematic review[J]. Sleep Med, 2023, 101: 106-117. DOI: 10.1016/j.sleep.2022.10.018.

[32] Wang Z, Luo Y, Zhang Y, et al. Heart rate variability in generalized anxiety disorder, major depressive disorder and panic disorder: a network meta-analysis and systematic review[J]. J Affect Disord, 2023, 330: 259-266. DOI: 10.1016/j.jad.2023.03.018.

[33] Pittig A, Arch JJ, Lam CW, et al. Heart rate and heart rate variability in panic, social anxiety, obsessive-compulsive, and generalized anxiety disorders at baseline and in response to relaxation and hyperventilation[J]. Int J Psychophysiol, 2013, 87(1): 19-27. DOI: 10.1016/j.ijpsycho.2012.10.012.

[34] Xhyheri B, Manfrini O, Mazzolini M, et al. Heart rate variability today[J]. Prog Cardiovasc Dis, 2012, 55(3): 321-331. DOI: 10.1016/j.pcad.2012.09.001.

[35] Berger M, Pichot V, Solelhac G, et al. Association between nocturnal heart rate variability and incident cardiovascular disease events: the HypnoLaus population-based study[J]. Heart Rhythm, 2022, 19(4): 632-639. DOI: 10.1016/j.hrthm.2021.11.033.

[36] Zhang L, Bao Y, Tao S, et al. The association between cardiovascular drugs and depression/anxiety in patients with cardiovascular disease: a meta-analysis[J]. Pharmacol Res, 2022, 175: 106024. DOI: 10.1016/j.phrs.2021.106024.

[37] Paniccia M, Paniccia D, Thomas S, et al. Clinical and non-clinical depression and anxiety in young people: a scoping review on heart rate variability[J]. Auton Neurosci, 2017, 208: 1-14. DOI: 10.1016/j.autneu.2017.08.008.

(收稿日期: 2024-07-17)
(本文编辑: 赵金鑫)