[36] DONG Y, QU J, ZHANG Z, et al. Human urinary kallidinogenase in treating acute ischemic stroke patients: Analyses of pooled data from a randomized double-blind placebo-controlled phase IIb and phase III clinical trial[J]. Neurol Res, 2020, 42(4): 286-290.

（收稿日期：2024-12-12 录用日期：2025-02-27）
（责任编辑：李 立）

·综述·

青少年网络游戏障碍与抑郁症共病的影响因素☆

靳娜*△ 黄凡凡* 王学义*✉

【摘要】网络游戏障碍和抑郁症共病成为全球普遍性问题，严重影响青少年的身心健康。网络游戏障碍与抑郁症或抑郁情绪密切相关，两者在症状维度存在一定联系与交互作用，导致青少年学习成绩下降，甚至出现非自杀性自伤、自杀意念等问题。两者共病的神经生物学机制方面，共病青少年存在杏仁核-背外侧前额叶皮质网络功能连接异常、默认模式网络的活动模式异常、多巴胺系统功能异常；社会心理学机制方面，共病青少年具有孤独感、认知偏差、不良应对策略的特点。探讨网络游戏障碍和抑郁症的共病机制，可帮助制定个体化的综合干预措施，减少青少年网络游戏障碍和抑郁症的发生与发展。

【关键词】网络游戏障碍 网络成瘾 抑郁症 青少年 神经生物学 社会心理学 共病现象 影响因素
【中图分类号】R749.4；R749.99 【文献标识码】A

Influence factors of comorbidity between gaming disorder and depression among adolescents. *JIN Na, HUANG Fanfan, WANG Xueyi. Mental Health Center of the First Hospital of Hebei Medical University, Mental Health Institute of Hebei Province, Hebei Clinical Medical Research Center for Mental and Psychological Disorders*, Shijiazhuang 050031, China. Tel: 0311-87155506.

【Abstract】 The comorbidity of online game disorder and depression has become a universal problem in the world, which seriously affects the physical and mental health of teenagers. Online game disorder closely relate to depression or depressive mood. There is a certain correlation and interaction between the two in the symptom dimension, leading to the decline of academic performance, and even non-suicidal self-injury, suicidal ideation and other problems. In terms of the neurobiological mechanism of the two comorbidity, there were abnormal functional connection of amygdaloid-dorsolateral prefrontal cortex network, abnormal activity pattern of default mode network and abnormal function of dopamine system in comorbidities. In terms of social psychological mechanism, comorbidities are characterized by loneliness, cognitive bias and poor coping strategies. Exploring the comorbidity mechanism of online game disorder and depression can help to formulate individualized comprehensive intervention measures to reduce the occurrence and development of online game disorder and depression in adolescents.

【Keywords】 Internet gaming disorder Internet addiction disorder Depression Adolescents Neurobiology Social psychology Comorbidity Influencing factor

doi:10.3969/j.issn.1002-0152.2025.02.010

☆ 河北省省级科技计划（编号：21377711D）；河北省引进外国智力项目（编号：YZ202204）；河北省医学科学研究课题计划（编号：20230167）

* 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（石家庄 050031）
△ 上海市嘉定区精神卫生中心
✉ 通信作者（E-mail：070@hebmu.edu.cn）

网络游戏障碍(internet gaming disorder,IGD)已成为全球公共卫生问题[1],2019年游戏障碍(gaming disorder,GD)被列入《国际疾病与相关健康问题统计分类第11版》(*International Statistical Classification of Diseases and Related Health Problems*,11th version,ICD-11)中,其三大核心症状包括对游戏的控制能力受损、将游戏置于首位、游戏导致功能损害[2]。目前IGD全球患病率为6.04%[3],可导致严重的不良后果,包括冲动控制障碍、攻击性行为、抑郁和(或)焦虑情绪,甚至自杀倾向[4]。此外,IGD与抑郁障碍等精神障碍共病率较高[4-5]。在COVID-19大流行期间,儿童和青少年抑郁症状的全球检出率约为25.2%[6],中国青少年抑郁症状的检出率从24.3%[7]增加到28.3%[8]。同时,青少年抑郁症与IGD等行为问题的共病率增加[2,9],导致包括非自杀性自伤、自杀意念和自杀未遂[10]、生活质量降低[11]、学习成绩下降[12]、感知不到幸福生活和社会支持[13]等问题。目前对于IGD和抑郁症在青少年群体中共病问题的相关研究较少。本文综合既往研究,探讨IGD和抑郁症的共病机制,为制定个体化的综合干预措施提供依据,以减少青少年IGD和抑郁症的发生与发展。

1 网络游戏障碍和抑郁症共病现象

大量证据表明,IGD和抑郁症常常共病[2],常见于青少年群体[14]。GONZÁLEZ-BUESO等[5]报告75%的IGD与抑郁症存在显著相关性。具有明显IGD症状的个体,其抑郁症的总患病率为32%[2]。即使诊断为IGD的青少年没有合并抑郁症,也可能存在轻中度的抑郁情绪[15]。既往多个研究显示,抑郁症的严重程度与IGD症状之间存在交互关系[16-18],初步证实抑郁症和IGD之间存在潜在的共同影响因素。IGD与抑郁症的症状有共同点,例如快感缺失、注意力及执行功能下降、社交退缩、精神萎靡、疲劳以及睡眠-觉醒模式破坏等[19],两者的某些症状重叠可能导致误诊和治疗的不确定性[20]。因此,需要进一步分析IGD与抑郁症之间的关联机制。

2 网络游戏障碍和抑郁症状的关联

CAI等[21]采用网络分析方法调查抑郁症状和网络使用问题的共存关系,发现青少年"网络的渴求"在网络成瘾和抑郁情绪共存模型中具有中介效应,随时间的推移,这两种症状产生负反馈的交互效应,最终导致网络成瘾和抑郁情绪共存现象[22]。

SIT等[23]对1362名高中生的网络研究表明,"无价值感"、"无意义感"和"心情沮丧"是青少年抑郁核心表现,而"沉迷"、"固执"和心理弹性差是青少年IGD的核心问题。在症状组合网络模型中,"情绪沮丧"与"逃避"、"缺乏动力"与"沉迷游戏"两两症状之间的关联最为密切。长期渴求从网络游戏中寻求快乐,获得自我掌控感,可能与游戏成瘾有关[24]。另外,"逃避"症状对抑郁症具有催化作用。抑郁症"缺乏动力"和IGD的"逃避"现实行为有相互强化作用。因此,IGD和抑郁症可能存在共同的神经生物学和社会心理学机制[25]。

3 网络游戏障碍共病抑郁症的神经生物学机制

3.1 杏仁核-背外侧前额叶皮质网络功能连接异常 在情绪调节中,杏仁核对情绪识别、处理和记忆的形成起着关键作用[26-27]。KO等[28]研究表明,杏仁核与背外侧前额叶皮质(dorsolateral prefrontal cortex,DLPFC)的网络连接减弱,导致IGD个体的控制能力下降和冲动性增加。左侧杏仁核对恐惧和愤怒面孔的情绪反应增强,而对积极面孔的情绪反应减弱,这些变化与重性抑郁障碍(major depressive disorder,MDD)患者的快感缺失和焦虑症状有关[29-30]。在IGD和抑郁症共病的患者中也有类似发现。LIU等[31]进行为期4年的fMRI研究发现,伴有抑郁情绪的IGD患者左侧杏仁核与右侧DLPFC的静息态功能连接(resting state functional connection,rsFC)显著增强,且与抑郁情绪的严重程度呈负相关。杏仁核主要涉及情绪的管理和调节,伴轻度抑郁情绪的IGD患者,其前额叶对杏仁核活动的控制能力增强[32],而在有严重抑郁症状的患者中,这种自我调控能力减弱,即杏仁核和DLPFC之间的连接性减弱,这表明抑郁症患者的杏仁核-DLPFC功能连接发生紊乱[33]。KONG等[34]研究也发现,在执行情绪的相关任务时,PFC-杏仁核功能连接性下降。以上研究表明,在IGD共病抑郁症的患者中,杏仁核和DLPFC之间的功能连接异常,这可能是导致IGD和抑郁症共病的脑功能机制。

WINKLER等[35]一项meta分析结果显示,对IGD患者进行每周1次、持续6周的网络渴求行为干预,可以直接降低IGD患者杏仁核对负性情绪的敏感性,使杏仁核-DLPFC功能连接趋于正常化,从而使网络成瘾和抑郁症状显著减轻,该研究同时发现杏仁核-额叶皮质的功能连接也降低。上述研究提示,杏仁核和DLPFC之间的异常功能连接,可能是IGD共病抑郁症的神经生物学基础和干预的潜在靶点。

3.2 默认模式网络的异常活动模式 默认模式网络(default mode network,DMN)与高级认知过程相关,如情绪调节、自

传体记忆和自我认知、社会认知、冒险决策、冲动和面向未来的思考[36-37]，其核心区域包括内侧额叶皮质、后扣带回、顶叶下叶、外侧颞叶皮质、内侧颞回以及海马。在静息状态下，上述脑区处于活跃状态，当执行注意任务时则受到抑制[38]。LIU等[39]研究发现，IGD患者的左侧角回与DMN脑区功能削弱，而突显网络和执行控制网络功能连接增强，这些变化可能会增加个体对网络游戏相关刺激奖赏的敏感性，增强注意力，削弱自控能力，从而强化了网络成瘾的奖赏效应，最终个体渴求行为转变为强迫行为，形成网络游戏成瘾的行为模式[37]。另有研究认为DMN的功能连接减弱，有助于预测IGD[40-41]。

HAN等[42]纳入145名13~23岁的男性受试者进行IGD队列研究，MDD共病IGD患者与单纯IGD患者、健康对照相比，在注意的执行任务中，DMN区域（后扣带回皮质、海马和海马旁回）显示较高程度的激活（抑制减弱），在威斯康星卡片分类测验（Wisconsin card sorting test，WCST）中持续反应次数和错误次数也较高，提示其额叶功能受损。

3.3 多巴胺系统功能异常 多巴胺（dopamine，DA）和5-羟色胺（5-hydroxytryptamine，5-HT）在物质依赖，特别是在奖赏和戒断方面起着重要作用。早期WEINSTEIN等[43]研究显示，IGD患者的纹状体中多巴胺D_2（DAD_2）受体和DA转运体（dopaminetransporter，DAT）利用率较低。最近ZHA等[44]采用正电子发射断层成像（positron emission computed tomography，PET）研究显示，IGD患者的前额叶、颞叶和边缘系统中的葡萄糖代谢降低，同时纹状体中的DAD_2受体利用率较低，且与IGD的病程相关；眶额叶皮质（orbitofrontal cortex，OFC）中的葡萄糖代谢降低与纹状体中的DAD_2受体利用率较低有关。在IGD中，低水平DAD_2受体利用率可能是IGD行为失控和成瘾行为的潜在机制[45]。

LIU等[46]采用fMRI的随机对照试验研究表明，MDD患者的快感缺失与富含DA的腹侧伏隔核（nucleus accumbens，NAc）和背侧纹状体（尾状核和壳核）区域内的奖赏激活减弱有关。给予D_2/D_3受体拮抗剂氨磺必利50 mg，可暂时增加DA水平，即时增加了在奖赏任务下纹状体的活性。PIZZAGALLI等[47]分析25例MDD患者和23名健康对照者的PET，以及15例MDD患者和14名健康对照者的尸检数据，结果显示MDD患者背侧纹状体DAT表达降低，尤其是反复发作MDD患者的DAT表达明显降低。未服用药物的MDD患者双侧壳核和腹侧被盖区的DAT可用性也显著降低，且随着抑郁发作次数增加，DAT可用性进一步下降；MDD患者在应激或创伤的环境中，腹侧被盖区域的DAT可用性明显降低；自杀死亡的MDD患者脑组织中，DAT表达水平也明显低于健康对照组。

MDD的症状改善与中脑DAT可用性增加有关，ROMINGER等[48]报告抑郁患者经艾司西酞普兰治疗6周后，纹状体DAT的可用性提高20%。SONG等[49]采用安非他酮和艾司西酞普兰两种抗抑郁剂治疗IGD，对其疗效进行比较，结果表明：安非他酮作为去甲肾上腺素（norepinephrine，NE）和DA的再摄取抑制剂，可有效减少IGD总游戏时间和对网络游戏的渴求，并减少冲动性、注意力不集中，改善抑郁情绪；艾司西酞普兰通过5-HT再摄取抑制作用，改善IGD的冲动性和强迫症状。以上证据表明，DA及5-HT再摄取抑制剂可改善IGD的强迫、冲动和抑郁情绪。

4 网络游戏障碍与抑郁症共病的社会心理学机制

4.1 孤独感 抑郁症可能表现出社交隔离和孤独感，而青少年网络游戏成瘾程度与孤独感水平呈正相关，“逃避现实动机”起着中介作用[50]。游戏成瘾者可能通过游戏来填补“社交能力”，寻求虚拟的“人际世界”获得补偿效应，由于沉迷于游戏减少了真实世界的社交活动，加剧抑郁情绪，进一步增加了对游戏的依赖，形成恶性循环。这些因素强化了抑郁症和IGD之间的关联，因此，在诊疗过程中需评估多种因素的交互影响，建立综合性的治疗方案。

4.2 认知偏差 IGD共病抑郁症的患者可能存在对自我和对客观事物的扭曲认知[51]。自我负性认知包括自我怀疑、自我效能感低下和消极的自我评价，在负性认知的影响下，共病患者可能利用网络来实现社交互动和获得价值感。在临床实践中，患者常描述：“我只有在网络上心情感觉很好”，“离线时我一文不值”，“在网上我才是主人”，“在现实中我是最差的人”，“我活在现实生活中很累，互联网才是我唯一能感到安全和放松的地方”，“在现实中没有任何人理解我、爱我”之类的想法。患者在上述自我否定和对客观事物扭曲认知的影响下，似乎在互联网上找到了“真实的自我”，获得短暂的愉悦感，最终形成过度使用网络游戏的行为模式[52]。

4.3 不良的应对策略 伴有抑郁情绪或过度压力的个体应对策略可分为两部分，即以问题为中心和以情绪为中心的应对方式[53]。以问题为中心是个体试图寻找问题的来源或诱发压力性事件的原因，这是积极的心理状态[54]。以情绪为中心的个体应对方式是调节对压力性事件的负性情绪反应，通常个体会采用自伤、沉迷网络等消极的行为方式，这种认知行为方式常会加剧抑郁情绪[55-56]。

视频游戏被认为是一种以情绪为中心的应对策略[57]。伴有抑郁情绪的青少年IGD患者，通常过度依赖网络游戏来应对压力或负性情绪，采取固执、否认、冲动和逃避现实等应对困难与挫折[53]。构建规律运动、积极参与现实活动、增加新的兴趣爱好等，可有效地改善游戏成瘾和抑郁情绪[58]。

5 小结

IGD和抑郁症常常共病，且在青少年群体尤为突出。共病患者的成瘾症状和抑郁症状互相交错影响，导致了诊断和治疗上的困难。综合既往研究，IGD和抑郁症共病的青少年患者，大脑存在杏仁核与DLPFC之间功能连接异常、DMN脑区抑制减弱和多巴胺系统功能异常等问题。另外，孤独感、认知偏差以及不良的应对策略，是共病患者共同的社会心理学特点。目前，关于青少年群体IGD和抑郁症共病的研究较少，二者的因果关系尚未明确，仍缺乏纵向的机制性研究。本文从流行病学、症状学、神经生物学以及社会心理学的角度，对青少年IGD与抑郁症的共同影响因素进行了分析，有助于共病问题的预防和早期识别，以确定最佳的整合性治疗模式。

参 考 文 献

[1] TIAN M Y, ZHOU X Y, LIAO X Y, et al. Brain structural alterations in internet gaming disorder: Focus on the mesocorticolimbic dopaminergic system[J]. Prog Neuropsychopharmacol Biol Psychiatry, 2023, 127: 110806.

[2] OSTINELLI E G, ZANGANI C, GIORDANO B, et al. Depressive symptoms and depression in individuals with internet gaming disorder: A systematic review and meta-analysis[J]. J Affect Disord, 2021, 284: 136-142.

[3] MENG S Q, CHENG J L, LI Y Y, et al. Global prevalence of digital addiction in general population: A systematic review and meta-analysis[J]. Clin Psychol Rev, 2022, 92: 102128.

[4] OHAYON M M, ROBERTS L. Internet gaming disorder and comorbidities among campus-dwelling U.S. university students[J]. Psychiatry Res, 2021, 302: 114043.

[5] GONZÁLEZ-BUESO V, SANTAMARÍA J J, FERNÁNDEZ D, et al. Association between internet gaming disorder or pathological video-game use and comorbid psychopathology: A comprehensive review[J]. Int J Environ Res Public Health, 2018, 15(4): 668.

[6] RACINE N, MCARTHUR B A, COOKE J E, et al. Global prevalence of depressive and anxiety symptoms in children and adolescents during covid-19: A meta-analysis[J]. JAMA Pediatr, 2021, 175(11): 1142-1150.

[7] TANG X, TANG S, REN Z, et al. Prevalence of depressive symptoms among adolescents in secondary school in mainland China: A systematic review and meta-analysis[J]. J Affect Disord, 2019, 245: 498-507.

[8] CHEN J, YANG K, CAO Y, et al. Depressive symptoms among children and adolescents in China during the coronavirus disease-19 epidemic: A systematic review and meta-analysis[J]. Front Psychiatry, 2022, 13: 870346.

[9] ESSAU C A, DE LA TORRE-LUQUE A. Comorbidity profile of mental disorders among adolescents: A latent class analysis[J]. Psychiatry Res, 2019, 278: 228-234.

[10] CONEJERO I, OLIÉ E, CALATI R, et al. Psychological pain, depression, and suicide: Recent evidences and future directions[J]. Curr Psychiatry Rep, 2018, 20(5): 33.

[11] KOLOVOS S, KLEIBOER A, CUIJPERS P. Effect of psychotherapy for depression on quality of life: Meta-analysis[J]. Br J Psychiatry J Ment Sci, 2016, 209(6): 460-468.

[12] WICKERSHAM A, SUGG H V R, EPSTEIN S, et al. Systematic review and meta-analysis: The association between child and adolescent depression and later educational attainment[J]. J Am Acad Child Adolesc Psychiatry, 2021, 60(1): 105-118.

[13] REN P, QIN X, ZHANG Y, et al. Is social support a cause or consequence of depression? A longitudinal study of adolescents [J]. Front Psychol, 2018, 9: 1634.

[14] GAO Y X, WANG J Y, DONG G H. The prevalence and possible risk factors of internet gaming disorder among adolescents and young adults: Systematic reviews and meta-analyses[J]. J Psychiatr Res, 2022, 154: 35-43.

[15] WAHL I, LÖWE B, BJORNER J B, et al. Standardization of depression measurement: A common metric was developed for 11 self-report depression measures[J]. J Clin Epidemiol, 2014, 67(1): 73-86.

[16] MÄNNIKKÖ N, RUOTSALAINEN H, MIETTUNEN J, et al. Problematic gaming behaviour and health-related outcomes: A systematic review and meta-analysis[J]. J Health Psychol, 2020, 25(1): 67-81.

[17] SUSSMAN C J, HARPER J M, STAHL J L, et al. Internet and video game addictions: Diagnosis, epidemiology, and neurobiology[J]. Child Adolesc Psychiatr Clin N Am, 2018, 27(2): 307-326.

[18] WONG H Y, MO H Y, POTENZA M N, et al. Relationships be-

tween severity of internet gaming disorder, severity of problematic social media use, sleep quality and psychological distress[J]. Int J Environ Res Public Health, 2020, 17(6): 1879.

[19] MOSHEL M L, WARBURTON W A, BATCHELOR J, et al. Neuropsychological deficits in disordered screen use behaviours: A systematic review and meta-analysis[J]. Neuropsychol Rev, 2024, 34(3): 791-822.

[20] GUILLOT C R, BELLO M S, TSAI J Y, et al. Longitudinal associations between anhedonia and internet-related addictive behaviors in emerging adults[J]. Comput Hum Behav, 2016, 62: 475-479.

[21] CAI H, BAI W, SHA S, et al. Identification of central symptoms in internet addictions and depression among adolescents in Macau: A network analysis[J]. J Affect Disord, 2022, 302: 415-423.

[22] ZHAO Y, QU D, CHEN S, et al. Network analysis of internet addiction and depression among chinese college students during the COVID-19 pandemic: A longitudinal study[J]. Comput Hum Behav, 2023, 138: 107424.

[23] SIT H F, CHANG C I, YUAN G F, et al. Depressive symptoms and depression in individuals with internet gaming disorder: A systematic review and meta-analysis[J]. Psychiatry Res, 2023, 322: 115097.

[24] GOMEZ R, STAVROPOULOS V, TULLETT-PRADO D, et al. Network analyses of internet gaming disorder symptoms and their links with different types of motivation[J]. BMC Psychiatry, 2022, 22(1): 76.

[25] VAN ROOIJ A J, FERGUSON C J, COLDER CARRAS M, et al. A weak scientific basis for gaming disorder: Let us err on the side of caution[J]. J Behav Addict, 2018, 7(1): 1-9.

[26] ŠIMIĆ G, TKALČIĆ M, VUKIĆ V, et al. Understanding emotions: Origins and roles of the amygdala[J]. Biomolecules, 2021, 11(6): 823.

[27] ROSEMAN L, DEMETRIOU L, WALL M B, et al. Increased amygdala responses to emotional faces after psilocybin for treatment-resistant depression[J]. Neuropharmacology, 2018, 142: 263-269.

[28] KO C H, HSIEH T J, WANG P W, et al. Altered gray matter density and disrupted functional connectivity of the amygdala in adults with internet gaming disorder[J]. Prog Neuropsychopharmacol Biol Psychiatry, 2015, 57: 185-192.

[29] GROGANS S E, FOX A S, SHACKMAN A J. The amygdala and depression: A sober reconsideration[J]. Am J Psychiatry, 2022, 179(7): 454-457.

[30] YOUNG K D, ZOTEV V, PHILLIPS R, et al. Amygdala real-time fMRI neurofeedback for major depressive disorder: A review [J]. Psychiatry Clin Neurosci, 2018, 72(7): 466-481.

[31] LIU L, YAO Y W, LI C R, et al. The comorbidity between internet gaming disorder and depression: Interrelationship and neural mechanisms[J]. Front Psychiatry, 2018, 9: 154.

[32] YAO Y W, LIU L, MA S S, et al. Functional and structural neural alterations in internet gaming disorder: A systematic review and meta-analysis[J]. Neurosci Biobehav Rev, 2017, 83: 313-324.

[33] RAPPENEAU V, BÉROD A. Reconsidering depression as a risk factor for substance use disorder: Insights from rodent models[J]. Neurosci Biobehav Rev, 2017, 77: 303-316.

[34] KONG L, CHEN K, TANG Y, et al. Functional connectivity between the amygdala and prefrontal cortex in medication-naive individuals with major depressive disorder[J]. J Psychiatry Neurosci JPN, 2013, 38(6): 417-422.

[35] WINKLER A, DÖRSING B, RIEF W, et al. Treatment of internet addiction: A meta-analysis[J]. Clin Psychol Rev, 2013, 33(2): 317-329.

[36] BUCKNER R L, DINICOLA L M. The brain's default network: Updated anatomy, physiology and evolving insights[J]. Nat Rev Neurosci, 2019, 20(10): 593-608.

[37] YAN H, LI Q, YU K, et al. Large-scale network dysfunction in youths with internet gaming disorder: A meta-analysis of resting-state functional connectivity studies[J]. Prog Neuropsychopharmacol Biol Psychiatry, 2021, 109: 110242.

[38] DI X, BISWAL B B. Identifying the default mode network structure using dynamic causal modeling on resting-state functional magnetic resonance imaging[J]. NeuroImage, 2014, 86: 53-59.

[39] LIU L, POTENZA M N, LACADIE C M, et al. Altered intrinsic connectivity distribution in internet gaming disorder and its associations with psychotherapy treatment outcomes[J]. Addict Biol, 2021, 26(2): e12917.

[40] DONG G, LI H, WANG L, et al. The correlation between mood states and functional connectivity within the default mode network can differentiate internet gaming disorder from healthy controls[J]. Prog Neuropsychopharmacol Biol Psychiatry, 2017, 77: 185-193.

[41] DONG G H, WANG Z, DONG H, et al. More stringent criteria are needed for diagnosing internet gaming disorder: Evidence from regional brain features and whole-brain functional connectivity multivariate pattern analyses[J]. J Behav Addict, 2020, 9 (3): 642-653.

[42] HAN D H, KIM S M, BAE S, et al. A failure of suppression

within the default mode network in depressed adolescents with compulsive internet game play[J]. J Affect Disord, 2016, 194: 57-64.

[43] WEINSTEIN A, LIVNY A, WEIZMAN A. New developments in brain research of internet and gaming disorder[J]. Neurosci Biobehav Rev, 2017, 75: 314-330.

[44] ZHA R, BU J, WEI Z, et al. Transforming brain signals related to value evaluation and self-control into behavioral choices[J]. Hum Brain Mapp, 2019, 40(4): 1049-1061.

[45] WEINSTEIN A, LEJOYEUX M. Neurobiological mechanisms underlying internet gaming disorder[J]. Dialogues Clin Neurosci, 2020, 22(2): 113-126.

[46] LIU Y, ADMON R, MELLEM M S, et al. Machine learning identifies large-scale reward-related activity modulated by dopaminergic enhancement in major depression[J]. Biol Psychiatry Cogn Neurosci Neuroimaging, 2020, 5(2): 163-172.

[47] PIZZAGALLI D A, BERRETTA S, WOOTEN D, et al. Assessment of striatal dopamine transporter binding in individuals with major depressive disorder[J]. JAMA Psychiatry, 2019, 76(8): 854-861.

[48] ROMINGER A, CUMMING P, BRENDEL M, et al. Altered serotonin and dopamine transporter availabilities in brain of depressed patients upon treatment with escitalopram: A [123I]β-CIT SPECT study[J]. Eur Neuropsychopharmacol, 2015, 25(6): 873-881.

[49] SONG J, PARK J H, HAN D H, et al. Comparative study of the effects of bupropion and escitalopram on internet gaming disorder [J]. Psychiatry Clin Neurosci, 2016, 70(11): 527-535.

[50] LI J, ZHAN D, ZHOU Y, et al. Loneliness and problematic mobile phone use among adolescents during the COVID-19 pandemic: The roles of escape motivation and self-control[J]. Addict Behav, 2021, 118: 106857.

[51] AKBARI M, MOHAMMADALIHA N, MOHAMMADKHANI S, et al. Cognitive, metacognitive, motivational, and emotional predictors of the intensity of internet gaming disorder among adolescents[J]. Psychiatr Q, 2024, 95(3): 385-414.

[52] BONNER J, ALLEN A, KATSIKITIS M, et al. Metacognition, desire thinking and craving in problematic video game use[J]. J Technol Behav Sci, 2022, 7(4): 532-546.

[53] SCHNEIDER L A, KING D L, DELFABBRO P H. Maladaptive coping styles in adolescents with internet gaming disorder symptoms[J]. Int J Ment Health Addict, 2018, 16(4): 905-916.

[54] CONG C W, LING W S, AUN T S. Problem-focused coping and depression among adolescents: Mediating effect of self-esteem [J]. Curr Psychol, 2021, 40(11): 5587-5594.

[55] YANG F, SUN J, LI J, et al. Coping strategies, stigmatizing attitude, and cyberbullying among Chinese college students during the COVID-19 lockdown[J]. Curr Psychol N B N J, 2022: 1-9.

[56] ZHAO Y, ZHAO X, ZHOU Y, et al. Self-injury functions mediate the association between anxiety and self-injury frequency among depressed Chinese adolescents: Sex differences[J]. Front Psychiatry, 2024, 15: 1378492.

[57] BLASI M D, GIARDINA A, GIORDANO C, et al. Problematic video game use as an emotional coping strategy: Evidence from a sample of MMORPG gamers[J]. J Behav Addict, 2019, 8(1): 25-34.

[58] YEN J Y, YEH Y C, WANG P W, et al. Emotional regulation in young adults with internet gaming disorder[J]. Int J Environ Res Public Health, 2018, 15(1): 30.

（收稿日期：2024-10-21　录用日期：2025-02-27）

（责任编辑：肖雅妮）