· 媒体使用与学生心理健康专栏 ·

大学新生手机依赖与大脑灰质体积的关系

邹立巍[1,2],伍晓艳[1,2],陶舒曼[3],杨娅娟[4],张清俊[5],洪雪冬[5],谢阳[1,2],李婷婷[1,2],郑穗生[5],陶芳标[1,2]

1.安徽医科大学公共卫生学院儿少卫生与妇幼保健学系,合肥 230032;
2.安徽医科大学出生人口健康教育部重点实验室/人口健康与优生安徽省重点实验室;
3.安徽医科大学第二附属医院肾脏内科;4.安徽医科大学护理学院;5.合肥平安健康(检测)中心

【摘要】 **目的** 基于体素形态学方法探讨大学生手机依赖与大脑灰质体积的关联。**方法** 采用随机抽样的原则,选择某大学 5 个不同专业学生共 566 名,使用电子问卷的形式,调查大学生一般情况和手机依赖症状。根据自愿原则招募,其中 266 名学生参与 3.0 T 核磁共振检查,采集大学生的高分辨 3D-T1 结构像。运用 VBM8 多重回归模型分析大学生手机依赖与大脑灰质体积的关联。**结果** 266 名被试中检出手机依赖者 81 名(30.5%)。不同性别、家庭居住地、是否独生子女、家庭经济收入和学习成绩之间的手机依赖得分差异无统计学意义(t/F 值分别为 -1.04, 0.40, -1.30, 0.23, 1.48, P 值均>0.05)。前扣带回和右侧梭状回的灰质体积与手机依赖得分呈负相关关系(FDR 校正,P<0.05),未发现正向关联的脑区灰质体积。**结论** 大学生手机依赖程度越高,前扣带回与右侧梭状回灰质体积越小。大学生手机依赖与大脑的奖赏、执行控制和情绪相关脑区的灰质体积存在关联。

【关键词】 便携式电话;行为,成瘾;脑;回归分析;学生
【中图分类号】 G 647.8 R 445 【文献标识码】 A 【文章编号】 1000-9817(2020)11-1614-04

Mobile phone dependence and gray matter volume in college freshmen/*ZOU Liwei**, *WU Xiaoyan, TAO Shuman, YANG Yajuan, ZHANG Qingjun, HONG Xuedong, XIE Yang, LI Tingting, ZHENG Suisheng, TAO Fangbiao.** *Department of Maternal, Child and Adolescent Health, School of Public Health, Anhui Medical University, Hefei (230032), China*

【**Abstract**】 **Objective** This study aimed to investigate the correlation between brain gray matter volume(GMV) and MPD based on voxel-based morphometry(VBM) method. **Methods** By using principle of random sampling method, 566 students were recruited from 5 different majors in a certain university. An electronic questionnaire was used to collect the general situation and MPD. Moreover, 266 students were obtained high-resolution 3-dimensional T1 structure images by 3.0 T MRI based on voluntary principle. A multiple regression model with VBM8 was performed to detect GMV associated with MPD scores. **Results** Among the 266 participants, 81 students(30.5%) reported MPD. There were no statistical differences of MPD scores between different characteristics, such as gender, residential area, sibling and perceived family income, as well as academic performance(t/F=-1.04, 0.40, -1.30, 0.23, 1.48, P>0.05). An inverse correlation was found between GMV of the anterior cingulate gyrus(ACC) and right fusiform gyrus (FFG) with MPD scores(FDR corrected, P<0.05), and no positive associations were found. **Conclusion** College students with higher severity of MPD have lower GMV of ACC and right FFG, and these results suggested that MPD was correlated with brain reward, executive control and emotional related GMV.

【**Keywords**】 Cellular phone; Behavior, addictive; Brain; Regression analysis; Students

中国互联网信息中心研究报告指出,截至 2020 年 3 月,我国手机网民规模达 8.97 亿,使用手机上网比例达 99.3%,其中学生群体占 26.9%[1]。尽管手机给人们带来了很多便利,但随着使用频次与使用时间的增加,也带来了许多潜在风险,尤其是刚入大学生活的大一新生,会因其方便的特性过度使用从而导致手机依赖。手机依赖是指手机过度使用而引起生理或心理上的不适,并对人体心理健康和社会功能造成消极影响[2-3]。有研究表明,手机依赖与心理健康存在关联,特别是抑郁症状[4-6]。如 Ng 等[7]研究发现,手机依赖与抑郁存在正向关联。韩国和美国的青少年研究中同样发现手机依赖与抑郁的正向关联[8-9]。一项 3 年的纵向随访研究发现,基线手机依赖状况可以显著预测 2 年后的抑郁症状[4]。另外,也有一些研究关注心理因素(如生活满意度、社会支持和情绪等)在手机依赖与心理病理症状关系中的作用[10-12]。越来越多的研究证据显示,大脑结构和功能在行为成瘾中起着重要作用[13-15]。Lee 等[13]纳入 45 名网络游戏成瘾者与 35 名正常对照分析,发现网络成瘾患者大脑前

【基金项目】 国家自然科学基金项目(81773455, 81803257);安徽医科大学博士科研资助基金项目(XJ201824)
【作者简介】 邹立巍(1988-),男,浙江丽水人,在读博士,助理研究员,主要研究方向为青少年行为与健康。
【通信作者】 陶芳标,E-mail:fbtao@ahmu.edu.cn
DOI: 10.16835/j.cnki.1000-9817.2020.11.004

扣带回、右侧眶回的皮质厚度与正常对照组相比较薄,扣带回和左侧眶回的灰质体积较小。另外有研究发现,网络成瘾的严重程度与左侧尾状核的灰质体积呈正相关,与左侧尾状核和右侧额中回的功能连接呈负相关[14]。有荟萃分析发现,在奖赏预期任务中,物质成瘾和赌博成瘾患者与对照相比纹状体活动降低[15]。本研究基于核磁共振检查技术,采用体素形态学测量方法研究大学生大脑灰质体积与手机依赖的关系,报道如下。

1　对象与方法

1.1　对象　采用整群随机抽样原则,于 2019 年选取某高校 2 个学院的大一新生 566 名完成问卷调查,其中 266 名参与核磁共振扫描检查。平均年龄(19.02±0.83)岁,其中男生 60 名,女生 206 名;农村生源 157 名,城市生源 109 名;独生子女 59 名,非独生子女 207 名。研究通过安徽医科大学伦理委员会的审批(编号:20170291),符合知情同意和自愿原则。

1.2　方法

1.2.1　一般资料　包括性别、年龄、家庭居住地(农村、城镇)、家庭经济收入(低、中、高)、是否独生子女、学习成绩(差、中等、好)、父母受教育程度(小学及以下、初中、高中及以上)等。

1.2.2　青少年手机使用依赖自评量表(Self-rating Questionnaire for Adolescent Problematic Mobile Phone Use, SQAPMPU)　此量表是课题组前期编制[16],包括戒断症状、渴求性和身心效应 3 个维度,共 13 个项目,每个项目根据李克特 5 级评分标准,即"从不"为 1 分,"偶尔"为 2 分,"有时"为 3 分,"经常"为 4 分,"总是"为 5 分,总分越高说明对手机依赖程度越高。本研究用第 75 百分位数(P_{75})作为手机依赖的界值,即得分≥28 分为手机依赖[17-18]。本研究中量表的 Cronbach α 系数为 0.90。

1.2.3　影像数据采集　采用 Philips Ingenia CX 3.0T 超导核磁共振扫描仪,检查前叮嘱检查者放松并尽量保持头不动。检查者采用仰卧位,并结合海绵泡沫垫和耳塞以减少头动与噪音的影响,采集常规的 T1WI、T2WI 和 FLAIR 图像,排除脑实质性疾病。高分辨 T1 结构像采用快速梯度回波序列扫描,参数如下:回波时间(echo time, TE)3.2 ms,重复时间(repetition time, TR)7.1 ms,视野范围(field of view, FOV)256×256 mm^2,层厚 1 mm,无间隔,矢状位扫描共 180 层,扫描时间为 305 s。

1.2.4　图像预处理　应用 SPM 12(http://www.fil.ion.ucl.ac.uk/spm/)软件的 VBM8 工具包进行数据处理,对 T1 结构像进行空间标准化及白质、灰质和脑脊液的分割,分割的灰质图像均经质量检测,再平滑,最大半高全宽 6 mm。

1.3　统计学处理　数据用 SPSS 23.0 进行统计分析,对符合正态分布的计量资料用($\bar{x}\pm s$)表示,不符合正态分布的采用中位数(M)表示,对分类变量用频数分析。基于全脑的体素相关分析在 SPM 12 软件中用多重回归模型进行,分析时控制年龄与性别因素,多重比较采用 FDR 校正。双侧检验水准 $\alpha=0.05$。

2　结果

2.1　不同人口学特征大学新生手机依赖得分比较　纳入样本中平均手机依赖得分为(24.63±8.33)分,不同性别、家庭居住地、是否独生子女、家庭经济收入和学习成绩之间的手机依赖得分差异均无统计学意义(P 值均>0.05)。见表 1。

表 1　不同人口学特征大学新生手机依赖得分比较($\bar{x}\pm s$)

人口学指标		人数	手机依赖得分	t/F 值	P 值
性别	男	60	23.65±9.89	−1.04	0.30
	女	206	24.92±7.82		
居住地	农村	157	24.80±7.87	0.40	0.69
	城镇	109	24.39±8.98		
独生子女	是	59	23.39±8.58	−1.30	0.20
	否	207	24.99±8.25		
家庭经济收入	低	55	24.69±8.69		
	中	196	24.72±8.44	0.23	0.79
	高	15	23.20±5.20		
学习成绩	差	48	26.50±9.13		
	中等	167	24.22±8.19	1.48	0.23
	好	51	24.24±7.91		

2.2　大学新生灰质体积与手机依赖得分相关的脑区多重回归分析发现,大脑前扣带回(体素数:77,坐标:$x=-8$, $y=40$, $z=10$)和右侧梭状回(体素数:25,坐标:$x=-24$, $y=9$, $z=-45$)的灰质体积与手机依赖得分呈负相关关系(未校正 $P=0.00$,FDR 校正 $P<0.05$),相关系数分别为−0.26 和−0.26,未发现与手机依赖呈正相关的脑区灰质体积。见表 2。

表 2　大学新生灰质体积与手机依赖得分相关的脑区

团块	区域	体素数	MNI 坐标			t 值
			x	y	z	
1	前扣带回	77	−8	40	10	4.49
2	右侧梭状回	25	24	9	−45	3.81

3　讨论

本研究发现,大脑前扣带回和右侧梭状回的灰质体积与手机依赖得分呈负相关,即手机依赖与大脑结构(灰质体积)相关联,提示大脑结构的改变可能是手机依赖的神经生物学基础。

前期研究结果发现,手机依赖患者的右侧额上回、右侧额下回、双侧丘脑、右侧的外侧眶额叶、左侧前脑岛、左侧颞下回、左侧海马旁回的灰质体积与正常对照相比较小[19-20],与本研究结果不同。而本研究结果与相关研究一致,发现网络成瘾患者的前扣带回灰质体积减小[21-22],同样在大脑功能方面也发现网络

成瘾患者前扣带回和梭状回的脑活动发生改变[23-24]。

前扣带回是奖赏系统的重要组成部分,主要编码预测误差,在注意和运动控制过程中起重要作用[25]。Dong 等[26]用基于功能磁共振技术的概率猜测任务发现,网络游戏成瘾患者前扣带回活动减弱,在应对一些情感任务中前扣带回的功能活动发生改变,可能会影响奖励相关的决策。在 STROOP 执行功能任务中,网络成瘾患者的前扣带回活动也发生改变,也表明在执行认知控制时预测误差的能力在下降[27],所以前扣带回的结构异常可能不仅与网络成瘾有关,也与手机依赖有关。

梭状回的功能主要负责情绪识别,右侧梭状回的灰质体积/皮层厚度与情绪症状有关。如 Lyoo 等[28]发现,双相情感障碍患者与健康对照者相比,右侧梭状回的皮层厚度减少。右侧梭状回皮层厚度减少与有家族史的抑郁症风险增加有关[29]。另有研究发现,重度抑郁症患者右侧梭状回灰质体积减少与较高的述情障碍得分相关[30]。以上结果均表明结果存在右侧化,可能是因为大脑右半球与情绪加工有关。因此,梭状回的灰质体积减少可能不仅与手机依赖有关,还提示早期右侧大脑结构异常在情绪加工及发展情绪症状风险中可能起到重要作用。

本研究的局限性:纳入分析的样本中男女比例相差较大,采用统计方法在分析中控制性别变量,减少了性别对结果的影响。本研究虽然有较大的样本,但是为横断面研究设计,所以统计推断力度有限。虽然有一定的局限性,但是本研究的结果发现手机依赖与大脑奖赏、执行控制和情绪相关脑区的灰质体积异常有关,右侧梭状回的灰质体积可能是手机依赖与情绪症状潜在的神经影像靶点。

4 参考文献

[1] CNNIC. The 45th China statistical report on Internet development [EB/OL]. [2020-04-28]. http://www.cnnic.net.cn/hlwfzyj/hlwxzbg/.

[2] BILLIEUX J, PHILIPPOT P, SCHMID C, et al. Is DYsfunctional use of the mobile phone a behavioural addiction? Confronting symptom-based versus process-based approaches[J]. Clin Psychol Psychother, 2015, 22(5): 460-468.

[3] 李静,张静平,闫国伟.医学生手机依赖现状及影响因素[J].中国健康心理学杂志,2016,24(7):1092-1096.

[4] ZHANG G, YANG X, TU X, et al. Prospective relationships between mobile phone dependence and mental health status among Chinese undergraduate students with college adjustment as a mediator[J]. J Affect Disord, 2020, 260: 498-505. DOI: 10.1016/j.jad.2019.09.047.

[5] DEMIRCI K, AKGONUL M, AKPINAR A. Relationship of smartphone use severity with sleep quality, depression, and anxiety in university students[J]. J Behav Addict, 2015, 4(2): 85-92.

[6] ZOU L, WU X, TAO S, et al. Mediating effect of sleep quality on the relationship between problematic mobile phone use and depressive symptoms in college students[J]. Front Psychiatry, 2019, 10: 822. DOI: 10.3389/fpsyt.2019.00822.

[7] NG K C, WU L H, LAM H Y, et al. The relationships between mobile phone use and depressive symptoms, bodily pain, and daytime sleepiness in Hong Kong secondary school students[J]. Addict Behav, 2020, 101: 105975. DOI: 10.1016/j.addbeh.2019.04.033.

[8] PARK S Y, YANG S, SHIN C S, et al. Long-term symptoms of mobile phone use on mobile phone addiction and depression among Korean adolescents[J]. Int J Environ Res Public Health, 2019, 16(19): 3584.

[9] GRANT J E, LUST K, CHAMBERLAIN S R. Problematic smartphone use associated with greater alcohol consumption, mental health issues, poorer academic performance, and impulsivity[J]. J Behav Addict, 2019, 8(2): 335-342.

[10] LACHMANN B, SINDERMANN C, SARIYSKA R Y, et al. The role of empathy and life satisfaction in Internet and smartphone use disorder[J]. Front Psychol, 2018, 9: 398. DOI: 10.3389/fpsyg.2018.00398.

[11] ELHAI J D, YANG H, FANG J, et al. Depression and anxiety symptoms are related to problematic smartphone use severity in Chinese young adults: fear of missing out as a mediator[J]. Addict Behav, 2020, 101: 105962. DOI: 10.1016/j.addbeh.2019.04.020.

[12] 杨蓉,李丹琳,万宇辉,等.中学生健康素养和手机使用依赖与发生心理病理症状的关联[J].中华预防医学杂志,2019,53(3):279-283.

[13] LEE D, NAMKOONG K, LEE J, et al. Abnormal gray matter volume and impulsivity in young adults with Internet gaming disorder[J]. Addict Biol, 2018, 23(5): 1160-1167.

[14] SEOK J W, SOHN J H. Altered gray matter volume and resting-state connectivity in individuals with Internet gaming disorder: a voxel-based morphometry and resting-state functional magnetic resonance imaging study[J]. Front Psychiatry, 2018, 9: 77. DOI: 10.3389/fpsyt.2018.00077.

[15] LUIJTEN M, SCHELLEKENS A F, KüHN S, et al. Disruption of reward processing in addiction: an image-based meta-analysis of functional magnetic resonance imaging studies[J]. JAMA Psychiatry, 2017, 74(4): 387-398.

[16] 陶舒曼,付继玲,王惠,等.青少年手机使用依赖自评问卷编制及其在大学生中的应用[J].中国学校卫生,2013,34(1):26-29.

[17] LI D, YANG R, WAN Y, et al. Interaction of health literacy and problematic mobile phone use and their impact on non-suicidal self-injury among Chinese adolescents[J]. Int J Environ Res Public Health, 2019, 16(13): 2366.

[18] XIE H, TAO S, ZHANG Y, et al. Impact of problematic mobile phone use and insufficient physical activity on depression symptoms: a college-based follow-up study[J]. BMC Public Health, 2019, 19(1): 1640.

[19] WANG Y, ZOU Z, SONG H, et al. Altered gray matter volume and white matter integrity in college students with mobile phone dependence[J]. Front Psychol, 2016, 7: 597. DOI: 10.3389/fpsyg.2016.00597.

[20] LEE D, NAMKOONG K, LEE J, et al. Lateral orbitofrontal gray matter abnormalities in subjects with problematic smartphone use[J]. J Behav Addict, 2019, 8(3): 404-411.

[21] LEE D, PARK J, NAMKOONG K, et al. Gray matter differences in the anterior cingulate and orbitofrontal cortex of young adults with Internet gaming disorder: surface-based morphometry[J]. J Behav Addict, 2018, 7(1): 21-30.

(下转第 1620 页)

adolescence: neurobiological, psychosocial and clinical issues[J]. Neurosci Biobehav Rev, 2017,76:174-184.DOI:10.1016/j.neubiorev.2016.12.024.
[2] CERNIGLIA L. Brief considerations on internet use in adolescent[J]. EC Psychol Psychiatr, 2017,5(1):10-11.
[3] MU K J, MOORE S E, LEWINN K Z. Internet use and adolescent binge drinking:findings from the monitoring the future study[J]. Addict Behav Rep, 2015,2:61-66. DOI: 10.1016/j.abrep.2015.09.001.
[4] 王若晗, 东宇, 谭荣英,等.青少年网络成瘾倾向与家庭环境的关系研究[J].护理研究,2019,33(11):1832-1836.
[5] CHOI S W, KIM D J, CHOI J S, et al. Comparison of risk and protective factors associated with smartphone addiction and Internet addiction[J]. J Behav Addict, 2015,4(4):308-314.
[6] KIM K, RYU E, CHON M Y, et al. Internet addiction in Korean adolescents and its relation to depression and suicidal ideation: a questionnaire survey[J]. Int J Nurs, 2006,43:185-192.DOI:10.1016/j.ijnurstu.2005.02.005.
[7] LAU J T F, WALDEN D L, WU A M S, et al. Bidirectional predictions between Internet addiction and probable depression among Chinese adolescents[J]. J Behav Addict, 2018,7(3):633-643.
[8] KO C H, YEN J Y, YEN C F, et al. The association between Internet addiction and psychiatric disorder: a review of the literature[J]. Eur Psychiatry, 2012,27(1):1-8.
[9] LI H C, CHAN S L, CHUNG O K, et al. Relationships among mental health, self-esteem and physical health in Chinese adolescents: an exploratory study[J]. J Health Psychol, 2010,15(1):96-106.
[10] CHRISTAKIS D A, MORENO M M, JELENCHICK L, et al. Problematic internet usage in US college students: a pilot study[J]. BMC Med, 2011,9:77.DOI:10.1186/1741-7015-9-77.
[11] BANJANIN N, DIMITRIJEVIC I, PANTIC I. Relationship between internet use and depression:Focus on physiological mood oscillations, social networking and online addictive behavior[J]. Comput Hum Behav, 2015,43:308-312.DOI:10.1016/j.chb.2014.11.013.
[12] 中国肥胖问题工作组.中国学龄儿童青少年超重、肥胖筛查体重指数值分类标准[J].中华流行病学杂志,2004,25(2):97-102.
[13] YOUNG. Internet addiction:the emergence of a new clinical disorder[J]. Cyberpsychol Behav, 1998,1(3):237-244.
[14] RADLOFF L S. The CES-D Scale: a self-report depression scale for research in the general population[J]. Appl Psychol Meas, 1997,1(3):385-401.
[15] 于长春, 贺佳, 范思昌,等.数据挖掘技术在医学领域中的应用[J].第二军医大学学报, 2003(11):1250-1252.DOI:10.16781/j.0258-879x.2003.11.034.
[16] 邬顺全.多组比较的倾向性评分模型构建及匹配法的研究和应用[D].上海:第二军医大学,2014.
[17] BLACHNIO A, PRZEPIORKA A, GORBANIUK O, et al. Cultural correlates of internet addiction cyberpsychology[J]. Cyberpsychol Behav Soc Netw, 2019,22(4):258-263.
[18] Internet Addiction Prevention Center. A survey on Internet addiction in 2017[EB/OL].[2020-07-08]. https://www.iapc.or.kr/eng/contents.
[19] KAWABE K, HORIUCHI F, OCHI M, et al. Ueno Internet addiction:prevalence and relation with mental states in adolescents[J]. Psychiatry Clin Neurosci, 2016,70(9):405-412.
[20] MAZAHERI M A, NAJARKOLAEI F R. Cell phone and Internet addiction among students in Isfahan university of medical sciences[J]. J Health Policy Sustain Health, 2014, 1: 101-105. DOI: 10.1080/13668250600876426.
[21] DEMIRCI K, AKGONUI M, AKPINAR A. Relationship of smartphone use severity with sleep quality, depression, and anxiety in university students[J]. J Behav Addict, 2015,4(2):85-92.
[22] 马洁,李芮,朱传芳,等.青少年学生网络成瘾与心理健康的关系[J].中国慢性病预防与控制,2008,16(2):161-164.
[23] DECI E L, RYAN R M. The "what" and "why" of goal pursuits:human needs and the self-determination of behavior[J]. Psychol Inq, 2000,11(4):227-268.
[24] KIM D, CHUNG Y, LEE J, et al. Development of smartphone addiction proneness scale for adults: self-report[J]. Korean J Couns, 2012,13:629-644.DOI:10.15703/kjc.13.2.201204.629.
[25] LEE Y K, CHANG C T, LIN Y, et al. The dark side of smartphone usage:psychological traits, compulsive behavior and technostress[J]. Comput Hum Behav, 2014,31:373-383.DOI:10.1016/j.chb.2013.10.047.
[26] WANG L, FENG Z, YANG G, et al. The epidemiological characteristics of depressive symptoms in the left-behind children and adolescents of Chongqing in China[J]. J Affect Disord, 2015,177(4):36-41.
[27] BRYANT J, ZILLMANN D. Using television to alleviate boredom and stress:selective exposure as a function of induced excitational states[J]. J Broadcast Electron Media, 1984,28(1):1-20.
[28] GENCER S L, KOC M. Internet abuse among teenagers and its relations to internet usage patterns and demographics[J]. J Educ Techno Soc, 2012,15(2):25-36.

收稿日期:2020-08-05 修回日期:2020-10-09 **本文编辑**:王苗苗

(上接第 1616 页)

[22] ZHOU Y,LIN F C,DU Y S,et al.Gray matter abnormalities in Internet addiction: a voxel-based morphometry study[J].Eur J Radiol, 2011,79(1):92-95.
[23] JIN C,ZHANG T,CAI C,et al.Abnormal prefrontal cortex resting state functional connectivity and severity of internet gaming disorder[J]. Brain Imag Behav,2016,10(3):719-729.
[24] QI X,YANG Y,DAI S,et al.Effects of outcome on the covariance between risk level and brain activity in adolescents with internet gaming disorder[J].Neuro Image Clin,2016,12:845-851.DOI:10.1016/j.nicl.2016.10.024
[25] HAYDEN B Y,HEILBRONNER S R,PEARSON J M,et al.Surprise signals in anterior cingulate cortex:neuronal encoding of unsigned reward prediction errors driving adjustment in behavior[J].J Neurosci, 2011,31(11):4178-4187.
[26] DONG G, HUANG J, DU X. Enhanced reward sensitivity and decreased loss sensitivity in Internet addicts: an fMRI study during a guessing task[J].J Psychiatr Res,2011,45(11):1525-1529.
[27] DONG G,SHEN Y,HUANG J,et al.Impaired error-monitoring function in people with Internet addiction disorder: an event-related fMRI study[J].Eur Addict Res,2013,19(5):269-275.
[28] LYOO I K,SUNG Y H,DAGER S R,et al.Regional cerebral cortical thinning in bipolar disorder[J].Bipolar Disord,2006,8(1):65-74.
[29] PAPMEYER M,GILES S,SUSSMANN J E,et al.Cortical thickness in individuals at high familial risk of mood disorders as they develop major depressive disorder[J].Biol Psychiatry,2015,78(1):58-66.
[30] FORSTER K,ENNEKING V,DOHM K,et al.Brain structural correlates of alexithymia in patients with major depressive disorder[J].J Psychiatry Neurosci,2020,45(2):117-124.

收稿日期:2020-08-03 修回日期:2020-09-18 **本文编辑**:王苗苗