· 流行病与统计方法 ·

贵州农村老年人日常生活能力、抑郁症状与认知功能关联的纵向研究

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摘要:目的　基于纵向调查资料探讨贵州农村老年人日常生活能力(Activities of Daily Living, ADL)、抑郁症状与认知功能的关联,为促进农村老年人健康提供科学依据。**方法**　采用多阶段整群抽样方法,选取贵州省 2 个县(区)内 5 个乡(镇)的 12 个村 60 岁及以上的农村老年人为研究对象,于 2019 年进行基线(T1)调查,并于 2022 年进行随访(T2),采用广义估计方程(Generalized Estimating Equations, GEE)分析 ADL、抑郁症状与认知功能的关联及交互作用。**结果**　本次共纳入 763 名老年人作为研究对象,结果显示,老年人 ADL 得分($\beta = -0.57$, 95% *CI*: $-0.68 \sim -0.47$)、抑郁得分($\beta = -0.20$, 95% *CI*: $-0.33 \sim -0.06$)均与认知功能(MMSE 评分)呈负关联,且两者与认知功能得分的关联存在交互作用($\beta = 0.11$, 95% *CI*: $0.08 \sim 0.15$)。进一步对抑郁得分水平分层分析,ADL 得分与认知功能得分均存在负关联(P 均 < 0.05);对 ADL 得分水平分层分析,在低 ADL 得分水平的人群中,抑郁得分与认知功能得分存在负关联($P < 0.05$);而在高 ADL 得分水平的人群中,则无统计学关联($\beta = -0.06$, 95% *CI*: $-0.28 \sim 0.17$)。**结论**　农村老年人的 ADL 受损、抑郁症状增加认知功能下降风险,抑郁可调节 ADL 与认知功能的关联,ADL 未受损老年人认知功能可能易受到抑郁的影响,加强老年人 ADL 和抑郁症状的监测及干预有助于预防或延缓农村老年人认知功能下降。

关键词:认知功能;日常生活能力;抑郁症状

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Longitudinal study on the association between activities of daily living, depression symptoms, and cognitive function in rural elderly, Guizhou

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Abstract: Objective　Based on longitudinal survey data, this study aimed to explore the associations between Activities of Daily Living (ADL), depressive symptoms, and cognitive function among rural elderly individuals in Guizhou Province, so as to provide scientific evidence for promoting the health of rural elderly populations. **Methods**　A multi - stage cluster sampling method was adopted to select rural elderly individuals aged 60 years and above from 12 villages in 5 townships (towns) of 2 counties (districts) in Guizhou Province. A baseline survey (T1) was conducted in 2019, and a follow - up survey (T2) was carried out in 2022. Generalized Estimating Equations (GEE) were used to analyze the associations and interaction effects between ADL, depressive symptoms, and cognitive function. **Results**　A total of 763 elderly individuals were included as participants in this study. The results showed that both ADL scores ($\beta = -0.57$, 95% *CI*: -0.68 – -0.47) and depression scores ($\beta = -0.20$ 95% *CI*: -0.33 – -0.06) were negatively associated with cognitive function (assessed by Mini - Mental State Examination [MMSE] scores). Furthermore, a significant interaction effect was observed between these two factors on cognitive function ($\beta = 0.11$, 95% *CI*: $0.08 - 0.15$). Stratified analysis by depression score levels revealed that ADL scores remained negatively associated with cognitive function across all strata (all $P < 0.05$). When stratified by ADL score levels, depression scores were negatively associated with cognitive function in the low ADL group ($P < 0.05$), whereas no statistically significant association was found in the high ADL group ($\beta = -0.06$, 95% *CI*: $-0.28 - 0.17$). **Conclusion**

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Impaired ADL and depressive symptoms increase the risk of cognitive decline in elderly individuals in rural areas. Depression can moderate the association between ADL and cognitive function: elderly individuals with unimpaired ADL may be more vulnerable to the impact of depression on cognitive function. Strengthening the monitoring and intervention of ADL and depressive symptoms in the elderly is conducive to preventing or delaying cognitive decline among elderly individuals in rural areas.

Keywords: Cognitive function; Activities of Daily Living (ADL); Depressive symptoms

随着人口老龄化进程加速,老年人增龄导致老年痴呆流行问题日益凸显[1]。据估计,全球有痴呆症年新增约 1 000 万人,预计到 2030 年痴呆症全球成本将增加到 1.7 万亿美元,这将给社会和家庭带来沉重的经济负担[2-3],探讨老年人认知功能下降的危险因素并及时干预是预防老年痴呆的重要策略。有研究显示,老年人日常生活功能(ADL)受损可通过减弱社会交往能力等途径,进而导致认知功能下降[4]。同时,老年人抑郁也可增加认知功能及相关认知领域(信息处理速度、记忆、执行功能等)下降风险[5-7]。此外,研究还显示,ADL 受损与抑郁之间存在双向关联作用[8-11],两者互相影响进而加剧对老年人健康受损,由此可推测,两者对认知功能的影响可能存在交互作用。目前,主要关注 ADL 与抑郁对认知功能的联合影响大多为横断面研究[12-13],两者对认知功能影响的关联时序性的研究证据较为缺乏,尤其是农村地区老年人。本研究以贵州省农村老年人为研究对象,采用纵向研究设计开展随访调查,探讨老年人群中日常生活活动能力、抑郁症状和认知功能的关联,为制定适合农村老年人群的认知功能保护方法提供科学依据。

1 对象与方法

1.1 研究对象 本研究数据来自一项贵州省农村老年人健康调查的前瞻性队列研究的基线及第一轮随访调查。研究方法在先前文献已有报道[14-15]。本研究以同时参加 2019 年(T1)和 2022 年(T2)年两次调查的人群作为研究对象,在剔除数据缺失及不合格的样本后,最终纳入 763 名对象进行分析。本次调查研究获得了贵州医科大学伦理委员会批准(批准号:201892)。

1.2 调查方法 调查采用"集中调查与入户访谈"相结合的方式进行面对面调查,调查内容涵盖年龄、性别、文化程度、婚姻状况等一般人口学基础资料,精神状态检查、日常生活活动能力、抑郁状态评定、慢性病患病情况、日常生活行为习惯及相关社会影响因素等信息。所有研究对象均签署了书面知情同意书。

1.3 变量评估

1.3.1 认知功能 采用简易精神状态评价量表(Mini-mental State Examination, MMSE)评估老年人的认知功能,包括 30 个条目[16]。每个条目回答正确计 1 分,总分为 0~30,得分越高则提示认知功能越好。该量表 Cronbach α 系数为 0.89。

1.3.2 抑郁症状 采用患者健康问卷—2 项(Patient Health Questionnaire-2, PHQ-2)筛查老年抑郁症状,该量表由 Kroenke 等人[17]基于 DSM-IV 抑郁障碍核心诊断标准开发,是 PHQ-9 量表的精简版,每个条目采用 0~3 分四级评分。两个问题得分相加,范围为 0~6 分。低抑郁组:得分=0 分,代表"无明显抑郁症状"群体;高抑郁组:得分≥1 分,代表"存在轻度及以上抑郁症状"群体。该量表 Cronbach α 系数为 0.84。

1.3.3 日常生活能力 采用日常生活能力量表(Activity of Daily Living Scale, ADL)评估老年人日常生活功能,该量表由 Lawton 和 Brody[18]基于老年人生活功能评估框架开发,包含两大核心维度:基础性日常生活活动能力(BADL)、工具性日常生活活动能力(IADL)。每个条目采用 1~4 分四级评分;14 个条目得分相加,范围为 14~56 分,以得分中位数划分高、低 ADL 得分水平。该量表 Cronbach α 系数为 0.82。

1.3.4 协变量 参考以往的研究[19-21],本研究纳入的协变量包括人口学特征(年龄、性别、文化程度、家庭年收入、婚姻状况)、健康行为(吸烟、饮酒)、患慢性病情况、健康自评及社会支持等。其中,文化程度依据研究对象是否完成相应阶段学习,分为文盲/半文盲、小学、初中及以上;家庭年收入根据问卷回答分为 0~3 万元、>3 万元;婚姻状况分为 2 个亚组,在婚(包括同居)、非在婚(丧偶/离婚/未婚/分居);吸烟定义为≥1 支/d,持续半年以上;饮酒定义为每周至少饮酒 1 次,持续半年以上;健康自评根据问卷回答分为较差(非常差/差)、一般、较好(非常好/好);社会支持采用社会支持评定量表(Social Support Rating Scale, SSRS)评估[22],分数越高说明所获得的社会支持越多。

1.4 统计分析 正态分布计量资料用 $\bar{x} \pm s$ 描述,偏态分布用 $M(P_{25}, P_{75})$ 描述,分类变量用率或构成比描述。重复测量的组内比较用 Wilcoxon 符号秩和检验(计量资料)或配对卡方检验(分类资料)。参照 Jiang 等[23]人的研究方法采用 GEE 模型分析 ADL、抑郁及

其交互作用对认知功能的影响。因变量为认知功能，自变量 ADL、抑郁均经中心化处理，纳入 ADL × 抑郁交互项及哑变量形式的协变量以揭示交互作用；采用恒等链接函数，通过 QIC 准则和 Wald 检验筛选最优模型（模型 1：仅含 ADL、抑郁及交互项；模型 2：调整混杂因素），最终选择 QIC 最小的模型，以回归系数（β）及 95% 置信区间（95% *CI*）报告效应大小。本研究分析采用 SPSS 27.0 与 R 4.5.0 软件“geepack”包进行统计分析，双侧检验水准 α =0.05。

2　结　果

2.1　*研究对象基本情况*　本研究共纳入 763 例研究对象，年龄在基线为 70.0（66.0，75.0）岁；女性占 59.8%（456 例）；文盲/半文盲占 75.1%（573 例）；文化程度以低学历为主。2019 年（T1）与 2022 年（T2）对象的社会支持得分、ADL 评分、MMSE 评分差异均具有统计学意义；抑郁得分无明显变化。其他基本情况详见表 1。

表 1　研究对象的基本情况（n =763）

Table 1　Basic characteristics of research objects（n =763）

变量	T1	T2	χ^2/Z	P 值
年龄[$M(P_{25}, P_{75})$]	70.0(66.0, 75.0)	73.0(69.0, 77.5)	–	–
性别[n(%)]			–	–
男	307(40.2)	–		
女	456(59.8)	–		
文化程度[n(%)]			–	–
文盲/半文盲	573(75.1)	–		
小学	113(14.8)	–		
初中及以上	77(10.1)	–		
家庭年收入[n(%)]			39.934	<0.001
0～3 万元	481(63.0)	592(77.6)		
>3 万元	282(37.0)	171(22.4)		
婚姻状况[n(%)]			5.480	0.019
在婚	480(62.9)	459(60.2)		
非在婚	283(37.1)	304(39.8)		
患慢性病情况[n(%)]			95.010	<0.001
是	509(66.7)	606(79.4)		
否	254(33.3)	157(20.6)		
吸烟[n(%)]			–	–
是	200(26.3)	200(26.3)		
否	563(73.8)	563(73.8)		
饮酒[n(%)]			0.520	0.471
是	184(24.1)	193(25.3)		
否	579(75.9)	570(74.7)		
健康自评[n(%)]			−3.822	<0.001
较差	286(37.5)	199(26.1)		
一般	219(28.7)	291(38.1)		
较好	258(33.8)	273(35.8)		
社会支持得分[$M(P_{25}, P_{75})$]	39(35, 44)	30(25, 35)	22.000	<0.001
ADL[$M(P_{25}, P_{75})$]	15(14, 17)	14(14, 16)	8.720	<0.001
抑郁得分[$M(P_{25}, P_{75})$]	0(0, 2)	0(0, 2)	–	–
MMSE[$M(P_{25}, P_{75})$]	22(18, 26)	21(16, 25)	9.707	<0.001

注：T1 为基线调查，T2 为随访调查；“–”表示重复省略或无统计学分析（如年龄、性别、文化程度等）。

2.2　*ADL、抑郁与认知功能之间的关联及交互作用*　对认知功能、ADL 与抑郁在 T1 和 T2 时间点进行相关分析，提示基线和随访数据存在关联，采用 GEE 模型分析纵向调查数据更为合理。结果详见表 2。

进一步采用 GEE 模型分析 ADL、抑郁对认知功能的影响及交互作用，在调整混杂因素后的模型 2 中，ADL 得分、抑郁得分均与认知功能得分呈负关联，提示 ADL 受损越严重、抑郁症状越明显，农村老年人认知功能越差。ADL 与抑郁的交互项也具有统计学意义，提示二者存在交互作用。详见表 3。

分层分析结果显示，在抑郁得分处于低水平人群中，ADL 得分与认知功能得分存在负关联；在抑郁得分处于高水平人群中二者关联强度有所减弱但仍存在。在 ADL 得分处于低水平人群中，抑郁得分与认知功能得分存在负关联；而在高 ADL 得分水平人群中二者无统计学关联。详见表 4。图 1 的结果也进一步支持了交互效应的存在。

表 2 基线和随访 ADL、抑郁与认知的 Spearman 秩相关

Table 2 Spearman correlations between ADL, depression, and cognitive function at baseline and follow – up

变量	$M(P_{25}, P_{75})$	T1 抑郁	T1 ADL	T1 认知	T2 抑郁	T2 ADL	T2 认知
T1 抑郁	0(0, 2)	1.00					
T1 ADL	15(14, 17)	0.09[b]	1.00				
T1 认知	22(18, 26)	−0.13[c]	−0.63[c]	1.00			
T2 抑郁	0(0, 2)	0.28[c]	0.10[b]	−0.18[c]	1.00		
T2 ADL	14(14, 16)	0.07[a]	0.49[c]	−0.45[c]	0.19[c]	1.00	
T2 认知	21(16, 25)	−0.06	−0.55[c]	0.72[c]	−0.19[c]	−0.49[c]	1.00

注:T1 为基线调查,T2 为随访调查;a 表示 Spearman 秩相关分析中 $P < 0.05$,b 表示 $P < 0.01$,c 表示 $P < 0.001$。

表 3 GEE 模型分析 ADL、抑郁对认知功能的主效应及交互作用

Table 3 Analysis of the main effects of ADL and depression on cognitive function and their interaction effect using the GEE model

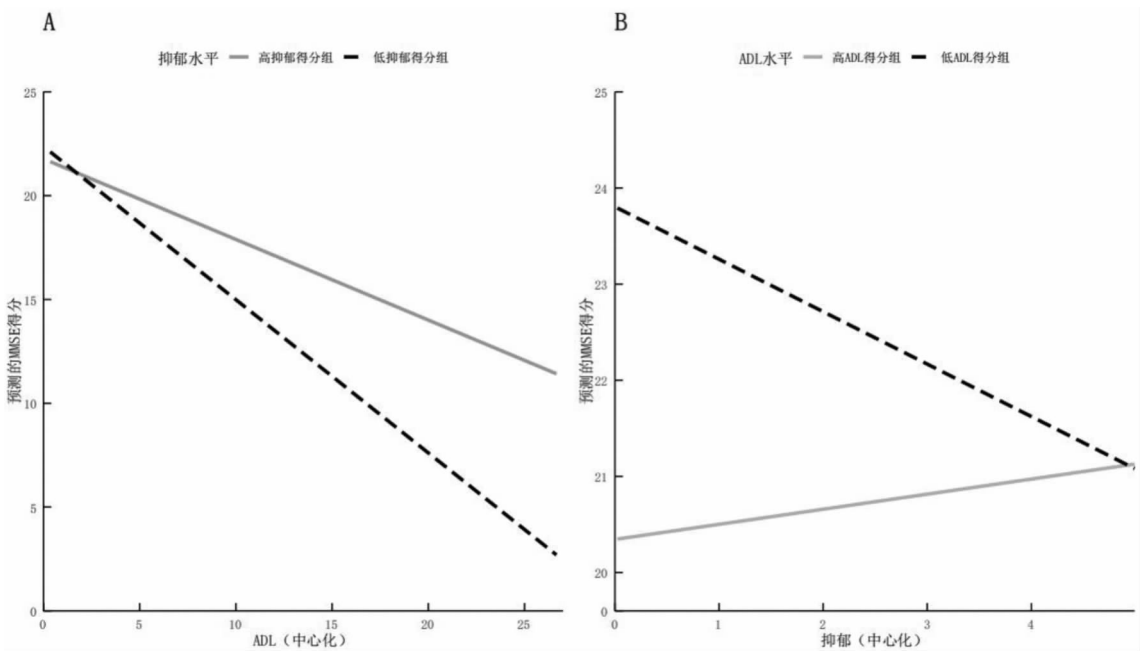
变量	模型 1		模型 2	
	β(95% *CI*)	*P* 值	β(95% *CI*)	*P* 值
截距	20.84(20.53 ~ 21.16)	<0.001	23.83(21.57 ~ 26.10)	<0.001
ADL	−0.58(−0.68 ~ −0.47)	<0.001	−0.57(−0.68 ~ −0.47)	<0.001
抑郁	−0.37(−0.53 ~ −0.20)	<0.001	−0.20(−0.33 ~ −0.06)	0.005
ADL × 抑郁	0.12(0.09 ~ 0.16)	<0.001	0.11(0.08 ~ 0.15)	<0.001

注:ADL 和抑郁得分均已进行中心化处理;模型 1 是未调整协变量,模型 2 对协变量(年龄、性别、文化程度、家庭收入、慢性病、吸烟、饮酒、健康自评及社会支持得分等)进行了调整。

表 4 ADL、抑郁与认知功能关联的分层分析

Table 4 Stratified analysis of the association between ADL, depression, and cognitive function

变量	β(95% *CI*)	*P* 值
按抑郁水平分层后,ADL 与认知功能的关联		
低抑郁得分组	−0.61(−0.73 ~ −0.50)	<0.001
高抑郁得分组	−0.35(−0.49 ~ −0.22)	<0.001
按 ADL 水平分层后,抑郁与认知功能的关联		
低 ADL 得分组(0 ~ M)	−0.25(−0.42 ~ −0.07)	0.006
高 ADL 得分组(>M)	−0.06(−0.28 ~ 0.17)	0.621



注:图 1 中 A 为按抑郁得分水平分层后 ADL 得分对认知得分的影响,B 为按 ADL 得分水平分层后抑郁得分对认知得分的影响。

图 1 ADL 与抑郁对认知的交互效应分析

Fig. 1 Analysis of the interaction effect of ADL and depression on cognitive function

3　讨　论

本次基于贵州农村老年人的随访调查数据,采用 GEE 模型在控制潜在混杂因素后的分析结果显示,ADL 得分、抑郁得分与认知功能得分均存在独立关联,且二者与认知功能的关联存在交互作用。抑郁调节了 ADL 与认知功能的关联,但两者依然呈现“稳定”的负关联;ADL 得分低水平(未受损或较小受损)的老年人中,认知功能与抑郁存在统计学关联,但 ADL 得分较高水平(受损较大)的老年人群中,抑郁与认知功能无统计学关联。

本研究结果显示老年人 ADL 与认知功能之间存在独立负关联,与以往的研究结果一致[24-26],本次提供了 ADL 对认知功能影响的时序证据。有研究显示,ADL 受损直接减少对前额叶、海马等关键脑区的认知刺激,导致认知功能受损[27];ADL 受损还能通过减少老年人社会活动,进而间接影响认知功能[4]。本次研究还显示了在不同抑郁水平个体中 ADL 与认知功能之间始终存在稳健的负关联,Fauth 等人的研究也发现 ADL 预测痴呆风险的结果不受抑郁症状的影响[28],这可能是因为临床前认知障碍与身体功能表现(如 ADL 相关任务)共享脑病理学病因[29],使得抑郁水平未对二者的核心关联产生干扰;同时,ADL 与认知功能之间还存在双向关联[30]。这些结论都提示了加强老年日常生活功能的维持,可能对老年人增龄后延缓认知功能的减退具有保护作用。

本研究发现,抑郁与认知功能呈负关联,与之前 Zhu、Bunce 等[6,31]人的研究结论一致。有研究显示,抑郁症患者的海马体较正常人小,且抑郁病程与海马体积越具有相关性,长期抑郁会使杏仁核体积增大,可加剧了认知损害[32]。抑郁症状可通过降低 ADL 能力和降低社会活动的双重中介路径来降低老年人群认知功能[13]。同时,本次研究显示,在 ADL 未受损或轻度受损的人群中,抑郁症状与认知功能存在关联,这可能是因为抑郁症状通过损害社会参与性、加剧社会孤立等途径,进而对认知功能产生负面影响[33-34];而在 ADL 重度受损人群中,躯体功能的严重缺损可能已经影响了认知功能,抑郁症状难以再通过上述路径进一步对认知功能产生更大的影响。

本研究中,在 ADL 受损的老年人中,抑郁症状与认知功能并没有统计学关联。这可能的原因为:首先,ADL 对认知功能的影响可能较大,如本研究中高 ADL 得分水平个体的预测认知得分已经处于低水平,进一步下降的幅度相对平缓,最终表现为抑郁对其认知的影响相对减弱。其次,ADL 受限的老年人因基础功能已受限,社会参与也不足[4],抑郁对认知功能造成额外损害的进一步作用相对有限。提示在 ADL 功能较好的农村老年人中,早期筛查与早期干预抑郁症状对减缓认知功能的下降具有重要作用。

既往现况研究也证实了抑郁症状与 ADL 对认知功能的影响存在交互作用[35],本次采用纵向研究进一步揭示了抑郁症状和 ADL 受损对老年人认知功能影响的时序证据。由于 ADL 受损多与慢性疾病、体力劳动下降相关,而抑郁则与丧偶、独居等社会因素高度相关,提示农村老年人群认知衰退受“躯体 - 心理 - 社会”的多维度驱动,因此,对老年人的心理、躯体干预可能对延缓老年人认知功能衰退具有重要作用,但这还需今后通过干预研究进一步证实。

本研究存在以下局限性:①为观察性研究,无法确立变量间的因果关系;②样本仅局限于贵州农村老年人,未纳入城市或其他省份农村人群,结论外推性受限,建议后续扩大研究人群验证结果;③认知功能仅采用 MMSE 量表评估,该量表受教育水平影响较大,而贵州农村老年人受教育程度偏低,可能因条目理解偏差导致得分低估、认知损害程度高估,未来可联合 MoCA 量表(对轻度认知损害敏感性更高,受教育水平干扰较小)以减少测量偏差;④GEE 模型只有两个时间点的数据,无法区分“个体内长期趋势”与“短期波动”,未来的研究应该开展 3 个及以上时间点的追踪。

本研究发现贵州农村老年人的 ADL、抑郁症状对认知功能都具有独立负关联,抑郁症状可调节 ADL 对认知功能的影响,在 ADL 未受损老年人的认知功能可能易受到抑郁的影响,本次研究为这些关联提供了时序性证据,建议加强老年 ADL 受损和抑郁的早期筛查与干预,以预防或延缓农村老年人认知功能下降。

利益冲突声明　本研究不存在任何利益冲突

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