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Study on the Relationship between Elderly Activity of Daily Living, Life Satisfaction, and Depression

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Abstract

Background: The elderly are facing the current situation of depression risk, decreased physical function and life satisfaction, but there are few studies on the longitudinal relationship between activities of daily living (ADL) , life satisfaction and depression. ***Objective:*** To analyze the complex interaction mechanism between ADL, life satisfaction, and depression among the elderly in China.

Method: a total of 6413 elderly people who participated in the China Health and Retirement Longitudinal Study(CHARLS) in 2018 (T1 period) and 2020 (T2 period) were selected. The ADL scale, life satisfaction scale and the Center for Epidemiological Studies-Depression scale(CES-D) were used for measurement. Descriptive statistics, chi square test, Pearson correlation analysis, linear regression analysis, cross-lagged model and mediation effect model were used to explore the relationship among various variables.

Results: ADL, life satisfaction and depression were correlated at T1 and T2 (P<0.05). Gender, age, residence, education level, marital status, regular physical examination, medical insurance, physical pain, number of chronic diseases, hearing status, sleep time, social participation, ADL and life satisfaction are the influencing factors of elderly depression, and life satisfaction plays a partial mediating effect between ADL and depression. T1 ADL positively predicted T2 depression (β=0.086), and T1 depression positively predicted T2 ADL (β=0.103); T1 life satisfaction negatively predicted T2 depression (β=-0.062), and T1 depression negatively predicted T2 life satisfaction (β=-0.079) (P<0.05). After incorporating T2 life satisfaction, the direct effect of T1 ADL on T2 depression remains significant, with a mediating effect accounting for 26.9%.

Conclusions: Life satisfaction plays a partial mediating role in the relationship between ADL and depression in the elderly, and ADL, life satisfaction and depression can predict each other. When the elderly experience a decline in physical mobility, it is important to pay timely attention to their life satisfaction and depression, and take measures to intervene.

1. Introduction

China is one of the countries with the fastest aging process in the world[1], and the proportion of the elderly population ranks first in the world. Aging is the inevitable result of social and economic development and the healthy development of residents[2], which has brought severe challenges and threats to China's medical care, pension and social services. Many institutions and researchers strongly appeal to focus on the elderly.

"Elderly health" is the core concept of "healthy aging". The definition of this concept should cover physical functional health, good cognitive function and mental health. The World health organization(WHO) predicted that depression is the third largest mental disease in the world, affecting the quality of life of about 7% of the elderly in the world[3]. It is often hidden and cannot be diagnosed and treated in time. Ward M found that the prevalence of severe depression in the elderly is about 5.37%

to 56%, and even induced suicide[4-5]. Therefore, it is increasingly urgent to accurately assess the psychological status of the elderly as soon as possible. The new crown epidemic has aggravated the psychological anxiety of the elderly[6] and increased the incidence of depression by 27.6% worldwide[7]. China is the country with the largest elderly population in the world. We should pay full attention to the challenges faced by elderly depression, and it is important to clarify the risk factors and pathogenesis of depression.

The concept of "self-care abilities" was first introduced by Katz in the 1950s[8], and ADL has since been utilized for the objective assessment of chronic diseases and the aging population[9]. A national survey conducted in the UK revealed a strong correlation between daily living abilities and depression, suggesting a potential cumulative effect[10]. According to the body-stress model, the decline in ADL is perceived as a stressor for the elderly, often leading to negative thinking and self-doubt, thereby triggering various negative emotions. Studies indicate that ADL is associated with depression, and there may be a bidirectional causal relationship, exhibiting dynamic variability[11-13]. However, there is currently limited longitudinal research on the relationship between daily living abilities and depression among large-scale elderly populations.

Katz first proposed the concept of ADL in the 1950s[8]. At present, ADL has been used to objectively evaluate chronic diseases and aging population[9]. A national survey in the UK found a strong link between ADL and depression, which may have a cumulative effect[10]. According to the constitution stress model, the decrease of ADL is regarded as the stressor of the elderly, which often produces negative thinking and self denial, and causes a variety of negative emotions. Studies have shown that ADL is related to depression, and there may be a two-way causal relationship with dynamic variability[11-13]. ADL disorder is a powerful predictor of depression in the elderly, and life satisfaction is also listed as an important predictor of depression[14]. Life satisfaction refers to the subjective experience formed after an individual's overall evaluation of their fulfillment in both spiritual and material aspects of life[15], serving as a key indicator for measuring the quality of life among older adults. According to the self-esteem theory[16], when the elderly need to rely on others in their daily life, the dissatisfaction of self-esteem will reduce their life satisfaction, and the level of life satisfaction affects their emotions. Research both domestically and internationally indicates that life satisfaction is negatively correlated with depression[17], and that there is a significant relationship between ADL and life satisfaction [18-19]. However, in the elderly group, the mediating effect of life satisfaction on ADL and depression has not been fully explored, mainly limited to the cross-sectional study, and the longitudinal study is relatively scarce.

In response to the requirement of "promoting the provision of mental health and care services for the elderly" outlined in the "Healthy China 2030" blueprint, this study employs a longitudinal approach to investigate the relationship between ADL, life satisfaction, and depression of the elderly. The aim is to provide a reference basis for formulating intervention measures aimed at enhancing the quality of life and improving the mental health status of the elderly, and to offer data support for the realization of healthy aging.

2. Methods

2.1Study sample

The data for this study comes from the CHARLS database [20]. This survey was approved by the Biomedical Ethics Committee of Peking University (No. IRB00001052-11015) and used a multi-stage sampling method, with samples covering 28 provinces, including autonomous regions and municipalities, and 450 communities or villages across the country. All participants signed informed consent forms. We screened the CHARLS 2018 data to include 7578 elderly individuals aged ≥60 years with complete sociodemographic and study variable data as baseline data. Then, combined with the 2020 follow-up data, a total of 6413 elderly individuals were included in the two-wave sample. The specific inclusion process is shown in Figure 1.

2.2Measures

2.2.1General Information

Including gender, age, place of residence, education level, marital status, nationality, religious belief, taking care of grandchildren, regular physical examination, medical insurance, physical pain, the number of chronic diseases , hearing status, sleeping time, social participation, whether to smoke (smoking means smoking at least one cigarette a day for at least one year), whether to drink (drinking means drinking more than once a week in the past six months), etc.

2.2.2ADL

The CHARLS questionnaire contains 12 items of ADL, and uses two dimensions of physical self-care ability and instrumental activities of daily living[21-22]. The answers to the four options of "no difficulty, difficulty but still achievable, difficulty requiring assistance, and inability to complete" will be scored 1-4 points respectively, with a total score of 12-48 points. More than 12 points means that ADL is damaged. The higher the score, the more serious the damage to ADL. In this study, the Cronbach 'α coefficient of the scale is 0.850, and the KMO is 0.908.

2.2.3Life satisfaction

According to the CHARLS questionnaire[20] "Are you satisfied with your life/health/child relationship?" as the measurement index. The five options of "not at all satisfied", "somewhat dissatisfied", "moderately satisfied", "very satisfied", and "extremely satisfied" are assigned scores ranging 1-5, with higher scores indicating higher life satisfaction. In this study, the Cronbach's α coefficient is 0.624, and the KMO is 0.607.

2.2.4Depressive symptoms

This variable is measured by the CES-D scale of the CHARLS[23], which consists of 10 questions. Among them, DC013 and DC016 are reverse scoring items, with answer options including "rarely or never (<1

day)", "not too often (1-2 days)", "sometimes or half the time (3-4 days)", and "most of the time (5-7 days)", assigned scores of 1-4 points respectively. The higher the score, the more likely the individual is to be depressed. According to existing research, more than 20 is considered indicative of depressive tendencies, assigned a value of 1; less than 20 is assigned a value of 0, indicating the absence of depression[24]. The Cronbach's α coefficient is 0.868, and the KMO is 0.920.

2.3Quality Control

The CHARLS national database is publicly released and available for application. The research team follows the database usage regulations, downloads the data after registration approval; then two graduate students from the research team perform data screening and cleaning. After completion, the included samples are compared, and if there are any disputes, a third party is involved for verification to ensure the quality of the samples.

2.4Statistical analyses

Data were processed using SPSS 26.0 and AMOS 24.0. Measurement data conforming to a normal distribution were expressed as ($\bar{x}\pm s$), while those not conforming were expressed as M(P25, P75). Enumeration data were presented as frequency (N) and percentage (%). The chi-square test was used to analyze differences in depression among elderly individuals with different characteristics, and Pearson correlation analysis was employed to explore the relationships between variables. Model 4 in Process 4.0 was used to test the mediating effect of life satisfaction on the impact of ADL on depression, with Bootstrap set to 5000, a two-tailed test level of α=0.05, and a confidence interval value excluding 0 indicating the presence of a mediating effect[25]. Cross-lagged analysis models and structural equation models were constructed, and P<0.05 was considered statistically significant.

3. Results

3.1Common method deviation test

Using the Harman single factor test method, it was found that there were five factors with the characteristic root greater than 1, and the first factor explained 23.13% and 24.96% of the total variation, which was far below the critical value of 40%, indicating that there was no common method deviation in this study.

3.2 Basic characteristics of elderly people in stage T2

Among 6413 elderly people, 2566 were men (40.01%) and 3847 were women (59.99%); the average age was (71.23±9.73) years. The largest age group was 60-69 years old, with 2760 people (43.04%), followed by 70-79 years old with 2328 people (36.30%). There were 4983 elderly people living in rural areas (77.70%) and 1430 in urban areas (22.30%). The majority had an education level of primary school or below, totaling 1554 people (24.23%). There were 4432 elderly people with spouses (69.11%), and 5966 were of Han ethnicity (93.03%), as shown in Table 1.

3.3Univariate Analysis of Depression in Elderly People in stage T2

At T2, the depression score of the elderly was (20.54±6.77), and the detection rate of depression was 49.71% (3188/6413). Depression in the elderly was related to gender, age, residence, education level, marital status, regular physical examination, medical insurance, physical pain, number of chronic diseases, hearing status, sleep time, social participation, smoking and drinking (P<0.05), as shown in Table 1.

Table 1: The descriptive statistics of the characteristics of the study Population and Social-demographic differences in depression (*N*=6413)

Variables	category	*N*（%）	Depression [*n*(%)]	Normal [*n*(%)]	χ^2	*P*
gender	male	2566（40.01）	1072（41.78）	1494（58.22）	107.722	< 0.001
	female	3847（59.99）	2116（55.00）	1731（45.00）		
Age (years)	60~69	2760（43.04）	1295（46.92）	1465（53.08）	16.080	< 0.001
	70~79	2328（36.30）	1192（51.20）	1136（48.80）		
	≥80	1325（20.66）	701（52.91）	624（47.09）		
Place of residence	town	1430（22.30）	527（36.85）	903（63.15）	121.718	< 0.001
	countryside	4983（77.70）	2661（53.40）	2322（46.60）		
education level	Primary school and below	1554（24.23）	951（61.20）	603（38.80）	196.027	< 0.001
	junior high school	1523（23.75）	822（53.97）	701（46.03）		
	high school	1519（23.69）	718（47.27）	801（52.73）		
	associate degree	1199（18.70）	484（40.37）	715（59.63）		
	bachelor's degree or above	618（9.63）	213（34.47）	405（65.53）		
Marital status	married	4432（69.11）	2046（46.16）	2386（53.84）	72.217	< 0.001
	No spouse	1981（30.89）	1142（57.65）	839（42.35）		
nation	Han	5966（93.03）	2999（50.27）	2967（49.73）	0.014	0.905
	ethnic minority	447（6.97）	221（49.44）	226（50.56）		
religious belief	have	718（11.20）	367（51.11）	351（48.89）	0.457	0.499
	none	5695（88.80）	2821（49.53）	2874（50.47）		

taking care of grandchildren	Yes	2667 (41.59)	1320 (49.49)	1347 (50.51)	0.087	0.780
	No	3746 (58.41)	1868 (49.87)	1878 (50.13)		
regular physical examination	Yes	3167 (49.38)	1513 (44.50)	1654 (55.50)	9.396	0.002
	No	3246 (50.62)	1675 (51.60)	1571 (48.40)		
medical insurance	have	6207 (96.79)	3136 (50.52)	3071 (49.48)	4.273	0.039
	none	206 (3.21)	89 (43.20)	117 (56.80)		
physical pain	Yes	4701 (73.30)	2596 (55.22)	2105 (44.78)	213.918	0.001
	No	1712 (26.70)	592 (34.58)	1120 (65.42)		
Number of chronic diseases	0~1	5136 (80.09)	2448 (47.66)	2688 (52.34)	45.412	0.001
	2~3	1096 (17.09)	626 (57.12)	470 (42.88)		
	3	181 (2.82)	114 (62.98)	67 (37.02)		
Hearing condition	good	814 (12.69)	299 (36.73)	515 (63.27)	90.544	0.001
	average	1042 (16.25)	461 (44.24)	581 (55.76)		
	bad	4557 (71.06)	2428 (53.28)	2129 (46.72)		
Sleeping time (h/day)	<7	4829 (75.30)	2474 (49.60)	2355 (50.40)	18.083	0.001
	≥7	1584 (24.70)	714 (45.08)	870 (54.92)		
social participation	have	2205 (34.38)	1046 (47.44)	1159 (52.56)	6.950	0.008
	none	4208 (65.62)	2142 (50.90)	2066 (49.10)		
smoking	Yes	625 (9.75)	235 (37.60)	390 (62.40)	40.632	0.001

	No	5788 (90.25)	2953 (51.02)	2835 (48.98)		
Drinking wine	Yes	1809 (28.21)	751 (41.57)	1058 (58.43)	67.723	< 0.001
	No	4604 (71.79)	2437 (52.93)	2107 (45.77)		
total		6413		100.00		

3.4The correlation between ADL, life satisfaction, and depression in the elderly over two periods

Daily living ability, life satisfaction, and depression were all correlated during periods T1 and T2, as shown in Table 2. Significant correlations were observed between ADL, life satisfaction, and depression during T1 and T2 (r=0.599, 0.472, 0.522). There were significant positive correlations between ADL and depression during T1 and T2 (r=0.285, 0.343), and significant negative correlations between life satisfaction and depression (r=-0.438, -0.436). Therefore, it indicates that ADL, life satisfaction and depression of the elderly during these two years meet the conditions of stability, correlation, and synchronicity.

Table 2: The correlation between ADL, life satisfaction, and depression in the elderly

Variables	$\bar{x}_{\pm S}$	1	2	3	4	5	6
1.T1 ADL	14.12±3.89	1					
2.T1 life satisfaction	9.48±1.94	-0.171*	1				
3.T1 depression	19.93±6.78	0.285*	-0.438*	1			
4.T2 ADL	13.95±3.95	0.599*	-0.170*	0.236*	1		
5.T2 life satisfaction	9.50±1.82	-0.164*	0.472*	-0.337*	-0.262*	1	
6.T2 depression	20.54±6.77	0.275*	-0.328*	0.522*	0.343*	-0.436*	1

Note: $^{*}P$0.05

3.5Linear Regression Analysis of Depression in the Elderly

In the first step of the linear regression analysis, gender, age, place of residence, education level, marital status, regular physical examinations, medical insurance, physical pain, number of chronic diseases, hearing condition, sleep time, social participation, smoking, and drinking were included as control variables. The second step was to add ADL. The results showed that ADL positively predicted depression (β=0.241, P<0.01), and there was 17.9% variance in predicting depression. After adding life satisfaction in the third step, life satisfaction had a significant impact on the score of depression (β=-0.351, P<0.01), the regression coefficient increased significantly, and the interpretation rate of model 3 increased by

11.5% compared with model 2, indicating that life satisfaction played a partial mediating role between ADL and depression.The results are shown in Table 3.

Table 3: Linear Regression Analysis of Depression in the Elderly

Variables		Depressive symptoms		
		Step1 （*β*）	Step2 （*β*）	Step3（*β*）
Demographic characteristics				
gender	（male vs. female）	0.066**	0.059**	0.060**
Age (years)	（60~69 vs. 70~79 vs.≥80）	-0.066**	-0.117**	-0.076**
Place of residence	（town vs. countryside）	0.086**	0.071**	0.073**
education level	（Primary school and below vs.junior high school vs.junior high school vs.associate degree vs.bachelor's degree or above）	-0.099**	-0.065**	-0.077**
Marital status	（married vs.No spouse）	0.053**	0.048**	0.037**
regular physical examination	（have vs. none）	0.046**	0.040**	0.028**
medical insurance	（have vs. none）	-0.012	-0.003	0.011
physical pain	（have vs. none）	0.162**	0.136**	0.102**
Number of chronic diseases	（0~1vs.2~3vs.（3）	0.102**	0.081**	0.065**
Hearing condition	（good vs.average vs.bad）	0.106**	0.095**	0.055**
Sleeping time （h/day）	（（7h vs.≥7h）	-0.094**	-0.093**	-0.081**
social participation	（have vs. none）	-0.023	-0.013	-0.012
smoking	（Yes vs. No）	0.024*	0.022	0.031*
Drinking wine	（Yes vs. No）	0.028*	0.021	0.015
ADL			0.241**	0.204**
Life satisfaction				-0.351**
F		67.264**	92.701**	166.608**
R^2		0.128	0.179	0.294
ΔR^2		0.128	0.051	0.115

Note（* *P*（0.05（** *P*（0.01

3.6Cross-lagged analysis of ADL, life satisfaction, and depression

3.6.1Cross-lagged analysis of ADL and depression

Based on the correlation analysis, a cross-lagged model was constructed to examine the mutual predictive relationship between ADL and depression. Demographic variables were introduced into the model as control variables. After controlling for T1 depression, T1 ADL positively predicted T2 depression (β=0.137); Controlling for T1 ADL, T1 depression positively predicted T2 ADL (β=0.071). The ADL and depression of the elderly can mutually predict each other. The cross-lagged model of ADL and depression is shown in Figure 2.

3.6.2Cross-lagged analysis of life satisfaction and depression

After controlling for T1 depression, T1 life satisfaction significantly negatively predicted T2 depression (β=-0.123); controlling for T1 life satisfaction, T1 depression negatively predicted T2 life satisfaction (β=-0.161). There is a mutual predictive relationship between life satisfaction and depression in the elderly. The cross-lagged model of life satisfaction and depression is shown in Figure 3.

3.6.3Analysis of the Mediating Effect of Life Satisfaction

The results showed that T1 ADL had a significant positive predictive effect on T2 depression (*c*=0.275), and the positive predictive effect was still significant (*c'*=0.209) after the intermediary variable was included; The product of the path (*a*) from T1 ADL to T2 life satisfaction and the path (*b*) from T1 life satisfaction to T2 depression is an indirect effect, where *a* is -0.164, *b* is -0.401, and the indirect effect value is -0.066; Moreover, the mediating effect of T2 life satisfaction between T1 ADL and T2 depression was significant (95%CI, [0.056,0.077]) (*P*<0.01), indicating that life satisfaction played a part of the mediating effect. The results are shown in Table 4, the mediating effect of T2 life satisfaction between T1 ADL and T2 depression is shown in Figure 4.

Table 4: Analysis of the Mediating Effect of Life Satisfaction

Path	Effect value	*P*	95%*CI*
a	-0.164	0.001	[-0.190-0.137]
b	-0.401	0.001	[-0.424-0.380]
c'	0.209	0.001	[0.1880.231]
*a*b*	0.066	0.005	[0.0560.077]
c	0.275	0.001	[0.2540.296]

4. Discussion

Depression, as one of the most common mental illnesses among the elderly [26], was found in this study to have a prevalence rate of 49.71% among older adults at time T2, lower than the 50.6% reported in the 2018 CHARLS report [27], but still higher than the global average [28]. This study found a correlation between depression and ADL, with ADL serving as a significant determinant of depression. This aligns with findings from a 9-year longitudinal study in the United States[12]. The research team posits that impaired ADL limits older adults' social and physical activities, reduces their independence, and impairs the establishment and maintenance of social networks. This leads to negative self-evaluation and ultimately depression[29]. Meta-analyses have demonstrated that older adults with impaired ADLs exhibit a significantly higher probability of depression compared to those with intact ADLs[30]. Stress theory explains the influence of ADLs on depression, positing that physical functional decline or disability serves as a stressor. During periods of health deterioration, older adults may experience compromised mental health due to stress coping, thereby increasing depression risk[31]. Some scholars suggest depression is linked to elevated cortisol levels, with impaired ADL and depression potentially sharing common hormonal and metabolic pathways. They propose that physical activity may regulate cortisol levels by upregulating glucocorticoid receptors[32].

Additionally, cross-lagged analysis indicates that older adults' ADL can predict depression levels two years later. When ADL abilities decline, requiring long-term care from others, it strains family relationships and increases both financial and emotional burdens on households, subsequently leading to depression. Therefore, a decline in ADL capabilities may signal worsening depression. Conversely, depression levels among older adults can predict their ADL status two years later. Depression may trigger related physiological issues such as functional impairment, weakened immunity, increased disease risk and chronic conditions, and heightened mortality risk, creating a vicious cycle of deteriorating physical health[33]. Research also confirms that mental health status significantly and directly influences ADL capacity in older adults[34]. Thus, this study posits that maintaining and restoring ADL abilities can help alleviate depression in older adults, while alleviating depression also contributes to the recovery and improvement of ADL abilities.

This study confirms that life satisfaction is a significant risk factor for depression in older adults, with a negative correlation between life satisfaction and depression, consistent with previous research findings[35]. Cross-lagged analysis revealed that life satisfaction negatively predicted depression levels two years later. Due to changes in physical functioning, older adults become more sensitive to their surroundings; life adversities lead to lower life satisfaction, subsequently triggering negative emotions such as anxiety and depression. Conversely, depression levels negatively predicted life satisfaction two years later. Research also found that depression significantly negatively impacts life satisfaction in older adults[36]. Psychological and social functioning significantly influence life satisfaction, while depressive states distort older adults' perceptions of life and quality of life, diminishing satisfaction[37]. Currently, depression detection rates among older adults are rising[38], emerging as a major threat to physical and mental health that severely undermines late-life satisfaction. To advance healthy aging, targeted health services should be provided to alleviate depressive symptoms while enhancing life satisfaction, thereby increasing well-being and a sense of fulfillment.

This study found that life satisfaction significantly mediated the relationship between ADL and depression. Specifically, ADL positively correlated with depression but negatively correlated with life satisfaction, while life satisfaction itself negatively correlated with depression. Previous research has identified life satisfaction as a key mechanism linking ADL and depression[39]. When ADL declines, life satisfaction can mitigate depressive symptoms in older adults. Relatively speaking, elderly individuals capable of self-care in daily living possess better health status and lighter psychological burdens. They exhibit higher levels of social participation, maintaining both physical health and a positive mindset. With good sleep quality, their life satisfaction tends to be relatively high[40]. Elderly groups with high life satisfaction demonstrate superior mental health levels, better adaptability to life challenges, and protected self-esteem[41], making them less prone to depression. In summary, improved daily living abilities foster positive self-evaluation and higher life satisfaction among older adults, thereby reducing depression risk. The new psychosocial-medical model emphasizes the importance of individual health impacts. The psychophysical functional status of the human body, such as life satisfaction, can serve as an indicator of the psychological state of the elderly[42]. From the perspective of state medicine, psychological and physical bodily functions form an integrated whole—the mind originates from the body while simultaneously exerting reciprocal influence[43]. The concept of mutual promotion between mind and body should be incorporated into measures aimed at enhancing the quality of daily life for the elderly. In summary, life satisfaction partially mediates the relationship between ADL and depression.

This study uses longitudinal data to explore the key influencing factors and lag effect of depression in the elderly. There are also limitations. First, the elderly may have subjective bias when completing the questionnaire survey; Second, some missing values are eliminated, and the design is not perfect. Third, the influence of unknown factors cannot be excluded, although some confounding factors have been controlled. The follow-up research group will continue to explore the influencing factors of depression by adding epidemic related factors.

5. Conclusion

The ability of daily activities and life satisfaction of the elderly need to be improved, and the depression status needs to be improved. Life satisfaction plays a partial mediating role in the relationship between ADL and depression in the elderly. The relationship between ADL and depression, life satisfaction and depression are predicted each other. When the ability of daily activities of the elderly decreases, necessary intervention measures should be taken to improve life satisfaction and reduce the adverse consequences of depression, so as to help healthy aging.

Declarations

Clinical trial number: not applicable.

Availability of data and materials: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Competing interests: The authors declare that there is no conflict of interest.

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Figures

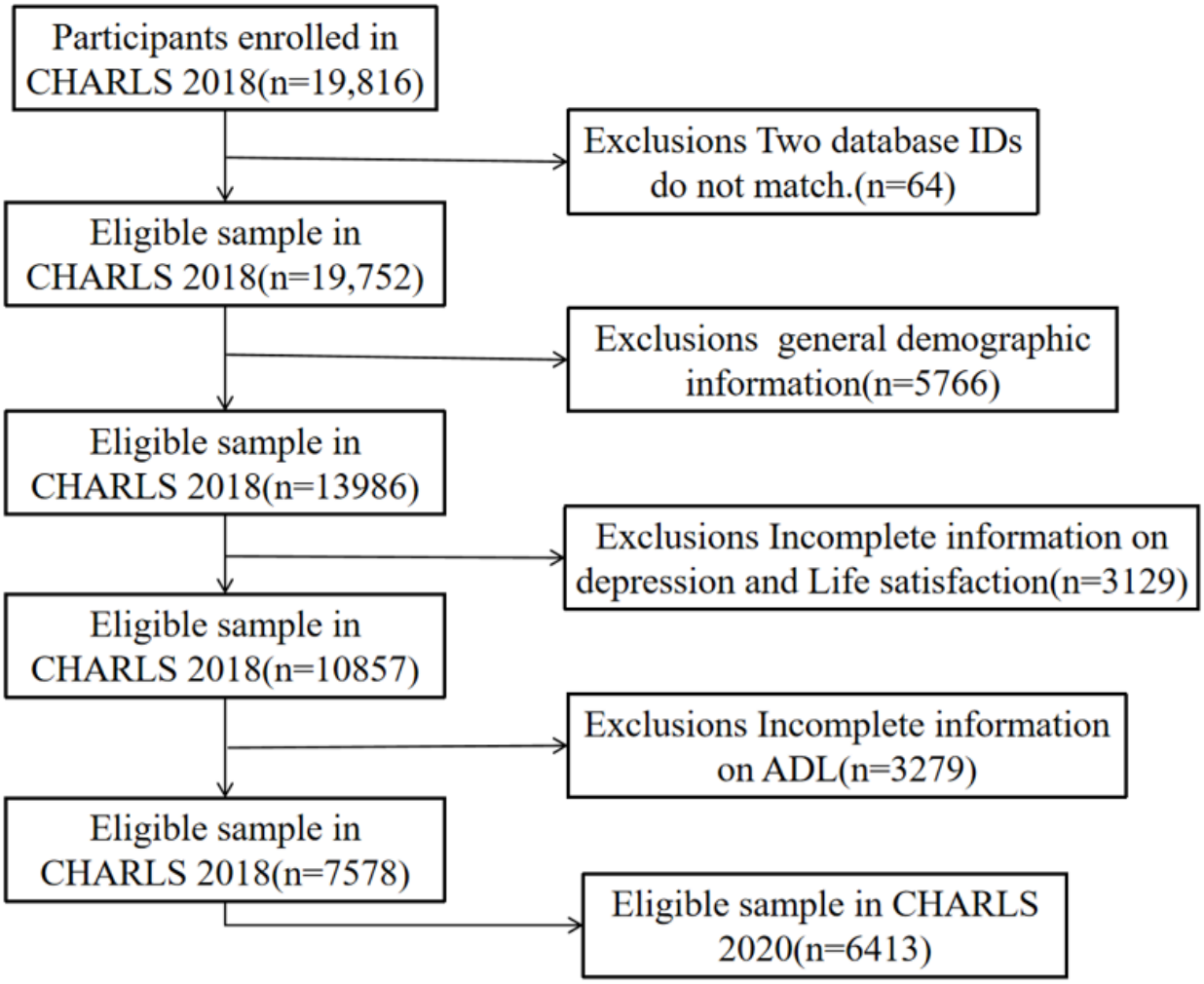


Figure 1

Flowchart of participant selection

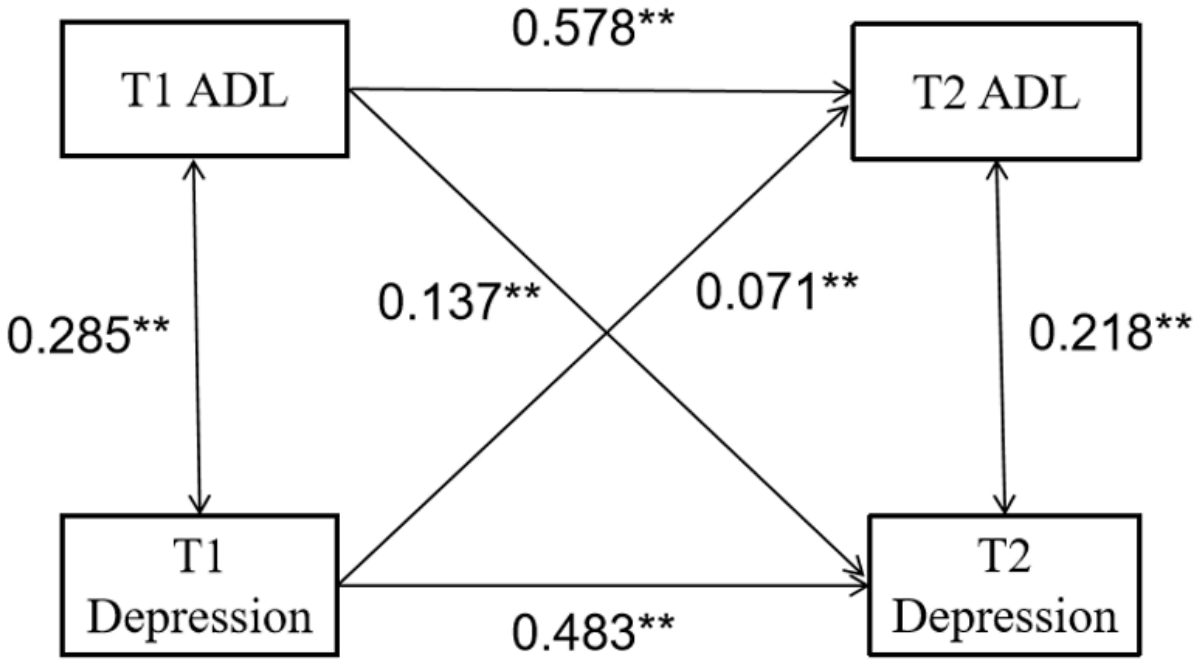


Figure 2

ADL and Depression Cross-Lagged Model（ ** *P*＜0.01）**

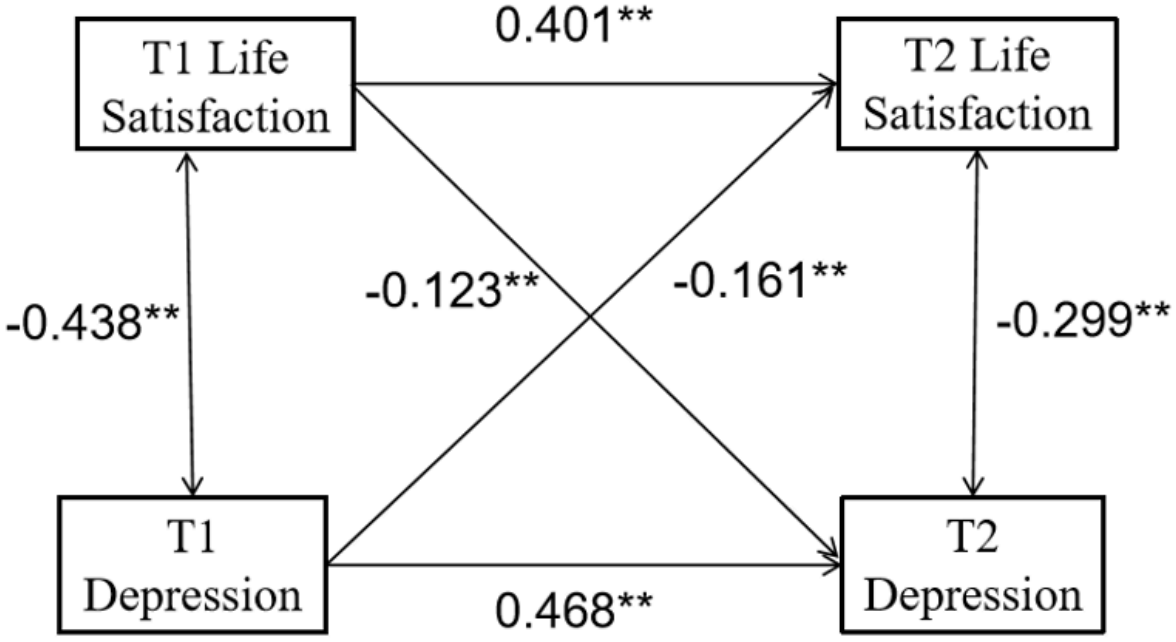


Figure 3

Cross-lagged model of life satisfaction and depression

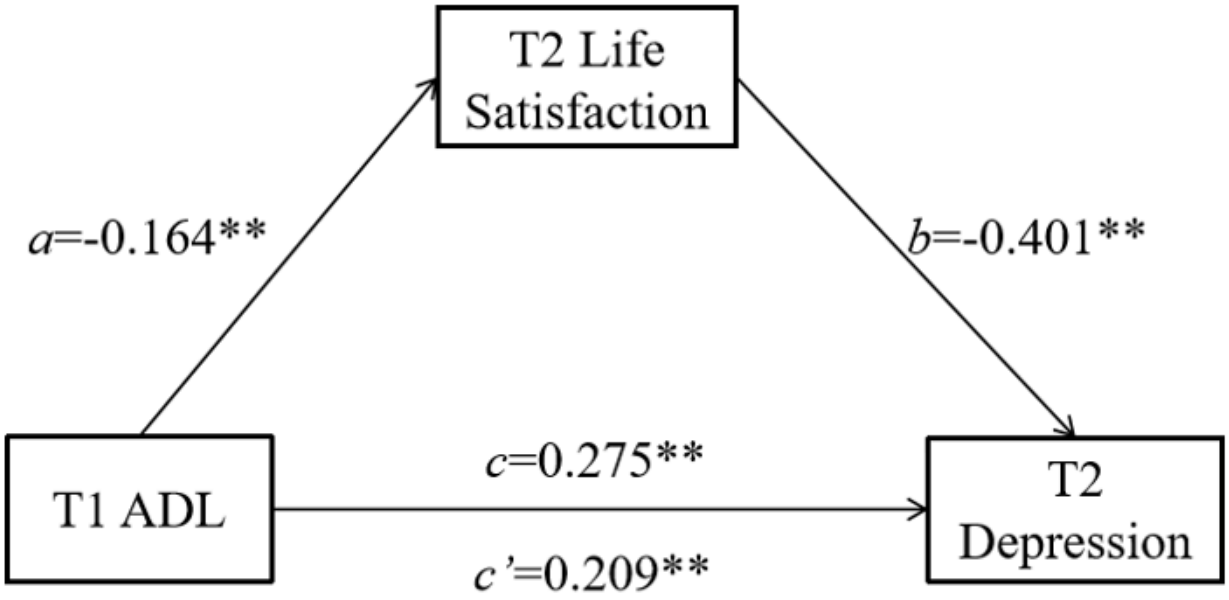


Figure 4

Mediating effect model diagram of T2 life satisfaction

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