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Associations with Life Satisfaction with Cognitive Function among Older Adults: Chain Mediation Effects of Instrumental Activities of Daily Living and Depressive Symptoms

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Abstract: *Based on the Broaden-and-Build Theory and the person-Environment Fit Theory, this study examined how life satisfaction influences cognitive function among older adults, with a particular focus on the independent and sequential mediating effects of instrumental activities of daily living (IADL) and depressive symptoms. Using nationally representative cross-sectional data from the 2020 wave of the China Health and Retirement Longitudinal Study (CHARLS), 6,724 adults were selected aged ≥60 with complete key variables. After adjusting for potential confounding factors(e.g., age, gender, education), a chain mediation analysis was conducted with SPSS 26.0 and the Hayes' PROCESS macro (Model 6). Indirect effects were tested using 5,000 bootstrap samples. Life satisfaction showed a significant total indirect effect on cognitive function was significantly positive (β=0.264, 95% CI: 0.224–0.306),. In contrast, the direct effect was significantly negative (β=-0.155, 95% CI: -0.257–-0.054), indicating a suppression effect. Three pathways were identified: (1) Life satisfaction indirectly promoted cognitive function by improving IADL (reflected by lower IADL scores) (β=0.056, 21.33% of the total indirect effect); (2) It indirectly promoted cognitive function by alleviating depressive symptoms (β=0.181, 68.37%); (3) It operated through the chain pathway of "IADL → depressive symptoms" (β=0.027, 10.30%). The protective effect of life satisfaction on cognitive function in older adults is primarily exerted through mediating pathways.*

Keywords: *Life satisfaction; Instrumental activities of daily living; Cognitive function; Depressive symptoms; Chain mediation effect*

1. Introduction

China is currently facing one of the most severe aging population challenge in the world. By the end of 2024, there were estimated 310 million people aged 60 and above, and 220 million people aged 65 and above[1].Against this backdrop of aging, mental health issues among older adults have become a critical aspect of public health. Poor mental health in older adults can lead to deterioration in physical and cognitive functions, thereby negatively impacting overall health and quality of life[2].Therefore, preventing cognitive decline and dementia among older adults are key components of promoting healthy aging[3].

Previous cognitive studies primarily focused on the negative effects of risk factors such as illness-related stigma[4]. chronic diseases[5] and passive social media use[6] on cognitive function. Recently, the integration of positive psychology with cognitive research has directed attention toward protective factors—including life satisfaction—that may help mitigate cognitive decline.

Life satisfaction, defined as an individuals relatively stable and overall evaluation of their current life circumstances, is an important indicator of mental health [7]. Research suggests that while external factors such as social support or good physical health contribute to life satisfaction, internal aspects such as emotional stability and a sense of purpose in life further also play a key role[8][9]. Therefore, life satisfaction, as an outcome of mental health, can also be regarded as a psychological resource. Individuals with high life satisfaction may possess more abundant internal resources (e.g., psychological resilience), forming a virtuous cycle that indirectly enhances cognition, slows physical decline, and ultimately promotes healthy aging.

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Although life satisfaction is increasingly recognized as a key positive psychological resource, its pathways to cognitive health remain poorly understood. Most existing studies have examined either emotional or behavioral mediators in isolation, making it difficult to capture the integrated psychological–behavioral–cognitive mechanism through which life satisfaction may shape cognitive aging. However, there has less study has simultaneously examined behavioral function (IADL) and emotional symptoms (depression) as sequential mediators linking life satisfaction to cognitive outcomes. Moreover, evidence from nationally representative Chinese aging populations remains scarce. Therefore, based on the Broaden and Build Theory and the Person Environment Fit Theory, this study aims to investigate how life satisfaction influences cognitive function through IADL and depressive symptoms, using data from the 2020 China Health and Retirement Longitudinal Study (CHARLS). By clarifying these pathways, the study seeks to provide empirical evidence for multi-target intervention strategies that promote cognitive health among older adults.

1.1. IADL as a Behavioral Mediator

According to the Person-Environment fit theory, healthy development requires positive interaction between individuals and their environment. Instrumental Activities of Daily Living (IADLs) are more sensitive than basic Activities of Daily Living (ADLs) in predicting cognitive decline, as IADLs incorporate more cognitive, behavioral, and environmental factors than basic ADLs [10]. A decline in IADLs indicates difficulty in performing complex tasks, allowing earlier detection of cognitive issues. Therefore, IADLs are selected as a mediator, serving as the core indicator of the fit between individual capability and environmental demands. Environments impose requirements for independent living, and individuals proficient in IADLs can adapt to and maintain engagement in complex social and cognitive activities, thereby creating a protective barrier that delays the onset of mental decline [11].

Life satisfaction, as a positive overall self-assessment, enhances self-efficacy and intrinsic motivation for behavior [12]. In other words, older adults who are satisfied with their lives tend to have stronger self-efficacy and are more proactive in adopting and maintaining health-promoting behaviors. This enables them to overcome behavioral inertia and practical barriers, sustain high levels of IADL performance, and avoid reverting to simpler lifestyles.

Based on this, we propose the following hypothesis: Life satisfaction maintains IADLs through self-efficacy and behavioral motivation. Well-maintained IADLs, in turn, lead to greater exposure to stimulating environments and activities, which positively impact cognitive functioning.

1.2. Depressive Symptoms as a Psychophysiological Mediator

Depressive symptoms are both a psychological disorder and a major risk factor for cognitive decline, primarily due to dysfunctions in the prefrontal-limbic circuitry and the development of systemic chronic inflammation. Neurobiologically, neuroimaging data show that individuals with depressive symptoms often exhibit weakened prefrontal control over the limbic system, leading to emotional dysregulation and impaired executive functions. Interestingly, individuals with Mild Cognitive Impairment (MCI) also experience similar emotional and cognitive management difficulties[13]. More fundamentally, this pattern reflects a neural dysfunction—specifically, a weakened ability to regulate one’s mind, heightened attentional bias toward negative stimuli and reduced responsiveness to positive stimuli, ultimately resulting in anhedonia and diminished life satisfaction[14].

Furthermore, from an immunological perspective, Depressive symptoms increase the risk of Alzheimer's disease and other dementias, while chronic physical comorbidities accelerate cognitive decline[15]. This indicates that depressive symptoms represent a significant risk factor for cognitive decline and dementia. Simultaneously, both Alzheimer's disease and other dementias, as well as depressive symptoms, are associated with neuroinflammation[16]. Thus, neuroinflammation may represent a potential pathophysiological mechanism linking depression to cognitive decline. Consequently, depressive symptoms not only exacerbate patients' current distress and inflammatory responses but also pose a potential threat to future cognitive decline through inflammatory mechanisms and other factors.

Therefore, improving life satisfaction could serve as a dual-pathway intervention that modifies brain connectivity and enhances immune function. The proposed mechanism is that behavioral activation and the accumulation of positive experiences may improve prefrontal cortex function, which is often deficient in depression. This process enhances the ability to process positive experiences and reduces sensitivity to negative stimuli, thereby restoring prefrontal regulatory control over other brain

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regions. Immunologically, positive emotions and improved well-being reduce stress responses and decrease pro-inflammatory factors. Thus, enhancing life satisfaction not only improves subjective well-being but may also mitigate long-term cognitive decline by reducing underlying inflammation.

1.3. The Vicious Cycle between IADL Impairment and Depressive Symptoms

IADL impairment leads to loss of social roles and social withdrawal, which exacerbates psychosocial stressors and worsens depression [17][18]. Meanwhile, core features of depressive symptoms—such as low motivation, reduced goal-oriented behavior [19], impaired executive function [20], and diminished anticipatory pleasure, leading to activity avoidance [21]—further compromise IADL performance. This creates a vicious cycle where functional ability and emotional well-being mutually deteriorate [22][23].

According to the Broaden-and-Build Theory, positive emotions associated with life satisfaction expand an individual's cognitive and behavioral resources, build resilience, and enhance social support, enabling better coping with functional challenges. This also boosts general self-efficacy [24], encouraging individuals to seek solutions rather than avoid difficulties when facing IADL challenges, thereby preserving functional ability. Consequently, maintained IADLs can help prevent depression resulting from functional decline. Thus, this paper argues that high life satisfaction may have a protective effect through a sequential mediation process: Life Satisfaction → Maintenance/Improvement of IADLs → Reduction in Depressive Symptoms → Improved Cognitive Function.

In summary, life satisfaction may influence brain function through complex pathways. However, most existing evidence comes from pairwise associations, with few studies examining IADL and depression simultaneously. The 2020 China Health and Retirement Longitudinal Study (CHARLS) dataset, which includes measures of life satisfaction, IADL, depression, and cognition, provides a unique opportunity to elucidate their interrelationships.

Building on these theoretical and empirical gaps,, this study utilizes the nationally representative cross-sectional data from CHARLS 2020 (N=6,724), this study constructs a structural equation model. After adjustingfor confounding factors including age, gender, marital status, household registration type (Hukou), education level, and chronic disease comorbidities, it systematically tests the following hypotheses:

H1: Life satisfaction has a direct positive effect on cognitive function.

H2: IADL serves as an independent mediator in the relationship between life satisfaction and cognitive function.

H3: Depressive symptoms serve as an independent mediator in the relationship between life satisfaction and cognitive function.

H4: IADL and depressive symptoms act as serial mediators between life satisfaction and cognitive function, i.e., "life satisfaction → IADL → depressive symptoms → cognitive function."

H5: After adjusting for the mediating pathways, life satisfaction may exhibit a statistically significant negative direct effect on cognitive function, suggesting that the total effect may be masked by unobserved variables.

2. Data and Methods

2.1. Second Section (Body Part) Data Sources and Study population

This study used data from the fifth wave (2020) of the China Health and Retirement Longitudinal Study (CHARLS). Participants were included if they (1) were aged ≥60 years and (2) had complete data on key variables, including chronic diseases, depressive symptoms, and cognitive function.After excluding individuals with missing key information or those who did not meeting the age criterion, the final analytical sample consisted of 6,724 older adults.

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2.2. Variable Selection

2.2.1. Independent Variable: Life Satisfaction

Life satisfaction was using a single item that asked respondents to rate their overall life satisfaction on a 5-point scale from 1 ("very dissatisfied") to 5 ("very satisfied"). Higher scores reflect greater life satisfaction.

2.2.2. Mediating Variable: IADL

IADL was evaluated using the Instrumental Activities of Daily Living component of the scale developed by Katz et al.[28]. Score ranges from 0 to 5, representing the number of IADL tasks with which an individual has difficulty. Higher scores indicate poorer independent living ability. The scale demonstrated acceptable internal consistency in our sample (Cronbach's α=0.72).

2.2.3. Mediating Variable: Depressive Symptoms

Depressive symptoms was measured using the 10-item Center for Epidemiologic Studies Depression Scale (CES-D-10) [26]. The total score ranges from 0 to 30, with scores≥10 indicating clinically significant depressive symptoms. For analysis, scores were categorized into three groups: 0-9 (no depressive symptoms, reference group), 10-19 (mild depressive symptoms), and 20-30 (moderate-to-severe depressive symptoms). The scale showed good internal consistency in our sample (Cronbach's α=0.79).

2.2.4. Dependent Variable: Cognitive Function

Cognitive function was assessed using a composite score (range: 0-21) derived from tests of memory, orientation, and calculation. Higher scores reflect better cognitive performance. The cognitive battery demonstrated good internal consistency in our sample (Cronbach's α=0.76).

2.2.5. Controlled Variables

Based on previous literature and theoretical considerations, the following variables were included as potential confounders: age, gender, marital status, household registration type (Hukou), education level, and the presence of chronic disease comorbidities.

2.3. Statistical Methods

All statistical analyses were conducted using SPSS 26.0. Chain mediation analyses were conducted using Haye's PROCESS macro (Model 6) [25], with 5,000 bootstrap samples used to estimate the confidence intervals (CIs) of the effects. Mediating effects were considered statistically significant if the 95% bias-corrected bootstrap CI did not include zero.

3. Results

3.1. Basic Characteristics of Study participants

Table 1 summarizes differences in cognitive function scores across demographic characteristics. Independent samples T-tests and analyses of variance revealed significant differences in cognitive function scores among age groups (60–70, 70–80, ≥80 years; p<0.001), indicating that cognitive scores declined with advancing age. No significant differences were observed bymarital status (p=0.237) or household registration type (p=0.889). Significant differences were detected across educational levels (primary school, junior high, senior high, college and above; p<0.001), with higher education associated with better cognitive function. Chronic disease comorbidities were not significantly associated with cognitive function scores (p=0.088). However, individuals with comorbidities exhibited a non-significant trend toward lower cognitive scores, potentially reflecting the burden of multiple chronic conditions. Overall, age and educational attainment were significantly associated with cognitive function in this study (p<0.001; Table 1).

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Table 1: Differences in Cognitive Function Scores among Older Adults by Different Demographic Characteristics

Variable	Category	Frequency	percentage	Cognitive Function t/F Value
Age	60-70	4171	62.00%	
	70-80	2184	32.50%	3.193***
	≥80	369	5.50%	
Marital	Status	1105	16.40%	0.237
	Married	5619	83.60%	
Household	Registration	3038	45.20%	0.889
	Rural	3686	54.80%	
Education	primary	2438	36.30%	
	Middle	1690	25.10%	40.839***
	High	1521	22.60%	
	College	1075	16.00%	
Multimorbidity	Yes	5780	86.00%	0.088
	No	944	14.00%	

*Note: p<0.001 is denoted as ***, p<0.01 as **, and p<0.05 as *.*

Spearman correlation analyses showed that life satisfaction was negatively correlated with IADL (r=−0.186, p<0.01) and depressive symptoms (r=−0.334, p<0.01), and weakly positively correlated with cognitive function (r=0.025, p<0.05). IADL was positively correlated with depressive symptoms (r=0.324, p<0.01) and negatively correlated with cognitive function (r=−0.155, p<0.01). Depressive symptoms were negatively correlated with cognitive function (r=−0.237, p<0.01). Details are presented in Table 2.

Table 2 Correlation Analysis of Life Satisfaction, IADL, Depressive Symptoms, and Cognitive Function

	Life Satisfaction	IADL	Depressive Symptoms	Cognitive Function
Life Satisfaction	1			
IADL	-0.186**	1		
Depressive Symptoms	-0.334**	0.324**	1	
Cognitive Function	0.025*	-0.155**	-0.237**	1

*Note: p<0.001 is denoted as ***, p<0.01 as **, and p<0.05 as *.*

After adjusting for potential confounders (age, gender, marital status, household registration, education, and chronic comorbidities), a structural equation modeling framework was used to test the serial mediation pathway "life satisfaction → IADL → depressive symptoms → cognitive function." The model comprised three regression equations (Table 3).

Model 1, with IADL as the dependent variable, showed that life satisfaction negatively predicted IADL (β=-0.222, p<0.001), indicating higher life satisfaction was associated with better IADL functioning. Age (β=0.139, p<0.001) and chronic comorbidities (β=0.276, p<0.001) were positively associated with IADL scores (indicating poorer functioning), while female gender (β=-0.159, p<0.001) and higher education (β=-0.047, p<0.001) were associated with lower IADL scores (indicating better functioning). The model explained 7.4% of the variance (R^2=0.074, F=76.712, p<0.001).

Model 2, with depressive symptoms as the outcome, indicated that life satisfaction negatively predicted depressive symptoms (β=-0.237, p<0.001), whereas IADL positively predicted depressive symptoms (β=0.161, p<0.001). Rural residence (β=0.153, p<0.001) and chronic comorbidities (β=0.133, p<0.001) were associated with more severe depressive symptoms, while higher education was associated with fewer symptoms (β=-0.057, p<0.001). This model explained 23.8% of the variance (R^2=0.238, F =262.770, p<0.001).

In Model 3, with cognitive function as the outcome, life satisfaction showed a significant negative direct effect on cognitive function after accounting for the mediators (β=-0.155, p<0.01) after including mediators. Both IADL (β=-0.253, p<0.001) and depressive symptoms (β=-0.762, p<0.001) negatively predicted cognitive function. Higher education (β=1.078, p<0.001) and being married (β=0.383, p<0.001) were associated with better cognitive function, whereas older age (β=-0.350, p<0.001) and rural registration (β=-0.611, p<0.001) were associated with poorer cognitive function. The model explained 22.8% of the variance (R^2=0.228, F=220.232, p<0.001; Table 3).

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Table 3: Regression Analysis Results for the Chain Mediation Model

Variable	Model 1 (IADL) β(SE)	Model 2 (Depressive Symptoms) β(SE)	Model 3 (Cognitive Function) β(SE)
Constant	0.950(0.068)***	1.257(0.043)***	10.569(0.244)***
Life Satisfaction	-0.222(0.015)***	-0.237(0.009)***	-0.155(0.052)**
IADL	—	0.161(0.008)***	-0.253(0.042)***
Depressive Symptoms	—	—	-0.762(0.065)***
Age	0.139(0.018)***	-0.014(0.012)	-0.350(0.061)***
Gender	-0.159(0.022)***	-0.118(0.014)***	0.049(0.075)
Marital Status	-0.015(0.030)	-0.127(0.019)***	0.383(0.099)***
Household Registration Type	0.107(0.022)***	0.153(0.014)***	-0.611(0.074)***
Education Level	-0.047(0.010)***	-0.057(0.006)***	1.078(0.035)***
Chronic Diseases	0.276(0.030)***	0.133(0.019)***	0.369(0.102)***
R^2	0.074	0.238	0.228
F	76.712***	262.770***	220.232***

Direct Effect: The direct effect of life satisfaction on cognitive function was -0.155 (95% CI: -0.257–-0.054).

The total indirect effect was 0.264 (95% CI: 0.224–0.306), indicating a positive overall mediation effect.

The indirect effects of life satisfaction on cognitive function operated through three pathways: For Path 1 (Life Satisfaction → IADL → Cognitive Function): The indirect effect was 0.056 (95% CI: 0.034–0.080), accounting for 21.33% of the total indirect effect. This indicates that life satisfaction improves cognitive function partly by by enhancing IADL functioning. For Path 2 (Life Satisfaction → Depressive Symptoms → Cognitive Function) , the indirect effect was 0.181 0.181 (95% CI: 0.147–0.215), accounting for 68.37% of the total indirect effect, identifying depressive symptoms as the primary mediator. For Path 3 (Life Satisfaction → IADL → Depressive Symptoms → Cognitive Function) , the indirect effect was 0.027 (95% CI: 0.021–0.035), accounting for 10.30% of the total indirect effect. This indicates that life satisfaction may also promote cognitive function by improving IADL functioning, which Subsequently alleviates depressive symptoms (see Table 4).

Table 4 Direct and Indirect Effect Analysis

path/Effect	Effect Size	Boot SE	95% CI	Effect Contribution
Direct Effect	-0.155	0.052	[-0.257,-0.054]	
Total Indirect Effect	0.264	0.021	[0.224,0.306]	
Life Satisfaction → IADL → Cognitive Function	0.056	0.012	[0.034,0.080]	21.33%
Life Satisfaction → Depressive Symptoms → Cognitive Function	0.181	0.018	[0.147,0.215]	68.37%
Life Satisfaction → IADL → Depressive Symptoms → Cognitive Function	0.027	0.004	[0.021,0.035	10.30%

Bootstrap analysis with 5,000 samples was used to estimate the direct, indirect, and serial mediating effects.

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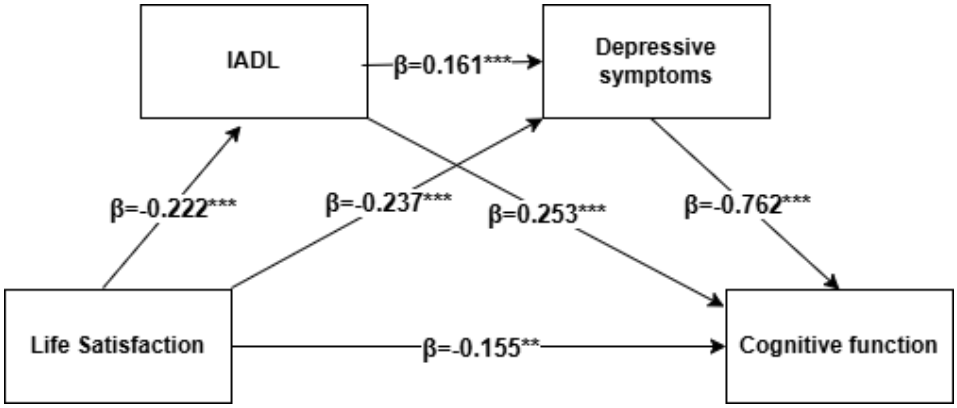

Figure 1: Mediating Effects of Functional Life Ability and Depressive Symptoms in the Relationship between Life Satisfaction and Cognitive Function among Older Adults

4. Discussion

This study used data from the 2020 CHARLS (N = 6,724) and structural equation modeling (SEM) to investigate the relationship between life satisfaction and cognitive function among older adults. The mediation analysis revealed a suppression (masking) effect. Specifically, the direct effect of life satisfaction on cognition was negative (β=-0.155), while the total indirect effect through the mediator(IADLs and depressive symptoms) was positive (β=0.264). According to the mediation analysis theory proposed by Wen Zhonglin & Ye Baojuan [27], the opposite signs indicate a suppression effect. This means that if these mediating pathways are not considered, the overall positive influence of life satisfaction would be obscured.

Decomposition of the indirect effects showed that depressive symptoms were the primary mediator in the model (Life Satisfaction → Depressive Symptoms → Cognitive Function, β=0.181, accounting for 68.37% of the total indirect effect). This indicates that life satisfaction primarily is associated with better cognition through reduced depressive symptoms. Furthermore, life satisfaction was additionally linked to better cognitive outcomes through through improved IADL, both directly (Life Satisfaction → IADL → Cognitive Function, β=0.056, 21.33%) and indirectly via a chain mediation (Life Satisfaction → IADL → Depressive Symptoms → Cognitive Function, β=0.027, 10.30%). In summary, life satisfaction exerts a positive indirect impact on cognitive function mainly by reducing depressive symptoms, with IADL serving as a secondary pathway (see Figure 1).

4.1. IADL and Depressive Symptoms as Mediators and Suppressors between Life Satisfaction and Cognitive Function

The results demonstrated that life satisfaction is indirectly associated with better cognitive function through improved IADL and reduced depressive symptoms. However, the negative direct path coefficient indicated a suppression effect in this pathway, leading to the rejection of H1 and acceptance of H5. A negative direct effect does not imply that life satisfaction is detrimental to cognitive function; rather, it suggests that the relationship is contingent on other factors.

One plausible explanation for the negative direct effect may be attributed to underlying neurobiological mechanisms. From a neurobiological standpoint, depression is associated with reduced activity in the prefrontal regions responsible for executive functions and decision-making, coupled with heightened activity in limbic areas processing negative emotions[14] This leads to diminished reward circuit functioning (e.g., in the nucleus accumbens and striatum), making it difficult for life satisfaction to translate into exploratory behavior, learning, and motivation. Moreover, an overactivated stress response system can impair hippocampal function, which is crucial for memory and flexible cognition[14]. Consequently, the brain prioritizes stress-related responses over engaging in higher-order cognitive processes.

Therefore, the negative direct effect should not be interpreted as suggesting that life satisfaction is harmful to cognitive function. Instead, it may indicate that in the presence of depressive pathology, the direct positive link between subjective well-being and cognitive performance is disrupted. After adjusting for the two key mediators (improvement in IADLs and reduction in depression), this negative

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coefficient might reflect this specific disruption in the direct pathway.

4.2. Theoretical Implications of the Concealment Effect and Cross-Cultural Comparisons in Positive Aging Research

Extensive research has demonstrated a close relationship among depression, cognition, and functional capacity[29]. Furthermore, the connections between social support[8],social engagement[29]and physical functioning[30], and these factors have been key areas of focus for researchers. The relationships between variables are not simple causal chains but involve more complex psychosocial influence mechanisms. Finally, depression, social participation, and activities of daily living have all been identified as important mediators . Key differences are as follows: First, regarding causality, this study found that life satisfaction exerted a significant positive indirect effect on cognitive function (β = 0.264, 95% CI: 0.224–0.306). In contrast, the direct effect was significantly negative (β = −0.155, 95% CI: -0.257 to -0.054)), differing from Feng Xiaocheng et al.'s findings that ADL positively influences cognitive function. This discrepancy may stem from the introduction of life satisfaction as a variable, revealing a masking effect where its impact on cognition is mediated through improved IADL and reduced depressive symptoms. Second, regarding the starting point or independent variable, this study logically began with life satisfaction—a metric emphasized in positive psychology—while international research often focuses on risk factors such as subjective memory complaints[31] and depressive symptoms[32]. This divergence may stem from differences in national welfare policies and cultural factors, though both approaches reflect a growing trend toward early prevention and proactive strategies for healthy aging.

4.3. Strategies for Elderly Depression Intervention and Cognitive Protection Based on Chain-Based Mediating Effects

Based on the findings from this chain-mediation study, relevant institutions can make improvements by addressing different variables and by identifying and intervening in depression as a risk factor. First, these institutions can increase older adults' access to social-emotional resources by enhancing their social connections through enriched social activities. Alternatively, they can boost older adults' sense of control and satisfaction with life by assisting them in improving personal health literacy and life skills. Second, relevant institutions should prioritize maintaining older adults' IADLs and preventing depression onset, while strengthening depression screening and targeted interventions. Third, these institutions should protect older adults' cognitive function by implementing the aforementioned segmented intervention strategies and focusing on depression as a core condition affecting cognitive impairment. This achieves cognitive preservation while simultaneously enhancing older adults' life satisfaction. Furthermore, life satisfaction serves as both an outcome and resource indicator. It functions as both a pathway—where instrumental ADLs and cognitive function mitigate depressive symptoms to enhance self-directed control—and an outcome that elevates life satisfaction. Concurrently, this study demonstrates that high life satisfaction itself acts as a protective factor: it either mitigates the negative impact of depressive symptoms on cognitive function or serves as a resource that bolsters psychological adaptation and behavioral regulation during functional decline. However, transforming this high satisfaction into sustainable resources requires coordinated efforts from individuals, families, communities, and policymakers. Key interventions should target critical elements along the pathway while adopting a synergistic approach to fully mobilize older adults' psychological resources and existing assets. This enables them to address the specific challenges of aging and achieve emotional fulfillment, relational harmony, and life integration during life's final stage.

Several strengths should be emphasized in this study. First, Theoretical integration and clarification of mechanisms: By combining the Broaden-and-Build theory with the person-Environment Fit theory, we constructed an integrated “psychological-behavioral-emotional-cognitive” framework. Thereby, it provides a framework for a more comprehensive exploration of the mechanisms linking life satisfaction to cognitive function. Second, Identification of a Masking Effect: We revealed that life satisfaction exerts a strong positive indirect effect on cognitive function through IADL and depressive symptoms, while its direct effect is negative, indicating a masking effect. Third, Validation and Quantification of a Serial Mediation pathway: This study confirmed the independent mediating roles of IADL and depressive symptoms. More importantly, it is, to our knowledge, the first to demonstrate the “life satisfaction → IADL → depressive symptoms → cognitive function” serial mediation pathway in a large-sample Chinese older adult population and quantify its contribution (accounting for 10.30% of the total indirect effect). This pathway delineates a sequential process from positive psychological

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resources to behavioral practices, then to emotional states, and finally to cognitive health, thereby providing a theoretical basis for multi-target interventions. Fourth, Prioritization of Intervention Targets by Identifying the Core Mediator: Comparing the effect sizes, we clearly identified depressive symptoms as the core mediator in the relationship between life satisfaction and cognitive function, accounting for 68.37% of the total indirect effect. This finding helps prioritize targets for public health strategies and clinical interventions in resource-constrained settings, suggesting that alleviating depressive symptoms should be a central component of cognitive health maintenance.

There are still several limitations in this study. First, the use of a single-item measure for life satisfaction in the CHARLS database may not comprehensively or reliably capture the multidimensional construct of life satisfaction in older adults. Second, although the study utilized a large, nationally representative sample, the exclusion of participants with missing data on core variables may have introduced some selection bias. Third, this study is a cross-sectional survey and cannot establish causal relationships between variables at this stage. Future longitudinal research is needed to clarify the interactions among variables.

5. Conclusions

The protective effect of life satisfaction on cognitive function in older adults is primarily exerted through mediating pathways. Depressive symptoms emerged as the core mediator. IADL not only exerted an independent mediating effect but also forms a "subjective perception-functional behavior-emotional state" linkage mechanism with depressive symptoms, constituting a crucial chain mediation pathway of "life satisfaction → IADL → depressive symptoms → cognitive function." Thus, enhancing life satisfaction, improving IADL, and alleviating depressive symptoms represents a multi-target, integrated intervention strategy for maintaining cognitive health in older adults.

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