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ARTICLE

Scarcity and Mental Health—Multiple Mediators of Sleep Quality and Life Satisfaction

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ABSTRACT

Background: In the current social environment, scarcity, as a universally present objective state, profoundly impacts individuals' decision-making and health through the subjective feeling it induces, known as a "scarcity mindset." Particularly, the feeling of scarcity related to money and sleep time is not only widespread but also directly linked to an individual's mental health. **Purpose:** This study aims to delve into the relationship between the feeling of scarcity and mental health, with a specific focus on the relationship between the feeling of money scarcity or sleep time scarcity and mental health, as well as the role of sleep quality or life satisfaction in this relationship. **Procedure:** We determined the sampling quotas based on the population and economic development levels of each province in the "China Statistical Yearbook (2021)" (National Bureau of Statistics, 2021). Participants were selected using the Probability Proportional to Size (PPS) sampling method. Data was collected by distributing online questionnaires to participants, and the relationships between the main variables were explored using structural equation modeling. **Results:** 1. In China, the feeling of sleep time scarcity is stronger than the feeling of money scarcity among the public. 2. The feeling of money scarcity is positively correlated with depression and anxiety, whereas the feeling of sleep time scarcity is only positively correlated with depression. 3. The feeling of scarcity mainly leads to depression and self-denial through reducing life satisfaction, and it leads to anxiety through reducing sleep quality. **Conclusion:** The feeling of scarcity in money and sleep time is related to different dimensions of mental health. Therefore, reasonably planning financial allocation and ensuring an adequate amount of sleep can reduce the sense of scarcity, thereby improving mental health. Additionally, improving sleep quality and increasing life satisfaction can alleviate the adverse effects of scarcity on mental health.

KEYWORDS

Scarcity; sleep quality; life satisfaction; mental health; multiple mediators

Introduction

Currently, China is facing financial risk issues, with interconnections between real estate, investment, land acquisition, and government debt, resulting in a combination of three risk factors that have a certain impact on short-term economic development. Additionally, many large companies have initiated a wave of "layoffs," leading to a significant impact on the mental and physical health of a large number of young people. Furthermore, China's economic transformation has led to a redefinition of social classes, with some individuals quickly becoming wealthy while others fall into poverty. These economic instabilities and inequalities deepen people's anxiety and the feeling of scarcity regarding money, prompting many individuals to choose to alleviate money anxiety by extending their working hours. According to data from the "China Labor Statistical Yearbook," the average weekly working hours of urban employed individuals in China have steadily increased from 45.5-h in 2015 to 47.6-h [1], exceeding the legal daily

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8-hour workday and the 44-h workweek system [2]. The extension of working hours directly results in a reduction of individuals' non-working time, giving rise to the feeling of scarcity of time. During non-working hours, sleep time accounts for a significant proportion and competes with leisure time. Since individuals cannot create additional time, they often borrow time from their sleep [3], leading to the feeling of scarcity of sleep time. Therefore, scarcity has become a societal issue that is prevalent in everyday life [4,5]. Among the various feelings of scarcity, the feeling of money scarcity and the feeling of scarcity of time are the most common, and this lack can be both actual and perceived [6]. However, objectively, the lack of money or time does not equate to the feeling of scarcity; the feeling of scarcity is a "mindset" that reflects people's existential anxiety. This study aims to explore the application of the feeling of scarcity in the field of health, focusing specifically on the feeling of money scarcity and the feeling of scarcity of sleep time, as well as the mediating effects of sleep quality and life satisfaction on mental health. By analyzing the relationships between these factors, we aim to reveal the potential impact pathways of the feeling of scarcity on individual mental health, providing a deeper understanding and guidance for promoting healthy lifestyles and improving mental health.

Hypothesis Development

Scarcity of money and scarcity of sleep time

According to the scarcity theory, individuals experience the feeling of scarcity when they perceive a need for more resources than they currently possess [7,8]. The theory of limited resources posits that human attention and cognitive resources are finite [9]. During problem-solving, cognitive activities consume an individual's cognitive resources. If the total cognitive resources required by these activities exceed the individual's available resources, the feeling of scarcity arises. The feeling of scarcity is a "mindset" that influences what people focus on and the trade-offs they make, affecting cognitive processes and the neural mechanisms related to decision-making, and ultimately influencing people's decisions and behaviors [8,10,11]. For individuals, the most prevalent feeling of resource scarcity stems from money and time, and the feeling of money scarcity is the most prevalent and fundamental feeling among low-income groups [8,12]. The feeling of money scarcity is the subjective feeling that individuals feel inadequate about the money resources they have, and it is not only related to income but also to the individual's money management, consumption habits, debt burden, and many other factors. Therefore, based on the viewpoint of scarcity theory, we define "money scarcity" as a feeling that individuals believe that the money resources, they have can hardly satisfy their economic needs. Time is also an important social and health resource [13], and sufficient disposable time can enhance life satisfaction and happiness [14]. In addition to objective time scarcity, we argue that subjective perceptions of time scarcity can likewise have an impact on an individual's behavior and health. This study further focuses on time scarcity in sleep behavior, defining individuals' subjective perception of whether their sleep time is sufficient as "the feeling of sleep time scarcity." It reflects a feeling where individuals believe that the "sleep time they have" cannot meet their "sleep needs." Short sleep duration may not be related to sleep quality, whereas the feeling of sleep scarcity may directly affect the quality of sleep.

Money scarcity and sleep time scarcity

Sleep is an important process of recovery and repair for the body and brain. A good night's sleep can help an individual regain strength and energy, promote the normal functioning of body systems. Research has found that sleep is closely related to cognitive function throughout the entire lifespan [15]. Lifestyle factors, including sleep, are associated with cognitive function and the risk of dementia [16], with approximately 15% of attention deficit disorders possibly being caused by sleep problems [17]. Therefore, improving sleep quality is beneficial for enhancing cognitive function. A study by Irwin et al. demonstrated an interaction between sleep and the immune system, with sleep disorders contributing to inflammatory disorders and major depressive disorder, and inflammatory processes affecting sleep [18]. Sleep can affect various immune functions, and good sleep can reduce the risk of infection in the human body [19]. Thus, good sleep quality contributes to the maintenance of normal functioning of the immune system and thus improves health. Chronic sleep deprivation (e.g., short sleep duration, sleep disorders) can lead to inflammation [20], increasing the prevalence of cardiovascular disease [21–25], diabetes mellitus, and obesity, among others [26,27]. In addition, sleep deprivation can lead to distraction, slow response, and reduced cognitive ability [25,28], and can also lead to increased psychological stress, induce psychological problems such as anxiety and depression [29]. This shows that sleep quality affects not only the physical health of individuals but also their psychological health.

It has been found that time scarcity can affect health by limiting the amount of time available to engage in healthy lifestyles [30–33]. It has also been associated with stress, illness, security, and sleep quality [13,34,35]. Adequate sleep duration does not exactly mean good sleep quality. Because sleep duration is an objective indicator, whereas sleep quality is a subjective indicator, and subjective sleep duration perception is more closely related to sleep quality than objective sleep duration, we hypothesize that subjective perception of sleep duration together with sleep quality will jointly affect the individual's heath status. In addition, the vast majority of current studies have only revealed the negative impact of objective money scarcity (e.g., low-income or low socioeconomic status) on sleep quality [36,37] but have rarely explored the mechanisms by which perceptions of money scarcity affect sleep quality. Therefore, we propose the hypothesis:

H1. Sleep quality plays a mediating role in the relationship between the feeling of scarcity and mental health.

H1a: The feeling of money scarcity reduces sleep quality, leading to depression.

H1b: The feeling of money scarcity reduces sleep quality, leading to anxiety.

H1c: The feeling of money scarcity reduces sleep quality, leading to self-denial.

H1d: The feeling of sleep time scarcity reduces sleep quality, leading to depression.

H1e: The feeling of sleep time scarcity reduces sleep quality, leading to anxiety.

H1f: The feeling of sleep time scarcity reduces sleep quality, leading to self-denial.

Life satisfaction and mental health

The concept of life satisfaction was first proposed by psychologist Ed Diener in 1984, who defined life satisfaction as an individual's overall evaluation of and satisfaction with his or her life [38]. Diener believes that money can increase life satisfaction to a certain extent, but it is not the sole influencing factor [39], factors such as individual personality traits [40], economic status [41], social support [42], and health status [43] can have a significant impact on life satisfaction. In addition, an individual's health status is closely related to life satisfaction. Individuals with poor health conditions are more likely to experience poor work environments compared to healthy people, and negative work conditions are associated with lower life satisfaction [44]. Older adults with good somatic functioning had higher life satisfaction; older adults with better mental health were more satisfied with their lives compared to those with average mental health [45]. At the same time, life satisfaction contributes to an individual's mental health and quality of life [46,47]. In addition, social environments where people's life satisfaction is higher are more likely to achieve stability and harmony and have higher levels of economic development and innovation [48,49].

This shows that life satisfaction is not only related to self-assessed health [50–52] but also closely linked to psychological health [53–57]. Also, specific domains of life satisfaction are associated with specific physical health outcomes, health behaviors, and social factors [58,59]. Studies based on longitudinal data from birth cohorts have demonstrated robust interactions between life satisfaction and mental health [60]. In addition, life satisfaction has been shown to act as a mediating variable in influencing an individual's health behavior choices [61,62] and emotional state [63–66].

Studies have shown that objectively low income or low socioeconomic class can lead to reduced life satisfaction or health status [67–71]. However, we believe that subjective feelings also play an important role. For example, individuals who feel that resources are scarce or that they are in a low socioeconomic class may develop feelings of self-depreciation and doubt about their abilities and sense of worth. This negative self-evaluation may lead to mental health problems, such as anxiety and depression [72], which can reduce well-being [68]. In addition, they may compare themselves to those who have more resources or are in a higher socioeconomic class, further influencing their mental health and sense of happiness [73]. In addition, time scarcity has also been shown to reduce well-being [74] and lead to anxiety and insomnia [34,35]. However, few studies have addressed the mechanism of the effect of sleep time scarcity on mental health, and therefore, we propose the hypothesis:

H2. Life satisfaction plays a mediating role in the relationship between the feeling of scarcity and mental health.

H2a: The feeling of money scarcity reduces life satisfaction, leading to depression.

H2b: The feeling of money scarcity reduces life satisfaction, leading to anxiety.

H2c: The feeling of money scarcity reduces life satisfaction, leading to self-denial.

H2d: The feeling of sleep time scarcity reduces life satisfaction, leading to depression.

H2e: The feeling of sleep time scarcity reduces life satisfaction, leading to anxiety.

H2f: The feeling of sleep time scarcity reduces life satisfaction, leading to self-denial.

In summary, the theoretical model of this study is shown in Fig. 1.

Materials and Methods

Data sources

The data used in this study came from an online survey on "Sleep Status of Chinese Residents" conducted in November 2021 by the Institute of Sociology, Chinese Academy of Social Sciences (CASS). The Probability Proportional to Size (PPS) sampling method was used to accurately determine the sampling quota for each province, taking into account the population size and economic development of each province as provided in the China Statistical Yearbook (2021) (National Bureau of Statistics, 2021). The survey samples were all between the ages of 18 and 71 and were drawn from 27 provinces, autonomous regions, and municipalities directly under the central government, except

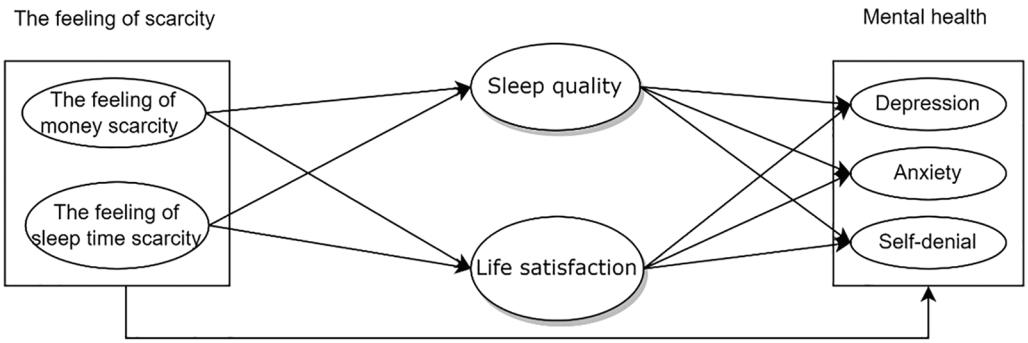

FIGURE 1. Theoretical model.

Tibet, Ningxia, Qinghai, Hainan, Hong Kong, Macao, and Taiwan. After excluding invalid questionnaires such as omitted answers, wrong answers, and random answers, the final sample was 4194 valid samples. The average age of the samples was 29.16 ± 9.33 years old, of which 2421 (57.73%) were male and 1773 (42.27%) were female. Although the exclusion of invalid questionnaires resulted in a slight imbalance in the male-female ratio in the sample data, in order to maintain and respect the authenticity of the measurement results, we retained all eligible samples after excluding invalid questionnaires. For detailed information on the samples, please refer to Table 1.

TABLE 1

Sample characteristics (N = 4194)

	Variables	N	%
Gender	Male	2421	57.73
	Female	1773	42.27
Educational level	Junior high school graduation and below	139	3.32
	High school	237	5.65
	Junior college/vocational high school/technical school	329	7.84
	College	969	23.10
	Undergraduate	2116	50.45
	Graduate student and above	404	9.63
Marital status	Single	2171	51.76
	Married for the first time with spouse	1777	42.37
	Remarried with spouse	70	1.67
	Divorced	59	1.41
	Widowed	16	0.38
	Cohabitation	75	1.79
	Other	26	0.62
Status of support for the elderly	None	1259	30.02
	One	490	11.68
	Two	1577	37.60
	Three	290	6.91
	Four	529	12.61
	Five or more	49	1.17
Residence	City	2975	70.93
	Townships	751	17.91
	Rural	468	11.16
Monthly household income	Less than 2000 RMB	213	5.08
	2001 RMB–6000 RMB	519	12.37
	6001 RMB–10,000 RMB	691	16.48
	10,000 RMB–15,000 RMB	786	18.74
	15,000 RMB–30,000 RMB	855	20.39
	30,000 RMB–45,000 RMB	335	7.99
	45,000 RMB–60,000 RMB	181	4.32
	60,000 RMB–100,000 RMB	252	6.01
	More than 100,000 RMB	362	
Employment status	Full-time student	1006	23.99
	Never worked	71	1.69
	Working	2581	61.54
	Leaving home	93	2.22
	Reapplying for a new job after leaving the workforce	38	0.91
	Resigned, retired or laid off	44	1.05
	Irregular job	213	5.08
	Unemployed	40	0.95
	Farming	24	0.57
	Working while farming	30	0.72
	Others	54	1.29
Subjective socioeconomic status	Lower	39	1.34
	Lower-middle	441	15.21
	Middle	1421	49
	Upper-middle	766	26.41
	Upper	233	8.03

Variables

Mental health

The dependent variable in this study was mental health, which was measured using the General Health Questionnaire GHQ-20 revised by Li et al. [75]. The questionnaire consists of 20 questions that are categorized into three dimensions: depression, anxiety, and self-affirmation. Each question has two options, "Yes" and "No", where 0 = "No" and 1 = "Yes". Scores were calculated by summing the scores of the items. The depression dimension consists of 6 questions, so the depression score ranges from 0 to 6, with higher scores indicating higher levels of depression. The anxiety dimension consists of 5 questions, so the anxiety score ranges from 0 to 5, with higher scores indicating higher levels of anxiety. The self-affirmation dimension consists of 9 questions, so the self-affirmation score ranges from 0 to 9. For ease of interpretation, the self-affirmation dimension was reverse coded to the self-denial dimension, where higher scores indicate higher levels of self-denial. Therefore, the higher the total scores for depression, anxiety, and self-denial dimensions, the more severe the psychological issues. It has been validated that the questionnaire and its depression, anxiety, and self-denial dimensions have Cronbach's α coefficients of 0.823, 0.781, 0.857, and 0.809, respectively, indicating good internal consistency. In this study, the scale demonstrated good model fit (χ^2 = 1453.987, df = 148, p < 0.001, CFI = 0.964, TLI = 0.954, RMSEA = 0.046, SRMR = 0.046). In this study, depression, anxiety, and self-denial are considered continuous variables.

The feeling of money scarcity and the feeling of sleep time scarcity

The independent variables in this study were the feeling of money scarcity and the feeling of sleep time scarcity. In

particular, the feeling of money scarcity was measured with the question "Do you have enough money?" 1 question item, where 1 = "completely enough", 2 = "mostly enough", 3 = "enough (generally)", 4 = "rarely enough", 5 = "not enough at all", the score is between 1 and 5, the higher the score, the stronger the feeling of money scarcity; the feeling of sleep time scarcity is measured by the question "In the past month, do you think you slept long enough?" 1 question item, where 1 = "too much", 2 = "a little too much", 3 = "just right", 4 = "not quite enough", and 5 = "not enough at all", with scores ranging from 1 to 5, with higher scores indicating a greater feeling of sleep time scarcity. Both were considered as continuous variables in this study.

Sleep quality

A mediating variable in this study was sleep quality, which was measured using the Chinese version of the Pittsburgh Sleep Quality Index scale. The Pittsburgh Sleep Quality Index (PSQI) was proposed by Buysse et al. in 1989 [76], translated into Chinese by Liu Xianchen et al. in 1996, and initially validated for its measurement reliability and validity. Later, because of its simplicity and ease of use, as well as its reliability and validity in different populations, which have been adequately tested, it has become one of the most frequently used scales in sleep quality research studies. The PSQI is suitable for the investigation of the sleep status of the general population in the last month. The self-assessment part of the scale includes seven factors: subjective sleep quality, sleep latency, sleep persistence, habitual sleep efficiency, sleep disorders, use of sleep medication, and daytime dysfunction, each factor score ranges from 0 to 3, with higher scores indicating poorer sleep quality. The total score of the Pittsburgh Sleep Quality Index ranges from 0 to 21, with higher scores indicating poorer sleep quality. It has been validated that the questionnaire has a Cronbach's α coefficient of 0.726, indicating excellent internal consistency. In this study, the scale demonstrated good model fit (χ^2 = 125.82, df = 8, p < 0.001, CFI = 0.981, TLI = 0.949, RMSEA = 0.059, SRMR = 0.023). In this study, sleep quality was considered as a continuous variable.

Life satisfaction

In this study, another mediating variable is life satisfaction, using the life satisfaction scale proposed by Diener [77], which consists of 5 items, expressed as "My life is roughly in line with my ideals." "My life situation is very satisfactory." "I am satisfied with my life." "Until now, I have been able to get the important things I would like to have in life." "Even if life could be started over, there is nothing I would want to change." These 5 question items were measured where 1 = "strongly disagree", 2 = "disagree", 3 = "not agree", 4 = "neutral ", 5 = "agree more", 6 = "agree", and 7 = "strongly agree", and final life satisfaction score was taken as the average of the five questions, with scores ranging from 1 to 7. average score, which ranges from 1 to 7, with higher scores indicating higher life satisfaction. The Cronbach's α coefficient of the questionnaire was verified to be 0.912, which has good internal consistency. In this study, the scale demonstrated good model fit (c2 = 196.059, df = 5, p < 0.001, CFI = 0.987, TLI = 0.975, RMSEA = 0.095, SRMR = 0.019). In this study, life satisfaction is considered as a continuous variable.

Data analysis

Utilize SPSS 26 software to conduct descriptive statistical analysis and correlation analysis on the feeling of money scarcity, the feeling of sleep time scarcity, life satisfaction, sleep quality, depression, anxiety, and self-denial among individuals. Employ Amos 28 software to conduct path analysis and mediating effect testing on the relationships between these seven main variables. The highest level of significance for this study was p < 0.05.

Results

Descriptive statistical analysis and correlation analysis of the main variables

As seen in Table 2, the mean value of people's sense of money scarcity is 3.021, with scores between "general" (=3) and "seldom enough" (=4), which indicates that people generally feel that their money is not quite enough, i.e., there is a slight sense of money scarcity. The mean value of people's sense of scarcity of sleep time is 3.621, with scores between "just enough" (=3) and "not quite enough" (=4), which indicates that people generally feel that their sleep time is not quite enough, i.e., a stronger sense of scarcity of sleep time. The average PSQI score for the public is 6.373, which is below the median value, which indicates that people generally perceive their sleep quality to be good; and the mean value of people's life satisfaction is 4.324 (SD = 0.684), with scores ranging between "neutral" (=4) and "agree more" (=5), indicating that people's life satisfaction is slightly above average; the scores for depression, anxiety, and self-denial among the public are all below the median for these dimensions. This suggests that people's levels of depression, anxiety, and self-denial are relatively low, indicating a good mental health status.

In addition, the feeling of money scarcity and the feeling of sleep time scarcity are significantly positively correlated with depression, anxiety, and self-denial, indicating that the stronger the feeling of money scarcity or sleep time scarcity, the higher the levels of depression, anxiety, and self-denial. Specifically, the strongest positive correlation is between the feeling of money scarcity and depression, followed by anxiety and self-denial; while the feeling of sleep time scarcity shows the strongest positive correlation with anxiety, followed by depression and self-denial. The Pittsburgh Sleep Quality Index is significantly positively correlated with depression, anxiety, and self-denial, indicating that the poorer the sleep quality, the higher the levels of depression, anxiety, and self-denial. Specifically, the strongest positive correlation is between PSQI and anxiety, followed by depression and self-denial. Life satisfaction is significantly negatively correlated with depression, anxiety, and self-denial, indicating that the lower the life satisfaction, the higher the levels of depression, anxiety, and self-denial. Specifically, the strongest negative correlation is between life satisfaction and self-denial, followed by depression and anxiety. The feeling of money scarcity and the feeling of

TABLE 2

Descriptive statistical analysis and correlation analysis of the main variables

Variables	Mean	SD	1	2	3	4	5	6	7
1 The feeling of money scarcity	3.021	1.036	1						
2 The feeling of sleep time scarcity	3.621	0.747	0.261***	1					
3 PSQI	6.373	3.165	0.211***	0.303***	1				
4 Life satisfaction	4.355	1.296	−0.527***	−0.275***	−0.316***	1			
5 Depression	1.290	1.661	0.313***	0.169***	0.305***	−0.444***	1		
6 Anxiety	1.899	1.923	0.287***	0.259***	0.428***	−0.359***	0.488***	1	
7 Self-denial	3.328	2.826	0.270***	0.156***	0.243***	−0.450***	0.384***	0.208**	1

Note: *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

sleep time scarcity are both significantly negatively correlated with life satisfaction, meaning that the weaker the feeling of money scarcity or sleep time scarcity, the higher the life satisfaction. Specifically, the feeling of money scarcity shows a stronger negative correlation with life satisfaction. PSQI is significantly negatively correlated with life satisfaction, indicating that the better the sleep quality, the higher the life satisfaction. The feeling of money scarcity and the feeling of sleep time scarcity are both significantly positively correlated with PSQI, meaning that the weaker the feeling of money scarcity or sleep time scarcity, the better the sleep quality. Specifically, the feeling of sleep time scarcity shows a stronger positive correlation with PSQI. The feeling of money scarcity is significantly positively correlated with the feeling of sleep time scarcity, indicating that the stronger the feeling of money scarcity, the stronger the feeling of sleep time scarcity.

Path analysis

As shown in Table 3, we have tested the fit of our theoretical model in this study. Due to the large sample size, the CMID/DF is slightly higher but still less than 10. Additionally, considering that other indicator values are relatively high, it can be concluded that the fit of the model is good.

TABLE 3

Model fit indicator values

Indicators	Values	Standard values	Conclusions
CMID/DF	9.429	<3 Excellent; <5 Acceptable	–
GFI	0.935	>0.8 Acceptable; >0.9 Good fit	Good fit
AGFI	0.922	>0.8 Acceptable; >0.9 Good fit	Good fit
CFI	0.936	>0.9	Good fit
TLI (NNFI)	0.927	>0.9	Good fit
RMSEA	0.045	<0.08 Excellent; <0.1 Acceptable	Excellent
SRMR	0.051	<0.08	Good fit

The results of the standardized path analysis shown in Table 4 indicate that, except for the non-significant direct effects of the feeling of money scarcity on self-denial, the feeling of sleep time scarcity on anxiety, and self-denial, the direct effects of the other paths are all significant. The model can explain 31.2% of the variance in life satisfaction, with the direct effect of the feeling of money scarcity on life satisfaction ($\beta = -0.5$, $p < 0.001$) being greater than the direct effect of the feeling of sleep time scarcity on life satisfaction ($\beta = -0.15$, $p < 0.001$); the model can explain 21.5% of the variance in PSQI, with the direct effect of the feeling of sleep time scarcity on PSQI ($\beta = 0.346$, $p < 0.001$) being greater than the direct effect of the feeling of money scarcity on PSQI ($\beta = 0.232$, $p < 0.001$); the model can explain 29.9% of the variance in the depression dimension, with the largest direct effect being life satisfaction on depression ($\beta = -0.372$, $p < 0.001$) and the smallest being the feeling of sleep time scarcity on depression ($\beta = -0.043$, $p < 0.01$); the model can explain 40.2% of the variance in the anxiety dimension, with the largest direct effect being PSQI on anxiety ($\beta = 0.524$, $p < 0.001$) and the smallest being the feeling of money scarcity on anxiety ($\beta = 0.068$, $p < 0.001$); the model can explain 22.2% of the variance in the self-denial dimension, with the largest direct effect being life satisfaction on self-denial ($\beta = -0.431$, $p < 0.001$) and the smallest being PSQI on self-denial ($\beta = -0.075$, $p < 0.001$).

Testing for multiple mediation effects

As shown in Table 5, the total effect of the feeling of money scarcity on depression is 0.308, with an indirect effect of 0.241, accounting for 78.2% of the total effect. Specifically, the indirect effect of the feeling of money scarcity on depression through PSQI is 0.054 (95% CI = [0.041, 0.071]); through life satisfaction, it is 0.186 (95% CI = [0.161, 0.210]), and the difference between the two is significant. This indicates that in this model, the effect of the feeling of money scarcity on depression is mainly achieved through the mediating effect of life satisfaction. The total effect of the feeling of sleep time scarcity on depression is 0.094, with an indirect effect of 0.137 and a direct effect of −0.043. Specifically, the indirect effect of the feeling of sleep time scarcity on depression through PSQI is 0.081 (95% CI = [0.062, 0.103]); through life satisfaction, it is 0.056 (95% CI

TABLE 4

Results of the model's path analysis

Dependent variable		Independent variable	Estimate	S.E.	C.R.	*p*	Std.estimate	R^2
Life satisfaction	<—	The feeling of money scarcity	−0.547	0.018	−30.409	***	−0.500	0.312
Life satisfaction	<—	The feeling of sleep time scarcity	−0.228	0.022	−10.575	***	−0.150	
PSQI	<—	The feeling of money scarcity	0.106	0.008	13.463	***	0.232	0.215
PSQI	<—	The feeling of sleep time scarcity	0.220	0.011	19.668	***	0.346	
Depression	<—	The feeling of money scarcity	0.017	0.004	3.746	***	0.067	0.299
Depression	<—	The feeling of sleep time scarcity	−0.015	0.006	−2.594	0.009	−0.043	
Depression	<—	PSQI	0.128	0.012	10.62	***	0.235	
Depression	<—	Life satisfaction	−0.085	0.005	−16.869	***	−0.372	
Anxiety	<—	The feeling of money scarcity	0.021	0.005	3.938	***	0.068	0.402
Anxiety	<—	The feeling of sleep time scarcity	0.004	0.007	0.661	0.509	0.010	
Anxiety	<—	PSQI	0.360	0.017	21.118	***	0.524	
Anxiety	<—	Life satisfaction	−0.039	0.006	−6.754	***	−0.136	
Self-Denial	<—	The feeling of money scarcity	0	0.005	−0.015	0.988	0	0.222
Self-Denial	<—	The feeling of sleep time scarcity	0.001	0.005	0.114	0.91	0.002	
Self-Denial	<—	PSQI	0.048	0.014	3.412	***	0.075	
Self-Denial	<—	Life satisfaction	−0.115	0.006	−18.079	***	−0.431	

Note: $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

TABLE 5

Testing for multiple mediation effects

Dependent variables	Mediating variables	Independent variables	ID	Std. estimate	95% CILL	95% CIUL	Conclusion
Depression	Sleep quality	The feeling of money scarcity	M1	0.054	0.041	0.071	H1a is supported, partial mediation.
	Life satisfaction	The feeling of money scarcity	M2	0.186	0.161	0.210	H2a is supported, partial mediation.
			M1+M2	0.241	0.216	0.264	
			M1–M2	−0.132	−0.164	−0.097	Significant difference
	Sleep quality	The feeling of sleep time scarcity	M3	0.081	0.062	0.103	H1d is supported, partial mediation.
	Life satisfaction	The feeling of sleep time scarcity	M4	0.056	0.044	0.069	H2d is supported, partial mediation.
			M3+M4	0.137	0.116	0.160	
			M3–M4	0.025	−0.001	0.050	Nonsignificant difference
Anxiety	Sleep quality	The feeling of money scarcity	M5	0.122	0.100	0.142	H1b is supported, partial mediation.
	Life satisfaction	The feeling of money scarcity	M6	0.068	0.047	0.090	H2b is supported, partial mediation.
			M5+M6	0.190	0.164	0.215	
			M5–M6	0.053	0.020	0.086	Significant difference
	Sleep quality	The feeling of sleep time scarcity	M7	0.182	0.154	0.209	H1e is supported, full mediation.
	Life satisfaction	The feeling of sleep time scarcity	M8	0.020	0.013	0.029	H2e is supported, full mediation.
			M7+M8	0.202	0.173	0.229	

(Continued)

Table 5 (continued)

Dependent variables	Mediating variables	Independent variables	ID	Std. estimate	95% CILL	95% CIUL	Conclusion
			M7–M8	0.161	0.133	0.189	Significant difference
Self-Denial	Sleep quality	The feeling of money scarcity	M9	0.017	0.008	0.03	H1c is supported, full mediation.
	Life satisfaction	The feeling of money scarcity	M10	0.216	0.191	0.242	H2c is supported, full mediation.
			M9+M10	0.233	0.208	0.257	
			M9–M10	−0.037	−0.056	−0.02	Significant difference
	Sleep quality	The feeling of sleep time scarcity	M11	0.026	0.011	0.045	H1f is supported, full mediation.
	Life satisfaction	The feeling of sleep time scarcity	M12	0.065	0.052	0.078	H2f is supported, full mediation.
			M11 +M12	0.091	0.073	0.113	
			M11–M12	−0.039	−0.062	−0.014	Significant difference

= [0.044-0.069]), and the difference between the two is not significant. This indicates that in the effect of the feeling of sleep time scarcity on depression, the mediating effects of PSQI and life satisfaction are essentially consistent.

The total effect of the feeling of money scarcity on anxiety is 0.258, with an indirect effect of 0.190, accounting for 73.6% of the total effect. Specifically, the indirect effect of the feeling of money scarcity on anxiety through PSQI is 0.122 (95% CI = [0.100, 0.142]); through life satisfaction, it is 0.068 (95% CI = [0.047, 0.090]), and the difference between the two is significant. This indicates that in this model, the effect of the feeling of money scarcity on anxiety is mainly achieved through the mediating effect of PSQI. The total effect of the feeling of sleep time scarcity on anxiety is 0.212, with an indirect effect of 0.202 and a non-significant direct effect. Specifically, the indirect effect of the feeling of sleep time scarcity on anxiety through PSQI is 0.182 (95% CI = [0.154, 0.209]); through life satisfaction, it is 0.020 (95% CI = [0.013, 0.029]), and the difference between the two is significant. This indicates that in this model, the effect of the feeling of sleep time scarcity on anxiety is mainly achieved through the mediating effect of PSQI.

The total effect of the feeling of money scarcity on self-denial is 0.233, with a direct effect of 0. Specifically, the indirect effect of the feeling of money scarcity on self-denial through PSQI is 0.017 (95% CI = [0.008, 0.030]); through life satisfaction, it is 0.216 (95% CI = [0.191, 0.242]), and the difference between the two is significant. This indicates that in this model, the effect of the feeling of money scarcity on self-denial is mainly achieved through the mediating effect of life satisfaction. The total effect of the feeling of sleep time scarcity on self-denial is 0.092, with an indirect effect of 0.091 and a non-significant direct effect. Specifically, the indirect effect of the feeling of sleep time scarcity on self-denial through PSQI is 0.026 (95% CI = [0.011, 0.045]); through life satisfaction, it is 0.065 (95% CI = [0.052, 0.078]), and the difference between the two is significant. This indicates that in this model, the effect of the feeling of sleep time scarcity on self-denial is mainly achieved through the mediating effect of life satisfaction.

The theoretical model diagram after testing is shown in Fig. 2.

Discussion

Chinese people have a weak sense of money scarcity but a strong sense of sleep time scarcity; sleep quality is generally good, life satisfaction is average, and mental health is good

First of all, people generally feel that they do not have too much money, and there is a slight sense of money scarcity. Although China will have eliminated absolute poverty by 2021, the shadow of poverty may not have dissipated. Its most common manifestation today is a sense of scarcity. According to the theory of relative deprivation, increasing socioeconomic inequality may cause more people to feel disadvantaged relative to the wealthier segments of society, and people tend to compare their situation with others or desired standards, creating a sense of psychological disadvantage and resource scarcity [78]. In addition, as the cost of living rises, especially in key areas such as education, health care, and housing, a portion of the middle-income level may also feel financial stress and a sense of monetary scarcity. The problem of the sense of money scarcity reflected in our findings is not acute due to the fact that China's economy has shown great resilience and solidity in the face of the complex international and domestic situation. Especially after the epidemic, China's economy has shown a good trend of rapid recovery, which, to a certain extent, is conducive to guaranteeing people's basic living needs, stabilizing the job market, and maintaining the overall stability of society.

Secondly, people have a strong sense of scarcity of sleep time. In a competitive social environment, individuals compete and struggle for higher social status and economic benefits, leading to increasing pressure in work and life and the phenomenon of "involution". In the face of intense work

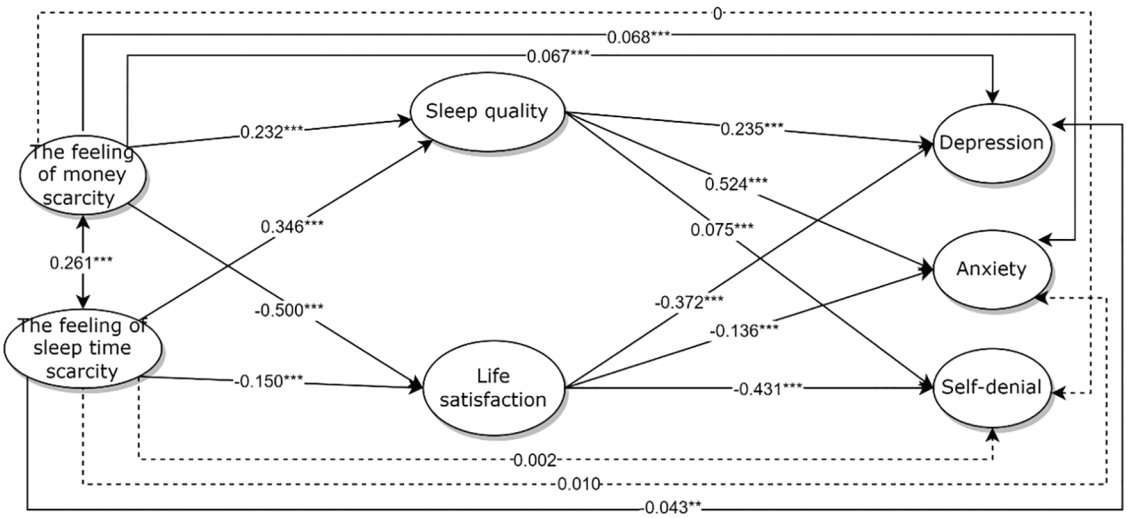

FIGURE 2. Model diagram of multiple mediating effects. Notes: Numbers on paths indicate standardized regression coefficients; arrows indicate affective relationships and double arrows indicate correlations; solid lines indicate significant paths, while dashed lines indicate non-significant paths. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

tasks and deadlines, people often need to work overtime, and this high-intensity work pressure not only leads to anxiety and other psychological problems but also disrupts the normal routine of work and rest, making it difficult for people to get enough sleep.

Third, the average score of PSQI is low, indicating that people have good sleep quality. It is well known that unhealthy lifestyles and excessive use of electronic devices (especially before bedtime) are two major factors affecting sleep quality [79–82]. Better sleep quality may be due to the fact that people have begun to focus on cultivating good sleep habits in their daily lives, such as setting regular work and rest schedules and avoiding excessive use of electronic devices; they may also have optimized their sleep environment, such as creating a quiet and comfortable bedroom environment to promote better sleep. This is a positive result that can reflect people's attention to their own sleep health and initiative to improve it. The next study should pay more attention to groups with average to low sleep quality and special groups and continue to explore the factors affecting their sleep quality, causes of sleep problems, and coping strategies.

Fourth, people's life satisfaction is average. Life satisfaction refers to people's overall comprehensive evaluation of their own lives [83] and is influenced by a variety of factors such as personal values, expectations, experiences, and environments. At the societal level, promoting economic growth, protecting and promoting social trust, and reducing income inequality are all conducive to improving life satisfaction [84,85]; at the individual level, positive social behaviors and social connections [86], personal life events, and social support [43] are all conducive to improving life satisfaction. Thus, improvements in life satisfaction require both individual and social facilitation. Implementing effective interventions at the individual level [87], the group level and the societal level is and is necessary [88,89]. Fifth, the mental health of the population is good. Health is a state of "complete physical, mental, and social well-being, not merely the absence of disease or infirmity" [90]. Further, positive health predicts increased longevity (corrected for quality of life), lower health costs, better mental health during aging, and better prognosis for disease coming to the forefront [91]. Our findings reflect the fact that most people are able to effectively maintain a positive state of mind. This state of mental health may be related to the improvement of the social environment, the promotion of mental health education, and the importance people place on mental health.

The stronger the feeling of money scarcity, the higher the levels of depression and anxiety; the stronger the feeling of sleep time scarcity, the higher the level of depression

The feeling of money scarcity or sleep time scarcity is associated with different dimensions of mental health issues, which is consistent with previous research [34,35,74,75]. Money and time represent different health resources that are not interchangeable, but having both amplifies the effects on health [7]. Scarcity is a pervasive real-life psychological phenomenon in which individuals feel a scarcity of money or time regardless of their economic status. The feeling of scarcity affects the way people allocate their attention, causing them to pay more attention to the problems they face in the present but, at the same time, neglecting the problems of the future [11]. This behavioral phenomenon is known as the "pipe dream effect", which causes the vicious circle of "scarcity-irrational decision-making-scarcity", making it more difficult for individuals to get rid of the scarcity state, and thus falling into a downward spiral in a dilemma. The individual will be trapped in a downward spiral. Meanwhile, long-term exposure to resource scarcity affects individuals' willingness to delay gratification, orientation toward others, self-esteem, and materialism, and even if resources become abundant, the negative consequences of resource scarcity will have a long-term impact on individuals [6,92,93]. In addition, cognitive consistency theory suggests that individuals tend to maintain consistency by adjusting their perceptions, even if this means changing their attitudes, beliefs, or behaviors.

Thus, individuals' feelings, attitudes, and thoughts play a decisive role in their behavior [94], i.e., once an individual subjectively identifies himself/herself as a "scarce" resource, he/she will adjust his/her attitudes, beliefs, or values to be consistent with this "scarce" cognitive element, in any state. "This will seriously affect and limit the survival and development of the individual. Therefore, understanding and managing the sense of scarcity is crucial to improving an individual's mental health and quality of life, for example, by developing rational time management and financial planning and by seeking external support and help to mitigate the negative impact of scarcity on mental health.

The feeling of scarcity can lower sleep quality or life satisfaction, leading to depression, anxiety, and self-denial, thereby affecting mental health

Firstly, the effect of the feeling of money scarcity on depression is mainly achieved through the mediating effect of life satisfaction, while in the pathway of the feeling of sleep time scarcity's effect on depression, the mediating effects of PSQI and life satisfaction are largely consistent. In the perspective of cultural theory, money is not just a neutral medium for transactions; it is also full of symbolic meanings and an important indicator of individual or family social status. In many cultures, the amount of wealth is often linked to personal success and social status [95], where individuals with greater wealth may be seen as more influential and respected. Therefore, money becomes a means to display and reinforce social status. Additionally, how individuals use and spend money reflects their values, tastes, and lifestyles [96,97]. Thus, compared to the feeling of sleep time scarcity, the feeling of money scarcity may touch upon an individual's sense of survival security, control over life, and social identity, thereby having a more direct and stronger impact on life satisfaction.

Furthermore, the effects of the feeling of money scarcity and the feeling of sleep time scarcity on anxiety are mainly achieved through the mediating effect of PSQI. Individuals under greater economic pressure are more likely to experience sleep problems such as insomnia and decreased sleep quality, which can lead to anxiety. Moreover, as the pace of society accelerates, people face increasing life stress, resulting in reduced sleep time. Sleep time scarcity can cause individuals to feel fatigued and have reduced concentration during the day, leading to anxiety. This conclusion helps us better understand the mechanisms behind anxiety and provides insights for its prevention and alleviation. In daily life, it is important to pay attention to personal money and time management, ensure an adequate amount of sleep, and maintain psychological well-being.

Lastly, the effects of the feeling of money scarcity and the feeling of sleep time scarcity on self-denial are mainly achieved through the mediating effect of life satisfaction. The feeling of money scarcity not only leads individuals to worry about their quality of life but also can create feelings of inferiority in interpersonal interactions, leading to social barriers that lower life satisfaction. Additionally, the feeling of money scarcity can make individuals overly focused on material wealth, neglecting other aspects of life pursuits, which can result in decreased life satisfaction. This decline in life satisfaction may cause individuals to doubt their abilities and worth, leading to self-denial. On the other hand, the feeling of sleep time scarcity can result in physical and mental exhaustion, as well as emotional fluctuations, impacting an individual's cognitive and emotional regulation abilities. This state of fatigue and instability can lead individuals to question their abilities and worth, affecting their social skills and relationships, ultimately reducing life satisfaction and triggering self-denial.

Limitations and Prospects

Although the relationship between the feeling of scarcity and psychological well-being has been widely confirmed, this study represents a novel attempt to explore the mechanisms underlying this relationship. On one hand, introducing life satisfaction as a mediating variable is an innovative approach; on the other hand, integrating the scarcity perspective into the study of sleep behavior in the health behavior domain, in line with current realities, validates the impact mechanism of the feeling of sleep time scarcity on psychological well-being. This not only enriches the related research on time scarcity but also broadens the scope of sleep research, facilitating innovative sleep intervention measures and approaches. However, this study also has some limitations: firstly, the data used in the study are all based on self-reporting by participants, which may introduce response bias affecting the accuracy of the results; secondly, due to the cross-sectional nature of the data used in the study, it is not possible to conclusively infer causality between the feeling of scarcity and psychological well-being; thirdly, this study is based on measuring the feeling of money scarcity and the feeling of sleep time scarcity within the social and cultural context of China, and the results may not necessarily be generalizable to other cultural backgrounds.

In conclusion, there exists a complex relationship between sleep quality, life satisfaction, and psychological well-being. The results of this study provide only a partial understanding of the relationship between the three. In future research, it is suggested to: firstly, use experimental methods to collect objective indicators of variables to enhance result accuracy; secondly, measure the samples at multiple time points to obtain longitudinal data for inferring causal relationships between variables; thirdly, consider validating results in different cultural contexts or introducing other relevant variables or mediating variables to construct models for in-depth exploration of the impact mechanisms of different types of scarcity on individual physical and mental health; fourthly, introduce demographic characteristics such as gender, age, education level, household income, and socioeconomic status as moderating variables to examine differences in the types of scarcity among different groups.

Conclusion

This study, through empirical research, has found that the stronger the feeling of money scarcity, the higher the levels of depression and anxiety, the stronger the feeling of sleep time scarcity, the higher the level of depression. The feeling

of money scarcity or the feeling of sleep time scarcity will both lower sleep quality or life satisfaction, leading to depression, anxiety, and self-denial, impacting mental health. We have not only confirmed the correlation between the feeling of money scarcity and the feeling of sleep time scarcity with different dimensions of mental health but also revealed the potential impact pathways of scarcity on individual mental health dimensions. This provides insight and guidance for promoting healthy lifestyles and improving mental health. Therefore, under objectively feasible conditions, it is important to plan finances and time reasonably, reduce the feeling of scarcity mentality, cultivate an optimistic and positive attitude towards life, be content, live in the present, and avoid falling into the "scarcity trap." Furthermore, improving sleep quality and life satisfaction can reduce the adverse effects of the feeling of scarcity on mental health.

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Availability of Data and Materials: The data are now confidential and for internal use only, but they will be shared with the public soon. To know more information about the data, please refer to the Chinese Social Survey (http://css.cssn.cn) conducted by the same institution. Both surveys used the same sampling framework and some of their questions were the same.

Ethics Approval: The study was approved by the Academic Committee of the Institute of Sociology, Chinese Academy of Social Sciences (no IRB number). All participants signed the informed consent in this study.

Conflicts of Interest: The authors declare that they have no conflicts of interest to report regarding the present study.

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