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Research on the Paradox of Staying Up Late and Its Consumption Transformation Mechanism

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Abstract: The phenomenon of staying up late is common, but the fracture mechanism between health cognition and sleep behaviour and its impact on the demand for intelligent sleep-aid products are still lacking empirical verification. This study takes 603 resident questionnaires from Zhengzhou City as a sample, and uses structural equation model and hierarchical regression analysis to test the paradox of health knowledge, trust and behaviour and its transformation path to purchase willingness. The results found that the respondents' health cognition and belief level is relatively high, but the difficulty of behavioural execution is prominent, showing the characteristics of "knowledge, high confidence, low line"; cognition and belief cannot directly reduce the frequency of staying up late, and behavioural execution difficulties are the core variables affecting the frequency of staying up late (β=0.511, p<0.001), and in recognition It plays an intermediary role between knowledge and the frequency of staying up late. Further analysis shows that behavioural execution difficulties indirectly promote the willingness to buy through health anxiety (indirect effect 0.119), which constitutes the transmission path of "difficulty → anxiety → willingness to buy"; perception of usefulness, health willingness to pay and marketing impact are significant drivers of willingness to buy, and health anxiety only plays the initial trigger. Effect, its effect is then absorbed by the above variables. Research shows that the root cause of the dilemma of staying up late lies in execution rather than cognition. The core value of intelligent sleep aid products should be located in reducing the cost of behavioural execution rather than the popularisation of knowledge.

Keywords: Staying Up Late; KAP Paradox; Behavioral Execution Difficulty; Health Anxiety; Purchase Intention

1. Introduction

Staying up late has become a common behaviour of contemporary residents. According to the 2025 *China Sleep Health Survey Report*, the sleep trouble rate of adults in China is as high as 48.5%, among which the use of electronic products before going to bed is an important trigger. It is worth noting that the public's awareness of the dangers of staying up late is constantly improving, but the improvement of behaviour is very limited, showing the prominent contradiction of "knowing easy but difficult to do". This systematic rupture between health cognition and sleep behaviour has constituted a key entry point for understanding contemporary sleep health problems.

This contradiction can be preliminarily explained by the health Knowledge-Attitude-Practice (KAP) model and temporal discounting theory. The KAP model divides behavior change into three stages: knowledge acquisition, attitude formation, and practice implementation. However, numerous studies have shown that the transformation from cognition to behavior is not linear. In the context of staying up late, temporal discounting theory explains the psychological mechanism by which individuals prefer immediate gratification over future health gains [1]. Nevertheless, there are two obvious gaps in existing research. First, in the domain of staying up late, the mediating mechanism of "behavioral execution difficulty" in the KAP paradox has not been empirically tested—that is, how cognition and attitude affect the frequency of staying up late through the mediation of behavioral execution difficulty. Existing findings are mostly

at the level of phenomenon description [2]. Second, how behavioral difficulties are transformed into consumption demand for intelligent sleep-aid products has not been systematically revealed. Although preliminary research has confirmed the positive effect of health anxiety on purchase intention [3], the integrated mechanism of this pathway in health product domains remains unexplored. The Chinese sleep economy has exceeded 530 billion yuan [4], and the psychological mechanism of purchase conversion urgently needs to be clarified.

Accordingly, this study aims to answer two questions: whether health cognition and attitude affect the frequency of staying up late through the mediating role of behavioral execution difficulty, and thus whether the KAP paradox holds; and through what pathway behavioral execution difficulty translates into purchase intention for intelligent sleep-aid products. The main innovation of this study is to introduce KAP theory into consumption decision analysis, incorporate health anxiety as a mediating variable, and construct and empirically test the pathway of "behavioral execution difficulty → health anxiety → purchase intention," thereby establishing a link between health behavior research and consumption behavior research.

The remainder of this paper is organized as follows. Section 2 reviews relevant theories and literature and proposes research hypotheses. Section 3 describes the data source and variable measurement. Section 4 uses structural equation modeling and hierarchical regression to test the hypotheses. Section 5 discusses the theoretical contributions and practical implications of the findings.

2. Literature Review

2.1 Health Knowledge-Attitude-Practice Theory and the Staying-Up-Late Behavior Paradox

The health KAP model divides behavior change into three stages: knowledge, attitude, and practice. However, numerous studies indicate a gap between cognition and behavior. The transtheoretical model of behavior change further points out that behavior change undergoes multiple stages, and individuals may experience prolonged stagnation between cognition and action [5]. In the context of staying up late, He et al. conducted a survey among college students in Guangxi and found that sleep KAP levels were significantly correlated with sleep quality, with an obvious gap between cognition and behavior; Yang also revealed that young people exhibit a pattern of "high knowledge, high attitude, low practice." [2,6]. Temporal discounting theory explains the psychological mechanism by which individuals prefer immediate gratification over future health [1]. However, existing studies have not systematically examined the mediating role of behavioral execution difficulty between cognition, attitude, and the frequency of staying up late. Although Sun et al. theoretically proposed the concept of health behavior failure, quantitative verification of the KAP paradox in the domain of staying up late remains lacking [7]. This gap constitutes the core empirical void regarding the KAP paradox in the context of sleep behavior.

2.2 From Health Behavior to Consumption Decision

Behavioral difficulties not only affect health but also may generate demand for external tools. The Nudge theory suggests that reasonable choice architecture can help individuals overcome implementation obstacles, and intelligent sleep-aid products are typical examples of such tools [8]. Research from the JD Research Institute for Consumption and Industrial Development found that health anxiety is an important psychological variable linking cognition and purchase intention for sleep-aid products; individuals become anxious due to worrying about the consequences of staying up late and then seek product help [9]. Ma et al. pointed out in their study on the commercial driving mechanism of health consumption that health anxiety, as an emotional mediating variable, plays a key moderating role in health product consumption decisions, transforming consumers' health concerns into purchase motivation [3]; the Technology Acceptance Model emphasizes that perceived usefulness is the core driver of technology product adoption [10]. Additionally, perceived risk is considered an important inhibitor of consumer decision-making; consum' concerns about product effectiveness, safety, or cost-effectiveness may weaken purchase intention. However, existing literature has not incorporated behavioral execution difficulty, health anxiety, and purchase intention into the same integrated

framework for testing. This study is based on this gap to construct and empirically test the transmission mechanism of "execution difficulty → health anxiety → purchase intention."

3. Theoretical Basis and Research Hypotheses

This study constructs a two-stage integrated model. Stage 1 validates the KAP paradox. Based on KAP theory and temporal discounting theory, it explores the relationships among cognition, attitude, behavioral execution difficulty, and frequency of staying up late. Stage 2 tests the transformation mechanism from behavioral difficulties to consumption decisions. Based on Nudge theory and the Technology Acceptance Model, it analyzes the pathway through which behavioral execution difficulty affects purchase intention via health anxiety, and examines the driving roles of perceived usefulness, willingness to pay for health, and marketing influence.

3.1 Hypotheses on the KAP Paradox

According to KAP theory, cognition and belief are the prerequisites for behavioural change, but the time discount theory shows that individuals tend to be satisfied immediately rather than healthy in the future, which may lead to a break between knowledge and action. Therefore, the direct inhibition effect of cognition and belief on the frequency of staying up late may be limited, and the difficulty of behavioural execution may be a key intermediary variable that connects cognition and the frequency of staying up late. Based on this, the hypothesis is put forward:

H1: Cognition has a positive impact on the difficulty of behaviour execution.

H2: Belief has a negative impact on the difficulty of behavioural execution.

H3: Cognition has a negative impact on the frequency of staying up late.

H4: Belief has a negative impact on the frequency of staying up late.

H5: Difficulty in behaviour execution has a positive impact on the frequency of staying up late.

H6: Behavioural execution difficulties play an intermediary role between cognition and the frequency of staying up late.

3.2 Hypotheses on Purchase Conversion Mechanism

Nudge theory suggests that external tools can help individuals overcome execution barriers [8]. Behavioral execution difficulty may trigger health anxiety about the consequences of staying up late, thereby prompting individuals to seek product help, forming purchase intention. The Technology Acceptance Model emphasizes that perceived usefulness is a core driver of technology adoption; meanwhile [10], willingness to pay for health and marketing influence may also promote purchase conversion. In addition, consumers often have concerns due to perceived risk (*e.g.*, uncertainty about effectiveness, safety issues), which may inhibit purchase intention. Accordingly, the following hypotheses are proposed:

H7: Behavioral execution difficulty has a positive effect on health anxiety.

H8: Health anxiety has a positive effect on purchase intention.

H9: Health anxiety mediates the relationship between behavioral execution difficulty and purchase intention.

H10: Perceived usefulness has a positive effect on purchase intention.

H11: Willingness to pay for health has a positive effect on purchase intention.

H12: Marketing influence has a positive effect on purchase intention.

H13: Perceived risk has a negative effect on purchase intention.

Based on the above hypotheses, this study constructs an integrated theoretical model, as shown in Figure 1.

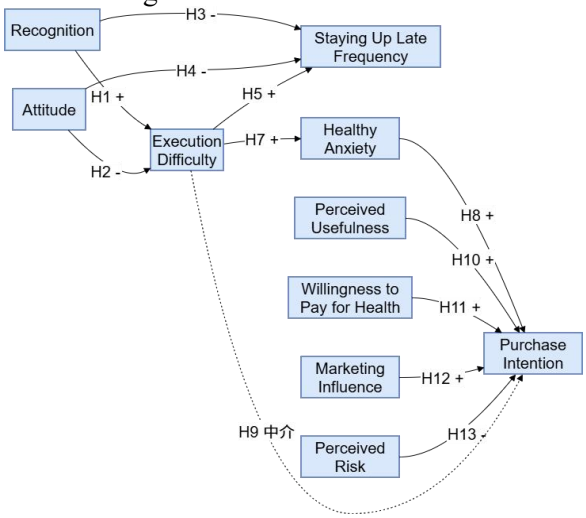

Figure 1. Theoretical Model of the Study

4. Research Design

4.1 Sample and Data Collection

This study targeted residents of six municipal districts of Zhengzhou (Jinshui, Erqi,

Zhongyuan, Guancheng Hui, Huiji, and Shangjie). A combination of stratified sampling and convenience sampling was used: first, sample quotas were allocated according to the proportion of the permanent population in each administrative district; then, questionnaires were distributed through online platforms and offline intercept surveys in each area. A pilot survey collected 106 valid questionnaires, based on which the wording and item design were revised. The formal survey yielded a total of 603 valid questionnaires, meeting the sample size requirements for structural equation modeling. The sample composition was as follows: male 42.8%, female 57.2%; age 18-25 40.0%, age 26-35 20.4%, with young adults (18-35) accounting for 60.4% in total; bachelor's degree or above 62.3%; students and corporate employees were the main occupational groups. This structure is consistent with the characteristics of the young adult population prone to staying up late, indicating good representativeness.

4.2 Variable Measurement

All core constructs were measured using Likert 5-point scales (1 = strongly disagree, 5 = strongly agree). Health cognition (3 items), health attitude (4 items), behavioral execution difficulty (3 items), health anxiety (2 items), perceived usefulness (3 items), willingness to pay for health (4 items), marketing influence (5 items), and purchase intention (5 items) were all based on established scales and revised after the pilot survey. Frequency of staying up late was measured using a single item asking the number of days per week staying up late in the past month. For all scales, Cronbach's α ranged from 0.685 to 0.903. The overall KMO was 0.839, and Bartlett's test of sphericity was significant ($p < 0.001$), indicating good reliability and validity.

4.3 Analysis Methods

Structural equation modeling (SEM) was used to test hypotheses H1-H6. Path coefficients were estimated using AMOS 24.0, and mediation effects were tested using the bootstrap method (5,000 resamples). Hierarchical regression analysis was used to test hypotheses H7-H13, with SPSS 27.0, gradually entering control variables, psychological variables, product perception variables, and marketing variables. The mediation effect of health anxiety (H9) was tested using the bootstrap method. All models were examined for multicollinearity.

5. Empirical Results

5.1 Descriptive Statistics and Preliminary Evidence

Respondents had a mean score of 4.00 (SD = 0.83) on health cognition and 4.04 (SD = 0.77) on health attitude, both at relatively high levels. However, the mean score for behavioral execution difficulty was as high as 3.70 (SD = 1.09), with a large standard deviation indicating significant individual differences. Among respondents, 68.7% reported staying up late for more than three days per week, with those staying up late 5-7 days per week accounting for 39.0% in total. This preliminary pattern reveals an imbalance of "high knowledge, high attitude, low practice," as shown in Figure 2.

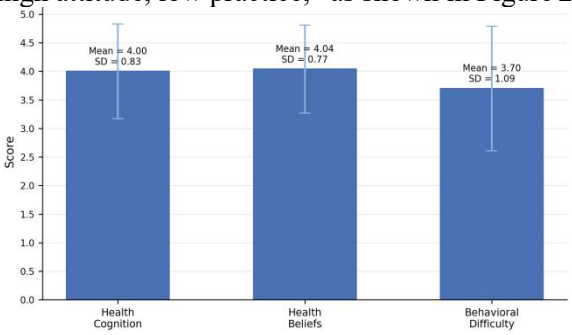

Figure 2. Comparison of Means of the Three KAP Dimensions

5.2 Test of the KAP Paradox

The fit indices of the structural equation model all met good standards: GFI = 0.964, CFI = 0.976, NFI = 0.965, TLI = 0.966, RMR = 0.037, PGFI = 0.569, indicating a good fit between the model and the data.

Path analysis results (see Table 1) showed that cognition had a significant positive effect on behavioral execution difficulty ($\beta = 0.292$, $p = 0.002$). Thus, H1 was supported. This indicates that the higher an individual's health cognition level, the stronger their perception of execution difficulty as "knowing that one should sleep early but finding it hard to do." The effect of attitude on behavioral execution difficulty was not significant ($\beta = -0.112$, $p = 0.235$); thus, H2 was not supported, suggesting that health attitude alone is insufficient to alleviate execution obstacles. The direct effect of cognition on the frequency of staying up late was not significant ($\beta = -0.114$, $p = 0.094$); H3

was not supported. The direct effect of attitude on frequency was also not significant (β = -0.011, p = 0.892); H4 was not supported. These results indicate that the direct inhibitory effects of cognition and attitude on staying-up-late behavior are not significant. Behavioral execution difficulty had a significant positive effect on frequency of staying up late (β = 0.511, p < 0.001); H5 was supported, indicating that execution difficulty is the core factor increasing the frequency of staying up late.

The mediation effect test showed that the indirect effect of cognition on frequency of staying up late through behavioral execution difficulty was 0.149 (Bootstrap 95% CI: [0.037, 0.322]), which did not include 0; thus H6 was supported. This suggests that the higher the cognition level, the more likely individuals perceive execution difficulty, which in turn indirectly increases the frequency of staying up late. Overall, the KAP paradox is verified in the domain of staying up late: cognition and attitude can hardly reduce the frequency of staying up late directly, and behavioral execution difficulty is the key fracture point linking cognition and behavior.

Table 1. Path Coefficients and Hypothesis Testing Results of the Structural Equation Model

Path (Latent Variables → Observed)	Standardized coefficient β	Standard error (S.E.)	Critical ratio (C.R.)	P
BED <--- Cognition	0.292	0.134	3.048	0.002
Frequency <--- Cognition	-0.114	0.135	-1.673	0.094
BED <--- Attitude	-0.112	0.143	-1.189	0.235
Frequency <--- Attitude	-0.011	0.143	-0.135	0.892
Frequency <--- BED	0.511	0.046	12.352	0.000

Note. BED = behavioral execution difficulty; Frequency = frequency of staying up late.

5.3 Test of Purchase Conversion Mechanism

(1) Effect of behavioral execution difficulty on health anxiety

After controlling for gender, age, frequency of staying up late, self-rated health status, and monthly income, behavioral execution difficulty had a significant positive effect on health anxiety (β = 0.212, p < 0.001); H7 was supported. This model had $R^2 = 0.116$, $\Delta R^2 = 0.058$, indicating that execution difficulty independently explains 5.8% of the variance in health anxiety, and the effect of frequency of staying up late became non-significant after adding execution difficulty, suggesting that perceived execution difficulty can trigger health anxiety more than the behavior itself.

(2) Mediating role of health anxiety

Bootstrap mediation test showed that the indirect effect of behavioral execution difficulty on purchase intention through health anxiety was 0.119 (95% CI: [0.105, 0.209]), which did not include 0; the direct effect was 0.061 (p = 0.022). Thus, health anxiety partially mediated the relationship between execution difficulty and purchase intention, supporting H9.

(3) Formation mechanism of purchase intention

Table 2. Hierarchical Regression Results for Purchase Intention

Variable	Model 1	Model 2	Model 3	Model 4
(Constant)	2.914***	1.259***	-0.343**	-0.401***
Age	-0.174***	-0.109***	0.002	0.022
Gender	0.071	0.010	0.037	-0.013
Frequency of staying up late	0.074***	0.040	0.080***	0.074***
Self-rated health status	0.089**	0.010	-0.003	-0.016
Monthly income	0.139***	0.106***	0.039	0.018
Health anxiety	—	0.542***	0.074**	0.002
Perceived usefulness	—	—	0.267***	0.154***
Perceived risk	—	—	0.070	0.009
Willingness to pay for health	—	—	0.510***	0.353***
Marketing influence	—	—	—	0.469***
R^2	0.065	0.351	0.643	0.718
ΔR^2	—	0.286	0.292	0.075
n	603	603	603	603

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

The hierarchical regression results are displayed in Table 2. Model 1 includes control variables

($R^2 = 0.065$). Model 2 adds health anxiety, and R^2 increases to 0.351; health anxiety significantly and positively predicts purchase intention ($\beta = 0.542$, $p < 0.001$), providing preliminary support for H8. Model 3 adds perceived usefulness, perceived risk, and willingness to pay for health; R^2 increases to 0.643. Perceived usefulness ($\beta = 0.267$, $p < 0.001$) and willingness to pay for health ($\beta = 0.510$, $p < 0.001$) are significant, supporting H10 and H11; perceived risk is not significant ($\beta = 0.070$, $p > 0.05$), thus H13 is not supported. Model 4 adds marketing influence, and R^2 increases to 0.718; marketing influence is significant ($\beta = 0.469$, $p < 0.001$), supporting H12. Notably, health anxiety is no longer significant in Models 3 and 4, indicating that its effect is absorbed by product value perception and willingness to pay. This suggests that the role of health anxiety is to "ignite" initial demand, while the final purchase decision relies more on users' evaluation of product usefulness, their willingness to invest in health, and external marketing information. All models had VIF values below 5, indicating no serious multicollinearity.

The purchase conversion mechanism displays a clear hierarchical feature: behavioral execution difficulty first stimulates health anxiety; health anxiety serves as an initial driving force prompting users to develop purchase interest. However, this anxiety-driven effect gradually attenuates when specific decision factors such as perceived usefulness, willingness to pay for health, and marketing influence are introduced. Ultimately, the formation of purchase intention relies more on users' recognition of the product's practical value, their initiative in health investment, and the promotion of external marketing information. The negative effect of perceived risk on purchase intention was not supported in this study, possibly because the sample group generally had low risk perception regarding intelligent sleep-aid products, or this variable interacted with other factors.

6. Conclusions and Recommendations

6.1 Research Conclusions

Based on the survey data of 603 residents in Zhengzhou, this study uses the structural equation model and hierarchical regression analysis to verify the paradox of knowledge, trust and behaviour in the behaviour of staying up late and the conversion mechanism of its willingness to buy intelligent sleep-aid products. The main conclusions are as follows: First, the paradox of knowledge, trust and action is established in the field of staying up late. The respondents have a high level of health cognition and belief, but the difficulty of behavioural execution is prominent. The direct inhibition effect of cognition and belief on the frequency of staying up late is not significant. The difficulty of behavioural execution is the core variable affecting the frequency of staying up late ($\beta=0.511$, $p<0.001$). Second, behavioural execution difficulties indirectly promote the willingness to buy through health anxiety (indirect effect 0.119), which constitutes the transmission path of "difficulty → anxiety → willingness to buy". Third, the final formation of the willingness to buy depends more on perceived usefulness, health willingness to pay and marketing impact. The direct impact of health anxiety is no longer significant in the subsequent model, indicating that it only plays an initial trigger role. The negative impact of perceived risk on the willingness to buy is not supported. The above conclusion reveals that the key link of intervention in staying up late is to reduce the cost of execution, not simply to improve cognition.

6.2 Practical Recommendations

Based on the above conclusions, three suggestions are put forward for enterprises: First, product design should focus on reducing the cost of behaviour execution, such as automatically triggering sleep aid programs, simplifying operation, strengthening habit formation, and helping users overcome the barrier of "knowing but difficult to do". Second, marketing communication should make good use of the transmission logic of health anxiety to guide anxiety to product value, and at the same time enhance the usefulness of perception through effect visualisation. Third, the pricing strategy should match consumers' willingness to pay healthily, and can design reasonable premiums and develop high-value additional services; at the same time, actively give full play to the influence of marketing, and promote purchase conversion through user word of mouth and expert recommendations.

6.3 Research Limitations

There are some limitations in this research. The

sample only covers residents of Zhengzhou City, and the regional representation is limited. Future research can be expanded to a wider geographical range to enhance the universality of the conclusion. In addition, this study adopts cross-sectional data design, and it is difficult to strictly infer the causal relationship between variables. In the future, vertical tracking or experimental methods can be tried to verify. Variables are based on self-report measurement and may be affected by social comprovalence. Future research can be cross-verified in combination with behavioural records or physiological indicators.

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