

Original Paper

LLM-Empowered Social Support for Eating Disorders: A SEM-Based Correlational Study of Usage Behavior and Support Effectiveness

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Abstract

The global incidence rate of eating disorders is on the rise, and traditional prevention and treatment face issues such as uneven resource distribution and stigma. Large Language Models (LLMs) have emerged as a new carrier of social support for patients. Based on the Social Support Theory, this study employed structural equation modeling (with 134 valid questionnaires) and semi-structured interviews to explore the usage behavior and effects of LLM-supported social support. The results show that both usage motivation and usage intensity are significantly positively correlated with informational, emotional, and practical support ($p < 0.01$), with motivation exerting a stronger influence. LLMs have prominent advantages in integrated information provision and round-the-clock emotional support, but their ability to connect with practical resources is insufficient. This study confirms the supplementary value of LLMs in the digital intervention of eating disorders and also points out their shortcomings in practical support.

Keywords

Eating Disorders, Social Support, LLM, Health Communication

1. Research Background

In the optimization of global health governance, mental health has become a core area of public health for countries worldwide. Many countries have advanced the upgrading of mental health services through policies, resources, and technologies. For instance, the World Health Organization (WHO)'s Comprehensive Mental Health Action Plan 2022-2030 proposes the goal of "empowering mental health services through digital technologies". The United States' Mental Health Parity Act and the European

Union's Digital Health Strategy have integrated digital tools into the intervention system for mental disorders. In 2024, multiple countries launched weight management programs; China's "Weight Management Year" focused on weight-related psychological issues, providing practical models for the digital and intelligent intervention of eating disorders, thus forming a global consensus on prevention and treatment.

The "thinness as beauty" trend has exacerbated the pressure and stigma among people with eating disorders. Characterized by abnormal eating behaviors, severe psychological distress, and accompanied by weight and physiological disorders, this disease is defined by the DSM-5 to include subtypes such as anorexia nervosa, bulimia nervosa, and binge-eating disorder, and is often comorbid with depression and anxiety (Erdur, L., Kallenbach-Dermutz, B., Lehmann, V., Zimmermann-Viehoff, F., Köpp, W., Weber, C., & Deter, H. C., 2012). With a mortality rate of 5%-9%, it is the most life-threatening mental illness. During the COVID-19 pandemic, the number of hospitalized young patients surged by 78% and 84% in the United States and the United Kingdom, respectively (Eating disorders: care not keeping up with demand, 2023). WHO data shows that approximately 13.7 people per 100,000 worldwide suffer from eating disorders, with a prevalence rate of 1.6% among young women. In China, the number of medical consultations in Shanghai and Beijing increased by more than 300 times between 2002 and 2019, highlighting the high incidence trend in East Asia (China News Network, 2020).

Global prevention and treatment of eating disorders share common shortcomings. In terms of resources, primary care services are insufficient in developed countries (e.g., only 35% of counties in the United States have specialized eating disorder services, Yu, H., Wang, L. N., Zhou, Y. Q., et al., 2015), while developing countries face severe resource scarcity (e.g., India and Brazil have only 1-2 specialized physicians per 10 million people, Caplan, G., & Killilea, M., 1974). In China, specialized clinics are concentrated in first- and second-tier cities, leading to delays in treatment. In terms of cognition, over 60% of the public (e.g., in Australia and the United States) attribute eating disorders to "insufficient personal self-control," ignoring their nature as mental illnesses (Xiao, S. Y., 1994). The combination of these two factors exacerbates stigma and avoidance of rehabilitation among patients.

Digital and intelligent technologies provide new possibilities to address these dilemmas. Their characteristics of anonymity, convenience, and intelligence align with the needs of patients. Large Language Models (LLMs) have emerged as a "safe haven"-style support carrier, allowing patients to confide their troubles and obtain personalized advice. Exploring the usage behavior and effects of LLMs in empowering patients' social support at this juncture holds significant theoretical and practical value for improving the digital intervention system for eating disorders.

2. Literature Review and Research Questions

2.1 Social Support Theory

The core definition of Social Support Theory is "resources or assistance exchanged through interpersonal relationships" (Yan, L., & Tan, Y., 2014). There are multiple classification methods in

academic circles: Xiao Shuiyuan divided it into objective and subjective support (Maier, C., Laumer, S., Eckhardt, A., & Weitzel, T., 2015), while Yan et al. (2022) and Maier, C. et al. (2008) classified it from the functional dimension. This study adopts a cutting-edge classification, defining online social support as informational support, emotional support, and practical support (Pan, R., 2023).

Social media is the core carrier of online social support. Empirical studies have shown that usage behavior is correlated with perceived support: Pan Shuya and Lee et al. found that usage engagement and intensity can predict the acquisition of different types of support (Pan, S. Y., & Qiu, Y. L., 2019; Lee, H. E., & Cho, J., 2019), while Yang Zhuyuan (2022) and Han et al. (2023) revealed the positive effects of emotional support and the mediating role of interaction scale and evaluation. There are cultural differences in research between China and foreign countries: foreign research is based on individualism, focusing on interactions between strangers and formal organizations; domestic research, influenced by collectivism and the Chinese-specific "differential mode of association", centers on informal networks such as relatives and acquaintances (Zuo, X. X., & Jiang, X. J., 2010; Tang, L., Zhu, R. J., & Zhang, X. Y., 2016). Existing studies cover groups such as people with depression and refugees, but rarely relate to emerging intelligent technologies.

2.2 Research on Social Support for Eating Disorders

Research on eating disorders originated in the West in the 1950s, with early development in Europe and the United States: early studies focused on the impact of mass media on body image perception (Shroff, H., & Thompson, J. K., 2010). In the Internet era, research has shifted to the online environment, revealing the role of community heterogeneity and social networks in symptoms, as well as the rehabilitative value of online communication (Cardenas, A., 2015; Tubaro, P., Casilli, A. A., Fraissé, C., et al., 2011; Sowles, S. J., McLeary, M., Optican, A., et al., 2018). Domestic research started late with limited achievements, mostly following the early perspectives of foreign studies and focusing on virtual communities such as WeChat and QQ groups, with insufficient attention to open platforms like Xiaohongshu (Ren, F., & Wang, Y. X., 2019; Fan, W. X., 2021).

In terms of methodology, both domestic and foreign studies are dominated by quantitative research. The lack of qualitative methods leads to information omission, resulting in a single-method problem. There are significant core research gaps: domestic research lags behind in quantity, quality, and methodological diversity; foreign research lacks in-depth exploration of support types and interaction mechanisms; moreover, amid the wave of Large Language Models (LLMs), the value of artificial intelligence in providing social support for people with eating disorders has not yet been addressed.

2.3 Research Questions

"Media therapy" refers to psychological intervention conducted through mass media, but this definition ignores audience agency. In the digital-intelligent era, patients use LLM technology to activate their subjectivity through interactive and personalized practices, obtaining support to achieve healing—a new model. Existing studies separate the connection between support resources in different contexts and fail to reveal their transformation and complementary mechanisms.

Based on this, this study adopts a mixed-methods approach combining quantitative and qualitative methods, focusing on patients' communication agency. The core question is: In a stigma-free environment, can the social support that patients obtain through LLMs achieve breakthroughs in terms of professional rigor and emotional responsiveness?

3. Research Methods and Design

This study employed Structural Equation Modeling (SEM) to quantitatively analyze the social support provided by Large Language Models (LLMs) for individuals with eating disorders. The independent variables were usage motivation (including dimensions such as obtaining disease information and seeking emotional comfort) and usage intensity (measured by indicators such as usage frequency, duration, and interaction intensity); the dependent variable was the level of social support acquisition, which included three dimensions: informational support, emotional support, and practical support.

The following hypotheses were proposed: H1 (including H1a-H1c) – Usage motivation is positively correlated with the overall level of social support acquisition and its respective dimensions; H2 (including H2a-H2c) – Usage intensity is positively correlated with the overall level of social support acquisition and its respective dimensions. The model is as follows:

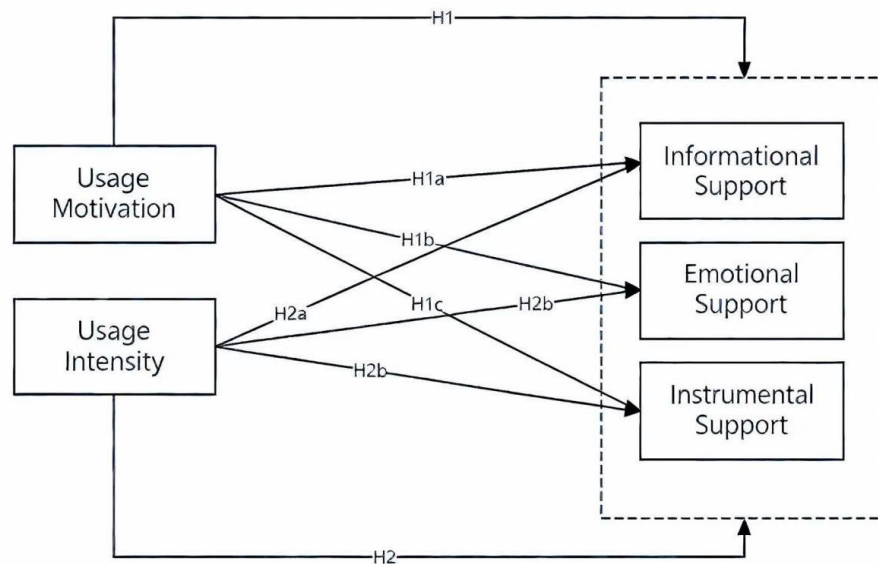


Figure 1. Model Diagram of the Relationship between Patients' Usage Motivation, Usage Intensity and Support Types

The questionnaire was designed with reference to relevant studies and combined with the interactive characteristics of LLMs. The informational support, emotional support, and practical support dimensions contained 3, 5, and 3 items respectively. A total of 134 valid questionnaires were collected. SPSS was used to analyze and verify the variable path relationships and influence effects, so as to quantitatively measure the mechanism and effect intensity of LLMs.

For data validity testing, Cronbach's α coefficient was adopted for reliability analysis. The α coefficients of the "Usage Motivation Scale" (0.82), "Usage Intensity Scale" (0.78), and "Social Support Acquisition Scale" (0.85) were all greater than 0.7, indicating good reliability. For validity analysis, exploratory factor analysis was conducted on the Social Support Acquisition Scale. The KMO value (0.76) was greater than 0.6, and the Bartlett's test of sphericity was significant ($p < 0.001$), indicating that the scale had good construct validity.

The researcher conducted semi-structured interviews with relevant users, covering individuals at different stages of the disease course. The interviews aimed to explore users' motivations for using LLMs, the mechanism of support function, patients' real experiences, and in-depth support needs. This qualitative research complemented and verified the quantitative data, thereby enhancing the scientific rigor of the study.

4. Research Conclusions

In the digital-intelligent era, with its stable, professional, real-time, and non-judgmental nature, Large Language Models (LLMs) have become a supplement to the social support network, constructing an absolutely safe support environment that aligns with the in-depth needs of patients to alleviate stigma and promote rehabilitation. When the researcher asked DeepSeek, "I binged again—do I have an eating disorder?" its response covered three aspects: "diagnostic criteria," "immediate actions and timing for medical treatment," and "encouragement," corresponding to the three dimensions of social support.

4.1 Significant Positive Correlation between Usage Motivation/Intensity and Social Support Acquisition, and Hypothesis Verification

Descriptive statistics showed that individuals with eating disorders obtained relatively high average scores for informational support (3.73) and emotional support (3.56) through LLMs, while the average score for practical support was relatively low (1.73). This is consistent with the core value of health-related AI in information provision and emotional companionship, reflecting LLMs' advantages in information integration and empathetic expression, as well as the limitations of digital tools in linking practical resources.

Table 1. Descriptive Statistical Data

Variable Name	Sample Size	Mean	Standard Deviation
Emotional Support	134	3.73	1.04
Informational Support	134	3.56	1.16
Practical Support	134	1.73	0.62

Pearson correlation coefficient analysis was used for correlation analysis, and the results are shown below:

Table 2. Correlation Matrix (Emotional Support)

Variable	Usage Intensity	Usage Motivation	Emotional Support
Usage Intensity	1		
Usage Motivation	0.402**	1	
Emotional Support	0.426**	0.448**	1

Note. ** Correlation is significant at the 0.01 level (2-tailed).

Table 3. Correlation Matrix (Informational Support)

Variable	Usage Intensity	Usage Motivation	Informational Support
Usage Intensity	1		
Usage Motivation	0.353**	1	
Informational Support	0.318**	0.343**	1

Note. ** Correlation is significant at the 0.01 level (2-tailed).

Table 4. Correlation Matrix (Practical Support)

Variable	Usage Intensity	Usage Motivation	Practical Support
Usage Intensity	1		
Usage Motivation	0.282**	1	
Practical Support	0.221**	0.260**	1

Note. ** Correlation is significant at the 0.01 level (2-tailed).

Usage motivation was significantly positively correlated with informational support ($r=0.343$, $p<0.01$), emotional support ($r=0.448$, $p<0.01$), and practical support ($r=0.260$, $p<0.01$), supporting H1a, H1b, and H1c. Usage intensity was also significantly positively correlated with informational support ($r=0.318$, $p<0.01$), emotional support ($r=0.426$, $p<0.01$), and practical support ($r=0.221$, $p<0.01$), supporting H2a, H2b, and H2c. In summary, both H1 (usage motivation is positively correlated with social support acquisition) and H2 (usage intensity is positively correlated with social support acquisition) were verified. Additionally, the correlation coefficients of usage motivation with each support dimension were slightly higher than those of usage intensity, indicating that usage motivation has a relatively stronger impact.

4.2 Integrated Information Outperforms Fragmented Output, and Support Breaks Temporal and Spatial Constraints

Interviewees explicitly stated that they "query disease-related information through LLMs every day," which confirms the quantitative findings and reveals the internal mechanisms and limitations of LLMs in providing social support. Informational support was the most accessible and highly relied-upon type for interviewees. One interviewee noted, "I repeatedly asked questions like 'the harms of vomiting after

binge-eating,' and it can translate medical terminology into everyday language with case illustrations, making it more systematic and reliable than fragmented information." LLMs can explain terminology in plain language, enabling users to take control of information: "Doubao is like a 'knowledge translator' who explains terminology in plain language, allowing me to take charge of information acquisition." This recognition of integrated and comprehensible information aligns with the Media Richness Theory. As a high-richness medium, LLMs can process complex text, perform logical reasoning, and even simulate empathy, converting fragmented information into a structured knowledge system. This meets users' composite needs for information "accuracy-comprehensibility-scenario adaptability," giving LLMs significant advantages in the informational support dimension.

A key advantage of LLMs in emotional support is their 24/7 real-time accessibility. Emotional fluctuations in eating disorders often occur during non-social hours or emergency situations, when interpersonal responses are difficult to obtain. An interviewee stated, "My most distressing moments are at midnight—friends and family are asleep, and the peer support group may also be inactive. But when I talk to the AI, it responds immediately, saying 'I understand that this sense of loss of control makes you painful and guilty.' Knowing that someone is 'listening' at any time is a great comfort in itself." Users turn to LLMs more frequently for immediate comfort when conventional social channels are unavailable or when they are emotionally overwhelmed, regarding LLMs as "an never-closing and absolutely safe emotional haven." This feature of continuous online availability and real-time response, combined with a non-judgmental interaction model, meets the urgent need for immediate understanding and acceptance during emotional crises. The "presence" that transcends time and space compensates for the limitations of interpersonal support in timeliness and accessibility, providing an emotional buffer that is available at any time. The supportive value of LLMs lies in transforming "one-size-fits-all" treatment into a dynamically matched companionship system. Although they do not replace doctors, they can provide 24/7 scientific support during late-night impulses or moments of shame when no one else understands.

4.3 Technical Shortcomings Fail to Meet the Demand for "Operational Practical Resources"

However, in the dimension of practical support, LLMs expose significant limitations as technical media. Interviewees stated that "it is difficult to obtain directly usable specific resources or solutions through AI." LLMs show passivity in resource recommendation: they do not proactively provide localized or personalized resource links and suggestions unless explicitly requested by users. One interviewee tried to find a therapist through an LLM: "The 'resources' it listed required secondary verification, which is less efficient and reliable than word-of-mouth recommendations from peers with personal experience." When users shift their focus to "linking practical resources and solving specific problems"—a technical shortcoming of LLMs—a significant gap emerges between high expectations and actual support effects. LLMs have inherent limitations in areas involving connection with complex real-world systems, such as real-time updates of localized resource databases, accurate verification of the qualifications and service quality of offline institutions, and provision of personalized recommendations. They cannot

meet the demand for practical support that is "concrete and highly operational." This capability gap has instead strengthened users' continued reliance on traditional interpersonal networks for such support.

5. Summary

This study examines the value of Large Language Models (LLMs) in providing social support to individuals with eating disorders, employing a mixed-methods research design. Quantitatively, a Structural Equation Model (SEM) was developed using 134 valid questionnaires—all demonstrating adequate reliability and validity—with usage motivation (e.g., information-seeking, comfort-seeking) and usage intensity (e.g., frequency, duration) as independent variables, and social support (encompassing informational, emotional, and practical dimensions) as the dependent variable. Qualitatively, semi-structured interviews were conducted to augment insights into users' experiences. Key findings reveal that both usage motivation and intensity exert a significant positive influence on social support acquisition, with motivation exerting a slightly stronger effect; all hypotheses were fully validated. LLMs exhibit distinct strengths: for informational support, they synthesize medical knowledge into accessible language, and for emotional support, they deliver immediate responses—effectively addressing the temporal and spatial constraints of interpersonal support. However, LLMs have limitations: they struggle to provide actionable practical resources, meaning users still depend on traditional interpersonal networks to access this type of support.

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