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ORIGINAL RESEARCH

Enhancing Psychosomatic Medicine Skills in General Practitioners: Insights from Ecological Systems Theory

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Purpose: Based on the Ecological Systems Theory, this study aims to identify multilevel factors that influence the psychosomatic medical service competency (PMSC) of general practitioners (GPs).

Methods: A cross-sectional survey was conducted among 699 community general practitioners in Shanghai from December 2022 to March 2023 using a stratified random cluster sampling method. GPs' PMSC was assessed using a validated 27-item scale, covering knowledge, attitude and skills dimensions, with additional self-evaluative measures on perceived competency and training needs. Based on ecological systems theory, individual, institutional and systemic factors were examined. A three-stage hierarchical regression analysis was performed to identify multilevel determinants of PMSC.

Results: A total of 713 questionnaires were distributed, yielding 699 valid responses. The response rate was 98.04%. According to the multiple hierarchical regression analysis, higher educational attainment ($p < 0.05$) and greater empathy ($\beta = 0.256$, $p < 0.001$) were significantly associated with higher PMSC, explaining 7% of the variance ($R^2 = 0.07$, $p < 0.001$). While institutional factors (including psychological services, medication availability and referral pathways) were associated with PMSC in bivariable analysis ($p < 0.01$), they were not significant in multivariable models. PMSC training emerged as the strongest predictor of PMSC ($R^2 = 0.263$, $p < 0.001$), emphasizing its critical role in competency development.

Conclusion: Educational attainment, empathy, and training significantly influence general practitioners' psychosomatic medical service competency, with training coverage being the strongest predictor. This study highlighted the urgent need for targeted training and policy reforms to enhance psychosomatic care in Chinese primary care settings.

Keywords: competency, empathy, general practitioners, primary care, psychosomatic medicine, training

Introduction

Psychosomatic disorders, characterized by the interplay of psychological, social, and biological factors in the onset, progression, and outcomes of physical illnesses, are a growing concern in primary care settings worldwide.[1] A large-scale multicenter survey in China found a high prevalence of psychosomatic syndromes among internal medicine patients, with alexithymia (a neuropsychological phenomenon characterized by difficulties in identifying and describing one's own emotions) reported in 64.47%, irritable mood in 20.55%, and demoralization in 15.60%.[2,3] Psychosomatic disorders have been recognized as a significant public health issue.[4]

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Integrating psychosomatic medical service (PMS) into primary care has become a global trend.[5] General practitioners (GPs), particularly those working in community health service centers (CHSCs), play a key role in identifying and managing psychosomatic disorders.[6] In the Chinese healthcare system, GPs can work either in CHSCs or in general practice departments of secondary or tertiary hospitals, although the latter are far less common. Compared with hospital settings, community-based services offer better accessibility, continuity of care, and cost-effectiveness.[6,7] Early identification and intervention for depression by GPs could significantly reduce treatment time and improve the remission rate.[8] A large-scale randomized controlled trial confirmed that providing PMS for patients with comorbid depression and diabetes mellitus or coronary heart disease resulted in an increase of 0.14 quality-adjusted life years per person and a cost reduction of £1,830 per person compared with standard physical treatments at 24 months.[9] However, limited diagnostic capabilities, lack of confidence, and insufficient training have hindered the effective delivery of PMS by GPs.[10] In China, the referral rate for mental health problems in primary care remains as low as 15.3%, and only 17.6% of GPs report familiarity with common psychiatric conditions such as major depressive disorder.[11–13]

This study adopts the definition of psychosomatic disorders proposed by the Psychosomatic Medicine Branch of the Chinese Medical Association.[14,15] In the context of primary care, psychosomatic disorders consist of a wide range of conditions. These include typical psychosomatic diseases (eg, hypertension, diabetes, cancer), common mental disorders closely related to psychosomatic manifestations (eg, depression, anxiety, dementia), psychologically-mediated physiological disorders (eg, sleep disorders), and psychological problems secondary to physical illness or its treatment (eg, post-stroke depression, adjustment disorders in cancer patients).[16] This broad spectrum requires GPs to adopt integrated care models that extend beyond conventional biomedical approaches.

The psychosomatic medical services competency (PMSC) of GPs focuses on the competencies required for the prevention, treatment, and rehabilitation of psychosomatic disorders. It promotes holistic, patient-centered care by addressing both the physical symptoms and underlying psychosocial factors. In this study, PMS specifically refers to the competencies and practices required for the prevention, diagnosis, management, and rehabilitation of psychosomatic disorders in primary care. These include not only clinical knowledge and communication skills, but also the ability to perform psychological assessments, deliver basic mental health interventions, refer patients appropriately, and collaborate with mental health professionals.[17,18] The factors influencing the PMSC of GPs are complex. Evaluating these factors is the first step toward enhancing their PMSC. According to Charles H. Zastrow's Ecological Systems Theory (EST), human social ecosystems can be divided into three layers: the microsystem, mesosystem, and macrosystem, which interact and influence one another.[19] The microsystem refers to the individual system, including biological, psychological, and social subsystems. The mesosystem refers to smaller-scale groups, such as the family, work groups, and hospitals. The macrosystem encompasses larger societal structures, such as culture, customs, and systems. The EST emphasized the reciprocal and symbiotic relationship between individuals and their environmental systems. This framework has been applied in nursing practice to improve nurse competencies and patient outcomes, particularly through interventions targeting multi-level systems.[20,21] Xu et al used the EST to examine the intrinsic logical relationship between professional competency and the workplace organizational environment.[22]

The provision of PMS by GPs can be viewed as an event within the framework of EST, where their PMSC is shaped by a combination of factors at the individual (microsystem), institutional (mesosystem), and medical systemic (macrosystem) levels. At the individual level, research has shown that GPs' ability to diagnose and treat psychosomatic disorders varies depending on their professional title, education level, and work experience.[23] Studies also suggest that GPs with lower levels of burnout or higher levels of empathy are more likely to consider the psychosocial factors of illness and address patients' intrinsic psychological needs.[24,25] At the institutional level, the development status of healthcare institutions and whether they have the necessary conditions to provide PMS may influence GPs' PMSC.[11] Furthermore, incentive policies for psychosomatic medicine and training in PMSC during various stages of medical education have been suggested as relevant systemic factors that may shape GPs' PMSC.[10,23] The EST offers a comprehensive framework for integrating these factors, however, empirical research applying this theory to GPs' PMSC remains absent.

Based on the Ecological Systems Theory, this study aims to identify multilevel factors that influence GPs' PMSC competency, including individual, institutional, and systemic elements. The objectives of this study are to quantify PMSC

across knowledge, attitude, and skills dimensions with validated scales, followed by an exploration of the factors influencing GPs' PMSC. Research findings may help inform the development of targeted interventions and policy recommendations that enhance GPs' PMSC, contributing to the global effort to improve primary healthcare services and and reduce mental health inequalities.

Material and Methods

Study Design and Sampling

A cross-sectional survey was conducted among community general practitioners (GPs) in Shanghai between December 2022 and March 2023, using a stratified random cluster sampling method. The sampling framework was established based on official statistics from the Shanghai Municipal Health Commission (2022), which documented 93 urban community health centers and 158 suburban centers, with an urban-to-suburban ratio of 1:1.7. In this study, we aimed to recruit approximately 600 GPs, ensuring a sample size 5 to 10 times larger than the number of questionnaire items.[26] Assuming an average of 30 GPs per center, we selected 23 centers (9 urban and 14 suburban) through computer-generated randomization. Trained coordinators at each selected center distributed electronic questionnaires to all GPs. The research content was clearly explained to all participants, who provided written informed consent before participation. All questionnaire items were mandatory to ensure completeness. A pilot study involving 30 GPs was conducted to test the questionnaire. Based on their feedback, we set a minimum completion time of 5 minutes as an exclusion criterion. After data collection, two data analysts reviewed the responses and excluded questionnaires completed in under 5 minutes. Of the 713 distributed questionnaires, 699 valid responses were obtained. The response rate was 98.04%.

Measurement

Psychosomatic Medical Services Competency Assessment of Chinese General Practitioners

GPs' psychosomatic medical services competency was assessed using the Evaluation Index System of General Practitioners' Psychosomatic Medical Service Ability, developed by Qian et al based on the competency iceberg model and classic competency modeling techniques.[17] The scale was constructed through a combination of literature analysis, behavioral event interviews, and expert Delphi consultations, which helped identify and refine key elements related to the core PMS competencies of GPs. The scale comprises 3 dimensions and 27 items. They are knowledge dimension (7 items), attitude dimension (9 items) and skills dimension (11 items), (Table 1). The knowledge dimension evaluates GPs' knowledge about psychosomatic medicine and related disciplines. The attitude dimension reflects GPs' professional competencies in psychosomatic medicine services. The skills dimension assesses GPs' clinical skills on prevention, treatment, and rehabilitation of psychosomatic disorders. Each item is rated on a 5-point skill rating scale, ranging from 1 (completely unskilled) to 5 (fully skilled). The score for each dimension is derived by aggregating the weighted item scores within that dimension, followed by multiplying the summed score by the dimension's weight. The weights for the three dimensions are as follows: knowledge (0.454), attitude (0.225), and skills (0.321). Finally, the weighted scores for all three dimensions are summed and converted into a percentage scale (0 to 100) to determine the total PMSC score. A higher total score indicates greater competency in PMS. In this study, the Cronbach's α was 0.976 and the split-half reliability was 0.914 for the whole scale. The subscales also demonstrated high reliability, with Cronbach's α values of 0.958 (knowledge), 0.959 (attitude), and 0.964 (skills), and split-half reliability values of 0.928, 0.925, and 0.935, respectively. Bartlett's test of sphericity was significant (($\chi^2(351)=21{,}354.26$, $p<0.001$)).

Two additional self-rated evaluative items were included to assess GPs' overall self-assessment of PMSC and their perceived need for PMSC.[27] "How satisfied are you with your overall competency in delivering psychosomatic medicine services?" Responses were recorded on a 5-point satisfaction rating scale: 1 = completely dissatisfied, 2 = somewhat dissatisfied, 3 = neutral, 4 = somewhat satisfied, 5 = extremely satisfied. "To what extent do you believe additional training is necessary to enhance your psychosomatic medicine services competency in clinical practice?" Responses were: "1 = completely unnecessary, 2 = somewhat unnecessary, 3 = neutral, 4 = somewhat necessary, 5 = extremely necessary".

Table 1 Items of Chinese General Practitioners' (GPs') Psychosomatic Medical Services Competency Questionnaire

Sub-Scale	Item
Psychosomatic Medicine and Related Disciplines Knowledge *(Knowledge Dimension)*	1. Knowledge of the mental health service system in China and community-based mental health service models. 2. Familiarity with the concept of psychosomatic medicine, the clinical features, and classification of psychosomatic disorders. 3. Familiarity with the common psychosomatic diseases in the community and their basic treatment principles. 4. Familiarity with the clinical manifestations of common mental disorders in the community and basic treatment principles. 5. Knowledge of common psychological issues caused by somatic diseases and their basic treatment principles. 6. Knowledge of the basic theories of psychological counseling and treatment, as well as the normal psychological states of individuals at various life stages. 7. Awareness of the impact of social and personal behavior on psychological health and behavioral methods for preventing psychosomatic disorders.
Specific professionism in Psychosomatic Medicine Services*(Attitude Dimension)*	8. Adherence to mental health-related laws and regulations, as well as ethical guidelines for psychological counseling and treatment. 9. Ability to apply a holistic medical approach and systemic thinking, understanding the patient and their psychosomatic disorder from the perspective of individual and family life cycles. 10. Respect for individual patient differences (e.g.cultural background, religious beliefs), with sensitivity to and understanding of how these factors influence psychosomatic health. 11. Awareness of the need for psychological screening when addressing somatic diseases. 12. Strong interpersonal communication skills, considering the patient's background factors and expectations. 13. Ability to perceive and understand the patient's emotions, providing appropriate emotional and content feedback. 14. Demonstrating sincerity and empathy when communicating difficult medical information to patients. 15. Ability to collaborate with community healthcare team members, establishing and maintaining an atmosphere of respect, trust, and positive responses. 16. Attention to one's own psychological health, actively engaging in various activities to promote personal well-being.
Prevention, Treatment, and Rehabilitation of Psychosomatic Disorders *(Skills Dimension)*	17. Ability to collect important medical histories and conduct basic mental health examinations for patients with common psychosomatic disorders in the community. 18. Ability to select appropriate psychological assessment scales for the community. 19. Ability to describe the main characteristics of psychosomatic disorders and document them in general practitioner SOAP notes. 20. Ability to construct and interpret genograms to analyze family dynamics in psychosomatic health. 21. Ability to prescribe and manage available psychiatric medications in the community to provide basic pharmacological treatment for patients. 22. Ability to apply supportive psychological counseling and therapeutic techniques to provide psychological guidance to patients. 23. Ability to evaluate the psychological well-being of community residents and assess their psychosomatic healthcare needs. 24. Ability to utilize community resources and various public education methods to promote psychological health awareness among residents. 25. Ability to implement targeted prevention strategies and provide ongoing follow-up care for psychosomatic disorders in high-risk and special populations within the community. 26. Ability to initially assess common psychological crises in the community and participate in emergency interventions, crisis management, and referrals. 27. Ability to provide follow-up evaluations and initial rehabilitation guidance for patients with mental disorders in the community, helping them reintegrate into society.

Individual, Institutional and Systemic Variables

Individual characteristics included gender (male/female), age, marital status (single/ married), educational attainment (associate degree/ bachelor's degree/master's degree or higher), professional title (junior/intermediate/associate senior or above), and years of practice (<5 years/5-10 years/>10 years). Burnout was evaluated using a two-item abbreviated burnout inventory validated by West et al.[28] The instrument comprises the statements:"I feel burned out from my work" (Emotional Exhaustion, EE) and "I've become more callous toward people since I took this job" (Depersonalization, DP). Responses were recorded on a 7-point frequency scale (0=never; 6=daily). A positive burnout screening was defined as a score >3 on either subscale. Empathy was measured using the Chinese version of the Jefferson Scale of Empathy (JSE) adapted by Jiang et al.[29] This 20-item validated instrument assesses three dimensions, ie perspective-taking, compassionate care, and standing in patients' shoes. Items were rated on a 7-point skill rating scale (1=strongly disagree; 7=strongly agree), with higher composite scores indicating greater empathic ability. The Cronbach's α of the JSE in this sample was 0.824.

The following institutional factors were assessed: (1) whether the community health service center is located in an urban or suburban area, (2) whether the institution provides psychological assessment services (Yes/No), (3) whether the institution offers a sufficient variety of psychiatric medications (Yes/No), and (4) whether there is smooth access to referral pathways for psychiatric hospitals (Yes/No).

Systemic factors included (1) the presence of performance-based incentive policies related to psychosomatic medicine services (Yes/No), and (2) the coverage of PMSC training in the standardized residency training and (3) continuing education phases for GPs, categorized as low (less than one third), moderate (from one third to two thirds), or high (more than two thirds).

Statistical Analysis

Analyses were conducted using SPSS version 25.0. Frequencies and percentages summarized the categorical variables, and means with standard deviations summarized the continuous variables. Bivariable analyses were performed using independent *t*-tests for dichotomous variables and one-way ANOVA for multiple groups. Pearson correlation coefficients were computed to assess relationships between empathy scores and PMSC scores. A three-stage hierarchical regression model was constructed to examine multilevel determinants of PMSC. Variables with marginal significance ($p < 0.10$) in univariable analyses were included in the multivariable model: Block 1 (individual factors: age, education, years of practice, depersonalization, empathy); Block 2 (institutional factors: availability of psychological services, sufficient variety of psychiatric medications, referral pathways); Block 3 (systemic factors: incentive policies, PMSC training in residency, PMSC training in continuing education). Statistical significance was defined at $p < 0.05$.

Results

Participant Characteristics

Of the 699 community GPs involved in this study, most were female (69.96%) and married (82.26%), had a bachelor's degree (75.11%), and held an intermediate professional title (67.10%) (Table 2). The average age was 40.07 years (range 22 to 65, SD = 8.00): 32.90% were aged 22–35 years, 40.06% were aged 36–45 years, and 27.04% were aged 46 years or older. Regarding time in clinical practice, 39.06% had less than 5 years, 47.21% had 5 to 10 years, and the remaining 13.73% had more than 10 years. The proportion of GPs who screened positive for emotional exhaustion and depersonalization was 10.87% and 14.74%, respectively. The total score of empathy ranged from 28 to 140. The average score of empathy was 103.45 ± 20.49. Regarding workplace, 37.91% and 62.09% of GPs worked in urban and suburban community health centers, respectively. Furthermore, 41.77%, 36.19%, and 67.10% of GPs reported that their institutions provided psychological assessment services, offered a sufficient variety of psychiatric medications, and ensured smooth access to referral pathways for psychiatric hospitals, respectively. Only 27.61% of GPs reported that their institution had performance-based incentive policies for PMS. Additionally, 30.04% and 38.77% of GPs indicated that they had a high percentage of coverage for PMSC training in the standardized residency training and continuing education phases, respectively.

Table 2 Individual, Institutional and Systemic Characteristics and Differences in General Practitioners' (GPs') Psychosomatic Medical Services Competency (PMSC) Scores

Variables	n (%)	PMSC Scores *(Mean±SD)*	*t/F*	*p*
Individual factors				
Gender				
Male	210(30.04)	69.6±13.78	0.412	0.680
Female	489(69.96)	69.1±13.91		
Age				
22–35	230(32.90)	70.7±13.48	3.903	0.021
36–45	280(40.06)	69.5±13.76		
≥46	189(27.04)	67.0±14.25		
Marriage				
Single	124(17.74)	69.5±15.95	0.236	0.813
Married	575(82.26)	69.2±13.38		
Educational attainment				
Associate degree	35(5.01)	62.6±12.08	4.526	0.011
Bachelor's degree	525(75.11)	69.8±13.57		
Master's degree and above	139(19.89)	68.8±14.97		
Professional title				
Junior	94(13.45)	70.1±12.83	0.408	0.665
Intermediate	469(67.10)	68.9±13.93		
Associate senior or above	136(19.46)	69.7±14.36		
Years of practice				
Less than 5 years	273(39.06)	70.6±14.00	2.376	0.094
5 to 10 years	330(47.21)	68.1±13.76		
More than 10 years	96(13.73)	69.3±13.61		
Emotional exhaustion				
Yes	76(10.87)	68.3±13.37	−0.611	0.541
No	623(89.13)	69.4±13.93		
Depersonalization				
Yes	103(14.74)	67.0±13.08	−1.818	0.070
No	596(85.26)	69.6±13.97		
Institutional factors				
Workplace				
Urban	265(37.91)	68.5±13.29	−1.112	0.266
Suburban	434(62.09)	69.7±14.19		
Psychological assessment service				
Yes	292(41.77)	71.1±13.52	2.941	0.003
No	407(58.23)	67.9±13.97		
Sufficient variety of psychiatric medications				
Yes	253(36.19)	71.6±14.64	3.317	0.001
No	446(63.81)	67.9±13.23		
Smooth referral pathways for psychiatric hospitals				
Yes	469(67.10)	70.7±13.98	3.955	<0.001
No	230(32.90)	66.3±13.16		
Systemic factors				
Incentive policies to PMS				
Yes	193(27.61)	72.6±13.96	3.947	<0.001
No	506(72.39)	68.0±13.63		
Coverage of PMSC training in residency				
Low	133(19.03)	57.6±13.41	114.452	<0.001

(*Continued*)

Table 2 (Continued).

Variables	n (%)	PMSC Scores *(Mean±SD)*	*t/F*	*p*
Intermediate	356(50.93)	68.6±11.47		
High	210(30.04)	77.7±12.08		
Coverage of PMSC training in continuing education				
Low	115(16.45)	57.5±12.67	97.920	<0.001
Intermediate	313(44.78)	67.6±11.65		
High	271(38.77)	76.1±12.76		

Note: In China, the educational requirements for general practitioners were relatively low in the past, which explains why some community GPs may hold less than a bachelor's degree. Not all totals add to 100.00% due to rounding effects.
Abbreviations: GP, general practitioners; PMS, psychosomatic medicine service; PMSC, psychosomatic medicine service competency; SD, standard deviation.

Association of GPs' PMSC with Individual Factors

The results of the difference tests showed no significant differences in PMSC across characteristics including gender, marital status, professional title, years of practice, emotional exhaustion, and depersonalization (all $p > 0.05$) (Table 2). However, there were significant differences in PMSC based on age distribution ($p < 0.05$) and educational attainment ($p < 0.05$). The total PMSC score was positively associated with empathy (Pearson correlation $r = 0.251$, $p < 0.001$). Hierarchical multiple linear regression models (Table 3) indicated that having a bachelor's degree ($\beta = 0.149$, $p < 0.05$), master's degrees or higher ($\beta = 0.151$, $p < 0.05$), and higher levels of empathy ($\beta = 0.256$, $p < 0.001$) were significantly positively associated with higher PMSC. Individual factors were found to explain 7% of the variance in PMSC ($R^2 = 0.07$). Details are provided in Tables 2 and 3.

Association of GPs' PMSC with Institutional Factors

GPs in institutions offering psychological assessment services had higher PMSC than those in institutions without such services ($p < 0.01$) (Table 2). GPs in institutions with a sufficient variety of psychiatric medications had higher PMSC compared with those in institutions with limited options ($p = 0.001$). Additionally, GPs in institutions with smooth referral pathways to psychiatric hospitals had higher PMSC than those in institutions lacking such pathways ($p < 0.001$). However, hierarchical linear regression analysis showed no significant associations between the aforementioned institutional factors and PMSC (all $p > 0.05$, Table 3).

Association of GPs' PMSC with Systemic Factors

GPs working in institutions with performance-based incentive policies for PMS demonstrated significantly higher PMSC scores compared with those in institutions without such policies ($p < 0.001$). However, this relationship was not significant in the hierarchical multiple linear regression model ($p = 0.154$). Model 3 (Table 3) showed that GPs receiving intermediate ($\beta = 0.294$, $p < 0.001$) and high ($\beta = 0.477$, $p < 0.001$) coverage of PMSC training in residency programs had higher PMSC scores. Similarly, GPs receiving intermediate ($\beta = 0.151$, $p = 0.009$) and high ($\beta = 0.282$, $p < 0.001$) coverage of PMSC in continuing education also had higher PMSC scores. Notably, the coverage of PMSC training was the most significant factor influencing GPs' PMSC in this study, accounting for 26.3% of the variance ($R^2 = 0.263$).

GPs' Overall Self-Assessment and Training Needs of PMSC

Only 22 (3.1%) general practitioners (GPs) were extremely satisfied with their current PMSC, while 272 (38.9%) were somewhat satisfied. Regarding the necessity of training to enhance PMSC, 198 (28.3%) GPs considered it somewhat necessary and 352 (50.4%) deemed it extremely necessary (Supplementary Figure 1).

Table 3 Hierarchical Multiple Linear Regression Models of General Practitioners (GPs') Psychosomatic Medical Services Competency (PMSC)

Variables	Model 1		Model 2		Model 3	
	β	*p*	*β*	*p*	*β*	*p*
Individual factors						
Age (ref. 22~35)						
36~45	−0.028	0.597	−0.026	0.621	−0.01	0.827
≥46	−0.119*	0.037	−0.104	0.068	−0.065	0.183
Educational attainment (ref. Associate degree)						
Bachelor's degree	0.144	0.058	0.153*	0.041	0.149*	0.019
Master's degree and above	0.094	0.226	0.109	0.158	0.151*	0.021
Years of practice (ref. Less than 5 years)						
5 to 10 years	−0.025	0.638	−0.009	0.866	−0.025	0.573
More than 10 years	0.05	0.32	0.052	0.302	−0.005	0.902
Depersonalization (ref. Yes)						
No	0.046	0.208	0.043	0.242	0.02	0.515
Empathy	0.229***	<0.001	0.217***	<0.001	0.256***	<0.001
Institutional factors						
Psychological assessment service (ref. Yes)						
No			−0.051	0.187	−0.009	0.79
Sufficient variety of psychiatric medications (ref. Yes)						
No			−0.08*	0.043	−0.006	0.849
Smooth referral pathways for psychiatric hospitals (ref. Yes)						
No			−0.074	0.06	−0.034	0.313
Systemic factors						
Incentive policies to PMS (ref. Yes)						
No					−0.05	0.154
Coverage of PMSC training in residency (ref. Low)						
Intermediate					0.294***	<0.001
High					0.477***	<0.001
Coverage of PMSC training in continuing education (ref. Low)						
Intermediate					0.151**	0.009
High					0.282***	<0.001
R^2	0.081		0.102		0.366	
Adjusted R^2	0.07		0.088		0.351	
ΔR^2	0.07		0.018		0.263	
F	*F* (8,690)=7.562, *p*<0.001		*F* (11,687)=7.107, *p*<0.001		*F* (16,682)=24.620, *p*<0.001	

Notes: *$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.
Abbreviations: GP, general practitioners; PMS, psychosomatic medicine service; PMSC, psychosomatic medicine service competency; ref, reference.

Discussion

This study assessed general practitioners' (GPs') psychosomatic medical service competency (PMSC) using validated scales and examined the multilevel factors associated with PMSC within the framework of Ecological Systems Theory (EST). The results highlighted the importance of individual factors (educational attainment and empathy) and institutional and systemic factors, particularly the coverage of PMSC training during both residency programs and continuing education, in shaping GPs' competencies. Additionally, the results indicate that GPs expressed low overall satisfaction with their current PMSC and strongly recognized the necessity of targeted training. These results have important

implications for both policy and practice, emphasizing the need for structured training programs to enhance community GPs' competencies in psychosomatic primary care.

At the individual level, the findings revealed that higher educational attainment (bachelor's or master's degrees) was significantly associated with higher PMSC scores. This aligns with the literature suggesting that formal education could improve clinical skills and care quality, especially in complex health issues such as psychosomatic disorders.[11,30–32] Moreover, higher levels of empathy were positively associated with higher PMSC scores, consistent with previous research indicating that healthcare professionals with higher empathy are more effective in recognizing and addressing patients' psychological needs along with their physical health concerns.[33–36] Empathy in GPs is essential for effective doctor-patient communication and relationship-building, which are key components of PMS, including history-taking, assessment, and psychological counseling.[37] As a core competency in psychological care, empathy not only forms the foundation of strong doctor-patient relationships but also enhances the quality and efficiency of psychosomatic medical services.[38]

At the institutional level, bivariable analyses showed that GPs working in institutions with psychological assessment services, an adequate variety of psychiatric medications, as well as smooth referral pathways to psychiatric services reported higher PMSC score. These findings suggest that a supportive healthcare environment could significantly enhance GPs' competency.[37] The presence of psychological services and the availability of medications could enable GPs to provide a comprehensive care to patients, while smooth referral pathways could facilitate better management of psychosomatic or psychiatric cases.[39,40] Nevertheless, these associations were not significant in the hierarchical linear regression analysis. It is noteworthy that despite Shanghai being one of China's most medically advanced cities, over half of the GPs reported the absence of psychological assessment services and a sufficient variety of psychiatric medications in their institutions. This indicates significant gaps in key support systems, such as standardized psychological assessment tools and the availability of psychiatric medications, which may limit GPs' ability to identify psychosomatic disorders early and implement standardized pharmacological interventions.[41] Although 67.1% of GPs reported that their institutions had smooth referral pathways to psychiatric hospitals, the lack of assessment tools and adequate medication options may still impact referral decisions. These deficiencies could lead to difficulties in accurately identifying referral indications or providing necessary transitional treatments, thereby weakening the practical effectiveness of referral mechanisms.[42] This paradox may explain why institutional support factors did not show significant associations in the hierarchical regression analysis. When basic resource allocation within an institution fails to meet standards, its potential benefits may not translate into improved clinical practice. Notably, this study did not identify significant differences in PMSC between urban and suburban GPs in Shanghai. This finding may reflect the success of recent efforts to achieve a more balanced distribution of healthcare resources across urban and suburban community health centers.[43]

Our results showed that PMSC training during both residency programs and continuing education had the most significant positive impact on PMSC scores for GPs. Moreover, GPs reported low satisfaction with their current competencies in psychosomatic medicine and expressed a strong willingness to attend targeted training. These findings highlight the need for integration of psychosomatic medicine into medical education curricula for general practice, as well as the crucial role of ongoing training in improving GPs' ability to address psychosomatic disorders. The EST emphasizes the reciprocal relationship between individuals and their environments. Providing continuous training, supervision, and support for GPs can equip them with the necessary competencies to leverage effectively both individual characteristics and institutional resources.[44,45] Millman et al found that GPs' who participated in an early psychosis educational campaign demonstrated improved performance in screening, referrals, and confidence in managing psychosis.[46] Therefore, standardized training in psychosomatic medicine is essential for cultivating GPs' service capabilities.[45]

However, inadequate training in psychosomatic medicine remains a widespread global challenge among GPs, particularly in low- and middle-income regions.[47] In China, the three-year standardized residency training allocates only one month to psychiatry rotations for GPs, without including psychosomatic medicine as a core discipline.[48] This is compounded by a scarcity of qualified instructors and the lack of standardized curricula.[18] Some developed countries have already established comprehensive training systems to enhance GPs' competencies in psychosomatic medicine, with Germany having one of the most well-established systems. In Germany, the postgraduate training regulations for GPs mandate an 80-hour foundational course in psychosomatic medicine (45 minutes per academic hour), structured into three modules.[49] The first module consists of 20 academic hours covering fundamental psychosomatic medicine theories,

the second comprises 30 hours on doctor-patient communication, and the third includes 30 hours of practical training in Balint group (a psychosomatic medical activity themed on the doctor-patient relationship).[50] To maximize effectiveness, the German Medical Association recommends that trainees complete the practical module over at least six months through multiple sessions.[49] China could adopt a similar structured approach to define the psychosomatic medicine curriculum within GP residency training. Given the extensive workload and multiple disciplines covered during residency training, it is also essential to continue training in psychosomatic medicine beyond residency.[51] An online learning platform for primary care providers could be developed to offer diverse training formats such as theoretical courses and blended learning modules combining theory with practice.[52] These advanced sub-specialty courses could be divided into multiple sessions and delivered through online or hybrid weekend training programs, ensuring accessibility and continuity in professional development.

In addition, the training system for GPs' PMSC should consider the development of individual attributes and the ability to use institutional resources effectively. For example, incorporating Balint group training into residency programs could enhance GPs' empathy, improve their competency in managing psychosomatic disorders and foster more harmonious doctor-patient relationships.[53] At the same time, scenario-based training, such as case discussions and simulated referral exercises, could strengthen GPs' capacity to apply institutional resources effectively.[54] These strategies would bridge individual, institutional, and systemic factors, providing a comprehensive approach to enhancing GPs' competency in psychosomatic medicine.[55]

Strengths, Limitations, and Future Studies

This study is the first to have quantified PMSC with validated scales and applied Ecological Systems Theory to examine the multilevel factors influencing PMSC among community-based GPs in Shanghai, China. The use of a stratified random cluster sampling method ensures that the study population is broadly representative of Shanghai's community GPs.

Several limitations should also be considered. First, the study relied on self-reported data, which may introduce biases such as overestimation of competencies. Second, the cross-sectional design limits the ability to draw causal conclusions. As the study was conducted in Shanghai, the findings may not be fully generalizable to GPs working in rural or resource-limited settings.

Future research should explore differences in PMSC between urban and rural primary care providers to identify contextual factors affecting competency development. Comparative studies across diverse healthcare settings may provide more tailored insights for optimizing psychosomatic care training and policy interventions in different regions.

Conclusion

Despite being one of the most medically developed cities in China, Shanghai's general practitioners still face challenges related to limited resources and inadequate training in psychosomatic medical services. This study found that educational attainment, empathy, and training significantly influence general practitioners' psychosomatic medical service competency. Additionally, we highlighted the urgent need for targeted training and policy reforms to enhance psychosomatic care in Chinese primary healthcare system.

Abbreviations

GP, general practitioners; PMS, psychosomatic medicine service; PMSC, psychosomatic medicine service competency.

Ethics Statement

The study received ethical approval from Tongji Hospital of Tongji University Institutional Review Board (Ethics No. K-W-2023-002), and was conducted in compliance with the Declaration of Helsinki. All participants provided written informed consent before participating in the study.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors report no conflicts of interest in this work.

References

1. Jantschek G, Rodewig K, von Wietersheim J, et al. Concepts of psychosomatic disorders in ICD-10: results of the Research Criteria Study. *Psychother Psychosom*. 1995;63(2):112–123. doi:10.1159/000288947
2. Xu W, Jiang W, Ding R, et al. Study of Rates and Factors Associated to Psychosomatic Syndromes Assessed Using the Diagnostic Criteria for Psychosomatic Research across Different Clinical Settings. *Psychother Psychosom*. 2024;93(6):386–396. doi:10.1159/000541404
3. Sifneos PE. The prevalence of 'alexithymic' characteristics in psychosomatic patients. *Psychother Psychosom*. 1973;22(2):255–262. doi:10.1159/000286529
4. Fava GA, Cosci F, Sonino N. Current Psychosomatic Practice. *Psychother Psychosom*. 2017;86(1):13–30. doi:10.1159/000448856
5. World Health Organization. World mental health report: transforming mental health for all. Available fromt https://www.who.int/publications/i/item/9789240049338. Accessed March 2, 2023.
6. Wang Y, Wang W, He Y, et al. Survey on the Community Treatment Groups' Demands of Mental Health Services in Shanghai. *Medicine Society*. 2014;27(04):82–85. doi:10.3870/YXYSH.2014.04.026
7. Berk M, Berk L, Denton T. Psychiatric disorders in primary care. *Aust N Z J Psychiatry*. 2014;48(6):497–499. doi:10.1177/0004867414536668
8. Barry MJ, Nicholson WK, Silverstein M, et al. Screening for Depression and Suicide Risk in Adults: US Preventive Services Task Force Recommendation Statement. *JAMA*. 2023;329(23):2057–2067. doi:10.1001/jama.2023.9297
9. Camacho EM, Davies LM, Hann M, et al. Long-term clinical and cost-effectiveness of collaborative care (versus usual care) for people with mental-physical multimorbidity: cluster-randomised trial. *Br J Psychiatry*. 2018;213(2):456–463. doi:10.1192/bjp.2018.70
10. England E, Nash V, Hawthorne K. GP training in mental health needs urgent reform. *BMJ*. 2017;356:j1311. doi:10.1136/bmj.j1311
11. Qin H, Sun B, Cao Z, et al. Investigation on the Ability of Psychosomatic Disease in General Practitioners in Pudong New Area. *Chin Primary Health Care*. 2018;32(09):61–63. doi:10.3969/j.issn.1001-568X.2018.09.0023
12. Du L, Ge C, Zhao Y, et al. Demand of General Practitioner in Beijing for Training on Depression and the Strategy. *Chin General Pract*. 2011;14(01):6–9. doi:10.3969/j.issn.1007-9572.2011.01.002
13. Xu X, Liu Z, Zhang H, et al. Analysis of referrals of outpatients with psychological disorders by general practitioners and its influencing factors. *Chin General Pract*. 2019;22(21):2537–2542. doi:10.12114/j.issn.1007-9572.2019.00.148
14. Li L, Peng T, Liu R, et al. Development of the psychosomatic symptom scale (PSSS) and assessment of its reliability and validity in general hospital patients in China. *Gen Hosp Psychiatry*. 2020;64:1–8. doi:10.1016/j.genhosppsych.2020.01.008
15. Yuan Y. The Path of the Diagnosis and Treatment Mode for Psychosomatic Medicinein China. *Psychological Commun*. 2021;4(4):200–204. doi:10.12100/j.issn.2096-5494.221065
16. Yuan Y. Classification and assessment of psychosomatic disorders in China. *China Med News*. 2019;34(12):12–13. doi:10.3969/j.issn.1000-8039.2019.12.010
17. Qian Y, Zhang W, Jiang J, et al. Empirical Research of the Evaluation Index System of General Practitioners' Psychosomatic Medical Service Ability. *J Tongji Univ*. 2024;45(05):746–752. doi:10.12289/j.issn.2097-4345.24093
18. Yang Y, Tao Y, Li D, et al. Thoughts on the role of psychosomatic medicine in general practice. *Chin J Gen Pract*. 2020;18(6):998–1001. doi:10.16766/j.cnki.issn.1674-4152.001412
19. Zastrow CH, Hessenauer SL. *Generalist Social Work Practice: A Worktext*. Oxford University Press; 2020.
20. Hua W, Fang Q, Lin W, et al. The level and influencing factors of graduating nursing students' professional commitment from the perspective of Ecological Systems Theory: a cross-sectional study. *Nurse Educ Today*. 2022;119:105567. doi:10.1016/j.nedt.2022.105567
21. Laustsen G. Environment, ecosystems, and ecological behavior: a dialogue toward developing nursing ecological theory. *ANS Adv Nurs Sci*. 2006;29(1):43–54. doi:10.1097/00012272-200601000-00005
22. Xu J, Chen X, Shi R, et al. Research on influencing factors of post competency of traditional Chinese physicians: based on qualitative comparative analysis of fuzzy sets. *Chinese Hospitals*. 2021;25(04):34–38. doi:10.19660/j.issn.1671-0592.2021.4.10
23. Yang Y, Zheng H, Li D, et al. Investigation and development suggestions on psychosomatic disease cognition and coping ability of community healthcare teams. *Chin Primary Health Care*. 2019;33(12):93–96. doi:10.3969/j.issn.1001-568X.2019.12.0030

24. Derksen F, Bensing J, Lagro-Janssen A. Effectiveness of empathy in general practice: a systematic review. *Br J Gen Pract*. 2013;63(606):e76–84. doi:10.3399/bjgp13X660814
25. Karuna C, Palmer V, Scott A, et al. Prevalence of burnout among GPs: a systematic review and meta-analysis. *Br J Gen Pract*. 2022;72(718):e316–e324. doi:10.3399/BJGP.2021.0441
26. MacCallum RC, Widaman KF, Zhang S, et al. Sample size in factor analysis. *PSYCHOLOGICAL METHODS*. 1999;4(1):84–89. doi:10.1037/1082-989X.4.1.84
27. Huang L, Zhang W, Zeng Z, et al. Survey on status quo of psychosomatic medical service ability and training needs among general practice resident physicians. *Chin J General Practitioners*. 2023;22(5):486–491. doi:10.3760/cma.j.cn114798-20220810-00839
28. West CP, Dyrbye LN, Sloan JA, et al. Single item measures of emotional exhaustion and depersonalization are useful for assessing burnout in medical professionals. *J Gen Intern Med*. 2009;24(12):1318–1321. doi:10.1007/s11606-009-1129-z
29. Jiang T, Wan X, Liu Y, et al. Reliability and validity of the Jefferson Scale of Physician Empathy in Chinese medical students. *J Sichuan Univ*. 2015;46(04):602–605. doi:10.13464/j.scuxbyxb.2015.04.021
30. Kaufman AS, Kaufman JC, Liu X, et al. How do educational attainment and gender relate to fluid intelligence, crystallized intelligence, and academic skills at ages 22-90 years. *Arch Clin Neuropsychol*. 2009;24(2):153–163. doi:10.1093/arclin/acp015
31. Bradley CP. Factors which influence the decision whether or not to prescribe: the dilemma facing general practitioners. *Br J Gen Pract*. 1992;42 (364):454–458.
32. Harapan H, Setiawan AM, Yufika A, et al. Knowledge of human monkeypox viral infection among general practitioners: a cross-sectional study in Indonesia. *Pathog Glob Health*. 2020;114(2):68–75. doi:10.1080/20477724.2020.1743037
33. Lelorain S, Brédart A, Dolbeault S, et al. How does a physician's accurate understanding of a cancer patient's unmet needs contribute to patient perception of physician empathy. *Patient Educ Couns*. 2015;98(6):734–741. doi:10.1016/j.pec.2015.03.002
34. Decety J. Empathy in Medicine: what It Is, and How Much We Really Need It. *Am J Med*. 2020;133(5):561–566. doi:10.1016/j.amjmed.2019.12.012
35. Wang Y, Wu Q, Wang Y, et al. The Effects of Physicians' Communication and Empathy Ability on Physician-Patient Relationship from Physicians' and Patients' Perspectives. *J Clin Psychol Med Settings*. 2022;29(4):849–860. doi:10.1007/s10880-022-09844-1
36. Steinmair D, Zervos K, Wong G, et al. Importance of communication in medical practice and medical education: an emphasis on empathy and attitudes and their possible influences. *World J Psychiatry*. 2022;12(2):323. doi:10.5498/wjp.v12.i2.323
37. Ma Z, Guo L, Li Z, et al. Development of the General Practitioner Competency Model Using Grounded Theory for Assessing General Practitioners' Competencies in Delivering Contracted Care Services. *Chin General Pract*. 2023;26(04):460–466+485. doi:10.12114/j.issn.1007-9572.2022.0376
38. Derksen F, Olde Hartman T, Bensing J, et al. Empathy in general practice-the gap between wishes and reality: comparing the views of patients and physicians. *Fam Pract*. 2018;35(2):203–208. doi:10.1093/fampra/cmx080
39. Klau J, Bernardo CO, Gonzalez-Chica DA, et al. Trends in prescription of psychotropic medications to children and adolescents in Australian primary care from 2011 to 2018. *Aust N Z J Psychiatry*. 2022;56(11):1477–1490. doi:10.1177/00048674211067720
40. Monteleone AM, Barone E, Cascino G, et al. Pathways to eating disorder care: a European multicenter study. *Eur Psychiatry*. 2023;66(1):e36. doi:10.1192/j.eurpsy.2023.23
41. Organization WH, Colleges WOoN, Academies. et al. *Integrating Mental Health Into Primary Care: A Global Perspective*. World Health Organization; 2008.
42. Wu A, Roemer EC, Kent KB, et al. Organizational Best Practices Supporting Mental Health in the Workplace. *J Occup Environ Med*. 2021;63(12): e925–e931. doi:10.1097/JOM.0000000000002407
43. Shi J, Jin H, Shi L, et al. The quality of primary care in community health centers: comparison among urban, suburban and rural users in Shanghai, China. *BMC Fam Pract*. 2020;21(1):178. doi:10.1186/s12875-020-01250-6
44. Saraceno B, van Ommeren M, Batniji R, et al. Barriers to improvement of mental health services in low-income and middle-income countries. *Lancet*. 2007;370(9593):1164–1174. doi:10.1016/S0140-6736(07)61263-X
45. Giosa R. Institutional and organisational influence on mental health management in Spanish and Italian primary care. *Int J Sociol Socl Policy*. 2024;44(3/4):341–356. doi:10.1108/IJSSP-03-2023-0081
46. Millman ZB, West ML, Thibeau H, et al. Changes in community providers' screening behaviours, referral practices, and clinical confidence following participation in an early psychosis educational campaign. *Early Interv Psychiatry*. 2022;16(7):744–751. doi:10.1111/eip.13215
47. Kakuma R, Minas H, van Ginneken N, et al. Human resources for mental health care: current situation and strategies for action. *Lancet*. 2011;378 (9803):1654–1663. doi:10.1016/S0140-6736(11)61093-3
48. Jing K, Ren J. A Comparison and Analysis of Chinese and German Practices in General Practitioner Training. *Chin General Pract*. 2024;27 (19):2330–2335. doi:10.12114/j.issn.1007-9572.2023.0259
49. B.LÄNDESÄRZTEKAMMER. Psychosomatische Grundversorgung. Available from: https://www.blaek.de/fortbildung/seminareveranstaltungen-der-blaek/psychosomatische-grundversorgung. Accessed Feb 5, 2023.
50. Balint M. The doctor, his patient, and the illness. *Lancet*. 1955;268(6866):683–688. doi:10.1016/s0140-6736(55)91061-8
51. Ahmed K, Wang TT, Ashrafian H, et al. The effectiveness of continuing medical education for specialist recertification. *Can Urol Assoc J*. 2013;7 (7–8):266–272. doi:10.5489/cuaj.378
52. VanNieuwenborg L, Goossens M, De Lepeleire J, et al. Continuing medical education for general practitioners: a practice format. *Postgrad Med J*. 2016;92(1086):217–222. doi:10.1136/postgradmedj-2015-133662
53. Diaz VA, Chessman A, Johnson AH, et al. Balint groups in family medicine residency programs: a follow-up study from 1990--2010. *Fam Med*. 2015;47(5):367–372.
54. Peh A, Tan G, Soon W, et al. Psychiatry in primary care and training: a Singapore perspective. *Singapore Med J*. 2021;62(5):210–212. doi:10.11622/smedj.2021056
55. Tataw DB. Individual, organizational, and community interprofessional competencies for education, training, and practice in health and social care. *J Hum Behav Soc Environ*. 2011;21(1):1–24. doi:10.1080/10911359.2011.528732