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Factors associated with mental health literacy and demand for mental health services among older adults in China: a cross-sectional study

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Abstract

Background There is limited research on mental health literacy (MHL) among Chinese older adults as well as their demand and willingness for mental health services (MHS). This study investigated the factors associated with them among Chinese older adults. Additionally, predictors of MHL as well as demand and willingness for MHS were compared between older adults living alone and those not living alone.

Methods This study is a cross-sectional study conducted among 494 older adults in Guangzhou, China. Sociodemographic characteristics, frequency of participating in community-based activities, mental health status, MHL, and demand and willingness for MHS were assessed through self-reported questions. A series of logistic regression analyses were conducted to examine factors associated with the MHL and demand and willingness for MHS.

Results The awareness rates for the three MHL-related questions were between 65.3% and 73.7%, and 62.0% and 69.6% of the participants indicated the demand and willingness, respectively, for MHS. Frequently participating in community-based activities increased the likelihood of awareness of the MHL-related questions (ORs = 2.92-4.18, Cls = [1.50,9.28]), as well as the demand and willingness for MHS (ORs = 2.16-2.24, Cls = [1.19,4.20]). Similar significant associations were found among the older adults who were not living alone but not among those living alone.

Conclusions Based on the results of this study, policymakers and clinicians are advised to develop more targeted community-based activities for older adults and focus especially on those living alone to enhance their MHL and increase willingness for MHS.

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Keywords Mental health literacy, Demand for mental health services, Willingness for mental health services, Community-based activity, Chinese context

Background

As the rate of population aging accelerates, the prevalence of mental disorders among older adults is also on the rise [1], and mental health problems are more and more common among older adults [2, 3]. A high level of mental health literacy (MHL) facilitates the early identification of mental disorders, reduces stigma, and accesses timely and effective support and treatment to improve mental health problems [4–7]. Mental health services (MHS) can play a positive role in patients' mental health by helping them recover from the four dimensions of fostering relationships, promoting well-being, providing treatment, and improving social inclusion [8]. However, the levels of MHL in Chinese residents are generally low. The results of a meta-analysis showed that the knowledge rate of mental health among Chinese urban residents was only 28.12% [9]. In addition, Chinese older adults are reported to be reluctant to seek MHS when needed due to self-stigma. Prior research found that older people were less likely to report any perceived need for mental health care than younger people [10]. Their negative attitudes toward mental illness and the low MHL may also discourage them from seeking help [11].

MHL, demand for MHS, and willingness to use MHS do not appear and develop simultaneously. Possibly due to concerns about the side effects of psychotropic medications and the stigma associated with mental illness, individuals with high MHL may still report unnecessary need for MHS. Moreover, even if older adults do have a need for MHS, they are not necessarily willing to seek professional help. One study has shown that MHS use was affected by MHL, demand, and attitudes toward help-seeking [12].

According to the findings of previous research, a variety of factors, such as stigma associated with mental illness [13–16], family support or endorsement of service use [17-19], and worries over medication side effects [20-22], may have a substantial impact on Chinese older adults' MHL and MHS access and utilization. At the individual level, socio-demographic characteristics (e.g., gender, age, and education level) and psychological conditions, such as symptoms of depression and anxiety and cognitive function, have significant correlations with MHL, demand for and willingness to seek help from MHS [23–35]. However, the results of studies exploring the influence factors of MHL and demand for MHS at the individual level are inconsistent. For example, a crosssectional study of MHL among older Koreans showed that MHL was positively associated with education level and literacy, and negatively associated with age [26]. In contrast, a cross-sectional study of MHL in older adults in Australia showed that gender and education level were not associated with MHL [24]. In addition, an Australian survey noted significantly higher MHL in women than in men [36], but one Japanese study pointed to significantly higher levels in men than in women [37]. In a study conducted in Quebec, Canada, 33% of older adults felt they demanded mental health care [38]. In contrast, a survey in a southern Chinese city showed that 64.2% of older adults reported a high demand for community MHS [39].

At the community level, community-based supports and services have been widely implemented in China as a new way to meet the needs of older adults and facilitate healthy aging [40]. Participation in the activities has been found to have a positive impact on health literacy and mental health of older adults [41–45]. However, the utilization rate of community care facilities is still relatively low and uneven [46]. Whether the frequency of participation in the community-based activities would promote older adults' MHL and be helpful to improve their demand as well as willingness for MHS is still unclear.

According to the developmental process of aging, older adults often experience significant life changes, such as the loss of close others. The number of older people living alone continues to increase in the aging society [47]. It was demonstrated that the mental health conditions of older people living alone tended to be poor [48, 49]. However, whether living alone would affect older adults' attitudes toward MHS and the acceptance of knowledge regarding mental health is not clear. On the one hand, living alone is likely to be detrimental to older adults' mental health conditions [50], which would drive them to learn more knowledge of mental problems and increase their demands for psychological assistance. On the other hand, living alone appears to decrease the cognitive function of older adults and makes it difficult to learn and accept new things [51]. Therefore, whether living alone would affect older adults' MHL and demand as well as willingness to use MHS and their influence factors is necessary to be figured out.

In summary, there are still several gaps in prior research on MHL and the demand and willingness for MHS in older adults. First, given that attitudes toward help-seeking in MHS are closely related to cultural beliefs and values [52]. The factors associated with older adults' MHL and demand and willingness for MHS might vary in different cultural backgrounds. However, few prior studies have investigated the impact factors of MHL and demand and willingness for MHS in China. Second, to our knowledge, there has not yet been a study exploring the association of the frequency of participation in the community-based activities with MHL and the demand and willingness for MHS. Third, there is limited research comparing the differences in MHL and demand as well as willingness to use MHS and their influence factors between older adults living alone and those not living alone. Identifying the specific factors associated with older adults' MHL and demand as well as willingness for MHS in individuals with different living conditions would be salutary for clinicians to develop targeted interventions in the future.

The aim of this study was to investigate the level of MHL as well as the need and willingness for MHS among older adults in the Chinese community. In addition, this study explored the effects of demographic variables, community-based activities participation, and psychological status of older adults on their MHL and demand as well as willingness for MHS. Moreover, this study compared the differences in factors influencing MHL as well as the need and willingness for MHS between older adults living alone and those not living alone. The results of this study would help to fill the gaps in prior research by providing evidence in Chinese community-dwelling older adults and be beneficial to develop intervention strategies for older adults with different living conditions to improve their mental health consequences.

Methods

Procedure and participants

In this study, a total of 494 older adults from two representative communities in Guangzhou, China, were selected from April to August 2023 using cluster sampling method. The two communities were selected in Baiyun district and Huangpu district of Guangzhou. Available participants in these two communities were all invited to participate in the study. Inclusion criteria for participation included: (a) aged 65 years and older; (b) no severe cognitive impairment and able to cooperate in completing the assessment. Forty-three cases were removed from the analysis due to missing responses on the MHL, and 8 additional cases were removed due to ineligibility. Therefore, the responses of 443 participants were included in the final data analysis.

Government-affiliated community staff, with no prior relationships with the older adults, facilitated participant recruitment. One week before the invesitgation, they sent invitation messages to all eligible participants or their caregivers. The participants were given the option of completing the questionnaire through either an onsite face-to-face interview or a mobile phone call. All participants chose the face-to-face interview. Considering that the majority of older adults found it difficult to read clearly by themselves, all surveys were conducted by investigators. Participants' responses were entered into an online survey platform by the investigators. All investigators had received professional training before the initiation of the investigation.

All participants provided written informed consent and were informed that they had the right to withdraw at any time. This study was carried out in accordance with the Helsinki Declaration as revised in 1989 and was approved by the Ethics Committees of South China Normal University (SCNU-PSY-2023-005).

Measures

Mental health literacy

Given that most of the established measures for MHL are aimed at the general public and adolescent groups [53–56] and few specific measurement tools were developed especially to assess MHL in older adults, this study used the following three questions for MHL in older adults based on the Ten Rules for Mental Health Literacy (2018 edition) of the National Health Commission of the PRC [57], including "Do you know that mental health is an essential component of health?", "Do you know that depression and anxiety can be effectively prevented and treated?", and "Do you know that frequently and regularly conducting physical and brain exercises and engaging in social activities can prevent Alzheimer's?" Participants were instructed to answer "Yes/no" to each question based on their perception. Considering that most Chinese older adults have a low education level, the three questions used in this study, including the importance of mental health, preventability and treatability of mental illnesses, and the means of preventing dementia are more in line with the Chinese cultural background of older adults and easy to be understood by the participants [58].

Demand and willingness for mental health services

Two questions were designed to investigate the demand and willingness of older adults for MHS. The question "Do you think older people need mental health services?" was used to assess the demand for MHS, and "Would you like to receive mental health services when you feel emotionally distressed?" was applied to evaluate the willingness. Considering that the majority of older adults in China have stigma about mental problems and feel ashamed to report personal demands for mental health services, the question about MHS demand was asked to the older adults from a more macro perspective (the older population) to better reflect the participants' actual viewpoint. In comparison, willingness for MHS was asked under the assumption of emotionally distressed situations in the future without reflecting the current psychological condition of participants. The individualoriented question was able to capture the actual attitude of participants. The question on MHS demand was rated on a 5-point Likert scale ranging from 1 (not need) to 5

(very need). The question on willingness was rated on a 3-point Likert scale (1 = willing, 2 = not very willing, 3 = unwilling).

In subsequent data analyses, the categories of MHS demands were recoded into three levels (1 = not need, 2 = neutral, and 3 = need), whereby the original categories "1 = not need" and "2 = not too need" were both recoded as "1 = not need"; the original category "3 = neutral" was recoded as "2 = neutral"; the former categories "4 = need" and "5 = very need" were both recoded as "3 = need." The MHS willingness category was recoded into two levels (0 = unwilling, 1 = willing), whereby the original categories "2 = not very willing" and "3 = unwilling" were both recoded as "0 = unwilling ".

Depressive symptom

The Chinese version of the Patient Health Questionnaire (PHQ-9) was used to measure depressive symptoms [59]. It consisted of 9 items, and each item was rated using a four-point rating scale ranging from 0 (not at all) to 3 (nearly every day and more than 10 days). A sum score of all items, ranging from 0 to 27, was calculated for analysis, with higher scores indicating more severe depressive symptoms. The questionnaire showed internal consistency, with Cronbach's alpha being 0.85 in this study.

Anxiety symptom

The Chinese version of Generalized Anxiety Disorder-7 (GAD-7) was used to assess participants' anxiety symptoms [60]. It consisted of 7 items and each item was rated using a 4-point scale ranging from 0 (not at all) to 3 (nearly every day and more than 10 days). A sum score of all items, ranging from 0 to 21, was computed for analysis, with higher scores representing more severe anxiety symptoms. The scale's internal consistency reliability was high, with Cronbach's alpha being 0.94 in this study.

Cognitive function

The Chinese version of Ascertain Dementia 8-item questionnaire (AD-8) was used to measure participants' cognitive impairment. It is a sensitive screening tool for identifying early dementia with good reliability and valid-ity [61]. Participants were required to respond to each question by selecting either "Yes (1)" or "No (0)". The total score, ranging from 0 to 8, was calculated for analysis, with higher scores indicating more severe cognitive impairment. The Cronbach's alpha was 0.86 in this study.

Frequency of participating in community-based activities and sociodemographic characteristics

When assessing the frequency of participation, we asked the question "Is there a place for older adults' activities near your home (e.g., a activity room or a college for older adults, etc.)?" with a follow-up question if the participant answered "yes", that is, "Do you often go to the activities?". If the participant answered that there was no activity place for the older adults or that they never participated in the activities, it was classified as "0=never". If they answered that they participated in the activities a few times a year but not as often as once a month, they were classified as "1=sometimes participated". If they participated in the activities at least once a month, they were classified as "2=always participated". Given that the community-based service for older adults was newly implemented in China in recent years, the activities were not provided frequently. Therefore, the three levels of frequency (i.e., never, sometimes, and always) should be sufficient to reflect the actual status of older adults' participation.

In addition, participants' sociodemographic characteristics were collected, including sex, age, length of education, and whether living alone (0 = no, 1 = yes).

Statistical analyses

All analyses were conducted with SPSS 26.0. Sociodemographic characteristics of participants, PHQ-9, GAD-7, AD-8, MHL, and demand and willingness for mental health services were described using means and standard deviations for continuous variables, or frequencies and percentages for discrete variables. One missing value on gender and living alone status were found in this study, both of which were missing at random not affecting subsequent data analysis [62, 63]. Chi-square tests, t-tests, and one-way ANOVA tests were used to examine the differences in sociodemographic variables, PHQ-9, GAD-7, and AD-8 among MHL in three dimensions and different levels of demand and willingness for mental health services. In addition, binary logistic regression analysis was used to examine the effects of sociodemographic characteristics, PHQ-9, GAD-7, and AD-8 on MHL dimensions and willingness for mental health services. Next, multivariable ordinal logistic regression was also used to examine the effect of sociodemographic characteristics, PHQ-9, GAD-7, and AD-8 on demand for mental health services. To further estimate the protective and risk factors for the prevalence of MHL dimensions and demand and willingness for mental health services in different living statuses, a stratified analysis was conducted in living alone and non-living alone separately. In all two-sided tests, the significance level was set at 0.05.

Results

Description of participants' characteristics

A total of 443 individuals were included in the present study. The participants' social-demographic characteristics are presented in Table 1. The current participants were aged between 65 and 96 years, with a mean age of 73.40 (SD = 6.59) years. The average length of education

Table 1 Social-demographic characteristics of the participants

Characteristics		n/Mean	%/SD
Sex (n & %)	Male	182	41.1
	Female	260	58.7
Age (year, mean & SD)		73.40	6.59
Length of education (year, mean & SD)		5.63	3.43
Living alone status (n & %)	Yes	49	11.1
	No	393	88.7
Frequency of participating in the	Never	139	31.4
community-based activities (n	Sometimes	215	48.5
& %)	Always	89	20.1
PHQ-9 (score, mean & SD)		1.47	2.93
GAD-7 (score, mean & SD)		0.47	1.60
AD-8 (score, mean & SD)		1.74	2.28

was 5.63 (SD = 3.43) years. Among the 443 participants, 58.7% were females and the majority (88.7%) were living with their relatives or caregivers. In terms of the frequency of participating in community-based activities, nearly one-third (31.4%) never attended, and the majority attended the activities sometimes (48.5%) or always (20.1%).

Mental health literacy profiles and univariate analysis

As shown in Figs. 1A and 115 (26.3%) older adults reported a lack of knowledge of the importance of mental

health. Approximately one-third (34.7%) of the participants were unaware of the preventability and treatability of mental illnesses, and 26.5% did not know the means of preventing dementia.

Table 2 shows the results of MHL profiles at different demographic and mental health status groups that were examined using univariate analysis. Participants who were unaware of the preventability and treatability of mental illnesses and the means of preventing dementia were more likely to be older (t = 2.818, p = .005 for the preventability and treatability of mental illnesses, t = 2.574, p=.011 for the means of preventing dementia) and with lower education levels (t = -3.309, p = .001 for the preventability and treatability of mental illnesses, t = -2.767, p = .006 for the means of preventing dementia). Participants who never or merely sometimes participated in the community-based activities appeared to lack MHL in three dimensions ($\chi 2 = 13.192$, p = .001 for the knowledge of the importance of mental health, $\chi 2 = 13.927$, p = .001for the preventability and treatability of mental illnesses, and $\chi^2 = 15.450$, p < .001 for the means of preventing dementia). Moreover, the older adults who were lack of the knowledge of preventability and treatability of mental illnesses and the means of preventing dementia were likely to report more depressive symptoms (t = 1.997, p=.047 for preventability and treatability of mental illnesses, t = 2.142, p = .034 for means of preventing



Fig. 1 Distributions of MHL and demand and willingness for mental health services. A Distributions of MHL. B Distributions of demand and willingness for mental health services

Variables		lmportai mental h	nce of iealth	χ^2/t	Preventa treatabili tal illness	bility and ity of men- ses	χ^2/t	Means of ing deme	f prevent- entia	χ^2/t	Demand 1 services	for mental	health	χ^2/F	Willingne mental h services	ess for ealth	χ^2/t
		YES N(%) / M(SD)	NO N(%) / M(SD)		YES N(%) / M(SD)	NO N(%) / M(SD)		YES N(%) / M(SD)	NO N(%) / M(SD)		Not need N(%)/M(SD)	Neutral N(%)/M(SD)	Need N(%)/M(SD)		Unwilling N(%)/M(SD)	Willing N(%)/M(SD)	
Sex	Male	133(41.3)	48(41.7)	0.007	124(43.5)	57(37.5)	1.475	138(43.4)	42(36.5)	1.643	27(48.2)	45(40.9)	109(40.1)	1.280	55(41.4)	126(41.6)	0.002
	Female	189(58.7)	67(58.3)		161(56.5)	95(62.5)		180(56.6)	73(63.5)		29(51.8)	65(59.1)	163(59.9)		78(58.6)	177(58.4)	
Age	M(SD)	73.23(6.27)	73.90(7.46)	0.853	72.73(5.96)	74.71(7.51)	2.818**	72.87(6.12)	74.89(7.58)	2.574*	72.86(5.36)	73.03(7.11)	73.67(6.17)	0.598	73.15(6.44)	73.55(6.68)	-0.586
Length of education	M(SD)	5.70(3.49)	5.41(3.31)	-0.773	6.03(3.35)	4.89(3.51)	-3.309***	5.92(3.43)	4.89(3.34)	-2.767**	6.07(3.68)	5.80(3.54)	5.46(3.34)	0.907	5.95(3.46)	5.49(3.43)	1.256
Living alone	No	286(88.8)	102(88.7)	0.001	254(89.1)	134(88.2)	0.093	283(88.7)	104(90.4)	0.259	1(1.8)	11(9.9)	36(13.3)	6.456*	9(6.8)	39(12.9)	3.516
status	Yes	36(11.2)	13(11.3)		31(10.9)	18(11.8)		36(11.3)	11(9.6)		55(98.2)	100(90.1)	235(86.7)		124(93.2)	264(87.1)	
Frequency of	Never	92(28.5)	42(36.5)	13.192***	84(29.4)	51(33.6)	13.927***	93(29.2)	42(36.5)	15.450***	19(33.9)	44(39.6)	73(26.8)	10.060*	49(36.8)	86(28.3)	5.662
participat-	Sometimes	152(47.1)	63(54.8)		129(45.1)	85(55.9)		146(45.8)	64(55.7)		25(44.6)	54(48.6)	135(49.6)		65(48.9)	148(48.7)	
ing in the community- based activities	Always	79(24.5)	10(8.7)		73(25.5)	16(10.5)		80(25.1)	(8.2)6		12(21.4)	13(11.7)	64(23.5)		19(14.3)	70(23.0)	
6-OHd	M(SD)	1.44(2.79)	1.59(3.36)	0.460	1.25(2.55)	1.90(3.55)	1.997*	1.21(2.55)	1.98(3.55)	2.142*	1.09(1.68)	1.16(2.69)	1.68(3.22)	1.780	1.02(1.62)	1.68(3.35)	-2.764**
GAD-7	M(SD)	0.46(1.58)	0.52(1.70)	0.375	0.40(1.48)	0.63(1.82)	1.341	0.37(1.43)	0.61(1.73)	1.351	0.25(1.37)	0.25(1.26)	0.61(1.76)	2.645	0.19(1.05)	0.60(1.79)	-3.015**
AD-8	M(SD)	1.55(2.22)	2.23(2.39)	2.741**	1.52(2.28)	2.13(2.25)	2.693**	1.54(2.16)	2.18(2.42)	2.645**	1.38(1.57)	1.48(1.89)	1.90(2.52)	2.107	1.41(1.71)	1.87(2.48)	-2.248*

dementia) but not anxiety symptoms (t=1.341, p=.181 for preventability and treatability of mental illnesses). In addition, participants who had insufficient MHL in three dimensions tended to report higher cognitive impairment (t=2.741, p=.006 for the knowledge of the importance of mental health, t = 2.693, p=.007 for the preventability and treatability of mental illnesses, and t=2.645, p=.008 for the means of preventing dementia).

Profiles of demand and willingness for mental health services and univariate analysis

As shown in Figs. 1B and 62.0% of the older adults reported the demand for MHS, among which 16.2% expressed a strong need. Over two-thirds (69.6%) of the participants expressed that they would be willing to receive MHS if they felt emotionally distressed.

Table 2 indicates the results of demand and willingness for MHS at different demographic and mental health status groups that were examined using univariate analysis. Compared with participants who expressed negative or neutral attitudes toward the necessity of MHS, those who indicated a need for MHS contained higher proportions of older adults who were living alone (13.3% vs. 1.8% vs. 9.9%; $\chi 2 = 6.456$, p = .040) and more percentages of participants who always participated in the communitybased activities (23.5% vs. 21.4% vs. 11.7%; $\chi 2 = 10.060$, p = .039). Additionally, participants who were willing to receive MHS howed higher scores on the scores of PHQ-9, GAD-7, and AD-8.

Logistic regression analysis

As shown in Table 3, after adjusting for other variables, those who always participated in the community-based activities were more likely to aware the importance of mental health (odds ratio (OR) = 3.70, 95% confidence interval (CI) = [1.72, 7.95]), preventability and treatability of mental illnesses (OR = 2.92, 95% CI = [1.50, 5.68]), and means of preventing dementia (OR = 4.18, 95% CI = [1.88, 9.28]), compared with those who never took part in the activities.

The results of ordinal logistic regression examining the factors associated with demand and willingness for MHS are shown in Table 4. Compared to the older adults who never participated in the community-based activities, those who always attended activities had higher levels of demand for MHS (OR = 2.16, 95% CI = [1.22, 3.79]) and willingness for MHS (OR = 2.24, 95% CI = [1.19, 4.20]).

Stratified analysis in living alone and non-living alone

The frequency of participating in the community-based activities was significantly correlated with the MHL among non-living alone (OR = 3.57, 95% CI = [1.54, 8.28] for the knowledge of importance of mental health, OR = 3.10, 95% CI = [1.48, 6.50] for the preventability and

Table 3 Results of logistic regression analysis of factors associated with mental health literacy

Variables Importance of men		of mental he	alth (ref: No)	Preventabi mental illn	lity and trea esses (ref: N	tability of o)	Means of preventing dementia (No)			
		Overall	Living alone	Non-living alone	Overall	Living alone	Non-living alone	Overall	Living alone	Non-living alone
		OR (95% CI)	OR (95% Cl)	OR (95% Cl)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Sex (ref: Male)	Female	1.17 (0.72, 1.91)	0.66 (0.08, 5.80)	1.14 (0.68, 1.90)	0.99 (0.62, 1.56)	0.17 (0.02, 1.52)	0.99 (0.61, 1.60)	0.98 (0.60, 1.61)	0.66 (0.07, 6.14)	0.91 (0.54, 1.53)
Age		1.00 (0.97, 1.04)	1.05 (0.91, 1.21)	1.00 (0.96, 1.04)	0.98 (0.94, 1.01)	0.99 (0.86, 1.14)	0.97 (0.93, 1.01)	0.98 (0.94, 1.02)	1.00 (0.87, 1.16)	0.97 (0.93, 1.02)
Length of education		1.02 (0.94, 1.10)	1.28 (0.87, 1.87)	0.99 (0.91, 1.08)	1.07 (1.00, 1.16)	1.37 (0.94, 2.01)	1.04 (0.96, 1.13)	1.06 (0.97, 1.15)	1.19 (0.81, 1.75)	1.05 (0.96, 1.14)
Frequency of par-	Sometimes	1.14 (0.70, 1.85)	6.74 (0.84, 53.79)	0.92 (0.55, 1.55)	0.92 (0.58, 1.46)	3.95 (0.52, 30.07)	0.79 (0.48, 1.29)	1.03 (0.63, 1.67)	2.52 (0.27, 23.9)	0.96 (0.58, 1.61)
ticipating in the communi- ty-based activities (ref: Never)	Always	3.70 (1.72, 7.95) ^{***}	3.93 (0.42, 36.59)	3.57 (1.54, 8.28)**	2.92 (1.50, 5.68)**	1.87 (0.19, 18.36) **	3.10 (1.48, 6.50)**	4.18 (1.88, 9.28) ^{***}	0.79 (0.09, 7.23)	5.51 (2.16, 14.02) ^{***}
PHQ-9		1.00 (0.90, 1.13)	1.08 (0.83, 1.42)	0.98 (0.86, 1.12)	0.95 (0.86, 1.05)	1.30 (0.95, 1.79)	0.88 (0.78, 1.00) [*]	0.92 (0.82, 1.02)	0.97 (0.75, 1.26)	0.89 (0.79, 1.02)
GAD-7		1.06 (0.86, 1.31)	1.01 (0.62, 1.65)	1.01 (0.78, 1.31)	1.12 (0.91, 1.36)	0.76 (0.49, 1.19)	1.19 (0.92, 1.54)	1.09 (0.88, 1.35)	1.00 (0.62, 1.59)	1.08 (0.83, 1.41)
AD-8		0.88 (0.79, 0.97) [*]	0.87 (0.61, 1.24)	0.87 (0.78, 0.97) [*]	0.93 (0.84, 1.03)	0.92 (0.66, 1.27)	0.92 (0.82, 1.03)	0.94 (0.84, 1.05)	0.79 (0.54, 1.15)	0.94 (0.84, 1.06)

OR = odds ratio, CI = confidence interval

*p <.05, **p <.01, ***p <.001

Table 4	Results of logistic	regression of factor	's associated with de	emand ^a and willing	ness for mental health services

Variables		Demand for me (ref: Not need)	ntal health service	s	Willingness for mental health services (ref: Unwilling)		
		Overall	Living alone	Non-living alone	Overall	Living alone	Non-living alone
		OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Sex (ref: Male)	Female	1.16 (0.76, 1.76)	0.40 (0.04, 3.90)	1.15 (0.74, 1.77)	0.93 (0.59, 1.48)	1.37 (0.12, 15.99)	0.89 (0.56, 1.44)
Age		1.00 (0.97, 1.04)	1.10 (0.95, 1.27)	0.99 (0.96, 1.03)	0.99 (0.96, 1.03)	0.97 (0.84, 1.12)	0.99 (0.95, 1.03)
Length of education		0.99 (0.93, 1.06)	1.36 (0.97, 1.91)	0.98 (0.91, 1.05)	0.97 (0.90, 1.05)	1.14 (0.84, 1.54)	0.96 (0.89, 1.04)
Frequency of	Sometimes	1.45 (0.94, 2.24)	0.47 (0.05, 4.51)	1.37 (0.87, 2.17)	1.29 (0.81, 2.06)	1.88 (0.16, 22.35)	1.22 (0.74, 1.99)
participating in the community-based activities (ref: Never)	Always	2.16 (1.22, 3.79) ^{**}	1.25 (0.11, 13.92)	1.98 (1.10, 3.59) [*]	2.24 (1.19, 4.20) [*]	7.54 (0.33, 173.84)	2.03 (1.05, 3.91) [*]
PHQ-9		1.02 (0.91, 1.13)	1.28 (0.70, 2.35)	1.02 (0.90, 1.14)	1.04 (0.92, 1.17)	0.92 (0.47, 1.82)	1.04 (0.91, 1.19)
GAD-7		1.09 (0.87, 1.35)	6865.29 (0.00, -)	0.96 (0.75, 1.23)	1.13 (0.87, 1.46)	9142.13 (0.00, -)	1.00 (0.76, 1.33)
AD-8		1.06 (0.96, 1.18)	0.81 (0.52, 1.27)	1.07 (0.96, 1.19)	1.05 (0.94, 1.17)	1.06 (0.66, 1.69)	1.06 (0.94, 1.19)

^a Using the "Not need" answer as a response to establish ordinal logistic regression of demand for mental health services

OR = odds ratio, CI = confidence interval

*p <.05, **p <.01, ***p <.001

treatability of mental illnesses, and OR = 5.51, 95% CI = [2.16, 14.02] for the means of preventing dementia) but not living alone (OR = 3.93, 95% CI = [0.42, 36.59] for the knowledge of importance of mental health, OR = 1.87, 95% CI = [0.19, 18.36] for the preventability and treatability of mental illnesses, and OR = 0.79, 95% CI = [0.09,7.23] for the means of preventing dementia). More frequent participation in the community-based activities consistently enhanced the awareness of all three dimensions of MHL. Additionally, the lower score of AD-8 was associated with the awareness of the importance of mental health among non-living alone (OR = 0.87, 95% CI = [0.78, 0.97]). Similarly, lower scores of PHQ-9 contributed to the awareness of the preventability and treatability of mental illnesses among non-living alone (OR = 0.88, 95% CI = [0.78, 1.00]). Furthermore, no factors showed a significant effect on MHL among those living alone (see Table 3).

More frequent participation in the community-based activities was significantly associated with a stronger demand (OR = 1.98, 95% CI = [1.10, 3.59]) and willingness (OR = 2.03, 95% CI = [1.05, 3.91]) for MHS among non-living alone. However, no variables showed a significant effect on demand and willingness for MHS among those living alone (see Table 4).

Discussion

This study revealed the conditions of the older adults' MHL as well as demand and willingness for MHS in China. In addition, and examined the associations of socio-demographics, participation in community-based activities, and mental health status with the older adults' MHL as well as demand and willingness for MHS.

In this study, the awareness rate of mental health knowledge among older adults regarding the prevention and treatment of mental disorders was 58.2%. Due to the limited number of similar studies and the lack of standardized survey tools, it might be difficult to compare the level of MHL with other populations. Furthermore, we found that over half of the participants expressed the demand for mental health services (62.0%), and over twothirds of the participants were willing to receive mental health services (69.6%). The rate of demand was higher than that reported among urban residents in Beijing, which was demonstrated to be 58.0% in 2017 [64]. The rate of willingness was also higher than that reported among community-dwelling persons in central areas of China in 2022, which revealed a percentage of 58.9% [65]. Potential explanations might be that more community-based services have been implemented among older adults these recent years in China. For example, mental health screening for older adults has been conducted. Timely psychological counseling or referrals are provided for older individuals who are at risk [66].

The binary logistic regression result indicated that participation in community-based activities was associated with MHL. MHL is a construct that has arisen from the domain of health literacy [67], and their relationship is positively correlated [68]. Participating in communitybased activities can be considered as one of the ways for older adults to engage in social participation. Given that positive associations were found between social participation and health literacy, social participation might also improve MHL [69]. Furthermore, older adults who always participate in community-based activities generally have more social support and a larger social network. Higher levels of perceived social support and social network size were proved to be positively related to MHL [70]. In addition, a positive correlation between social network size and MHL was demonstrated in a prior study [26]. The cognitive function condition might also influence the awareness of the importance of mental health among older adults. The more severe the cognitive impairment, the less likely the older adults could be aware of the importance of mental health.

There was no significant correlation between depressive symptoms and MHL in this study. The result is partially consistent with previous studies [28], demonstrating that depression did not significantly contribute to a higher mental health knowledge, including basic knowledge, such as mental health is an integral part of health, and more specific knowledge, such as proper exercise can relieve anxiety and depression symptoms were not significantly associated. However, the non-significant effect of depressive symptoms on MHL found in this study might be due to that the total PHQ-9 scores were predominantly clustered at lower levels. Future studies may re-investigate the association between depression and MHL using other measures, such as CES-D and GDS-30 to assess the severity of older adults' depressive symptoms. In this study, PHQ-9 was used as a screening tool for depressive symptoms with a cutoff score of 5. A total PHQ-9 score greater than or equal to 5 was determined to indicate the presence of depression [71, 72]. The results showed that the prevalence of depression among older adults in this study was 9%, which was much lower than the prevalence of depressive symptoms among older adults in China found in some other studies using the Center for Epidemiologic Studies Depression Scale (CES-D) or Geriatric Depression Scale (GDS-30) [73-75]. We speculated that this may be due to the differences in instruments assessing depression, given that some studies using the PHQ-9 also showed a relatively low prevalence of depression in older Chinese adults [28]. Future studies may explore the differences in the measures of depression when employed in older adults. Another possible reason might be that face-to-face interviews were more likely to bring in the social desirability effect. Participants might perceive stigma and be reluctant to disclose their actual emotional state to a stranger [73].

In the logistic regression analyses of the demand and willingness for MHS, results indicated that the levels of participation in community-based activities were likely to influence the demand and willingness for mental health services among older adults. A prior study used the Big Five personality traits measurement to explore the relationship between personality traits and the need for mental health care. It was demonstrated that openness was associated with the need for mental care. Individuals with higher openness were more likely to perceive the need for mental health care [76]. Openness refers to an individual's attitude of being open to experiences and exploration [77]. Older adults who participate frequently in community-based activities were thought to exhibit relatively higher levels of openness, thereby impacting their demand and willingness for mental health services. Furthermore, regular participation in community-based activities implies that individuals might have more understanding and accessibility to mental health services, given that these services were commonly built in community-based activities. This understanding may increase their awareness of mental health services, leading them to be more likely to express the demand and positive attitude toward such services.

The results of the stratified analysis indicated a significant negative correlation between depressive symptoms and the preventability and treatability of mental illnesses among non-living-alone older individuals, which is consistent with previous research [28]. Regular participation in community-based activities was significantly associated with MHL and the demand and willingness for mental health services among non-living alone older adults, but not in the group of older adults living alone. This suggested that living alone might be a risk factor for MHL and the demand and willingness for mental health services offset the positive effect of community activities. Targeted psychosocial interventions are recommended to be developed according to older adults with different living situations.

There are several limitations in this study. First, the findings of this study were not able to establish causal associations of demographic variables, participation in community-based activities, mental health status with MHL, demand, and willingness for mental health services due to the cross-sectional design. Second, although the questions to assess the older adults' MHL were based on prior research [57], they were not standardized. In this study, the measurement of MHL only evaluated three aspects of the awareness of mental health knowledge, which may not include the entire view of the MHL among older adults. Third, given that the majority of participants were not living alone in this study, the sample size for the living alone group was relatively small, which might limit the ability to detect the risk factors for MHL with small effect sizes or underestimate their effect sizes. Future research may specifically target older adults who are living alone and investigate the factors associated with their MHL and demand for mental health services. In addition, although the sociodemographic characteristics of the participants recruited in this study were comparable to the older population found from a national investigation in China [78], It is not clear whether the findings can be immediately generalized to rural areas. Finally, some other factors, such as stigma associated with mental illness [79, 80], family support or endorsement of service

use [17, 81], and worries over medication side effects [82, 83], are also important for MHL and demand as well as willingness of MHS among Chinese older adults. Additional studies are recommended to identify their impacts on MHL and MHS access and utilization in the future.

Conclusions

This study enriches the research related to MHL as well as demand and willingness for MHS among older adults in China. The results revealed that, although the majority of Chinese older adults were aware of the basic knowledge of mental health, their MHL might not be enough. More frequently participating in community-based activities was strongly associated with higher MHL and acceptance of MHS for older adults. However, this beneficial impact was more likely to take effect among those who were not living alone but not among those living alone. Therefore, non-living-alone older adults might gain greater benefits from activity participation in terms of MHL and openness to MHS. To enhance older adults' MHL and acceptance of MHS, clinicians and policymakers should pay more attention to the frequency and quality of community-based activities in the future, and develop more targeted approaches and policies to incentivize older adults to participate in activities. In addition, the older adults who are living alone should be paid particular attention.

Abbreviations

MHL	Mental Health Literacy
MHS	Mental Health Services
PHQ-9	Patient Health Questionnaire-9
GAD-7	Generalized Anxiety Disorder-7
AD-8	Ascertain Dementia 8-item questionnaire
OR	Odds Ratio
CI	Confidence Interval
CES-D	Center for Epidemiologic Studies Depression Scale

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Author contributions

HC analyzed and interpreted the respondent data regarding mental health literacy and demand for mental health services, prepared and created the published work, specifically writing the initial draft. ZM provided the conceptualization of this study and guided the writing and review of the manuscript. RH, YL, HL, ZZ, and XM were mainly responsible for the preliminary investigation, management and coordination responsibility for the research activity planning and execution. DW, WW, JL, WL, LY, and RZ participated in this project administration and contributed to the investigation. YF and FF provided the idea for the study, and was responsible for ensuring that the descriptions are accurate, in addition, funds were provided to support this study. All authors read and approved the final manuscript.

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Data availability

The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

All participants provided written informed consent and were informed that they had the right to withdraw at any time. This study was carried out in accordance with the Helsinki Declaration as revised in 1989 and was approved by the Ethics Committees of South China Normal University (SCNU-PSY-2023-005).

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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