Depressive symptoms, social support, and health-related quality of life: A community-based study in Shanghai, China

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ABSTRACT

Background: Depressive symptoms erode both physical and mental aspects of health-related quality of life (HRQoL). Social support (SS) may improve HRQoL through its direct effects or buffering effects. The association among depressive symptoms, SS, and HRQoL has been studied in specific groups, but research in the general adult population remains limited. This study examined the association among depressive symptoms, SS, and HRQoL, including exploring whether SS (including its three dimensions: subjective SS, objective SS and support utilization) mediated or moderated the relationship between depressive symptoms and HRQoL among community-based adults.

Methods: We conducted a cross-sectional survey in six communities in Shanghai, China, and 1642 adult participants with complete information on depressive symptoms and/or SS, and HRQoL were included. Linear regression analysis was used to investigate the association among depressive symptoms, SS, and HRQoL. In addition, we explored the mediating and moderating role of SS in the relationship between depressive symptoms and HRQoL.

Results: More depressive symptoms were associated with lower physical HRQoL (B = −0.64, p < .001) and lower mental HRQoL (B = −0.83, p < .001). SS (B = 0.07, p = .02), specifically subjective SS (B = 0.09, p = .03), was positively related to mental HRQoL. After adjusting for covariates, we found no evidence for a mediating role of SS in the relationship between depressive symptoms and HRQoL, while SS (subjective SS and objective SS) moderated the association between depressive symptoms and mental HRQoL.

Limitations: Due to the low voluntary participation rate of employees, participants represented approximately 50% of the individuals approached, thus limiting the generalizability of our findings. Data collected through self-report scales could lead to information bias.

Conclusions: SS does not appear to underlie the relationship between depressive symptoms and HRQoL. However, interventions to increase SS (in particular, subjective SS and objective SS) should be studied to determine whether they may be beneficial in alleviating the adverse impact of depressive symptoms on mental HRQoL.

1. Introduction

Depression is a leading cause of suboptimal health and a major contributor to global disease burden [1], affecting approximately 280 million people of all ages worldwide [2]. In China, as assessed by the Center for Epidemiologic Studies Depression (CES—D) scale, 37.9% of adults (i.e., ≥18 years old) experience depressive symptoms, and 4.1% suffer from severe depression [3]. Although depressive symptoms are distributed across all age groups of adults, the prevalence of depression gradually increases with age [4]. Therefore, it is essential to not only focus on depressive symptoms/depression in specific groups but also to design tailored interventions for depressive symptoms/depression for all

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adults.

Social support (SS) is an element of social relationships that promotes health and well-being at various levels [5]. SS can be classified into different dimensions, specifically subjective SS, objective SS, and support utilization. Subjective SS refers to the experiential or emotional SS, namely that, the individual feels understood and respected. Objective SS refers to actual or visible SS, including direct material assistance and the network of social relationships. Support utilization refers to the conscious or unconscious use of a SS system to cope with challenges or stress [6]. The relationship between depression and SS can differ across these SS dimensions. For example, a prospective study in Finland suggests that depression is more often associated with subjective SS than objective SS [7], which is also supported by findings from Chinese college students [8].

The association among depressive symptoms, SS, and health-related quality of life (HRQoL) has been studied in many specific groups, including childbearing women [9,10], adolescents with heart disease [11], veterans [12], and HIV populations [13,14]. However, only a few studies have been carried out in the general adult population [15,16]. HRQoL is a multidimensional concept that encompasses physical, emotional, and social components associated with illness or treatment [17]. Therefore, the dimensions of social relationships and functioning as well as the emotional and mental functioning in HRQoL, could be associated with SS and depressive symptoms. HRQoL is commonly described as the health aspects of quality of life, generally considered to reflect the impact of disease and treatment on disability and daily functioning. It has also been described as the impact of perceived health on an individual's ability to live a fulfilling life [18]. Traditionally, biomedical outcomes have been the principal endpoints in medical and health research. However, more recently, HRQoL has been proposed as a meaningful indicator of health status and has become a vital endpoint, which is complementary to the traditional biomedical approaches of health research [19,20]. An individual's perception of decreased HRQoL can be a predictor of later poor health outcomes for that individual, such as hospitalization or mortality [21].

Depression erodes both the physical and mental aspects of HRQoL among various specific groups [14,22]. Two main mechanisms underlie the effects of SS on HRQoL: the direct effects model, and the buffering model. According to the direct effect model, the more SS an individual gains, the better their HRQoL is. In other words, lack of SS is directly related to a low level of HRQoL [23]. In contrast, the buffering model suggests that positive SS buffers the deleterious effects of psychosocial adversity (e.g., depression). In other words, SS exerts an indirect impact on HRQoL [24].

Given the inconsistent findings from previous studies, the relationship among depressive symptoms, SS, and HRQoL is complex. For example, although most existing studies deem insufficient SS to be a cause of depression, a longitudinal study using structural equation modeling suggests that depression causes SS erosion rather than vice versa [25]. Therefore, SS may be an underlying pathway between depressive symptoms and HRQoL. In addition, the various dimensions/ subtypes of SS may function differently. For instance, greater perceived SS predicted improved HRQoL, but received SS did not appear to have the same benefit [26]. It has been found that emotional SS exerts positive effects on the physical aspects of HRQoL in rural Malaysia elderly adults [22], as well as having both direct and indirect favorable effects (through its buffering effect on depression) on the HRQoL of HIV populations in China [14]. Yet, informational SS was negatively related to HRQoL and had no moderating effect on depression in Chinese adults with HIV [14]. Therefore, more studies are needed to develop a comprehensive understanding of the interactions among depressive symptoms, SS, and HRQoL, which is essential to well-designed tailored health policies and interventions to achieve public health benefits.

Sampling from a community-based general population, we aimed to investigate the association among depressive symptoms, SS, and HRQoL and explore whether the different dimensions of SS (i.e., subjective SS,

objective SS, and support utilization) mediated or moderated the association between depressive symptoms and HRQoL. Our hypotheses were as follows:

H1. Depressive symptoms were inversely associated with HRQoL.

H2. Social support was positively related to HRQoL.

H3. Social support mediated the association between depressive symptoms and HRQoL.

H4. Social support moderated the association between depressive symptoms and HRQoL.

2. Methods

2.1. Study design and participants

From May to July 2016, a questionnaire-based survey was conducted in six communities in the Longhua residential district, Shanghai, China. Participants were voluntary adult residents (i.e., ≥18 years old) with adequate literacy skills. All eligible residents were informed about the study objectives and were assured of confidentiality by written notice. Signed informed consent was obtained from each participant. Community general practitioners enrolled the participants and made appointments to complete the survey. Face-to-face surveys were conducted at specific times at either community health care centers or neighborhood committees. Participants were instructed to complete the written questionnaire on-site, after which the questionnaire was reviewed by investigators for quality control; those of insufficient quality were excluded from the study. Of the total of 2000 collected questionnaires, 1642 participants with complete information on depressive symptoms and/or SS and HRQOL were included in the final study population. All study documents were approved by the Fudan University School of Public Health Institutional Review Board (IRB#: 2015-12-0574).

2.2. Instruments

The following instruments were included in the questionnaire: the Patient Health Questionnaire (PHQ-9), the Chinese Social Support Rating Scale (CSSRS), and the 12-item Short-Form Health Survey (SF-12).

The PHQ-9 is a brief self-report screening instrument designed to identify depression or depressive symptoms. It is widely used in both clinical and research settings [27]. The validity of the PHQ-9 has been validated in various populations, including Chinese community residents [28–30]. Participants rated the degree to which they experienced each of the nine symptoms of depression over the last 2 weeks from 0 (not at all) to 3 (nearly every day). The sum score method totals the scores of all the symptoms, and a cutoff score is used to describe depression. The summed scores of the PHQ-9 range from 0 to 27, with higher scores representing more depressive symptoms: 0–4 suggests a minimal level of depression; 5–9 (mild); 10–14 (moderate); 15–20 (moderately severe); and > 20 (severe) [27]. We used a cutoff score of 7 to define depression, based on previous validation in a Chinese population [28]. The Cronbach's α of the Chinese version of the PHQ-9 was 0.86 in our study.

We used the 10-item Chinese Social Support Rating Scale (CSSRS) to measure the three dimensions of SS: objective SS (3 items), subjective SS (4 items), and support utilization (3 items). A higher CSSRS scores indicates greater SS [6]. The following is an example of an item measuring objective SS: 'In the past, when you encountered an emergency situation, the sources of financial support or help to solve practical problems: (1) No source (2) The following sources (multiple choice): Couples/ lovers; other family members; friends; relatives; colleagues; official or quasi-government organizations such as work units or unions; unofficial organizations, such as religion and social groups.' The item score is equal to the number of sources a participant selects. The reliability and validity of the CSSRS have been validated among general populations in

Table 1
Descriptive statistics of participants (*N* = 1642).

Characteristics	
Age, mean (SD), years	63.0 (15.0)
Age group, N (%)	
≤ 35	135 (8.2)
35 to 55	229 (13.9)
55 to 75	972 (59.2)
> 75	306 (18.6)
Sex (male), N (%)	695 (42.3)
Education, N (%)	
Primary or below	151 (9.2)
Junior high school	571 (34.8)
High school	470 (28.6)
College or above	450 (27.4)
Marital status (married), N (%)	1393 (84.8)
Employment status (employed), N (%)	347 (21.1)
Self-perceived economic status, N (%)	
Very bad	4 (0.2)
Bad	54 (3.3)
Average	1075 (65.5)
Good	455 (27.7)
Very good	54 (3.3)
Chronic conditions[a], mean (SD), kinds	1.2 (1.3)
Depressive symptoms, mean (SD) (*N* = 1592)	2.4 (3.4)
Minimal depression[b], N (%)	1243 (78.0)
Mild depression, N (%)	299 (18.8)
Moderate depression, N (%)	32 (2)
Moderately severe depression, N (%)	15 (0.9)
Severe depression, N (%)	4 (0.3)
Social support, mean (SD) (*N* = 1471)	31.7 (7.4)
Objective social support	8.0 (2.8)
Subjective social support	16.9 (4.7)
Support utilization	6.8 (2.0)
Health-related quality of life (SF-12) scores, mean (SD)	
Physical component summary (PCS)	49.5 (7.8)
Mental component summary (MCS)	53.2 (7.2)

Imputed data are reported.

[a] Included diabetes mellitus, hypertension, hyperlipidemia, coronary heart disease/ myocardial infarction, stroke, chronic trachea/lung diseases, bone or joint diseases, and cancer/tumor.

[b] Summed scores of PHQ-9 range from 0 to 27, with higher scores representing more depressive symptoms: 0–4 represent a minimal level of depression; 5–9 (mild); 10–14 (moderate); 15–20 (moderately severe); and > 20 (severe).

China [31,32]. In our sample, the Cronbach's α for the CSSRS was 0.74; the Pearson correlation coefficients of the three SS dimensions ranged from 0.32 to 0.40.

As one of the most widely used instruments to assess self-reported HRQoL, the 12-item Short-Form Health Survey (SF-12) was used to measure two domains of HRQoL: (1) the physical component summary (PCS), an index of physical HRQoL; and (2) the mental component summary (MCS), an index of mental HRQoL [33]. We used the

standardized algorithm to construct the PCS and the MCS, each ranging from 0 to 100 with higher scores reflecting greater HRQoL, and the mean score was 50 (SD = 10) for the American general population [34]. The SF-12 has good reliability among diverse sociodemographic and clinical samples [35,36], and has concurrent validity with other measures of quality of life [37]. The SF-12 has also been documented to be valid, reliable and sensitive in Chinese populations [38,39]. The Cronbach's α for the SF-12 was 0.87 in our sample.

2.3. Covariates

As in previous studies [3,24,40], we collected the following demographic information to use as potential confounding variables: age, sex, education, marital status, employment status, economic status, and chronic disease conditions. Marital status was dichotomized as 'married' and 'not in marriage' (including unmarried, divorced, and widow); employment status was dichotomized as 'employed' and 'unemployed'; education was categorized as 'primary school or below', 'junior high school', 'high school', and 'college or above'; and self-rated economic status was obtained using a five-point Likert scale (1 'very bad' to 5 'very good'). Chronic disease conditions were collected by self-report of a clinical diagnosis of any of the following conditions: diabetes, hypertension, hyperlipidemia, coronary heart disease/myocardial infarction, stroke, chronic bronchitis/asthma/emphysema, osteoporosis or osteoarthritis, tumor/cancer, and others. The number of these chronic conditions was totaled for each participant.

2.4. Statistical analysis

For descriptive purposes, continuous data are presented as the mean and SD, and categorical data are presented as numbers and percentages. Linear regression was used to evaluate the association among depressive symptoms, SS, and HRQoL. We introduced depressive symptoms to the regression model as both a continuous variable and a dichotomized variable (i.e., 'depression-free' vs. 'depression'). In the initial model (Model 1), we presented results without adjusting for any covariates, and in a second model (Model 2) we presented results with adjustment for all covariates.

Next, we examined the mediating effect of SS on the association between depressive symptoms and HRQoL. Contemporary mediation literature do not recommend Baron and Kenny's causal steps approach for mediation analysis due to several limitations [41–43]. Furthermore, a significant causal relationship between the independent variable (i.e., depressive symptoms) and the dependent variable (i.e., HRQoL) is not a premise for mediation analysis [44,45]. Therefore, we utilized a state-of-the-art method by testing for an indirect effect of SS on the relationship between depressive symptoms and HRQoL using the 'mediation' R package [46]. A significant indirect effect suggests the presence of

Table 2
Depressive symptoms and health-related quality of life.[a,e]

Depressive symptoms (PHQ-9)	PCS-12					MCS-12				
	B	95% CI	β	SE	*p*-value	B	95% CI	β	SE	p-value
Continuous										
Model 1[b]	−0.83	−0.94, −0.73	−0.36	0.02	<0.001	−0.88	−0.97, −0.79	−0.42	0.02	<0.001
Model 2[c]	−0.64	−0.74, −0.54	−0.27	0.02	<0.001	−0.83	−0.93, −0.73	−0.40	0.02	<0.001
Dichotomized[d]										
Model 1	−7.43	−8.61, −6.26	−0.30	0.02	<0.001	−8.51	−9.55, −7.47	−0.37	0.02	<0.001
Model 2	−5.94	−7.03, −4.85	−0.24	0.02	<0.001	−7.83	−8.90, −6.77	−0.35	0.02	<0.001

[a] Linear regression was used to examine the relation between depressive symptoms and health-related quality of life, where depressive symptoms was the independent variable, and the two components of health-related quality of life (i.e., PCS-12 and MCS-12) were the dependent variables. B denotes unstandardized coefficient; β denotes standardized coefficient; SE stands for standard error of the standardized coefficient. The sample size for analysis was 1593.

[b] Model 1 was adjusted for no covariates.

[c] Model 2 was adjusted for age, sex, education, marital status, employment status, self-perceived economic status, and chronic conditions.

[d] A cutoff value of 7 was used to define depression. Depression-free subjects (*N* = 1419) served as the reference group.

[e] Abbreviations: PHQ, Patient Health Questionnaire; PCS, physical component summary; MCS, mental component summary.

Table 3
Social support and health-related quality of life.[a,d]

| Social support	PCS-12					MCS-12				
	B	95% CI	β	SE	p-value	B	95% CI	β	SE	p-value
Total										
Model 1[b]	0.14	0.09, 0.19	0.13	0.03	<0.001	0.07	0.02, 0.12	0.07	0.03	0.004
Model 2[c]	−0.01	−0.06, 0.04	−0.01	0.03	0.64	0.07	0.01, 0.12	0.06	0.03	0.02
Objective										
Model 1	0.28	0.14, 0.41	0.10	0.02	<0.001	0.12	−0.00, 0.25	0.05	0.02	0.05
Model 2	0.03	−0.10, 0.15	0.01	0.02	0.70	0.10	−0.03, 0.23	0.04	0.03	0.15
Subjective										
Model 1	0.18	0.10, 0.26	0.11	0.03	<0.001	0.10	0.03, 0.18	0.07	0.03	0.007
Model 2	−0.07	−0.15, 0.01	−0.04	0.02	0.09	0.09	0.01, 0.17	0.05	0.03	0.03
Utilization										
Model 1	0.40	0.20, 0.59	0.10	0.02	<0.001	0.18	0.003, 0.36	0.05	0.02	0.05
Model 2	0.16	−0.02, 0.34	0.04	0.02	0.08	0.14	−0.04, 0.32	0.04	0.03	0.12

[a] Linear regression was used to examine the relation between social support and health-related quality of life, where social support was the independent variable, and the two components of health-related quality of life (i.e., PCS-12 and MCS-12) were the dependent variables. The sample sizes for the analysis of social support total score, objective social support, subjective social support, and support utilization were 1471, 1590, 1524, and 1592, respectively. B denotes unstandardized coefficient, β denotes standardized coefficient, and SE stands for standard error of the standardized coefficient.
[b] Model 1 was adjusted for no covariates.
[c] Model 2 was adjusted for age, sex, education, marital status, employment status, self-perceived economic status, and chronic conditions.
[d] Abbreviations: PCS, physical component summary; MCS, mental component summary.
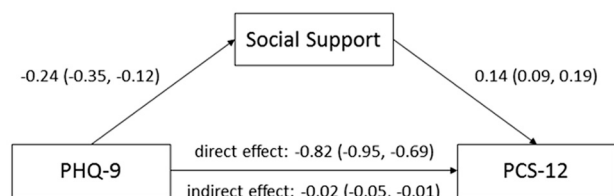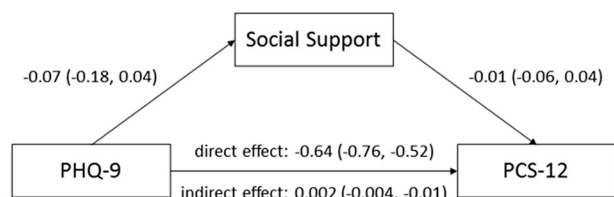

Fig. 1. Mediation analysis of social support on the association between depressive symptoms and health-related qualify of life.[a,b]
a Only participants with complete information on depressive symptoms, social support (total score), and health-related qualify of life were included in the mediation analysis (n = 1422). Covariates included age, sex, education, marital status, employment status, self-perceived economic status, and chronic conditions. The results of MCS-12 were not shown because the indirect effect was not significant in either model.
b Abbreviations: PCS, physical component summary; MCS, mental component summary; PHQ, Patient Health Questionnaire.

mediating effects [47,48]. A 95% confidence interval (CI) of the indirect effect was calculated using a bootstrap resampling method with 5000 simulations.

For the moderation analyses, we dichotomized SS scores into a 'high SS group' and a 'low SS group' using the median values and compared the association of depressive symptoms with HRQoL in two groups. By

inspecting the covariate-adjusted regression plots of the association between depressive symptoms and HRQoL, a moderating effect was determined if there was a significant difference in the HRQoL between the two groups with the same level of depressive symptoms (i.e., the 95% CI of the predicted values did not overlap). Since the PCS-12 and MCS-12 scores were weighted and normalized and very few subjects had extremely high scores, interaction effects were unlikely to be affected by floor or ceiling effects of the scoring due to scaling artifacts [49].

On average, 1.0% of covariate data were missing and were determined to be missing at random indicated by Little's test. These missing data were accounted for by using multiple imputation by chained equations (MICE) to minimize the bias of complete case analysis [50]. Ten imputed datasets were generated with a fully conditional specified model, and we reported only the pooled estimates. Statistical significance was set as α < 0.05 (2-sided). All analyses were performed using R statistical software (v 3.5.1).

3. Results

3.1. Descriptive statistics

Table 1 presents participant characteristics and target variables. Participants were an average of 63 years old with more females than males (57.7% vs. 42.3%). The prevalence of depressive symptoms (PHQ-9 total score ≥ 5) was 22%, and 10.9% of the participants were identified as having depression using the cutoff value of 7.

3.2. Depressive symptoms and HRQoL

Table 2 shows the association between depressive symptoms and HRQoL. More depressive symptoms were significantly associated with both lower PCS (B = −0.64, $p < .001$) and lower MCS (B = −0.83, $p < .001$) after adjusting for covariates. Using 7 as the cutoff value, the depression group scored significantly lower on both components of HRQoL than the depression-free group (B = −5.94, $p < .001$ for PCS; B = −7.83, $p < .001$ for MCS).

3.3. SS and HRQoL

As shown in Table 3, after adjusting for covariates, total SS (B = 0.07, $p = .02$) and subjective SS (B = 0.09, $p = .03$) were significantly associated with MCS, but not with PCS. Neither objective SS nor support utilization was associated with either component of HRQoL.
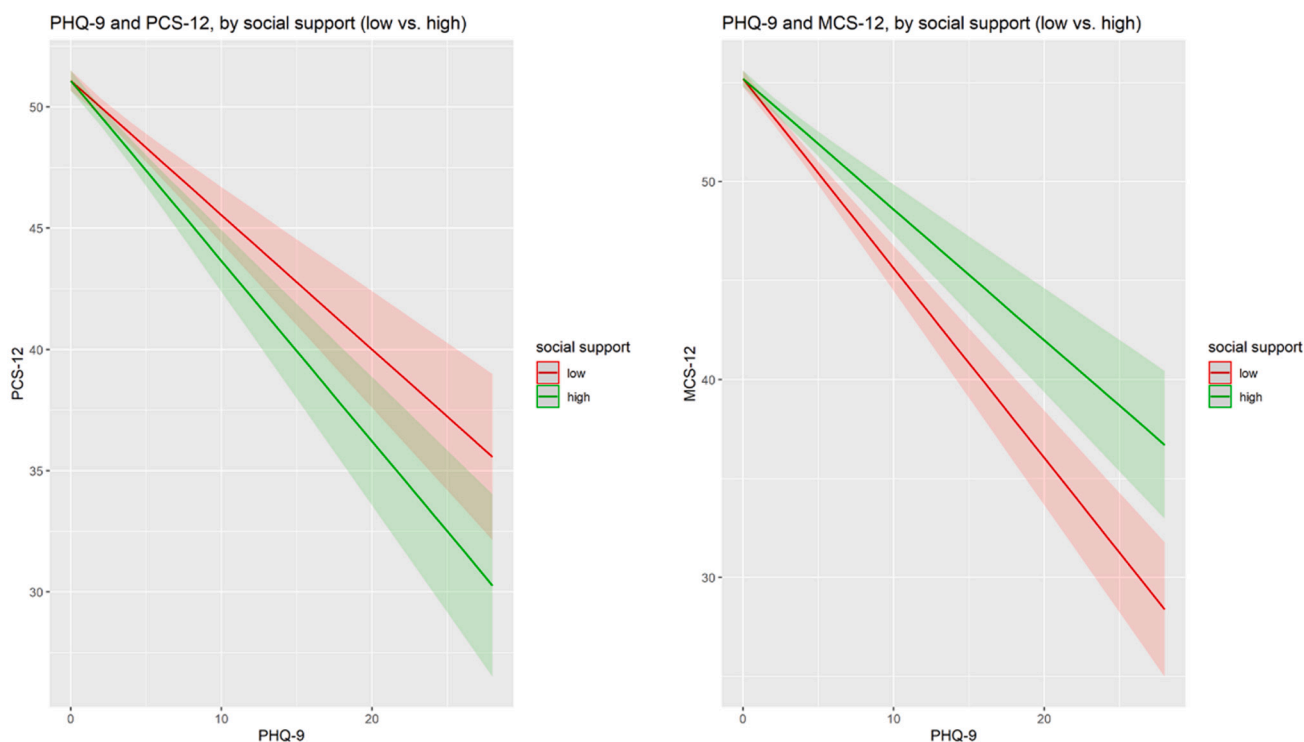
Fig. 2. Moderating effect of social support on the association between depressive symptoms and health-related qualify of life.[a,b]
a Only participants with complete information on depressive symptoms, social support total score, and health-related qualify of life were included in the analysis. A cutoff value of 31 was used for social support total score (low 659 vs. high 763). All analyses were adjusted for covariates, including age, sex, education, marital status, employment status, self-perceived economic status, and chronic conditions.
b Abbreviations: PCS, physical component summary; MCS, mental component summary.

3.4. Mediating effect of SS on the association between depressive symptoms and HRQoL

As displayed in Fig. 1, without adjusting for covariates, the association between depressive symptoms and PCS was partially mediated by SS as indicated by the significant indirect effect (B = −0.02, 95% CI -0.04 to −0.01, $p < .001$). However, there was no evidence for a mediating role of SS in the association between depressive symptoms and HRQoL after adjusting for covariates. We found no significant indirect effects of SS between depressive symptoms and MCS, regardless adjustment for covariates (results not shown).

3.5. Moderating effect of SS on the association between depressive symptoms and HRQoL

Fig. 2 shows that SS significantly moderated the association between depressive symptoms and the MCS component of HRQoL. Furthermore, as illustrated in Fig. 3, both subjective SS and objective SS had moderating effects on the association between depressive symptoms and MCS. It also demonstrated that as the PHQ-9 score increased, the difference in the MCS score between the 'low-SS' group and the 'high-SS' group became larger. The overlapping 95% confidence intervals of the regression-based predicted MCS values did not suggest a significant moderating effect of support utilization. Interestingly, for PCS, the coefficients of the interaction term were all negative, suggesting that with the same level of depressive symptoms, participants with more SS tended to have lower PCS scores. However, the overlapping 95% confidence intervals of the predicted PCS values did not reach significance.

4. Discussion

This study investigated the association between depressive

symptoms, SS, and HRQoL in the general population using a community sample in Shanghai, China. We performed mediation and moderation analyses to explore the role of SS in the relationship between depressive symptoms and HRQoL. Several findings are noteworthy.

In our study, using standardized questionnaires, 22% of the participants reported at least mild depressive symptoms, and 10.9% had depression. Depressive symptoms and depression were inversely associated with both the physical and mental aspects of HRQoL, which is consistent with most existing evidence [12,14,22]. Hence, effective intervention to reduce depressive symptoms and depression could be a viable approach to enhance HRQoL among Chinese community-based individuals.

The current study also showed that SS, particularly subjective SS, was positively associated with mental HRQoL, indicating that the more SS (and subjective SS) individuals perceive, the better mental HRQoL they experience. In contrast, other prior studies reported that SS (including the three dimensions) was positively related to both physical and mental HRQoL in certain groups, such as older adults with chronic disease [40,51] and pregnant women with HIV [52]. However, Painter et al. found that for veterans, SS was positively associated with mental HRQoL but not physical HRQoL [12], which is in line with our findings. We speculate from the mixed findings that interventions designed to increase SS, particularly subjective SS, could also benefit mental HRQoL. In other words, it may be important for interventions consider an individual's subjective feelings and needs in addition to the actual SS provided in community populations. Although the effectiveness of interventions for SS remains unclear due to the large variety of existing treatment protocols and areas of application [53], there have been a few studies focusing on those for subjective SS. For example, a Danish research demonstrated favorable effects of an intervention program designed to increase subjective SS in female victims of intimate partner violence [54]. In another study, an intervention to elevate the subjective
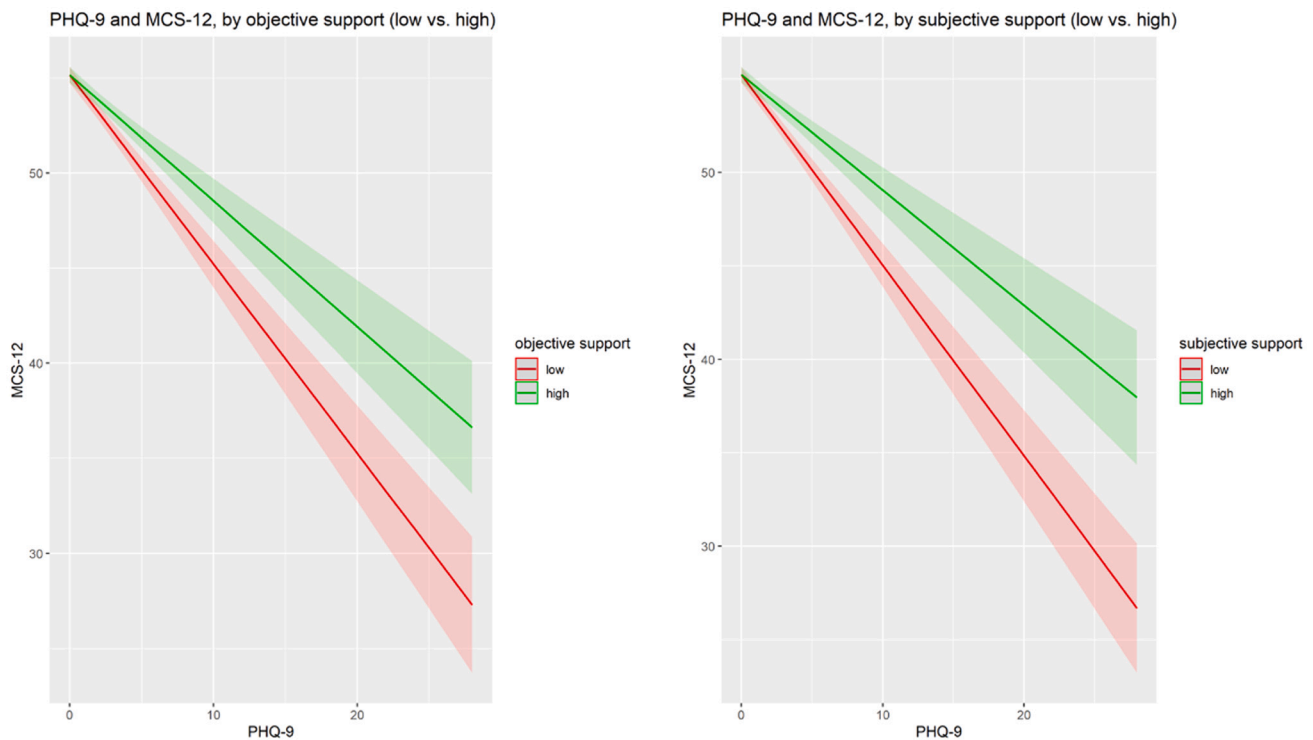
Fig. 3. Moderating effect of objective and subjective social support on the association between depressive symptoms and health-related qualify of life (mental component summary score).[a,b]

a Only participants with complete information on depressive symptoms, objective/subjective social support, and health-related quality of life were included in the analysis. A cutoff value of 8 was used for objective social support (low 541 vs. high 881), and a cutoff value of 17 was used for subjective social support (low 691 vs. high 731). All analyses were adjusted for covariates, including age, sex, education, marital status, employment status, self-perceived economic status, and chronic conditions.

b Abbreviations: PHQ, Patient Health Questionnaire; MCS, mental component summary.

SS of American female adolescents also demonstrated effectiveness [55]. Despite the heterogeneous study populations, these studies shed light on the benefits of developing customized interventions applicable to general populations. In a community context, intervention design should include not only family members who bear the primary responsibilities and are the first to offer mental comfort and support [56] but also society, social workers, neighbors, friends, and specialized organizations and institutes, which may vary across different age groups [57].

Some previous studies suggested that SS mediated the association between depressive symptoms and HRQoL [40,58]. However, we did not observe any mediating effect of SS when adjusting for all covariates, which is similar to the findings from several studies of specific groups, such as prostate cancer survivors [59] and patients with heart failure [60]. Differences in study populations and covariate adjustment may underlie the inconsistent findings. Interestingly, the moderation analyses suggest a buffering effect of SS (including both subjective SS and objective SS) on mental HRQoL through its moderating effect. Principally, SS weakens the deleterious effect of depressive symptoms on mental HRQoL. This finding is consistent with prior research showing that SS buffers the negative impact of depression on HRQoL in Malaysian men with HIV and opioid dependence [13]. For intervention studies, a mediating variable is often about 'how does the intervention work', whereas a moderating variable provides more hints on 'for which groups does the intervention work' [61]. Therefore, our findings suggest that interventions to increase SS can help alleviate the adverse impact of depressive symptoms on mental HRQoL, especially when the target population develops notable levels of depressive symptoms.

The average age of our study population was 63 years. The prevalence of depression gradually increases with age [4], which can be attributed to the largely reduced social networks for aged people [40]. It is important to identify community residents with depressive symptoms

and implement timely SS intervention. In China, the rate of help-seeking behavior (such as seeking help from mental health professionals and general physicians) for depressive symptoms is low [62]. Concerted efforts are needed to ensure an individual's social connectedness with family members, friends, and local communities to closely monitor their mental HRQoL and to establish an effective SS system (e.g., a neighborhood committee). In addition, assistance through either a hotline or the Internet has become a substantial source for help-seeking people with depressive symptoms, second only to informal help [62]. Thus, various offline and online interventions can be implemented to encourage community residents to communicate with other people when encountering trouble, spend more time with family and friends, seek help, and actively participate in daily social activities [40].

Several limitations of this study should be acknowledged. First and foremost, the participants represented approximately 50% of the individuals approached, mainly due to the low participation rate of employees. Additionally, the participation rate for the elderly living in the community exceeded 80%. Therefore, older residents who did not work (or who had retired) were likely overrepresented in our study, which limits generalizing the findings to younger populations. In addition, this study was conducted in Shanghai, one of the most developed cities in China, thus the results might not apply to community residents in other cities. Second, self-report scales were used to collect data, potentially leading to information bias. Obtaining an assessment from multiple informants (e.g., doctors or family members) may enhance the accuracy of the collected data. Finally, this study was an observational study using a cross-sectional design, thus no causal conclusions can be drawn.

5. Conclusions

This study extends our insight into the association among depressive

symptoms, SS, and HRQoL in Chinese community-based adults. Despite the findings that the alleviation of depressive symptoms and enhancement of SS contribute to a better HRQoL, the complex role SS plays in the relationship between depression and HRQoL warrants further investigation.

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