An analysis of social participation and depression in middle-aged and senior citizens in China: A fixed-effect analysis

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Abstract

Background

Social activities has been suggested to prevent for depression for middle-aged and senior citizens for a long time. However, researchers failed to reach an agreement on the influence of formal and informal social activities on depression for both males and females. This study aimed to investigate the difference between these two types of social activities on depressive symptoms in middle-aged and senior citizens for both males and females in China.

Methods

Based on activity theory, social activities are classified into formal social activities and informal social activities according to the degree of intensity and intimacy. A total of 8610 participants from an 8-year period of the Chinese Health and Retirement Longitudinal Study (2011–2018) were analyzed using fixed-effect analysis. 10-item center for Epidemiologic Studies Depression Scale was used to measure depression symptoms for middle-aged and senior citizens.

Results

The average depression score for women and men are 9.235 and 7.141, respectively. There was a significant negative relationship between participating in informal social activities and depression scores. Moreover, the coefficient of informal social activities for men are significantly higher than women.

Conclusion

Only informal social activities can reduce depressive symptoms middle-aged and senior citizens. The effects of informal social participation on depression are different between men and women among middle-aged and senior citizens. Middle-aged and senior women are more likely to be depressed, but men can benefit more from informal social activities.

Introduction

Depression is one of the leading public health problems globally because of its serious influence on people's health [1]. More than 264 million people of all ages suffer from depression [2]. Specifically, depressive symptoms can predict numerous adverse health outcomes, such as obesity [3], frailty [4] and type 2 diabetes [5]. Moreover, depression is also a major contributor to suicide cases, which is close to 80,000 pers year, and caused disability in 50 million people [6], causing heavy psychological burden not only to the sufferer, but also to their families and to the whole society.

In addition, the prevalence of depression starts reaching significant levels in middle- and old ages [7]. Depression is even steeper in low- and middle-income countries. Over 80% of this disease burden occurred in low- and middle-income countries (LMICs) [6]. Moreover, 76% to 85% of people in LMICs receive no treatment for their disorder due to insufficient professional resources of treatments [2]. China, one of the low- and middle-income countries, has the largest population in the world and is experiencing severe aging, with 41.4% of the population aged 45 and above [8]. What's more, 30% of males and 43% of females suffered from depression symptoms among residents aged 45 and over in China as measured by 10-item center for Epidemiologic Studies Depression Scale (CESD-10) [9], which indicates the urgency of finding a population-based strategy to prevent depression for this big vulnerable group in China.

Social participation has become a widely studied way to protect against depression due to its low cost, wide accessibility and no side effects compared to drug therapy [10]. Previous studies have explored the impact of certain kind of social activities on depression, such as talking with friends [11], participating in volunteer activities [12] and dancing [13]. Previous researches have also studied how various kinds of social activities influencing depression level in different ways [7,14]. However, these studies always ignore the theoretical logic of the effect of social participation on depression.

As activity theory suggested, middle-aged and senior residents tend to lose previous identities because of retirement or other variations in life. Social participation is one of the most effective ways to help older generation to attain a new social role support or reinforcement [15]. Therefore, social activities can protect them against depression. More specific role supports come from higher frequency and more intimate social activities [16]. Thus, engaging in more intimate and intense social activities may increase life satisfaction more and thus be more effective in preventing depression [17]. Considering such important characteristic of social activities, some studies have divided social activities into informal social activities and formal social activities based on its intensity and intimacy. Informal social activities are believed to have greater role feedback because it is focus on emotional function and thought to be based on major group relationships such as family, friends and neighbors [18]. In contrast, formal activities are organized by formal organization, such as volunteer group and they always focus on achieving specific goals [19]. However, researchers failed to reach an agreement on the influence of these two types of social activities on depression [20,21]. Considering the influence of formal and informal social activities on depression were inconclusive due to different regional cultures [7], it is necessary to explore this relationship again a different cultural context and add some new insights for protecting middle-aged and seniors against depression.

However, as the key mechanism played in social activities and depression of this paper is based on activity theory (20). The roles related to the participants are as important as the characteristics of social activities [22]. In this paper, we will consider the gender factor due to the following considerations: It is generally accepted in academia that women are more likely to suffer from depression than men [23]. Second, from the perspective of activity theory, the reason that social activities can prevent elderly from depression is participating in social activities can help people gain role support and role reinforcement. However, women born prior to the 1970s were more likely to be a housewife in China [24], thus their roles

won't change dramatically compared to men. Third, in general, men and women have different social networks, women tend to recognized many people as their friends and man tend to have a few close friends [25,26]. There is also existing evidence indicating a different relationship between types of social activities and depression between male and females [20,21]. In order to make better use of social activities as a tool to protect middle-aged and senior residents against depression, the relationship between types of social activities and depression in men and women needs to be studied separately.

In sum, this study was conducted with three aims: 1) To get a preliminary understanding of depression of middle-aged and senior citizens with different genders. 2) To increase our understanding between different types of social activities and depressive symptoms from the perspective of considering the intimacy and intensity of social activities. Furthermore, to eliminate endogenous interference, we use a fixed effect analysis.

Methods

2.1 Sample and data collection

The data used in the present study was derived from China Health and Retirement Longitudinal Study (CHARLS), a national survey designed to provide micro information on the respondents aged 45 and above. The baseline survey of CHALRS was carried out in 2011 and tracked every two years. CHARLS conducted surveys and interviews in 2011, 2013, 2014 (the special project of "survey on the life course of middle-aged and elderly people in China"), 2015 and 2018 in 450 communities (villages) from 150 counties of 28 provinces, which includes autonomous regions and municipalities directly under the central government. The data included not only demographic information such as gender, year of birth and education, but also physical and mental health, income, family, and retirement information of the respondents. The target population of CHARLS were residents aged 45 and above, their partners/spouses were included in the survey irrespective of age. Adequate information makes CHARLS a good panel data for studying the influence of social activities on depression among the middle-aged and seniors. In this study, we only kept information about respondents aged 45 and above.

The 2011 baseline data included 17,708 respondents, followed by wave 2 investigated in 2013, in which 2,522 respondents were not included in wave 2. Then we got 15,186 records, followed by wave 3 in 2015 and 4 in 2018. We didn't use any data investigated in 2014, because that survey only includes data about health indicators. Among 15,186 respondents in wave 1 and wave 2, 1,621 residents were not included in wave 3. And 1,577 respondents were lost in contact in wave 4. We finally got 11,988 respondents in all four waves. Since we want to investigate the influence of different types of social activities on depression, we selected 8,610 participants based on the following criteria: 1) Providing social participation information in all four waves. 2) Providing depression scores in all four waves. 3) Aged 45 and above in wave 1. The detailed sampling process was shown in Figure 1.

2.2 Measures

2.2.1 Informal and formal social activities

According to CHARLS, respondents were asked whether they have participated in 10 listed activities in the past month. Those ten activities are “ (1) Interacted with friends; (2) Played Ma-jong, played chess, played cards, or went to community club; (3) Provided help to family, friends, or neighbors who is not living with you and would not pay for the help; (4) Went to a sport, social, or other kind of club; (5) Took part in a community-related organization; (6) Done voluntary or charity work; (7) Cared for a sick or disabled adult who is not living with you and would not pay you for the help; (8) Attended an educational or training course; (9) Stock investment; and (10) Used the Internet;” Seven of them are social activities while the other three, i.e., (3), (9) and (10) are not [27]. Based on the intimacy and intensity of these activities, we classified “(1) Interacted with friends; (2) Played Ma-jong, played chess, played cards, or went to community club; and (4) Went to a sport in park, social, or other kind of club” into informal activities, and the remaining into formal activities.

2.2.2 Depression symptoms

CHARLS survey uses CESD-10 scale to measure depression symptom in middle-aged and senior citizens in China. CESD-10 scale is a shortened scale widely used to predict depression in older adults [28]. The respondents are asked the feeling about experienced things during the last two weeks. The scale includes ten items which are “ (1) I was bothered by things that don’t usually bother me; (2) I had trouble keeping my mind on what I was doing; (3) I felt depressed; (4) I felt everything I did was a struggle; (5) I felt hopeful about the future; (6) I felt fearful; (7) My sleep was restless; (8) I was happy; (9) I felt lonely; and (10) I could not live like this anymore” We scored “Rarely or none of the time; some or a little of the time; occasionally or a moderate amount of the time; and Most or all of the time” as 0, 1, 2 and 3 respectively. The question of (5) and (8) are positive items and they were reverse-coded. We added them together and got the CESD score. People with higher score are more likely to be considered as depressed. We checked the internal consistency of the CESD-10 scale in our sample, and the Cronbach’s $\alpha=0.792$.

2.2.3 Potential confounding variables

Potential confounding variables mainly include demographic variables, financial related variables, children relation related variables and health related variables. Demographic variables include age, marital status, living area, household registration, years of education and year of investigated. Financial related variables include job status and household financial status. Social relation related variables include living status. Health related variables include self-evaluation of health, smoke, alcohol drink and number of chronic diseases. Based on previous research, we used total household income divided by square root of number of people in the household to represent the family’s financial status [7]. We also

used an important dummy control variable to indicate whether the respondents had experienced the loss of a child (children). The detailed information about data defining and data processing are shown in Table 1.

Table 1. Process of the potential confounding variables

Variables	Process
Demographic variables	
Gender	Female=1; Male=0
Age	Continuous variables
Marital status	partnered=1; Single=0
Living area	Urban=1; rural=0
Household registration	Urban=1; rural=0
wave	"2011"=1; "2013"=2; "2015"=3, "2018"=4
Education level	Illiterate=1; primary school and lower=2; junior middle school=3; senior middle school and higher=4
Economic status	
Job status	Work=1; not work=0
Household financial status	Total household income/square root (#number of people in the house hold)
Children relations	
Live with children	Whether the respondents live with a child of Yes=1; No=0
Number of living children	The number of living children of the respondents
Ever lost a child (children)	Have respondents ever lost a child (children)? Yes=1; No=0
Health status	
Self-evaluation of health	Health=1; unhealthy=0
Smoke	Have respondents ever smoked? Yes=1; No=0
Alcohol drink	Have respondents ever drinks any alcohol last year? Yes=1; No=0
#types of chronic diseases	Total of 12 types of chronic diseases including hypertension, diabetes, cancer, lung disease, heart problem, stroke, arthritis, dyslipidemia, liver disease, kidney disease, stomach/digestive disease, asthma.
memory	Self-reported memory: fair, Good or Excellent=1; Poor=0

2.3 Analytical strategy

In order to solve the endogenous problem, we used longitudinal fixed effect regression model in our analysis to estimate which type of social activities can decrease the level of depression symptoms. The fixed effect model can solve the problem of omitted variables which are caused by unobservable individual differences. Our model are as follows:

$$cesdscore_{it} = \beta_1 informal_{it} + \beta_2 formal_{it} + \beta_3 v_{it} + u_i + \varepsilon_{it}$$

Where $cesdscore_{it}$ is the respondent i 's depression score measured by CESD-10 scale in year t , and $isinformal_{it}$ is a dummy variable indicating whether respondent i has participated in informal social activities in year t , if the respondent i has participated in informal social activities in year t , then $informal_{it}=1$. If not, it equals to 0. In the same way, the variable $formal_{it}$ indicates whether respondent i has participated in the informal social activities in year t . β_1 and β_2 are the coefficients of variables $informal_{it}$ and $formal_{it}$, respectively. v_{it} means time-varying confounders, u_i represents variables that changes with individuals but not with time.

In order to further verify whether our model is reasonable, we made a series of tests. the first analysis we conducted was the F test, the results of F test showed that $p<0.001$, which indicated the fixed effect model is better than pooled ordinary least square. Then we used Hausman test to test whether fixed effect model is better than random effect model. The results also showed that $p<0.001$. Thus, we still use fixed effect model.

Results

3.1 Data description in wave 1

Table 2 displayed the basic characteristics of all respondents and comparisons between citizens who are females and males in wave 1. The average age of all respondents in wave 1 was 57.9 years old. If we set depression scores above 10 points as a threshold for depression as previous literature suggested [21], we found the depression rate of these participants was 36.2%. Among 8610 participants, there were 65.2% ($n=7084$) participants lived in rural areas. A greater proportion of participants were partnered (90.0%), female (53.8%), still working (75.6%), with rural hukou (82.3%), with primary education level or lower (66.9%), living with child (60.5%), thinking themselves healthy (74.0%), having not experienced losing a child (children) (92.3%), and not participating social activities (50.6%). The participants in wave 1 were more likely to participate in informal activities than formal activities (46.9% vs. 2.5%). The average number of chronic diseases of the participants was 1.40.

Compared with men, women had significantly higher depression scores (9.235 vs. 7.141, $p\text{-value}<0.001$), were less likely to work (70.2% vs. 81.9%, $p\text{-value}<0.001$), less likely to drink (12.4% vs. 57.7%, $p\text{-value}<0.001$) and smoke (7.4% vs. 74.2%, $p\text{-value}<0.001$). Women also had more chronic diseases (1.49 vs. 1.29, $p\text{-value}<0.001$) and less likely to participate in formal social activities (1.9% vs. 3.2%, $p\text{-value}<0.001$) than men. More detailed comparisons between males and females were listed in Table 2.

Table 2. Descriptive statistics of participants in baseline

variables	Gender difference: Mean (SD or n) and p-value			
	Total (n=8,610)	Female (n=4,629)	Male (n=3,981)	p-value
Depression score	8.267 (6.237)	9.235 (6.556)	7.141 (5.640)	0.000
Depression rate	0.362 (0.481)	0.429 (0.495)	0.285 (0.451)	0.000
Demographic				
Age	57.897 (8.226)	57.361 (8.193)	58.521 (8.220)	0.000
Marital status	0.900 (0.300)	0.878 (0.328)	0.926 (0.262)	0.000
Living area	0.348 (0.476)	0.358 (0.479)	0.337 (0.473)	0.038
Household registration	0.177 (0.382)	0.159 (0.366)	0.198 (0.399)	0.000
Education level				
Illiterate	0.257 (2,215)	0.391 (1,810)	0.102 (405)	0.000
Primary	0.412 (3,544)	0.373 (1,726)	0.457 (1,818)	0.000
middle school	0.218 (1,878)	0.163 (756)	0.282 (1,122)	0.000
High school+	0.113 (973)	0.073 (337)	0.160 (636)	0.000
Financial problems				
Job status	0.756 (0.429)	0.702 (0.458)	0.819 (0.385)	0.000
Household financial status	14,991 (19984)	15,189 (20,257)	14761 (19332)	0.525
Social relations				
Live with children	0.605 (0.489)	0.617 (0.486)	0.591 (0.492)	0.015
Number of living children	2.566 (1.325)	2.616 (1.335)	2.507 (1.312)	0.000
Ever lost a child (children)	0.077 (0.267)	0.086 (0.280)	0.068 (0.251)	0.002
Health status				
Self-evaluation of health	0.740 (0.468)	0.701 (0.458)	0.787 (0.410)	0.000
Smoke	0.383 (0.486)	0.074 (0.262)	0.742 (0.437)	0.000
Alcohol drink	0.334 (0.471)	0.124 (0.330)	0.577 (0.494)	0.000
#types of chronic diseases	1.397 (1.367)	1.488 (1.395)	1.291 (1.325)	0.000
Memory	0.654 (0.476)	0.596 (0.491)	0.721 (0.449)	0.000
Social activities				
informal	0.469 (0.499)	0.467 (0.499)	0.471 (0.499)	0.713
formal	0.025 (0.156)	0.019 (0.135)	0.032 (0.176)	0.000
Social	0.494 (0.494)	0.486 (0.524)	0.503 (0.549)	0.130

3.2 Social participation in all waves

Table 3 showed the proportion of informal and formal social activities among men and women participants in all four waves. Compared with females, males were more likely to participate in formal activities in the first three waves (p-value<0.001). Participants who were females had a lower probability of participating in formal activities in wave four, but the difference is not significant (p-value=0.102). Comparisons between male and female groups show no statistical differences in participation in informal social activities among four waves (p-value>0.05 for all four waves).

Table 3. Social activities of different groups of respondents

		Gender difference: % (n)			
Wave		Total (n=8,610)	Female (n=4,629)	Male (n=3,981)	p-value
Wave 1	Informal	0.469 (4,039)	0.467 (2163)	0.471 (1,876)	0.713
	Formal	0.025 (214)	0.019 (86)	0.032 (128)	0.000
Wave 2	Informal	0.531 (4,568)	0.526 (2,435)	0.536 (2,133)	0.365
	Formal	0.044 (378)	0.035 (161)	0.055 (217)	0.000
Wave 3	Informal	0.467 (4,020)	0.461 (2,132)	0.474 (1,888)	0.205
	Formal	0.036 (311)	0.029 (132)	0.045 (179)	0.000
Wave 4	Informal	0.426 (3,665)	0.436 (2,018)	0.414 (1,647)	0.038
	Formal	0.052 (444)	0.048 (222)	0.056 (222)	0.102

3.3 Regression results

To get the effect of types of social activities on depression scores, we conducted fixed effect regression analysis with robust standard error. The results of regression are shown in Table 4. As we can see in Table 4, column (1) displays the estimates for the full sample. Subsample analyses by gender and registered residence are presented in the following column. From column (1) in Table 4, we found that, after controlling for other variables, participation in informal activities was associated with a decrease in depression score of approximately 0.239 in the full sample ($p\text{-value}<0.01$). We found that depression score has a significantly positive relationship with age. Particularly, an increase in age of one year was associated with an average increase of 0.030 in depression scores. column (4) and column (5) showed that informal social activities can significantly benefit both females and males ($p\text{-value}<0.05$ for females and $P<0.01$ for males). As we can see from column (4), for female participants, the group that took part in informal social activities was associated with a 0.189 lower depression score than the group that not. For male participants, men who participated in informal social activities had depression scores 0.307 points lower than those who did not. We found -0.307 is significantly smaller than -0.189 ($p\text{-value}<0.01$). We couldn't find any significant relationship between formal activities and depression score in all models ($p>0.1$).

Table 4. Regression results of types of social activities on depression scores

Variables	Total (n=8,610)		Female (n=4,629)		Male (n=3,981)	
	β	t-statistics	β	t-statistics	β	t-statistics
<i>Social activities</i>						
Informal social activity	-0.239***	-3.597	-0.189**	-2.020	-0.307***	-3.308
Formal social activity	0.084	0.609	0.078	0.345	0.096	0.558
<i>Demographic variables</i>						
age	0.030**	2.505	0.046***	2.630	0.013	0.793
Marital status	-1.280***	-5.698	-1.406***	-4.864	-0.914***	-2.627
Living area	-0.127	-0.986	-0.305*	-1.662	0.093	0.526
Household registration	-0.528**	-2.547	-0.535*	-1.738	-0.515*	-1.870
<i>Financial status</i>						
Job status	-0.073	-0.730	0.013	0.099	-0.206	-1.353
Household financial status	-0.171	-0.714	-2.747**	-2.415	0.048	0.588
<i>Children relations</i>						
Live with children	-0.013	-0.182	-0.004	-0.044	-0.016	-0.165
Number of living children	0.048	0.738	0.058	0.639	0.033	0.355
Ever lost a child (children)	0.293**	2.043	0.278	1.383	0.316	1.566
<i>Health status</i>						
Self-evaluation of health	-1.756***	-19.379	-1.728***	-14.474	-1.798***	-12.933
Alcohol drink	0.010	0.111	0.133	0.913	-0.099	-0.807
Smoke	0.161	0.868	0.175	0.402	0.232	1.122
#types of chronic diseases	0.185***	4.52	0.206***	3.600	0.148**	2.560
Memory	-1.282***	-16.533	-1.398***	-13.697	-1.099***	-9.254
Constant	11.700***	3.613	45.727***	3.042	8.602***	5.623
Observations		34,440		18,516		15,924
R-squared (Overall)		0.1955		0.1857		0.1892
Number of ID		8,610		4,629		3,981

Note: *** p<0.01, ** p<0.05, * p<0.1.

3.4 Robustness analysis

We undertook robustness analysis by excluding the variable whether the participant took part in formal social activities. The results are shown in Table 5. Results shown in Table 5 were largely consistent with our original analyses, which could support the robustness of the reported findings.

Table 5. robust test regression (delete variable: formal)

Variables	Total (n=8,610)		Female (n=4,629)		Male (n=3,981)	
	β	t-statistics	β	t-statistics	β	t-statistics
<i>Social activities</i>						
isinformal	-0.237***	-3.576	-0.188**	-2.009	-0.304***	-3.286
<i>Demographic variables</i>						
age	0.030**	2.531	0.046***	2.649	0.013	0.812
Marital status	-1.280***	-5.696	-1.405***	-4.859	-0.915***	-2.631
Living area	-0.127	-0.988	-0.306*	-1.666	0.093	0.530
Household registration	-0.528**	-2.547	-0.535*	-1.740	-0.515*	-1.868
<i>Financial status</i>						
Job status	-0.073	-0.724	0.014	0.104	-0.206	-1.349
Household financial status	-0.170	-0.714	-2.743**	-2.413	0.048	0.587
<i>Children relations</i>						
Live with children	-0.013	-0.181	-0.004	-0.042	-0.016	-0.165
Number of living children	0.048	0.739	0.058	0.638	0.033	0.358
Ever lost a child (children)	0.292**	2.040	0.278	1.38	0.315	1.563
<i>Health status</i>						
Self-evaluation of health	-1.755***	-19.368	-1.728***	-14.468	-1.797***	-12.926
Alcohol drink	0.012	0.126	0.134	0.921	-0.097	-0.793
Smoke	0.162	0.871	0.175	0.403	0.232	1.125
#types of chronic diseases	0.185***	4.529	0.206***	3.600	0.148**	2.562
Memory	-1.281***	-16.531	-1.398***	-13.695	-1.099***	-9.253
Constant	11.679***	3.611	45.655***	3.040	8.586***	5.616
Observations		34,440		18,516		15,924
R-squared (Overall)		0.1955		0.1857		0.1892
Number of ID		8,610		4,629		3,981

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Discussion

4.1 Informal and formal social activities

Social activity has been one of the most widely studied non-pharmacological approaches to depression prevention [19,21]. This paper examined the relationship between types of social activities and depression symptom among different groups of middle-aged and older people in China. We found a significant relationship between informal social activities and depression in all groups. However, we did not find a significant relationship between formal social activities and depression in any group. Similarly, previous studies also only found a relationship between informal social activities and life satisfaction [21]. According to activity theory, older people tend to find their new roles from participating social activities [29]. Thus, social activities can protect them against depression caused by role loss. Since the classification of informal activities and formal activities is based on different degrees of intimacy and intensity, informal activities can lead to more intimate relationships and higher frequency of participation. Thus, people can get higher social support from informal social activities, which reduces depression scores more effectively. Meanwhile, as we can be seen from Table 2, in each wave, more than 40% of our participants have participated in informal social activities, while less than 10% of them have participated in formal activities, so above relationship between formal social activities and depression may be caused by the low statistical power due to low participation in formal social activities.

4.2 Gender difference

Young Bum Kim used Hallym Aging Panel Data to explore the relationship between different types of social activities and the morale of people aged 54 and over in South Korea. He found that participating in informal activities only benefits women and participating in formal activities only benefits men [30]. Unlike that study, we found different results in Chinese context. We found a negative relationship between informal social activities and depression scores in both men and women, we didn't find significant relationships between formal activities and depression score in both men and women group. And we found the coefficient of informal activities is larger in men than women, which means the informal social activities is more effective for men. We have two explanations for above results: First, in China, informal social activities involve communication with friends, women tend to compare themselves with their friends when they communicating with them while men are more likely to solve practical problems when interacting with their friends [25,26]. Second, men tend to retire from full-time jobs and careers; However, many women spend their retirement in less dramatic ways, they will either doing housework or working part time because of Asia's male-dominated culture [30,31]. Thus, males can benefit more from participating in informal activities.

4.3 Strengths and limitations

To the best of our knowledge, this paper is the first to study the effect of social activities on depression symptom from the perspective of activity theory in China. We examined the different effects of informal and formal social activities on depression in middle-aged and senior Chinese and used fixed effect model that rules out the influence of potential endogeneity. The study found that informal social activities lowered depression scores among the whole sample. Meanwhile, this study is also one of the few studies to include all males and females in Chinese scenario. The findings of this paper reveal some differences between male and female participants. The results showed that males and females will both benefit from the informal social activities. The results of our study also imply that role change is also important to understand the relationship between social activities and level of depression.

The results of this study should be interpreted with caution due to the following limitations: First, considering that the survey we used was conducted every two or three years, the influence of the social activities on depression would fade with time. Thus, we could not adopt a lagged model. Second, with fixed effect model, we can't include variables that constant with time. Third, the sample size of respondents who participated in formal activities is small, we can do this study in a context where formal activities are more common in the future. Fourth, we only considered gender difference in this paper. Future studies can consider to examine other factors that could influence the outcome, such as place of residency and education.

Conclusion

In summary, this study investigates the relationship between social activities and depression symptom from a new perspective by applying activity theory into analysis. We have following main findings: First, women have higher depression scores and participates fewer social activities than men. Second, not all types of social activities are useful, the participants should be treated differently according to various characteristics. Formal activities had no effect on depression scores of middle-aged and senior residents. Informal activities can benefit to both groups of participants. Our study can help practitioners who provide services for the elderly to better take care of the elderly's psychology. For example, under the current home- and community-based care service model, this study provides some insights on how to provide spiritual consolation for the elderly.

List Of Abbreviations

CHARLS: Chinese Health and Retirement Longitudinal Study

CESD-10:10-item center for Epidemiologic Studies Depression Scale

Declarations

Ethics approval and consent to participate: The questionnaire was established according to the ethical guidelines of the Helsinki Declaration and was approved by Biomedical Ethics Committee of Peking University. Written informed consent was obtained from individual or guardian participants.

Consent for publication: Not applicable

Availability of data and materials: Not applicable

Competing interests: Not applicable

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Availability of data and material: The data that support the findings of this study are available from Peking University but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. The data can be applied through the website of Peking University, the specific address is as follows: <http://charls.pku.edu.cn/index/zh-cn.html>

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Figures

Figure 1

The process of respondent selection. Source: CHARLS (2011-2018)