

The influence of health-promoting lifestyles on the quality of life of retired workers in a medium-sized city of Northeastern China

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Abstract

Objectives The aim of this study was to clarify the actual state of retired workers' lifestyles and quality of life (QOL) in a medium-sized city of Northeastern China and to assess the relationship between these according to differences between gender groups.

Methods The Chinese version of the Health Promotion Lifestyle Profile II (HPLP-II), the World Health Organization Quality of Life-BREF (WHOQOL-BREF), and demographic variables were used to measure 343 (aged 50–79 years) retired workers' lifestyles and QOL. The results were analyzed using the *t* test, one-way analysis of variance, correlation analysis, and multiple linear regression analysis.

Results Among the six lifestyle subscales of HPLP-II, the highest mean score was for Interpersonal Relations (IR) and the lowest was for Health Responsibility (HR), which has not been reported previously. The youngest group (50–60 years) had higher scores for lifestyles and QOL

than the other age groups. When the results were analyzed based on financial situation, the lowest income group (below ¥2000) had the poorest scores. Analysis according to gender group revealed different tendencies for the scores of lifestyle and QOL, as well as in the multiple regression analysis between variables.

Conclusion Our results suggest that an effective approach to maintain a desirable lifestyle and QOL for retired workers at the regional level would be to introduce daily activities to improve HR and to maintain and enhance social support for the low-income populations. Further research is needed to understand the complex causal pathways between regional health and welfare factors, health behavior, and QOL.

Keywords Quality of life · Lifestyle · Health Promotion Lifestyle Profile II · Retired workers

Introduction

China has entered the aging society where the health and well-being of the elderly are becoming particularly important. The importance of a healthy lifestyle is receiving increasing attention due to its effect on health and well-being. The World Health Organization (WHO) reported that approximately 50.8 % of deaths are attributable to major chronic diseases (cancer, cardiovascular disease, chronic respiratory disease, and diabetes mellitus) that are closely related to an unhealthy lifestyle [1]. The epidemiologic transition from infection to chronic disease as a leading cause of death together with the aging of the population and rapidly escalating healthcare costs illustrate the urgent need for a shift in public health care systems from acute treatment to the prevention of disease and the

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promotion of better health-related behavior [2]. It is therefore necessary to focus on lifestyle as a fundamental measure for the prevention of lifestyle-related diseases [3].

A health-promoting lifestyle is a pattern of self-initiated actions which individuals take to control, maintain, or enhance their own health [4, 5]. Lifestyle patterns have significant effects on long-term morbidity and mortality that is becoming increasingly evident. Many studies have demonstrated that healthy lifestyles not only promote health but also can mitigate the negative effects of chronic disease and decrease the incidence of various health conditions [6, 7]. Consequently, encouraging a healthy lifestyle is crucial in terms of potentially preventing the development of chronic diseases, reducing morbidity, improving the quality of life (QOL), and decreasing medical costs and the healthcare burden on society.

The WHO defines QOL as “individuals’ perception of their position in life in the context of the culture and value systems in which they live, and in relation to their goals, expectations, standards and concerns” [8]. It is a broad-ranging concept which encompasses a person’s physical and psychological state, level of independence, and social relationships [9]. However, the association between healthy lifestyles and QOL has been the subject of relatively few studies, and these have focused mainly on disease populations [10–12]. In one earlier study on the relationship between healthy lifestyle and QOL, the authors found that positive psychosocial behavior, positive health practices, and exercise and physical recreation were all significantly related to perceived health and well-being [5]. Health outcome appraisals is a vital part of QOL, and an understanding of the relationship between healthy lifestyle and QOL would have important implications for the design of health promotion programs to improve the overall QOL of the general public [13].

Previous Chinese studies of lifestyles or QOL focused mainly on urban populations and patients or on specific populations, such as AIDS patients, HIV-infected heroin users, Bell’s palsy patients, workers exposed to coal dust, rural-to-urban migrants, civil servants, professional drivers, and earthquake victims [14–21]. However, very few studies have examined whether and, if so, how QOL is associated with lifestyles and health among retired workers. In this context, the present study is unique because we focused on retired workers residing in Northeastern China, first clarifying the actual state of their lifestyles and QOL and then assessing the relationship between these, with comparisons to differences among gender groups. We used a questionnaire of the Chinese version of Health Promoting Lifestyle Profile II (HPLP-II) to evaluate the retired workers’ lifestyles and the Chinese version of the WHO Quality of Life-BREF (WHOQOL-BREF) instrument to directly relate these factors to QOL.

This research may facilitate our understanding of health-promoting lifestyles and QOL of Chinese retired workers in a medium-sized city. Such information may prove to be valuable to local healthcare policy-makers and researchers for determining the most effective levels of public health interventions to be implemented with the aim of improving the QOL of these populations. The study may also provide credible basic information for the Healthy China 2020 program.

Methods

Data collection and sampling

This was a cross-sectional survey of 343 retired workers (aged 50–79 years; the retirement age is 60 years for men and 50 years for women in the general workforce in China) who were recruited from the Retired Workers Activity Center of Liaoning Power Plant (LPP) among 1,497 retired workers. The LPP was constructed in 1957 and is a state-owned enterprise in Northeastern China that is located in a rural–urban fringe in Fushun City, Liaoning Province. The LPP, and not the community, provides an annual physical examination and a number of social welfare benefits to all employees, including retired workers. The Retired Workers Activity Center is a location where retired workers can meet on a daily basis and participate in recreational activities, including billiards, Chinese chess, dancing, reading, mah-jong, table tennis, among others. It is managed by eight office managers. The participants in the study could read and write Chinese. A self-reporting questionnaire was distributed to these individuals from July to October 2011.

Instruments

The study was a questionnaire survey. The questionnaires consisted of questions from the Chinese version of HPLP-II and the Chinese version of the WHOQOL-BREF and those on socio-demographic factors. The HPLP-II has been extensively used to measure and evaluate lifestyles or daily activity [22]. The Chinese version of HPLP-II was developed by Wang et al. [23], and the reliability and validity have been demonstrated. The HPLP-II instrument contains the following six subscales with total of 52 items: (1) health responsibility (HR, 9 items), (2) spiritual growth (SG, 9 items), (3) physical activity (PA, 8 items), (4) interpersonal relationships (IR, 9 items), (5) nutrition (N, 9 items), and (6) stress management (SM, 8 items). The overall score of HPLP-II was calculated from the mean score of 52 items. Each participant was asked to rate each item according to a Likert response scale where 1 = never, 2 = sometimes, 3 = often, and 4 = routinely. A mean of

≥ 2.50 was considered to be a positive response, in line with a previous study [24].

The psychometric properties of the WHOQOL-BREF [25] derived from the WHOQOL-100 [26] have been previously evaluated in different cultures and societies [27, 28]. The Chinese version of WHOQOL-BREF consists of 26 items and includes two aspects (Q1 as general QOL and Q2 as general health) and four domains: physical domain (D1, 7 items), psychological domain (D2, 6 items), social interaction domain (D3, 3 items) and environmental domain (D4, 8 items). Each item is rated on a 5-point Likert scale (very poor, poor, fair, good, excellent), and the total score for each domain is standardly converted to a score that ranges either from 4 to 20, with low scores indicating poor QOL [29]. In our study, a domain was treated as missing when $>20\%$ of the items pertaining to that domain were missing.

Ethical considerations

This study was conducted after obtaining informed consent from all subjects in written form and approval from the ethics committee of Kumamoto University Faculty of Life Sciences (approval number 408). The study was performed in accordance with the Declaration of Helsinki. All selected subjects were informed of the purpose of the study and were assured confidentiality upon receipt of the questionnaire. Consent to participate in the study was confirmed upon completion and return of the questionnaire. Data were processed at a restricted location using a personal unidentifiable code for each subject.

Statistical analysis

Statistical analysis was performed using SPSS ver. 17.0 for Windows (SPSS, Inc., Chicago, IL). The scores were normally distributed and the variability in the data was homogeneous. Cronbach's alpha analysis was performed to determine the reliability of the survey. The *t* test and a one-way analysis of variance were used to assess group differences with respect to their statistical significance. The correlation analysis and multiple linear regression analysis were performed to assess the relationships between age, income, health-promoting lifestyles, and QOL of retired workers by gender. Statistical significance was set at $p < 0.05$.

Result

Demographic characteristics of participants

A total of 343 retired workers (mean age 63.63 ± 6.35 years) participated in this questionnaire survey. Table 1 summarizes the demographic characteristics of the participants.

Reliability analysis

The Cronbach's alpha coefficient for the HPLP-II in this sample was 0.93, and that for each subscale was 0.82 (HR), 0.81 (SG), 0.73 (PA), 0.77 (IR), 0.70 (N), and 0.82 (SM). For the WHOQOL-BREF Cronbach's alpha coefficient was 0.84, and that for each domain was 0.33 (Physical), 0.61 (Psychological), 0.69 (Social interaction), and 0.74 (Environment).

Univariate analysis

As shown in Table 2, the overall HPLP-II mean score for all participants was 2.56 ± 0.39 . Among the six health-promoting lifestyle subscales, the highest mean score was for IR (2.80 ± 0.42) and N (2.65 ± 0.41), and the lowest mean score was for HR (2.29 ± 0.52) and PA (2.35 ± 0.58). There was a statistically significant difference in groups of different ages in terms of overall score and the scores for SG, IR, and SM, respectively ($p < 0.05$ for each). The youngest group (50–60 years) had higher scores than the other age groups. A significant difference was also observed between men and women in overall

Table 1 Participant characteristics

Characteristics	Values
Mean age (years)	63.63 ± 6.35 (50–79)
Age groups (years)	
50–60	131 (38.2)
61–70	148 (43.1)
71–79	64 (18.7)
Gender	
Male	171 (49.9)
Female	172 (50.1)
Marital status	
Single	23 (6.7)
Married	320 (93.3)
Educational level	
Primary school	8 (2.3)
Junior high school	150 (43.7)
High school	133 (38.8)
College or higher	52 (15.2)
Income	
Low (below ¥2000)	168 (49.0)
Middle (¥2001–¥3000)	118 (34.4)
High (¥3001 or above)	57 (16.6)
All participants	343 (100)

Data are presented as the mean \pm standard deviation (SD) with the range in parenthesis, or as the number of participants with the percentage in parenthesis

scores and scores for the subscales HR, SG, IR, and N, respectively ($p < 0.01$ for each), with men having lower scores than women. Income seemed to significantly influence overall scores and those for subscales SG, PA, N, and SM, respectively ($p < 0.05$ for each). We also found that the high income group had higher scores overall and for each of the six subscales (Table 2).

The mean quality of life scores for all participants is shown in Table 3. There was a statistically significant difference between age groups in the scores for Q1, Q2 and most domains ($p < 0.05$ for each) except for D4. The youngest group (50–60 years) trended to have higher scores than the older two age groups. No statistically significant difference was found for gender in the scores for Q1, Q2, and all domains except D3 ($p < 0.001$). The high income group appeared to have significantly higher scores in Q1, Q2 and all domains ($p < 0.05$ for each) except D3 ($p > 0.05$) (Table 3).

Health-promoting lifestyle and QOL

Results from the correlation analyses (see Table 4) revealed that age ($r = -0.18$ for men, -0.21 for women; $p < 0.05$), income ($r = 0.23$ for men, 0.16 for women; $p < 0.05$), HR ($r = 0.37$ for men, 0.43 for women; $p < 0.001$), SG ($r = 0.59$ for men, 0.62 for women; $p < 0.001$), PA ($r = 0.47$ for men, 0.49 for women; $p < 0.001$), N ($r = 0.38$ for men, 0.43 for women; $p < 0.001$), SM ($r = 0.57$ for men, 0.55 for

women; $p < 0.001$), and overall HPLP-II ($r = 0.59$ for men, 0.65 for women; $p < 0.001$) were significantly correlated with a better QOL for both male and female participants. For male participants, income was shown to be significantly different for all HPLP-II subscales except HR ($r = -0.08$, $p > 0.05$), while for female participants income was significantly correlated with all HPLP-II subscales except IR ($r = -0.03$, $p > 0.05$) (Table 4).

Criterion-related validity was indicated by significant correlations with concurrent measures of lifestyle and QOL. The overall HPLP-II and QOL scores showed a highly significant and reliable relationship ($r = 0.602$, $p < 0.001$), as did the overall HPLP-II and WHOQOL-BREF domain scores ($r = 0.411-0.558$, $p < 0.001$).

Results from multiple regression analyses were conducted on the overall models for both men and women ($p < 0.001$ for each) for each domain of the QOL. Of the demographic variables, income was not a significant predictor of a better QOL for both men and women, while age was a significant predictor of a better QOL for women (Q2 $\beta = -0.19$; D1 $\beta = -0.17$; D2 $\beta = -0.18$; D3 $\beta = -0.19$) only. Of the various types of health-promoting lifestyle, those related to HR (Q2 $\beta = 0.33$ for men, 0.27 for women), SG (Q1 $\beta = 0.33$ for men, 0.27 for women; D2 $\beta = 0.30$ for men, 0.55 for women; D4 $\beta = 0.30$ for men, 0.29 for women), and PA (Q2 $\beta = 0.29$ for men, 0.25 for women; D4 $\beta = 0.17$ for men, 0.16 for women) were significant predictors of a better QOL for both men and women. SG was a significant predictor of a better general

Table 2 Distribution of average score of health lifestyle behaviors according to the HPLP-II^a based on completed and returned survey questionnaires ($n = 343$)

Variables (total n)	Overall	HR	SG	PA	IR	N	SM
Age (years)							
50–60 (131)	2.63 ± 0.38	2.37 ± 0.52	2.79 ± 0.52	2.40 ± 0.57	2.86 ± 0.42	2.64 ± 0.43	2.67 ± 0.52
61–70 (148)	2.54 ± 0.38	2.25 ± 0.52	2.59 ± 0.52	2.34 ± 0.57	2.79 ± 0.40	2.66 ± 0.39	2.55 ± 0.54
71–79 (64)	2.45 ± 0.43	2.22 ± 0.53	2.42 ± 0.60	2.26 ± 0.60	2.68 ± 0.45	2.62 ± 0.40	2.47 ± 0.62
<i>F</i>	4.931**	2.364	10.885***	1.183	4.164*	0.285	3.315*
Gender							
Male (171)	2.49 ± 0.41	2.19 ± 0.53	2.55 ± 0.54	2.31 ± 0.61	2.72 ± 0.43	2.59 ± 0.40	2.53 ± 0.58
Female (172)	2.63 ± 0.37	2.38 ± 0.50	2.71 ± 0.55	2.39 ± 0.55	2.88 ± 0.39	2.70 ± 0.41	2.63 ± 0.51
<i>t</i>	-3.252**	-3.403**	-2.637**	-1.280	-3.677***	-2.618**	-1.704
Income (in RMB)							
Low (168)	2.48 ± 0.38	2.23 ± 0.50	2.50 ± 0.58	2.27 ± 0.56	2.78 ± 0.45	2.57 ± 0.40	2.47 ± 0.51
Middle (118)	2.62 ± 0.38	2.37 ± 0.52	2.74 ± 0.49	2.39 ± 0.57	2.79 ± 0.38	2.73 ± 0.40	2.64 ± 0.55
High (57)	2.66 ± 0.40	2.31 ± 0.58	2.79 ± 0.50	2.50 ± 0.61	2.85 ± 0.41	2.70 ± 0.42	2.78 ± 0.60
<i>F</i>	7.064**	2.784	93690***	4.112*	0.611	5.767**	7.963***
All participants	2.56 ± 0.39	2.29 ± 0.52	2.63 ± 0.55	2.35 ± 0.58	2.80 ± 0.42	2.65 ± 0.41	2.58 ± 0.55

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ according to the independent samples *t* test or one-way analysis of variance (ANOVA) Data are presented as the mean ± SD

^a HPLP-II, Health Promoting Lifestyle Profile II instrument. Overall is the mean score of all 52 items in the six subscales: HR Health responsibility, SG Spiritual growth, PA Physical activity, IR Interpersonal relationships, N Nutrition SM Stress management

Table 3 Distribution of average score of quality of life according to the WHOQOL-BREF^a based on completed and returned survey questionnaires^a ($n = 343$)

Variables (total n)	General QOL	General health	Physical (D1)	Psychological (D2)	Social interaction (D3)	Environment (D4)
Age (years)						
50–60 (131)	3.78 ± 0.73	3.66 ± 0.80	3.55 ± 0.36	3.62 ± 0.42	3.81 ± 0.47	3.42 ± 0.49
61–70 (148)	3.68 ± 0.70	3.47 ± 0.91	3.47 ± 0.40	3.47 ± 0.39	3.59 ± 0.48	3.43 ± 0.44
71–79 (64)	3.45 ± 0.94	3.16 ± 1.17	3.34 ± 0.51	3.33 ± 0.61	3.55 ± 0.76	3.39 ± 0.71
<i>F</i>	3.935*	6.323**	5.616**	9.817***	7.555**	0.125
Gender						
Male (171)	3.70 ± 0.81	3.52 ± 0.96	3.48 ± 0.43	3.48 ± 0.51	3.63 ± 0.62	3.44 ± 0.57
Female (172)	3.65 ± 0.73	3.44 ± 0.92	3.46 ± 0.39	3.53 ± 0.41	3.71 ± 0.48	3.39 ± 0.46
<i>t</i>	0.680	0.775	0.483	−0.930	−1.305***	0.895
Income (in RMB)						
Low (168)	3.52 ± 0.77	3.33 ± 0.92	3.41 ± 0.45	3.43 ± 0.45	3.64 ± 0.55	3.35 ± 0.50
Middle (118)	3.76 ± 0.80	3.53 ± 0.97	3.57 ± 0.50	3.57 ± 0.50	3.66 ± 0.58	3.35 ± 0.56
High (57)	3.93 ± 0.59	3.84 ± 0.84	3.58 ± 0.34	3.60 ± 0.38	3.79 ± 0.50	3.56 ± 0.41
<i>F</i>	7.443**	6.818**	4.425*	4.783**	1.613	4.139*
All participants	3.67 ± 0.77	3.48 ± 0.94	3.47 ± 0.41	3.50 ± 0.46	3.67 ± 0.55	3.42 ± 0.52

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ according to the independent samples *t* test or one-way ANOVA

Data are presented as the mean ± SD

^a Quality of life (QOL) was evaluated using the Chinese version of the World Health Organization (WHO) QOL-BREF instrument which consists of 26 items and includes two aspects (Q1 as general QOL and Q2 as general health) and four domains: physical domain (D1), psychological domain (D2), social interaction domain (D3) and environmental domain (D4)

Table 4 Correlations between variables for male and female participants

Variables	1	2	3	4	5	6	7	8	9	10
1. Quality of life	–	−0.21**	0.16*	0.43***	0.62***	0.49***	0.40***	0.43***	0.55***	0.65***
2. Age	−0.18*	–	−0.18*	−0.02	−0.19*	−0.07	−0.02	0.04	−0.11	−0.09
3. Income	0.23**	−0.27***	–	0.23**	0.24**	0.18*	−0.03	0.25**	0.23**	0.25**
4. HR	0.37***	−0.08	0.11	–	0.55***	0.48***	0.36***	0.58***	0.63***	0.80***
5. SG	0.59***	−0.23**	0.32***	0.52***	–	0.45***	0.50***	0.50***	0.76***	0.84***
6. PA	0.47***	−0.06	0.18*	0.50***	0.59***	–	0.16*	0.53***	0.62***	0.72***
7. IR	0.41***	−0.15*	0.21**	0.46***	0.58***	0.39***	–	0.22**	0.39***	0.56***
8. N	0.38***	0.04	0.17*	0.62***	0.57***	0.53***	0.45***	–	0.61***	0.75***
9. SM	0.57***	−0.11	0.26**	0.56***	0.79***	0.62***	0.50***	0.56***	–	0.88***
10. Overall	0.59***	−0.12	0.27***	0.78***	0.86***	0.77***	0.70**	0.76***	0.85***	–

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Correlations between variables for female participants are shown above and to the right of the diagonal and correlations between variables for male participants are shown below and to the left of the diagonal

health for men only ($\beta = 0.36$), while PA was a significant predictor of a better QOL for women only (Q1 $\beta = 0.28$; D1 $\beta = 0.22$; D2 $\beta = 0.18$) (Table 5).

Discussion

Various aspects of health-promoting lifestyles are important determinants of the QOL. Although the relationship between health-promoting lifestyles and physical health

has been widely established, little is known about health-promoting lifestyles and the associated QOL for retired workers in Fushun City, a medium-sized city located in Northeastern China. The aim of the present study was identify the actual state of a healthy lifestyle of individuals and to examine its relationship with QOL. The results of the study should provide useful information to health professionals when designing health interventions to promote healthy practices for the general public in China.

Table 5 Multiple linear regression for quality of life by gender

Variables	Male (n = 171)						Female (n = 172)					
	Q1	Q2	D1	D2	D3	D4	Q1	Q2	D1	D2	D3	D4
Age	-0.08	-0.08	-0.11	-0.09	-0.10	0.02	0.06	-0.19**	-0.17*	-0.18**	-0.19**	0.08
Income	0.05	0.05	0.01	0.01	0.04	0.01	0.03	0.04	0.01	0.08	0.11	0.01
HR	0.01	0.33***	0.01	0.03	0.05	0.02	0.05	0.27**	0.13	0.06	0.10	0.01
SG	0.44***	0.36**	0.02	0.30*	0.04	0.30*	0.28**	0.15	0.17	0.55***	0.12	0.29*
PA	0.10	0.29**	0.08	0.11	0.05	0.17*	0.28**	0.25**	0.22*	0.18*	0.11	0.16*
IR	0.08	0.07	0.02	0.11	0.14	0.02	0.19*	0.03	0.04	0.02	0.36***	0.15*
N	0.06	0.01	0.02	0.05	0.06	0.07	0.21*	0.01	0.13	0.06	0.03	0.23*
SM	0.07	0.010	0.40	0.13	0.17	0.12	0.08	0.26*	0.10	0.01	0.09	0.16
Adjusted R ²	0.33***	0.28***	0.27***	0.35***	0.20***	0.26***	0.39***	0.28***	0.26***	0.45***	0.28***	0.27***

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Scores shown are standardized regression coefficients (β). R^2 is the coefficient of determination

In this study, the subjects achieved higher scores on the N and SG subscales, moderate scores on the SM subscale, and lower scores on the PA subscale; these results are consistent with those reported in the literature [30, 31]. Our study is the first to report that retired workers achieved the highest scores on the IR subscale (Table 2), with the highest score being for item 31 (“Touch and am touched by people I care about”; 3.20 ± 0.75), and the second highest for item 13 (“Maintain meaningful and fulfilling relationships with others”; 3.16 ± 0.66). These high scores may stem from Confucianism and other cultural influences that potentially lead to Chinese individuals emphasizing forbearance and interpersonal harmony—they are a warm, helpful, and cohesive population [32]. On the other hand, all subjects had retired from the same enterprise, had worked together, and lived in the same community for a long time. Therefore, community health nurses may be encouraging the participants in our study to strengthen existing social support and acquire new social support, thus contributing to their general well-being.

The extent to which an individual contributes to his/her own health is his/her responsibility [33]. In this study, the participants obtained the lowest scores for the HR subscale, which is worth emphasizing. One possible reason why these retired workers did not feel any desirable degree of health responsibility may be that aged people do not consider health controls as being necessary to lead a healthy life in this area. In general, if an individual does not perceive his/her health problems, he/she will not make an effort to promote his/her health [34]. In China, especially in such regions as the rural and rural–urban fringe, if individuals can carry out their daily routines and if their health does not affect their work, they do not consider themselves as to be ill [35]. It is thus particularly important for this population that not only is the health of individuals improved, but also that a proper healthy lifestyle is adopted.

Demographic features have been found to affect health promotion and lifestyle [36–38]. In our study, significant differences in the HPLP-II scores were found in the three age groups. The older population group obtained significantly lower scores than the younger population groups for the overall HPLP-II and for many of its subscales, such as SG, IR, and SM (Table 2). These findings are inconsistent with those reported previously [37, 39]. However, in China, the “empty nest” phenomenon has become increasingly prominent, with the number of empty-nest families increasing annually. As such, it has become one of the more important problems that cannot be ignored in the aging population [40]. In addition, the unhealthy lifestyle of rural empty-nesters (e.g., watching television watching for ≥ 3 h per day) may seriously affect physical health, leading to the occurrence of many diseases [41]. Therefore, it may be an important and urgent task for community nurses of Northeastern China to improve the health management of the older members of the general population in order to promote their health.

In terms of the association of gender with HPLP-II scores, females had higher scores for the HR, SG, IR, and N subscales and for the overall HPLP-II (Table 2), which is consistent with previous studies [13, 33]. However, there was no significant difference for PA between men and women (Table 2), which is also in accordance with previous studies [31, 42, 43]. This result is probably due to the specialty of the subjected populations who regularly utilize the activity center where they are actively involved in physical training and other activities. It is important to note that physical activity is strongly associated with self-rating health score. It has been reported that individuals who are physical inactive, as well as those who are underweight or obese are more likely to have a poor self-rated health score than other subjects [44]. Regular exercise protects against poor mobility and poor self-rated health, while a lower

activity level increases the hazard of death [45]. These findings suggest that it is particularly important for the community to provide older individuals with a place for sports activities.

Regarding the association of income with HPLP-II and QOL, we found that the high income group had the highest scores for some subscales of the HPLP-II, for the overall HPLP-II, and for the QOL domains, whereas the lowest scores for the HPLP-II and QOL were found in the lowest income group (below ¥2,000) (Tables 2, 3). Similar results reported by other research groups also showed that physical health and material conditions (income and housing conditions) are the most important factors affecting the QOL of retired people [46]. Healthcare organizations concerned with the QOL of retired people in China should thus address the need for an increased income and improved housing conditions. In addition, the growing concern over the present-day contradiction between low income and rising prices in China should also be considered in such analyses.

Male and female participants were shown to have different tendencies on the scores of lifestyle and QOL, as well as in the correlations between variables (Tables 4, 5). This difference might be explained by the gender role associated with certain types of behavior. For example, research has shown that masculinity is related to health behavior such as regular exercise [47] smoking, and drinking [48, 49]. Therefore, men might be more likely to engage in such behavior to emphasize their masculine gender role. In addition, in the Chinese culture, women are often categorized to assume a caregiving role while men are expected to receive care.

Our results suggest that an effective approach to maintain a desirable lifestyle and QOL for retired workers in a medium-sized city of Northeastern China would be to introduce daily activities to improve HR and to maintain and enhance social support for the low-income populations. Our results highlight the importance of identifying the correlates of lifestyle and QOL for different groups and examine why differences exist between these groups. In addition, improvements in the community service system should be a focus of community work in the future.

There are several limitations to our study. We recruited subjects by convenience through sampling visitors to the Retired Workers Activity Center (343 of the 1,497 retired workers participated in the survey; participation rate of 22.9 %). Individuals who often go to activity centers may have a relatively better lifestyle and QOL than those who do not. Thus, there may have been a selection bias in the sampling process. In addition, in our study, education and marital status did not significantly influence the score of lifestyle and QOL, and future investigations are thus necessary to clarify these points. Finally, further research is

needed to understand the complex causal pathways between regional health and welfare factors, health behaviors, and QOL.

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Conflict of interest The authors declare that they have no conflicts of interest.

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