Original Article

Quality of life predictors in physically disabled people

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Abstract:

BACKGROUND: Physically disabled people experience more restrictions in social activities than healthy people, which are associated with lower level of well-being and poor quality of life (QoL).

STUDY DESIGN: A cross-sectional study was conducted

METHODS: This study was investigated on among 302 eligible physically disabled people. The predictive role of the demographics and clinical characteristics, anxiety and depression, physical activity, and self-efficacy on the 36-Item Short Form Health Survey (SF-36) was examined.

STATISTICAL ANALYSIS USED: Statistical analysis used univariate and multivariate regression models.

RESULTS: Gender, self-reported physical activity levels, use of the disability aid tools, and depression were significantly predictors of the physical component summary (PCS) (R^2 = 0.20, P < 0.001). We realized that anxiety, depression, and self-efficacy could significantly predict the mental component summary (MCS) (R^2 = 0.43, P < 0.001).

CONCLUSIONS: Study results revealed that four and three variables could predict 20% and 43% of PCS and MCS variations, respectively. These findings warranted the detection of QoL risk factors and establishment of targeted interventions to optimize the health-related QoL among physically disabled people.

Keywords:

Disability, hospital anxiety and depression scale, predictors, quality of life, regression analysis, SF-36

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Introduction

Physical disability is defined as "the loss of motor function of varying degrees or limitation in movements or activities resulting from deformed limbs, body paralysis, or deformity caused by damage to the structure or function of body parts.[1] Physically disabled people are unable to carry out normal social roles, and their daily life is affected by societal barriers.[2] Disabilities have caused a substantial disease burden[3] and showed an increased trend in developing countries'[4] physically disabled people experience more restrictions in social activities than healthy people, which are associated with lower level of well-being and relative poor quality of life (QoL).[5-7] The QoL as a great public health concern is related to disability[8] and it is a complex multidimensional concept including physical health, psychological and social well-being features, and beliefs.[9] Since the QoL is subjective and affected by intrinsic and extrinsic factors, it is difficult to manage and optimize this concept without predicting its determinants.[10] Some of the QoL determinants include anxiety and depression[11], self-efficacy[12], and physical activity.[13]

Psychological factors such as anxiety and depression influence negatively on QoL[14-16]; nevertheless, the co-occurrence

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and the combined effect of these factors on QoL are unclear. Anxiety and depression were associated with impairment of QoL in Korean[17] and Chinese patients.[18] Satisfied patients and those with fulfilled needs who experience less social barriers have a better QoL and less anxiety and depression[13], and therefore, experience greater mental health.[19] Previous reports showed that the more chronic pain is associated with the more depressive mood, fatigue, anxiety, and poor self-efficacy.[20]

Self-efficacy as the perceived ability of a person about performing a successful task in the future[21] and belief or sense of confidence in abilities[22] has been shown as an important mediator of health outcomes [23]. Self-efficacy has a mediating role between stress and depression as well as supportive effects against the negative impacts of pain and fatigue.[23] It is suggested that depression was negatively and self-efficacy was positively associated with QoL. Self-efficacy directly influenced self-care behavior and indirectly affected the mental health component of QoL.[24]

Low physical activity restricts the body capacities and functions and increases the risk of chronic and secondary complications among physically disabled people, but the role of type and severity of physical activity have not been examined.[25] The positive relationship was seen between physical activity and QoL though this was varied according to the type and severity of the physical activity and QoL domains.[26] Salguero *et al*. demonstrated that all domains of QoL, except role-emotional aspect, were significantly correlated with the physical activity.[13]

QoL and health status measures are largely subjective concepts which can be evaluated through the judgment of people about their own health and life status.[10] Previous studies were applied the univariate and multivariate analysis to determine factors influencing on QoL in different areas of physical disability.[27] According to the studies health-related QoL (HRQoL) is influenced by different independent factors such as age, gender, physical disability levels, depression[27], physical activity[28], fatigue[29], low self-efficacy, and bodily pain.[21] In contrary, other studies have demonstrated that age, education, marital status, employment status, disease duration and course[29], gender, and duration of disability[30] could not predict the HRQoL. There is little knowledge about the relationship between QoL and its predictors in physically disabled people and also, only a few studies focused on the demographic, sociocognitive, psychological, and other variables that affect the QoL in people with physical disabilities.

Based on the abovementioned statements and some controversies found in the previous studies in this regard, we put our objectives on examining the unclear relationships between the independent variables and QoL subsequently, to show the predictor role of these self-reported variables on QoL domains in Iranian physically disabled people.

Methods

Study design and participants

This cross-sectional and self-report survey was conducted on physically disabled people with the age of 18 years and older in five physiotherapy clinics of Kermanshah, Iran. All participants were randomly selected from patients attending these clinics from August 2015 to January 2016. A multistage sampling technique (including cluster sampling, proportional, and then randomized sampling) was used to select the samples. First, the three private rehabilitation centers of Kermanshah (clusters) were selected. Then, sample size for each physiotherapy clinic was considered based on its population coverage. In the last stage, the physically disabled people referring to each physiotherapy clinic were selected randomly using simple randomization table. The study sample size was calculated using the following formula:

$$n = [\frac{z_a + z_b}{c(r)}]^2 + 3 \text{ , in which } c(r) = \frac{1}{2}\ln\frac{1+r}{1-r} \text{ . The}$$

correlation between three supposed main predictors and QoL were obtained from previous studies, that is, physical activity ($r = 0.75$),[31] self-efficacy ($r = 0.64$),[21] and depression (-0.69).[32] The power of the study was set at 90%. The 90% confidence interval was considered for calculating sample size. The final sample size was calculated with regard to study groups as 296 samples. Insufficient medical record documentations, the diagnosis of mental retardation or serious neurological and psychiatric disorders were exclusion criteria in this study. The study protocol was approved by the Research Centre of Kermanshah University of Medical Sciences with project registration number of 95141. To preserve the confidentiality, all participants were informed about the study's purpose and asked to complete the consent form before interviews and questionnaire completion. In this study, nobody refused the consent. Participants were diagnosed according to the international classification of functioning, disability, and health.[30] To the diagnosis, all participants were visited by our physiotherapist. According to this, we divided the severity of disability into three levels of "low," "moderate," and "severe." All participants were interviewed by two trained health professionals who also reviewed the participants' medical record to collect some demographic and clinical information. A total number of 302 eligible physically disabled people were recruited to complete the demographic questionnaire (for further information),

short-form health survey scale (SF-36), Hospital Anxiety and Depression Scale (HADS), Physical Activity Scale (PAS), and self-efficacy scale. Participants were initially given the instruction, and then they answered the questionnaires. Their personal information such as name and identification number was not recorded to maintain their privacy. No missing data were found in the study. Participants did not receive any financial compensation for their participation. The scales and questionnaires were dated by the interviewer, and all of them were previewed for completeness and consistency.

Measures

Demographic questionnaire

This was used to collect the demographic and clinical features such as age, gender, educational level, marital status, employment status, living place, disability level, time from disability, comorbidities (noncommunicable diseases including cardiovascular disease, stroke, diabetes, cancer, and asthma), self-rated physical activity levels, and the use of disability aid tools. The interview process and questionnaire completion took around 4 min.

SF-36

This is a health outcome tool developed to evaluate physical and mental health concepts.[33] Scoring of this scale was a two-step process; first, numeric values are recoded and each item was scored from 0 to 100 as a high score indicated a good health status. Second, items in the same scale were averaged together to estimate the eight domains of patient functioning: physical functioning, role limitation due to physical health, role limitation due to emotional problems, vitality (energy/fatigue), mental health, social functioning, bodily pain, and general health perceptions. It also included a single item that provides an indication of perceived change in health. The scale scores represent the average for all items. Reliability and validity of this scale were well documented, and Cronbach's alpha for all of the QoL domains was greater than 0.75 for Iranian population.[34] The time for interview process and completion of this scale took around 13 min.

Hospital Anxiety and Depression scale

This self-report scale comprised of 14 items in two subscales of anxiety (A) and depression (D) with seven items in each subscale which developed for measuring the existence of these disorders.[11] Each item is scored on a 4-point Likert scale ranging from 0 to 3; therefore, the score for each subscale is in the range of 0–21. Total scores for each subscale are calculated by simple summation of individual items, in which scores of 0–7 indicate normal levels, 8–10 indicates borderline abnormal levels, and 11–21 suggests abnormal levels of anxiety or depression.[35] The Iranian version of the HADS is acceptable as a valid and reliable tool in determining the psychological distress, in which Cronbach's alpha

was reported 0.78 for the anxiety and 0.86 for the depression subscales.[36] The time for interview process and completion of this scale took around 7 min.

Physical Activity scale

This scale was used to assess the physical activity of people with physical disability. This scale consisted of 13 items: the leisure activities (6 items) including walking and wheeling outside the home not specifically for exercise; light, moderate, and strenuous sport and recreation; exercise to increase muscle strength and endurance; household activity (6 items) including light and heavy housework; home repair; lawn work; outdoor gardening; caring for another person; and occupational activity (1 item) other than office work. They were asked the number of days in the past week to participate in these activities as never, seldom (1–2 days/week), sometimes (3–4 days/week), or often (5–7 days/week) and then on average hours per day (<1 h, 1 but <2 h, 2–4 h, and >4 h). The scores were obtained by multiplying the average hour per day of physical activity during the past week by an estimated metabolic equivalent value reflecting activity intensity and summing over items 2 through 13.[25] Reliability and validity of the PAS were proved and Cronbach's alpha for this scale was reported as 0.67–0.71.[37] Only face validity of PAS was evaluated through translate back-translate process for the current study. The time for interview process and completion of this scale took around 9 min.

Self-efficacy scale

The Moorong Self-Efficacy Scale is originally applied for spinal cord injury (SCI) patients. Considering the presence of some SCI patients in this study, we used this scale to measure self-efficacy. The time for interview process and completion of this scale took around 7 min. The 16-item version of this scale consists of two concepts: daily activities and social functioning. It is scored by summing all 16 items on a 7-point scale ranging from 1 (very uncertain) to 7 (very certain). Total scores range from 16 to 112 with higher scores indicating higher self-efficacy or stronger beliefs in the person's ability to control their behavior and outcomes such as personal hygiene, household participation, maintaining relationships, and accessing community and leisure pursuits. We have averaged the total scale scores through dividing it by number of questions. It is mentioned that the self-efficacy scale is internally consistent, responsive, and stable, with good concurrent, convergent, and discriminant construct validity as the stability over the 6-week period was 0.74 and statistically significant item correlations ranged from 0.46 to 0.80.[22]

Statistical analysis

Descriptive statistics were applied for all demographic variables. Quantitative data and categorical variables

were described as mean ± standard deviation (M ± SD), and frequency or percent, respectively. Physical component summary (PCS) and mental component summary (MCS) of SF-36 scale were the two main outcome measures. Not only demographics, disability levels, and comorbidities but also the scale scores including anxiety, depression, self-efficacy, and physical activity were evaluated for the extent to which they were predictors of PCS and MCS outcomes. For this, all of the variables were entered into univariate and multivariate regression models to identify which clinical variables were independently associated with the SF-36 main outcomes. Before conducting multivariable analysis, the data were assessed for multicollinearity to bias regression coefficient estimation. The test statistic can vary between 0 and 4, with a value of 2 meaning that the residuals are uncorrelated. As a general rule, results between 1.5 and 2.5 indicate that residuals are uncorrelated[38]. Case-wise diagnostics which set at >3 SD were conducted to assess the influence of outliers on the model. Hence, individual cases with standardized residuals outside the range of ±3.0 were identified. A normally distributed histogram and linear probability plot of standardized residuals were used to ensure that they were normally distributed. The results from regression analyses were reported as regression coefficients with 95% confidence intervals and an R^2 statistic to determine the amount of variation in the main outcomes explained by the predictor variables. SPSS software version 18 was used for statistical analysis and significance level was defined at $P < 0.05$.

Results

Participants in five physiotherapy clinics completed self-administered questionnaires and scales in 3-month period. According to the respondent's reports, the main causes in development of physical disability were identified to be birth defects or congenital abnormalities, severe automobile accidents lead to mainly SCI, medical-surgical errors, unintentional household or workplace injuries, burning, and multiple sclerosis (MS).

Overall, 302 participants ranged in age from 18 to 86 years old, with a mean and SD of 36.45 and 10.77 years, respectively. More than 62% of participants were men and about half of them were married. Time from appearance of disability ranged from 1 to 70 years, and some of the participants used more than one disability aid tool. Most of the participants did not have any academic educations, lived in the city, and suffered from moderate levels of disability. The further demographic characteristics of the study population are summarized in Table 1.

The mean and SD of the scores in the PCS and MCS main outcomes were 37.22 ± 9.11 and 51.41 ± 10.47, respectively. The mean and range of the scores obtained

for main and minor SF-36 subscales and other applied scales were summarized in Table 2.

The purpose of the univariate examination was to screen the most relevant and important independent variables

Table 1: Demographic characteristics of participants with physical disability (*n*=302)

Characteristics	*n* (%)* or mean±SD
Age (ranged from 18 to 86 years)	36.45±10.77
18-35	156 (51.6)
36-55	125 (41.4)
56-86	13 (4.3)
Gender	
Male	189 (62.6)
Female	113 (37.4)
Years with disability	24.78±14.47
(ranged from 1 to 70 years)	
Education levels	
Illiterate	29 (9.6)
Elementary school	65 (21.5)
Middle school	47 (15.6)
High school (diploma)	98 (32.5)
Associate degree	10 (3.3)
Bachelor degree and higher	53 (17.6)
Disability levels	
Low	3 (1)
Moderate	159 (52.6)
Severe	136 (45.0)
Physical activity levels	
Low	88 (29.1)
Moderate	181 (59.9)
High	32 (10.6)
Marital status	
Single	133 (44.0)
Married	150 (49.7)
Separated	11 (3.6)
Deceased spouse	2 (0.7)
Employment	
Unemployed	89 (41.6)
Worker	25 (8.3)
Employee	18 (6)
Retired	3 (1)
Self-employment	64 (21.2)
Housekeeper	32 (10.6)
Student	10 (3.3)
Comorbidity	95 (31.5)
Living place	
Village	11 (3.6)
City	291 (96.4)
Use of the disability aid tools	
No tool	179 (59.3)
Wheelchairs	20 (6.6)
Walker	8 (2.6)
Hearing aid	1 (0.3)
Walking stick	65 (21.5)
Others	52 (17.2)

*Incompleteness percentage and the number of some variables were due to the missing data. SD=Standard deviation

correlated with SF-36 subscales. Table 3 represents univariate relationships between each identified demographic, clinical, and scale-based predictor variable and either MCS or PCS scores. Higher levels of both physical and mental health status were predicted by lower levels of anxiety and depression, higher physical activity levels, and higher self-efficacy scorers. In general, univariate analysis showed that there were not statistical significant correlations between five and eight demographic and clinical variables with PCS and MCS scores, respectively. However, in both subscales, the significant correlations were found based on the scores from HADS, PAS, and self-efficacy scales.

Multivariate predictors of physical component summary and mental component summary in subjects with physical disability

The maximum intercorrelation was $r = 0.61$ between anxiety and depression. The variance inflation factor as a collinearity diagnostic for PCS and MCS predictors ranged from 1.00–1.18 to 1.51–1.83 and also, the tolerance statistics ranged from 0.85–0.99 to 0.55–0.66 for PCS and MCS, respectively, indicating that multicollinearity was not a significant problem for further analysis. The Durbin–Watson statistics which test the serial correlations between errors were 1.81 and 1.93 for PCS and MCS, respectively, confirming independence of errors.

Only one of the cases had a standardized residual more than three SDs from the PCS mean, and the regression

modeling was performed based on the total 301 cases. Finally, among the variables, gender, self-reported physical activity levels, use of the disability aid tools, and depression which were significantly associated with PCS were entered in the multivariate regression model as the independent variables. These variables account for more than 20% of PCS variance ($P < 0.001$). In the case of the PCS, due to the exclusion of the PAS scores from regression model, we supposed some variables such as comorbidity, gender, and physical disability levels as probable confounding factors, but only the physical disability levels play the role of the confounding and decreased the prediction coefficient of the entered variables on the PCS subscale more than 10%.

In two repetitions of the model for MCS, we recognized that five cases had a standardized residual more than three; therefore, after the removal of the outlier cases,

Table 2: Mean scores of SF-36 main and minor subscales, hospital anxiety and depression scale, physical activity, and self-efficacy scales from physically disabled people (*n*=302)

Scales and/or subscales	Mean±SD	Range
SF-36		
PCS	37.22±9.11	18.40-61.05
Physical functioning	45.30±30.59	0-100
Role limitation due to physical health	30.55±30.98	0-100
Body pain	58.28±28.92	0-100
General health perceptions	44.09±21.16	0-100
MCS	51.41±10.47	18.05-75.96
Energy/fatigue	57.24±19.12	0-100
Social functioning	57.62±28.49	0-100
Role limitation due to emotional problems	54.75±41.44	0-100
Emotional well-being	64.25±19.20	0-100
HADS	16.30±6.90	3-34
Anxiety	7.74±4.51	0-20
Depression	8.56±3.15	3-18
Physical activity	15.98±14.11	0-80.72
Self-efficacy	5.28±1.29	1-7

SF-36=Short form health survey scale, HADS=Hospital Anxiety and Depression Scale, PCS=Physical component summary, MCS=Mental component summary, SD=Standard deviation

Table 3: Univariate regression of physical component summary and mental component summary scores in participant with physical disabilities (*n*=302)

Variable	Coefficient	95% CI	P
PCS			
Age	−0.15	−0.22--0.03	0.009
Gender	0.11	−0.13-4.11	0.07
Marital status	−0.08	−2.98-0.50	0.16
Literacy	0.18	0.43-1.73	0.001
Employment	0.10	−0.06-0.92	0.09
Living place	0.01	−5.23-5.81	0.92
Time from disability	0.05	−0.04-0.10	0.38
Disability levels	−0.17	−4.92--0.97	0.004
Physical activity levels	0.36	3.88-7.08	<0.001
Comorbidity	0.18	1.33-5.73	0.002
Use of the disability aid tools	−0.27	−7.09--3.04	<0.001
Anxiety	−0.19	−0.62--0.17	0.001
Depression	0.31	−1.19--0.56	<0.001
Physical activity	0.23	0.08-0.22	<0.001
Self-efficacy	0.31	1.41-2.93	<0.001
MCS			
Age	0.09	−0.2-0.20	0.12
Gender	−0. 04	−3.28-1.62	0.51
Marital status	0.04	−1.35-2.66	0.52
Literacy	0.11	0.01-1.52	0.05
Current job	0.19	0.38-1.50	0.001
Living place	0.03	−4.52-8.14	0.57
Time from disability	0.15	0.02-0. 19	0.01
Disability levels	−0.04	−3.12-1.52	0.50
Physical activity levels	0.17	0.94-4.83	0.004
Comorbidity	0.04	−1.56-3.57	0.44
Use of the disability aid tools	−0.08	−4.15-0.67	0.16
Anxiety	−0.58	−1.57--1.14	<0.001
Depression	−0.48	−1.92--1.26	<0.001
Physical activity	0.25	0.10-0.27	<0.001
Self-efficacy	0.45	2.78-4.42	<0.001

PCS=Physical component summary, MCS=Mental component summary, CI=Confidence interval

the strength of the regression model improved based on the 297 cases. Subsequently, we realized that anxiety, depression, and self-efficacy scales were significant predictor of the MCS subscale ($P < 0.001$). According to the adjusted R^2, these variables accounted for more than 43% of the MCS total variance. Multivariate predictors of PCS and MCS in physically disabled people were shown in Table 4.

Discussion

This study explores the association between health status, demographic, sociocognitive, and psychological factors in an Iranian sample with mild-to-severe disability. Better mental health in our sample was associated with concurrent higher self-efficacy and physical activity. Higher anxiety and depression were associated with lower mental and physical health scores. People with physical disability consistently demonstrate a pattern of impairment psychological function according to HADS. Some studies reviewed physical[39,40] and mental[41] features and effects of them on QoL in individuals with physical disability. The health issues including any kind of disability such as physical one can affect and reduce the QoL by imposing the high costs on physically disabled people.[1] In the present study, we recruited the convenience sample of physically disabled people and realized that percent of men were more than women, but the latter group indicated more comorbidities in mental and physical health conditions than men. We unable to attribute the special causes to development of the disabilities, but in some studies, the MS has accounted for the 45% of disability occurrences.[32]

In general, the total score of QoL subscales was at moderate level, and this was affected mainly by

Table 4: Multivariate predictors of physical component summary and mental component summary in participants with physical disability

Variables	Coefficient	SE	Lower limit and upper limit	P
PCS (*n*=301)				
Gender	0.12	0.99	0.40-4.28	0.02
Physical activity levels	0.26	0.86	2.27-5.67	<0.001
Use of the disability aid tools	−0.19	0.99	−5.45-−1.56	<0.001
Depression	−0.18	0.16	−0.84-−0.21	0.001
B	36.21			
R²	0.20			
MCS (*n*=297)				
Anxiety	−0.43	0.13	−1.22-−0.71	<0.001
Depression	−0.18	0.19	−0.95-0.20	<0.001
Self-efficacy	0.16	0.42	0.42-2.10	<0.01
B	57.58			
R²	0.43			

PCS=Physical component summary, MCS=Mental component summary, SE=Standard error

physical conditions other than mental issues. Because QoL is subjective concept and partly depends on patient's happiness,[32] these lower levels of scores may be correlated with poor social support, community problem, and attitude of healthy peoples toward physically disabled people. Although the score levels obtained from our study in both subscales of SF-36 were lower than those for Iranian community residents,[42] the PCS score was higher and MCS score was lower than levels for muscular dystrophy patients.[43]

Several correlations have been identified between demographic, clinical, and scale-based variables with both QoL main subscales which could induce a probable role of these variables on predicting power for QoL. According to multivariate regression, we found that four characteristics including gender, self-reported physical activity levels, use of the disability aid tools, and depression were significantly associated with PCS, and these can be applied as predictors of this SF-36 feature. Regression coefficients revealed that this four-variable model was account for more than 20% of QoL variance according to the PCS main subscale. In our study, the levels of physical disability did not show any statistical significant impacts on PCS, and this was consistent with findings of other studies in individuals with physical disability.[44,45] We did not find any effects for mean scores of PAS in predicting main subscales of QoL, while when we used each PCS minor subscales into univariate regression model, we found that physical functioning, role limitation due to physical health, bodily pain, and general health have significant correlations with these scores. This shows that although PAS is a validated tool for measuring of physical activity in disabled people, it is not assessed cross-culturally in Iranian disabled population and this can be responsible for bias in predicting of PCS according to the PAS scale score. In addition, it is possible that some routine physical activities among large number of our selected population not take into account in the PAS and this may lead to higher or lower levels of reported PA scores. Therefore, some questions of the PAS may need to be corrected according to the culture and lifestyle of the Iranian community. Accordingly, we found that physical disability levels played a confounding role in relation between PAS and PSC scores owing to decrease in regression coefficient. Some studies suggested that physical activity can positively affect impairment, function, and health-related QoL in older adults, but its effects on disability and QoL are controversial.[39] Furthermore, QoL is not correlated with physical impairment of individual with Duchenne muscular dystrophy.[43]

In the case of MCS, we extracted variables such as anxiety, depression, and self-efficacy for predicting of this main subscale which can explain about 40% of QoL variance. Similarly, some researches showed that

psychosocial features including anxiety, depression, and social support can affect all domains of HRQoL. According to the extended range of time from physical disability initiation, QoL in recently physically disabled people may be affected more than those with long-term disability and these can explain some differences for allocated predictor factors on QoL. As previously supported, self-efficacy is a mediating fa[46]ctor between PA, disability, and QoL outcomes among older adults.[39] In other studies on psychosocial predictors of health-related QoL among adults with physical disabilities, the direct effect of PA on QoL was higher for the physical health than for the mental one.[47] One study with application of MS QoL scale on 120 MS patients revealed that physical part can be predicted by fatigue, depression, and physical disability features, while mental subscale is only related with depression and fatigue.[32] However, some demographic discrepancies in subgroups, e.g. living in city and village, should be considered in interpretation of results.

Conclusions

Our findings showed that gender, self-reported physical activity levels, use of the disability aid tools, and depression were the powerful predictor of 20% of the PCS variations. Furthermore, we approved that anxiety, depression, and self-efficacy are significantly associated with and predicted more than 43% of the MCS variations. To our knowledge, this study is the first one supporting the relationship between the psycho-cognitive factors with mental section of QoL in physically disabled. It is interesting that self-reported physical activity levels were more predictor of physical component than mental ones of QoL, and subjective features were more predictor of mental component. Overall, these findings warranted the detection of risk factors influencing QoL and the establishment of targeted interventions to optimize the HRQoL among physically disabled people.

Conflicts of interest

There are no conflicts of interest.

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