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ORIGINAL RESEARCH

Comparison of Life Satisfaction in Persons With Spinal Cord Injury Living in 22 Countries With Different Economic Status

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Abstract

Objective: To analyze and compare life satisfaction (LS) in persons with spinal cord injury (SCI) living in 22 countries participating in the International Spinal Cord Injury (InSCI) community survey. The study tested the hypothesis that there are differences in LS across InSCI countries according to the countries' economic status specified as gross domestic product per capita purchased power parity (GDP-PPP).

Design: Cross-sectional survey.

Setting: Community setting (22 countries representing all 6 World Health Organization regions).

Participants: Persons (N=12,108) with traumatic or nontraumatic SCI aged at least 18 years, living in the community and able to respond to one of the available language versions of the questionnaire.

Interventions: Not applicable.

Main Outcome Measures: LS measured by 5 items selected from the World Health Organization Quality of Life Assessment-BREF: satisfaction with overall quality of life, health, daily activities, relationships, and living conditions. LS index was calculated as the mean of these 5 items.

Results: The highest level of LS was reported by persons with SCI living in the United States, Malaysia, and Switzerland (mean range, 3.76-3.80), and the lowest was reported by persons with SCI living in South Korea, Japan, and Morocco (mean range, 2.81-3.16). There was a significant cubic association between LS index and GDP-PPP. Regression tree analysis revealed the main variables differentiating LS index were GDP-PPP and monthly income, followed by time since injury and education.

Conclusions: Life satisfaction reported by persons with SCI related mainly to their country economic situation expressed by GDP-PPP and monthly income. The results of this study underscore the need for policy dialogues to avoid inequalities and improve the life experience in persons with SCI. Archives of Physical Medicine and Rehabilitation 2022;103:1285–93

Evaluation of a person's quality of life (QoL) provides valuable and complementary information to the assessment of functional outcomes in determining the effectiveness of therapy, as well as the overall situation of persons with spinal cord injury (SCI).[1] Previous research has shown that life satisfaction (LS), the cognitive and subjective part of QoL, in persons with SCI is lower than in able-bodied individuals.[2-5] The use of varied methodologies along with selection of different variables incorporated into prediction models has resulted in a large variety of factors believed to

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influence LS after SCI. Among the factors associated with LS after SCI, researchers identified sociodemographic characteristics, including age, marital status, education, employment, and income, as well as leisure-time physical activity, social functioning, mood, self-efficacy, and other psychological factors.[2-4,6-15] LS in persons with SCI can be influenced by the level and severity of SCI, time since injury, secondary health conditions, pain intensity, and the risk of rehospitalization.[4,5,8,9,16]

Current evidence relating to LS and factors associated with LS in persons with SCI is largely based on research from high-income countries.[2,5,7-13,15,16] Information on LS in persons with SCI living in other regions is very limited. Previous findings showed that LS in persons with SCI living in low-middle−income countries is significantly diversified and lower compared with those living in high-income countries.[17-20] A recent study examining how performance indicators for the health system are linked with QoL using data from the International Spinal Cord Injury (InSCI) community survey showed that the most important indicators for QoL in persons with SCI were social attitudes and access to health care services. In general, QoL was positively correlated to the country income level group; however, this relationship was not linear because some countries had above average performance of health system indicators compared with other countries in the same group.[21] Studies often equate the terms LS and QoL and measure LS as a way to assess QoL. This approach is consistent with the definition of QoL according to the World Health Organization Quality of Life Assessment project, namely as "an individual's perception of his/her position in life in the context of the culture and value systems in which he/she lives, and in relation to his/her goals, expectations, standards and concerns."[22(p153)] Therefore, it is appropriate to characterize the World Health Organization Quality of Life Assessment-5 (WHOQOL-5) as a measure of life satisfaction.

The InSCI project is a multinational community survey based on the International Classification of Functioning, Disability, and Health Core Sets for SCI aimed at identification of factors associated with functioning, health, and well-being of persons living with SCI in all 6 World Health Organization (WHO) regions. The study provides a unique opportunity to explore LS in persons with SCI in relation to economic status of their home countries.[23] According to the World Bank open source data there is a linear relationship between LS and gross domestic product per capita purchased power parity (GDP-PPP) for the general population of 22 InSCI countries (Fig 1).[24] However, it is not known if this relationship remains true for persons with SCI living in these countries. The findings of this community-dwelling study should highlight attention on the needs of persons with SCI. For example, to increase financial independence, rehabilitation professionals should equip individuals with SCI with adequate job-seeking or self-employment skills.[25]

The main aim of this study was to analyze and compare LS in persons with SCI living in countries with low to high economic status. Specifically, the study tested the hypothesis that there are differences in LS across InSCI countries according to the economic status of the country (GDP-PPP) in relation to sociodemographic and lesion characteristics.

List of abbreviations:

CART	**classification and regression tree**
GDP-PPP	**gross domestic product per capita purchased power parity**
InSCI	**International Spinal Cord Injury**
LS	**life satisfaction**
QoL	**quality of life**
SCI	**spinal cord injury**
WHO	**World Health Organization**
WHOQOL-5	**World Health Organization Quality of Life Assessment-5**

Methods

Design

This study used cross-sectional data from the InSCI community survey conducted in 22 countries between January 2017 and May 2019.

Procedures

The InSCI Coordinating Institute at Swiss Paraplegic Research developed the questionnaire together with representatives from participating InSCI countries and provided standard operating procedures for data collection and management.[23,26] The survey was conducted between January 2017 and May 2019 in all participating countries. Participants completed a 125-item self-report questionnaire covering sociodemographic and lesion characteristics together with questions about level of activities and participation, environmental and health service use, and personal factors and an appraisal of their health and well-being. Response modes included paper and pencil, online questionnaire, telephone, or personal interviews. The study adhered with the national laws and regulatory approvals by the institutional review boards or ethical committees for all countries and conformed to the Declaration of Helsinki. All participants gave informed consent.

The study enrolled persons with SCI (traumatic or nontraumatic), aged 18 years or older, living in the community, and able to respond to one of the available language versions of the questionnaire. Because of the absence of central SCI registries in most of the participating countries, the study allowed for different types of sampling, ranging from convenience sampling to random samples based on available patient databases. A minimal sample size of 200 participants per country was required to obtain adequate statistical power. The power analysis was based on the estimated minimum sample sizes to detect a 10% difference for 5 standardized International Classification of Functioning, Disability, and Health−based scales between 2 subgroups.[23] Altogether 12,591 persons with SCI met the inclusion criteria and participated in the study, but because of missing data on LS, 483 persons were excluded from analysis.

Measures

To assess LS the WHOQOL-5 was used. This measure was specifically developed for cross-cultural use and is currently available in 36 languages. Psychometric properties have been examined in 23 countries with samples of persons who are disabled and healthy, with internal consistency coefficients lying between 0.75 and 0.87. The measure has been validated in 13 of our 22 InSCI countries.[27-29] The 5 items measure overall QoL, satisfaction with health, daily activities, relationships, and living conditions. Responses are provided on a 5-point Likert scale ranging from

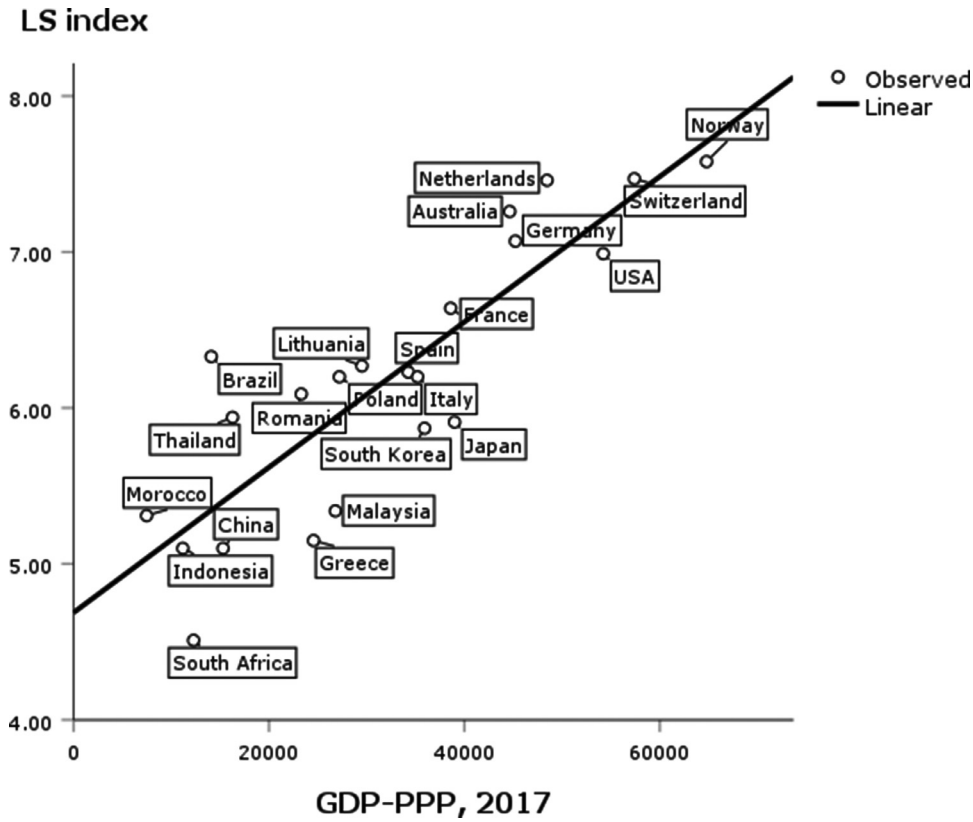

Fig 1 Self-reported LS vs GDP-PPP (2017) for the general population.[24]

1=very dissatisfied to 5=very satisfied. An LS index was calculated as the mean of all 5 items. The WHOQOL-5 measure has been suggested to be cross-culturally valid in persons with SCI. Rasch analysis showed that the WHOQOL-5 is unidimensional and valid for use in cross-cultural research.[30] The 5-item version has been used in various international WHO collaboration projects.[31-33]

Age at the time of the study, age at onset of SCI, and time since the SCI were calculated from the years of birth, years post-onset of SCI, and year of completing the questionnaire. Sex had the response options male and female, level of SCI had options paraplegia and tetraplegia, and severity of SCI had options complete and incomplete. The income was measured in deciles of the respective country's income distribution. Years of education was measured as the total years of formal education before and after SCI, including school and vocational training.

To estimate each country's economic status, the GDP-PPP 2018 (constant 2017 international $) was used.[34] GDP measures the value of all goods and services produced in a country during a year divided by the number of people in this country, and PPP is a measurement of the prices of specific goods to determine the absolute purchasing power of the countries' currencies. PPP is a theoretical exchange rate indicating the purchase of the same amount of goods and services in every country expressed in international dollars fixed prices adjusted for inflation and differences in the cost of living.

Statistical analyses

Continuous variables were presented as mean and SD. Categorical variables were presented as number and percentage. The coefficient of determination (R^2) was used to assess the significance and strength of relationships between country GDP-PPP and LS. To test the study hypothesis, the classification and regression tree (CART) was used (SPSS Decision Trees 26.0[a]). CART splits the data into groups that are as homogeneous as possible with respect to the dependent variable. The node shows the distribution of the value of an explained variable; it specifies metadata and data properties for each field: the measurement level, data values, the role, and missing value definitions. A terminal node in which all cases have the same value for the dependent variable is a homogeneous "pure" node. The dependent variable was the LS index. Independent variables included GDP-PPP, age at the time of the study, time since onset of SCI, sex, education, marital status, household income, and level and extent (completeness) of SCI. For scale-dependent variables (LS index), the least-squared deviation measure of impurity was presented as the within-node variance, adjusted for any frequency weights or other influences. The importance of an independent variable is presented as the network's model-predicted value changes for different values. Normalized importance is calculated by importance values divided by the largest importance values and expressed as percentages (SPSS Decision Trees 26.0[a]). The internal consistency (Cronbach α coefficient) of LS index for all InSCI countries was calculated.[35] All statistical analyses were performed using IBM SPSS Statistics.[b]

Results

A total of 12,108 persons with SCI (73% male) living in the 22 countries participated in this study. The mean age of participants at study entry was 51.3±15.3 years, and the mean time since onset of injury was 13.1±11.9 years. The respondents had complete

Table 1 Mean scores of LS in persons with SCI living in 22 countries and GDP-PPP, 2018 (constant 2017 international $)

No.	Country/Response Mode[26]	n	LS Index			GDP-PPP, 2018 (Constant 2017 International $)[33]
			Mean	SD	Cronbach α	
1	Switzerland/a, b, d, e	1269	3.80	0.68	0.796	68,479.4*
2	Norway/a, b, c, e	602	3.67	0.66	0.775	63,332.8
3	US/a, b, c, e	200	3.76	0.68	0.739	61,391.4
4	Netherlands/a, b	252	3.58	0.69	0.814	56,454.9
5	Germany/a, b	1587	3.47	0.75	0.770	53,660.0
6	Australia/a, b, e	1524	3.59	0.80	0.816	49,576.0
7	France/a, b	401	3.39	0.73	0.820	45,561.0
8	Italy/a, b, d	195	3.28	0.81	0.899	42,198.2
9	South Korea/a, b, d	856	2.81	0.79	0.870	41,894.1
10	Japan/a	299	3.14	0.72	0.830	41,074.1
11	Spain/a, d	412	3.38	0.84	0.851	40,328.9
12	Lithuania/a, b, d	217	3.53	0.73	0.791	35,390.0
13	Poland/a, b, d, e	948	3.39	0.67	0.762	31,765.7
14	Greece/a, b, d	187	3.56	0.84	0.857	29,711.9
15	Romania/a, b, d	214	3.68	0.68	0.746	28,565.5
16	Malaysia/a, d	288	3.80	0.70	0.834	27,536.9
17	Thailand/a, d	320	3.56	0.65	0.854	18,086.5
18	China/b, c, d, e	1354	3.20	0.62	0.742	15,243.2
19	Brazil/a, d, e	201	3.38	0.77	0.821	14,596.2
20	South Africa/a, d	199	3.62	0.66	0.735	12,630.7
21	Indonesia/b, d	198	3.44	0.72	0.850	11,371.5
22	Morocco/a, d, e	385	3.16	0.73	0.797	7437.6

NOTE. Response mode: a, paper-pencil; b, online; c, smart phone; d, personal interview; e, telephone interview.
Abbreviation: US, United States.
* Ranking of InSCI countries according to GDP-PPP in descending order.

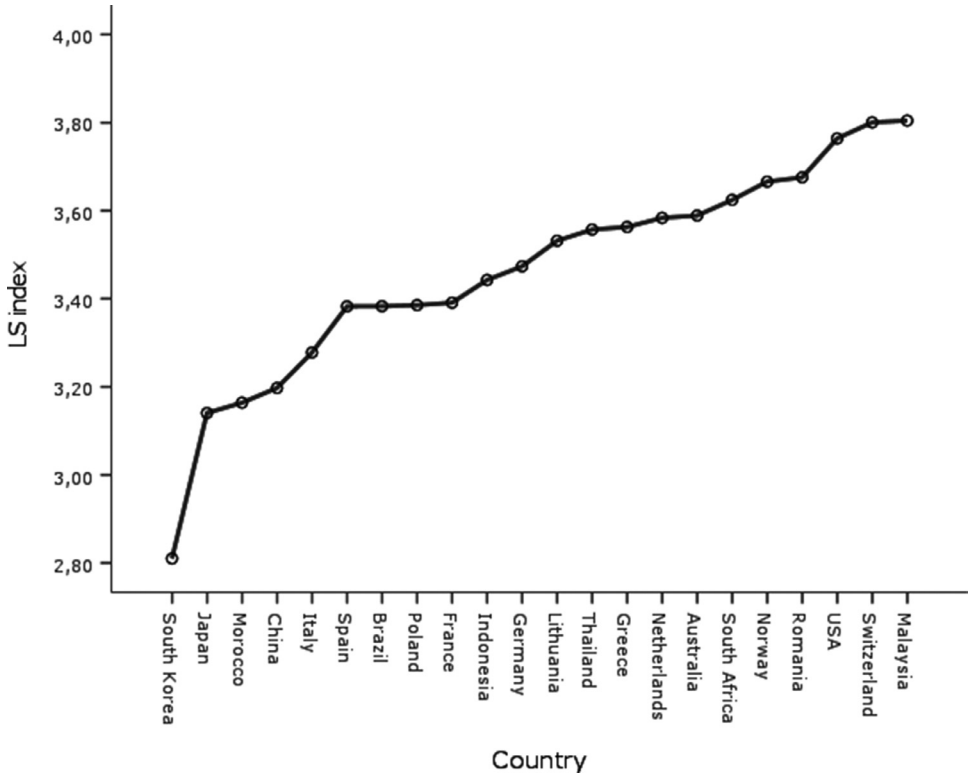

Fig 2 Ranking of InSCI countries according to the LS index.

Table 2 Linear and cubic models of the association between LS index per InSCI country and GDP-PPP

	Model Summary				
Equation	R^2	F	*df*1	*df*2	*P* Value
Linear	0.084	1.835	1	20	.191
Cubic*	0.356	3.310	3	18	.044
Cubic†	0.438	4.416	3	17	.018

* All InSCI countries.

† InSCI countries without South Korea.

paraplegia (29%), incomplete paraplegia (34%), complete tetraplegia (10%), or incomplete tetraplegia (27%). Half (52%) of respondents were married, 75% had at least upper secondary education, and 55% had a monthly income below the third decile of country's income distribution. Detailed sociodemographic characteristics are presented in supplemental tables S1 and S2.

Table 1 shows mean scores of the LS index in persons with SCI living in 22 countries and GDP-PPP. The internal consistency of the LS index was assessed as good with Cronbach α per country ranging from 0.74-0.90. LS indexes (fig 2) were highest in the United States, Malaysia, and Switzerland (mean range, 3.76-3.80) and lowest in South Korea, Japan, and Morocco (mean range, 2.81-3.16). The LS index in South Korea was clearly lowest compared with the other InSCI countries.

There was a significant cubic association (R^2=0.36) between LS index and GDP-PPP (table 2, fig 3). Excluding South Korea from the analysis improved the quality of the model and raised the R^2 to 0.44, and therefore this country has been excluded from the final CART analysis.

The first 2 levels of the classification tree showed 2 main variables differentiating LS index: GDP-PPP and monthly income (fig 4). At the first level, the LS index (dependent variable) was differentiated by the GDP-PPP (see table 1). Persons with SCI living in 18 InSCI countries with GDP-PPP≤56455 PPP dollars had significantly lower level of LS (mean, 3.4) than persons with SCI living in 4 InSCI countries (Switzerland, Norway, United States, Netherlands) with GDP-PPP>56455 PPP dollars (mean, 3.8). At the second level, LS index was differentiated by the household monthly income. For those living in countries with GDP-PPP≤56455 dollars the cutoff was at the fourth decile of the InSCI country's income distribution differentiating persons with SCI with lower (mean, 3.3) and higher (mean, 3.5) LS index. For those living in countries with GDP-PPP higher than given above, the cutoff was at the fifth decile differencing persons with SCI with lower (mean, 3.7) and higher (mean, 3.9) LS index.

The importance chart of factors related to LS in persons with SCI shows the values sorted in descending order (fig 5). The most important factors were GDP-PPP (100%) and monthly income (41.5%). These 2 variables together with time since injury (25.0%) and education (23.6%) had the greatest effect on perceived LS in persons with SCI. Less important variables related to LS after SCI were marital status (20.1%) and the level of SCI (13.5%).

Discussion

This study compared LS in persons with SCI living in countries with different economic status. The results are consistent with previous studies reporting the mean LS in persons with SCI was

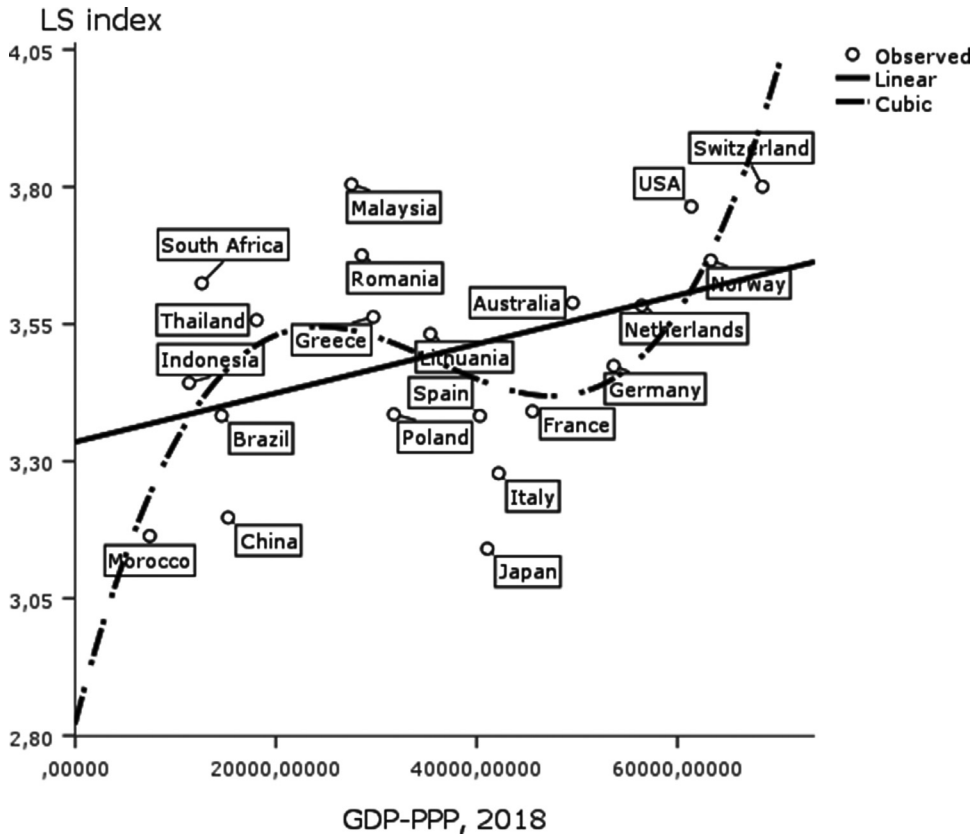

Fig 3 Self-reported LS vs GDP-PPP (2018) for persons with SCI.

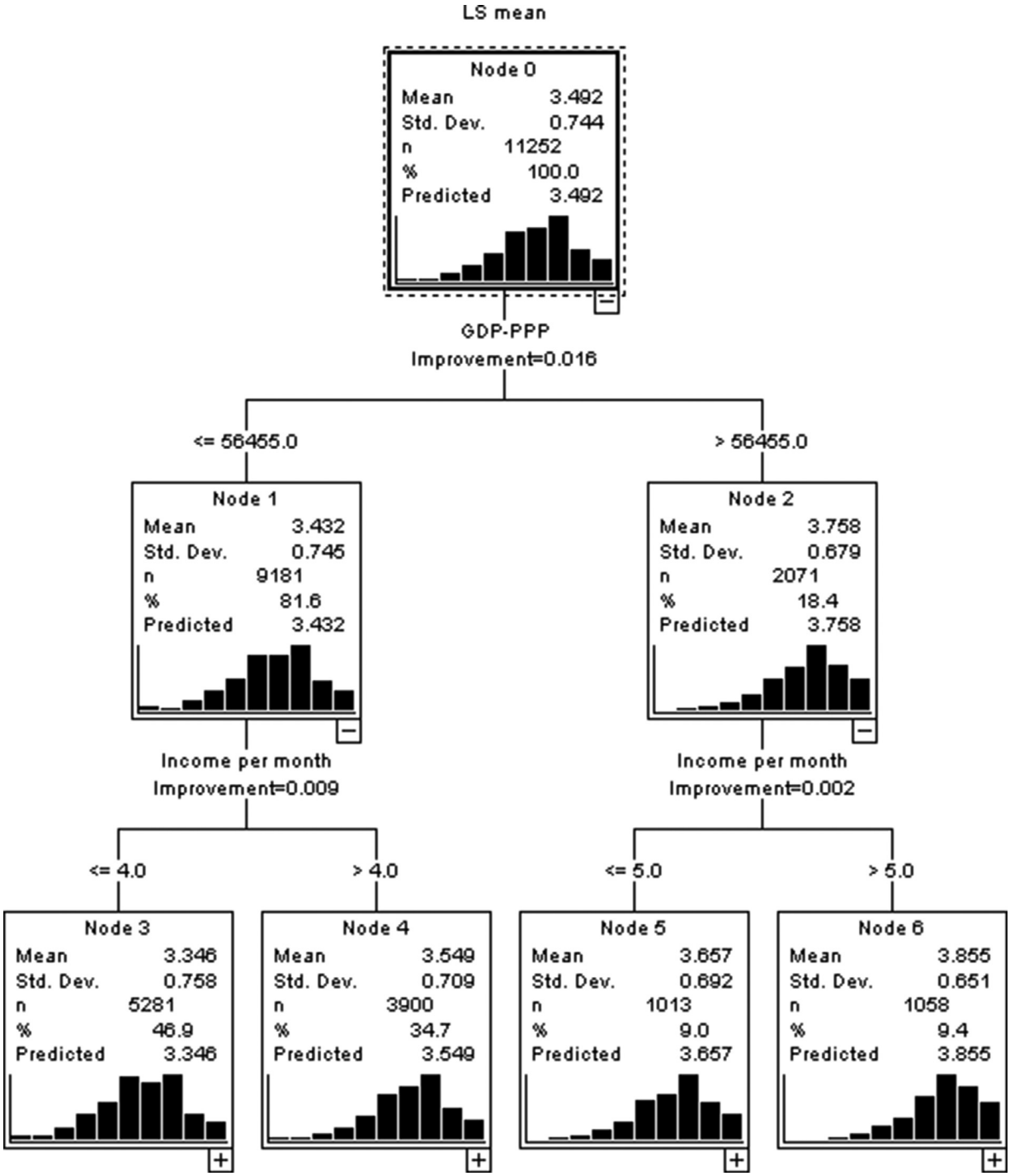

Fig 4 Classification tree with LS index as dependent variable (first two levels).

varied considerably between "rather dissatisfied" and "rather satisfied."[7,18,19] Building on the previous InSCI study,[21] we found the main added value of the present analysis is inclusion of all main sociodemographic and SCI characteristics not as confounders but as determinants and reporting on their associations with LS. The hypothesis of the present study that there are differences in LS across InSCI countries according to the countries' economic status specified as GDP-PPP was confirmed. Unsurprisingly, persons with SCI living in high-income countries report higher levels of LS than their counterparts living in low-income countries. The association between GDP-PPP and LS may be partly explained by the more generous levels of support and facilities in high-income countries. Also, those with higher monthly household incomes report higher levels of LS. Previous studies on LS after SCI confirm that personal income plays an important role as a predictor of subjective QoL.[9,11,13] However, income has been defined in different ways, either as annual salary ($) or as salary related to the type of employment (full-time, part-time, voluntary work).

The association between LS and GDP-PPP for persons with SCI living in InSCI countries was not linear, as in the case of the

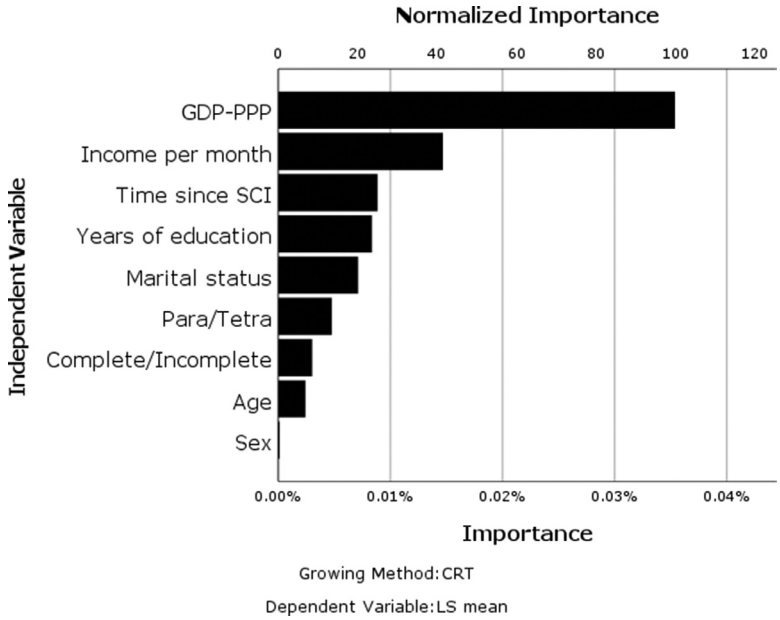

Fig 5 Normalized importance of factors related to LS after SCI in 22 InSCI countries. Abbreviation: CRT, classification and regression tree.

general population in these countries.[24] For instance, persons with SCI living in Malaysia and Switzerland had the highest and the same mean LS index, but GDP-PPP in Malaysia was almost 3 times lower than in Switzerland. On another note, persons with SCI living in South Korea had the lowest level of LS among the InSCI countries despite the fact that GDP-PPP in this country was higher than 13 other InSCI countries. Low LS in persons with SCI in South Korea may be partly explained by the economic context whereby low employment rate of persons with SCI (13%) compared with the low unemployment rate in general population combined with high out-of-pocket expenditures of health care.[36,37] Unexpectedly, persons with SCI living in Japan had lower LS index than their peers living in 10 less developed InSCI countries (see table 1). The aforementioned findings suggest that there are additional factors, independent from country's economic status, that influence perceived LS after SCI. The level of LS among persons with SCI living in less developed countries may be higher than their peers living in economically more efficient countries for several reasons. For example, persons with complete high cervical lesions have lower survival rates in low-income countries and are therefore less likely to be captured in studies.[38] Also, those living in less resourced countries may have lower expectations across different life areas and may perhaps be more satisfied with what they have, even though many of their needs are not met. Typically, in low-income countries people live in multigenerational families providing support for people with disabilities (including older generations). These possibilities warrant further investigation.

The other important predictors of LS in persons with SCI revealed in this study were time since injury, education, marital status, level and severity of SCI, and age. Other studies on predictors of LS after SCI present varied results. Sociodemographic factors such as age, marital status, education, and employment have been associated with LS in persons with SCI.[2,8-12] There are also studies confirming that SCI-related factors, such as lesion level and severity of disability resulting from SCI or time since injury, are important predictors of LS after SCI.[5,9,16] However, other researchers have not confirmed relationships between these SCI-related factors and LS.[2,4,11-13] A plausible explanation for the inconsistency may lie in the different methodological approaches and instruments used to measure LS after SCI.

Study strengths and limitations

To our knowledge, this InSCI study is the first worldwide SCI survey simultaneously conducted in a large number of countries from all 6 WHO regions. This study also provides recent data for LS vs GDP-PPP both for persons with SCI and the general population in the 22 countries that allowed a holistic comparison between countries. Another strength of the study was application of an LS measurement tool with proven cross-cultural validity in all countries and that appropriate standards were set for the valid translation of the questionnaire to the respective languages. These processes strengthened the validity of the comparisons across the 22 countries.

The main weakness of the InSCI study is the variation in sampling frames and use of convenience samples in many countries that may have influenced between-country comparability and thus, the generalizability of the results. As a result, LS estimation may be biased in countries applying convenience sampling. However, the mean LS level found in this study was very similar to results from earlier reports.[7,18,19] Given the lack of population-based data on individuals with SCI in most world regions, we were not able to estimate the representativeness of the InSCI sample on a country-by-country basis. However, some patterns of key sociodemographic and lesion characteristics observed for the InSCI sample suggest satisfactory face validity.[26] Further, there was a wide variation in sample sizes across countries, so that countries with larger samples weighted more in the total scores. The WHOQOL-5 was earlier found to be cross-culturally valid in persons with SCI, but the LS model presented in this study could be affected by factors not included in the analysis because they were not measured, were unknown, or were country specific. Also, the diverse response modes, from individual (independent) to telephone or personal interviews, could influence the quality of collected sensitive data such as LS. There is lack of evidence with respect to equivalence of different response modes using the InSCI survey.

Conclusions

Persons with SCI living in different countries around the world reported levels of LS related mainly to their country economic status expressed by GDP-PPP and personal financial situation based on household monthly income. Other important predictors of subjective QoL after SCI were time since injury, education, marital status, and level and severity of SCI. The present study on LS in persons with SCI undertaken in 22 countries revealed that economic factors play an important role in subjective QoL after SCI. Targets for intervention such as facilitating return to work are of high priority. For societies, return to work policies and/or systems should be improved to support persons with SCI to gain employment. Also, generally, governments should guarantee a minimum standard of living (housing, income, assistive devices, transportation, etc) for all their citizens, with or without SCI.

Suppliers

a. SPSS Decision Trees 26.0; SPSS Inc, Chicago, IL.
b. IBM SPSS Statistics 26.0; IBM Corp, Armonk, NY.

Keywords

Gross domestic product; Internationality; Personal satisfaction; Quality of Life; Rehabilitation; Spinal cord injuries

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This study is based on data from the International Spinal Cord Injury (InSCI) Community Survey, providing the evidence for the Learning Health System for Spinal Cord Injury (LHS-SCI, see Am J Phys Med Rehabil 2017;96 (Suppl):S23-34).The LHS-SCI is an effort to implement the recommendations described in the WHO report International Perspectives on Spinal Cord Injury (Bickenbach J, et al. Geneva: WHO Press; 2013). The members of the InSCI Steering Committee are James Middleton (ISCoS representative, Member Scientific Committee, Australia), Julia Patrick Engkasan (ISPRM representative, Malaysia), Gerold Stucki (Chair Scientific Committee, Switzerland), Mirjam Brach (Representative Coordinating Institute, Switzerland), Jerome Bickenbach (Member Scientific Committee, Switzerland), Christine Fekete (Member Scientific Committee, Switzerland), Christine Thyrian (Representative Study Center, Switzerland), Linamara Battistella (Brazil), Jianan Li (China), Brigitte Perrouin-Verbe (France), Christoph Gutenbrunner (Member Scientific Committee, Germany), Christina-Anastasia Rapidi (Greece), Luh Karunia Wahyuni (Indonesia), Mauro Zampolini (Italy), Eiichi Saitoh (Japan), Bum Suk Lee (Korea), Alvydas Juocevicius (Lithuania), Nazirah Hasnan (Malaysia), Abderrazak Hajjioui (Morocco), Marcel W.M. Post (Member Scientific Committee, The Netherlands); Anne Catrine Martinsen (Norway), Piotr Tederko (Poland), Daiana Popa (Romania), Conran Joseph (South Africa), Mercè Avellanet (Spain), Michael Baumberger (Switzerland), Apichana Kovindha (Thailand), and Reuben Escorpizo (Member Scientific Committee, United States). The authors thank Janusz Wachnicki (Predictive Solutions, Poland) for assistance with statistical analyzes for this article.

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