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Socio-economic status and self-rated health in East Asia: a comparison of China, Japan, South Korea and Taiwan

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Background: Few cross-national studies have compared the relationship between socio-economic status (SES) and health among East Asian countries. This study elucidates the relationship between SES and self-rated health (SRH) in four societies of East Asia: China, Japan, South Korea and Taiwan. **Methods:** We used the data from the East Asian Social Survey 2006, which consists of nationally representative samples from each of the four countries. Logistic regression analysis of SRH was performed using four standardized SES indices (income, education, occupation and class identification) as explanatory variables to compare the degree of association of each SES index with SRH. **Results:** A total of 8120 respondents in the age range of 20–69 years were analysed. Overall, social gradients in health were observed in the East Asian societies. In China, South Korea and Taiwan, three of the four SES indices showed a statistically significant association for both male and female groups. In Japan, except class identification, no other SES index showed a significant relationship with SRH. With regard to the differences between the SES indices, class identification exhibited the strongest association with SRH, while occupational class displayed the weakest association. **Conclusion:** Our study results indicate that Japan has low levels of health inequality compared to other East Asian countries. Furthermore, an index of occupational classes may be insufficient to explain health inequalities in East Asia.

Introduction

Since publication of the 'Black Report',[1] it has been well established that a social gradient in health is a common feature of societies in Western countries.[2,3] In addition, many studies have compared among Western countries[4–8] as well as between Western and Asian countries.[9] These studies have shown that the relationship between socio-economic status (SES) and health varies in strength among countries according to the SES index that was used in the study.

However, cross-national comparative studies of East Asian countries are rare, although some have assessed SES and health in individual countries of the region.[10–15] In addition, cross-national studies that include samples from East Asia—for example, Martikainen *et al.*[9]—often do not use nationally representative samples. To our knowledge, a data set drawn from a standardized questionnaire that facilitates a cross-national comparison has so far been limited in East Asia.

Using cross-national surveys, Yamaoka[16] investigated the relationship between SES, social capital at the individual level, and health across Japan, South Korea, Singapore, five areas in mainland China and Taiwan. However, as Yamaoka's work focused mainly on general trends in the relationships between social capital and health, the differences in SES and health among East Asian countries may need further consideration. For example, the categorization criteria used for SES indices were unclear, and this makes it difficult to compare the relationships between SES and health across these countries.

Moreover, some previous studies question the interchangeability of SES indices, such as income, education and occupational class, and have shown that the association between SES and health can vary by SES indices, health outcomes and countries.[17,18] To explore which SES indices are important for health in East Asian societies, we need appropriate data and methods that allow for the comparison among countries and between SES indices.

This study uses the East Asian Social Survey (EASS) 2006 data set, a cross-national survey consisting of nationally representative samples from China, Japan, South Korea and Taiwan. We sought to compare the SES gradient in health among the four societies using the index of self-rated health (SRH) and standardized SES indices of income, education, occupation and class identification.

Methods

Data

Data used in this study are from the EASS 2006 provided by the EASS Data Archive. The archive provides data from respondents whose identities are undisclosed, for the secondary analysis of cross-national comparisons in East Asia. These data consist of a common module, set into a General Social Survey (GSS) type questionnaire, which is a nationally representative sample survey from each of the four societies. Samples were selected by multistage stratified random sampling. Respondents were surveyed from June to December 2006 by interview in China, South Korea and Taiwan and by interview and placement (self-administered) methods in Japan. Valid response rates were 38.5% in China, 59.8% in Japan, 65.7% in South Korea and 42.0% in Taiwan. Details for EASS data are described at the EASS website (http://eass.info).

EASS 2006 includes information on income, education, occupation and class identification, allowing us to compare the validity of the SES index to analyse the social gradient in health. Given that many studies have claimed the necessity of using cross-national data but instead have actually only used limited samples from specific regions or organizations, the EASS 2006 is considered a valuable data set that consists of representative samples from four East Asian countries. The target ages of samples in EASS 2006 were 18–69 in China, 20–89 in Japan, 18 or over in South Korea and 19 or over in Taiwan. This study used the sample drawn from 20- to 69-year olds, a common age group throughout the four countries. Accordingly, 8120 samples were included in our analysis.

Dependent variable: SRH

The dependent variable was SRH. Respondents were asked, 'How would you rate your health?' and were prompted to answer on a 5-point scale from 1 (Very good) to 5 (Very bad). We dichotomized responses into 0 and 1, with 0 representing responses 1 through 3 ('good') and 1 representing responses 4 and 5 ('poor').

Independent variable: SES index

Our study made use of four items of the SES index: income, education, occupation as an objective measure and class identification as a subjective measure. These original variables were recoded and categorized as follows.

Income

Equivalent income was calculated by dividing household income by the square root of the number of family members. However, household incomes in Japan and Taiwan were categorical values (19 and 26 categories, respectively); therefore, we took the median value of each category for our calculation. The equivalent incomes we calculated were categorized into four levels (lowest, low, high and highest) by using one-half of the median equivalent income as a cut-off value in each country. This follows the criteria that are often used as a definition of relative poverty.[19]

Education

Highest education level was used as an indicator of education. The original variable had six categories: 0 (No formal qualification), 1 (lowest formal qualification), 2 (Above lowest qualification), 3 (Higher secondary completed), 4 (Above higher secondary level) and 5 (University degree completed). We converted the original six categories into four (lowest, low, high, highest) by combining categories 0, 1 and 2 into one category. This procedure seemed reasonable, considering that some countries have few or no applicable cases for the three lower categories. Particularly, there were no valid cases of 0 (No formal qualification) and 2 (Above lowest qualification) in Japan.

Occupational class

EASS 2006 includes a variable of the 4-digit ISCO-88 by ILO[20] as respondents' occupational information. By using this detailed occupational code, we applied internationally comparable occupational measures, namely the International Socio-Economic Index of Occupational Status (ISEI).[21,22] On the basis of the ISEI score, all samples from the four countries were categorized into a quartile (lowest, low, high and highest), not in each countries but within whole samples.

Class identification

In addition to the aforementioned three objective measures of SES, we employed a subjective variable of class identification. 'Top-bottom self-placement' on a 10-point scale can be used in Japan, South Korea and Taiwan and 'Class identification' on a 5-point scale is available in China. The question involving 'Top-bottom self-placement' was: 'In our society there are groups which tend to be towards the top and groups which tend to be towards the bottom. Below is a scale that runs from bottom to top. Where would you put yourself on this scale?' Available choices were numerical on a 10-point scale from 1 (lowest) to 10 (highest). The question regarding 'Class identification' asked: 'In your opinion, which level do you and your family respectively belong to in terms of your personal and family socio-economic status? (Choose one in each column)'. Choices were 1 (Upper level), 2 (Upper middle level), 3 (Middle level), 4 (Lower middle level) and 5 (Lower level). As the class identification variable for China we used responses to questions about 'Your socio-economic status' rather than 'Your family's socio-economic status'.

We converted the 10-point scale of 'Top-bottom self-placement' into a 5-point scale and merged the two highest categories of class identification because of the smaller number of applicable cases in these groups. Moreover, we reversed the scale of 'Class identification' and merged the two highest categories. As a result, we obtained four levels (lowest, low, high and highest) of class identification index for analysis.

Standardized score of SES

In order to make comparisons of magnitude of the association with different SES indices among different populations (by countries and gender), we converted each category of the SES to a standardized score ranging between 0 and 1 according to the proportion of population in each SES index. This score is used for calculating the Slope Index of Inequality (SII) or the Relative Index of Inequality (RII) based on the cumulative proportion of the SES categories and the midpoint of its range.[23] The score represents the mean relative rank of the SES categories, and it can be considered as a standardized SES index that enables comparison among different indices.

Models

We performed a logistic regression analysis using SRH as a dependent variable and each standardized score of SES as an independent variable. The odds ratio (OR) estimated from the analysis shows the ratio of the risk to be poor SRH for the top rank (standardized SES score = 1) compared to that for the bottom rank (standardized SES score = 0). The lower the OR of the standardized SES score, the steeper the social gradient in health. In the model 1, each of the four standardized SES scores was included separately, while in the model 2 all the SES scores were included simultaneously, for the mutual adjustment. In order to argue whether there were regional and gender differences in the social gradient in health, we applied the models using the samples stratified by the four countries and by gender. Our control variable was age, categorized at 10-year intervals (20–29, 30–39, 40–49, 50–59 and 60–69). The basic statistics of variables are shown in table 1.

Results

Table 2 shows the results of logistic regression analysis.

On the whole, the model 1 showed strong associations between SES and SRH for South Korean males and for Taiwanese males and females. The associations for Japanese males and females were weak. In the three countries other than Japan, three of the four SES were statistically significant for both gender groups. As for differences in SES indices, class identification had the strongest relationship to SRH, while occupation had the weakest association. In regard to gender difference, in many countries and SES indices, ORs were lower for the male population than the female population, suggesting the social gradient in health tends to be steeper for males. However, the differences were not large.

In the analysis of samples from China, all SES indices showed a significant relationship with SRH, except for occupation among males and education among females. Income showed the strongest relationship, with an OR of 0.23 (95% CI 0.12–0.46) in males and 0.27 (0.16–0.45) in females. Except for the remarkable relationship between class identification and SRH (males: OR = 0.21, 0.09–0.52; females: OR = 0.28, 0.12–0.64), no other significant relationships were confirmed in Japan in male and female samples. In South Korean samples, all SES indices except for occupation exhibited significant relationships. Especially, estimated ORs

Table 1 Basic characteristics of respondents

	China ($n = 3110$) n (%)	Japan ($n = 1756$) n (%)	South Korea ($n = 1430$) n (%)	Taiwan ($n = 1824$) n (%)	Total ($n = 8120$) n (%)
SRH					
Good	2659 (85.6)	1568 (89.5)	1209 (84.5)	1561 (85.6)	6997 (86.3)
Poor	448 (14.4)	183 (10.5)	221 (15.5)	263 (14.4)	1115 (13.7)
Age					
20–29	575 (18.5)	226 (12.9)	281 (19.7)	418 (22.9)	1500 (18.5)
30–39	759 (24.4)	329 (18.7)	389 (27.2)	399 (21.9)	1876 (23.1)
40–49	734 (23.6)	327 (18.6)	419 (29.3)	444 (24.3)	1924 (23.7)
50–59	649 (20.9)	433 (24.7)	196 (13.7)	351 (19.2)	1629 (20.1)
60–69	393 (12.6)	441 (25.1)	145 (10.1)	212 (11.6)	1191 (14.7)
Sex					
Male	1401 (45.0)	786 (44.8)	642 (44.9)	909 (49.8)	3738 (46.0)
Female	1709 (55.0)	970 (55.2)	788 (55.1)	915 (50.2)	4382 (54.0)
Income					
Lowest	711 (25.2)	142 (11.7)	215 (15.4)	279 (16.8)	1347 (19.0)
Low	701 (24.8)	452 (37.1)	448 (32.1)	514 (31.0)	2115 (29.8)
High	494 (17.5)	311 (25.6)	363 (26.0)	442 (26.6)	1610 (22.7)
Highest	919 (32.5)	312 (25.6)	370 (26.5)	425 (25.6)	2026 (28.5)
Education					
Lowest	1945 (62.5)	223 (12.8)	258 (18.1)	643 (35.3)	3069 (37.9)
Low	721 (23.2)	904 (51.8)	457 (32.0)	475 (26.1)	2557 (31.5)
High	297 (9.5)	244 (14.0)	298 (20.9)	332 (18.2)	1171 (14.4)
Highest	147 (4.7)	374 (21.4)	416 (29.1)	372 (20.4)	1309 (16.1)
Occupation					
Lowest	1046 (37.7)	223 (18.2)	177 (20.0)	224 (17.2)	1670 (27.0)
Low	538 (19.4)	323 (26.4)	228 (25.8)	344 (26.4)	1433 (23.2)
High	827 (29.8)	434 (35.5)	236 (26.7)	358 (27.5)	1855 (30.0)
Highest	366 (13.2)	243 (19.9)	244 (27.6)	377 (28.9)	1230 (19.9)
Identification					
Lowest	1238 (40.2)	106 (6.1)	99 (7.0)	93 (5.2)	1536 (19.1)
Low	917 (29.8)	393 (22.7)	464 (32.6)	239 (13.3)	2013 (25.1)
High	846 (27.5)	927 (53.6)	644 (45.3)	1064 (59.0)	3481 (43.3)
Highest	78 (2.5)	302 (17.5)	216 (15.2)	406 (22.5)	1002 (12.5)

in South Korean males were the lowest among the four countries' male populations, for income (OR = 0.22, 0.08–0.57), occupation (OR = 0.33, 0.11–1.03) and class identification (OR = 0.16, 0.06–0.42). Also, all ORs of males were lower than for females. In Taiwan, income, education and class identification showed a similar relationship with SRH as in South Korea. However, among the eight stratified populations, Taiwanese females showed the lowest ORs for income (OR = 0.19, 0.09–0.39) and for class identification (OR = 0.10, 0.04–0.22). Moreover, education (OR = 0.23, 0.10–0.52) showed the strongest association among the four countries' female populations.

Table 2 also includes the results of the model 2 in which the four SES indices were adjusted simultaneously. Only a few indices were significantly related to SRH in each country. Those were income for Chinese males (OR = 0.31, 0.13–0.71) and females (OR = 0.33, 0.17–0.66), class identification for Chinese females (OR = 0.45, 0.24–0.85), Japanese males (OR = 0.14, 0.04–0.57) and females (OR = 0.13, 0.03–0.63), South Korean females (OR = 0.17, 0.05–0.54), and Taiwanese males (OR = 0.14, 0.04–0.46) and females (OR = 0.13, 0.04–0.42).

Discussion

Summary of findings

Findings obtained from our analysis were as follows. Overall, a social gradient in health is apparent in East Asia. The magnitude of the relationship with SRH varies in SES indices; class identification was the strongest, while occupation was the weakest and least clear in many population groups. As for differences among countries, Japan showed the weakest relationship between SRH and SES among the four countries. The differences observed in SES indices and in countries were common for males and females, although the association between SES and SRH was somewhat stronger among males.

To date, a social gradient in SRH has been reported from a cross-national data set that targeted a number of countries—for example the World Values Survey[24,25] or the World Health Survey.[26] Considering that previous studies showed the association between SRH and both income and education across the world, it is not surprising that the same tendency was observed from EASS 2006. However, since cross-national surveys like World Values Survey often have difficulties in the translation of the question and unified survey methods[27], it would be important to accumulate the findings from multiple data sources, particularly in East Asia, where cross-national data has been of limited availability. Moreover, we should look carefully at the differences among countries in the same region. Therefore, our results highlight that the magnitude of associations between SRH and SES were often varied by the definitions of SES indices and by countries.

Class identification

Regardless of gender and countries, class identification showed strong association with SRH, suggesting this index can be highly sensitive to SRH. In addition to the objective status at the time the survey was conducted, class identification may also reflect more complex elements, such as SES of the respondent's parents or anxiety about future uncertainties.

Since both class identification and SRH can be regarded as subjective indices, there is a possibility of reverse causation; that is, poor SRH of the respondents may cause lower ratings for their class identification. In addition, the variable we used in this study was not ideal. For cross-national comparison, it must be noted that the original question and scale used in China differed from that used for other countries, and that the question inquiring about respondents' subjective identification may be affected by the translation. Although we are aware that creating one variable from two similar but originally different questions may be problematic, this was the last expedient for considering subjective measure in our analysis.

At any rate, the results imply that each objective index alone is inadequate for constituting the dimensions of SES. Wilkinson[28,29] has

Table 2 OR and 95% CI of standardized SES scores for reporting poor SRH (estimated by logistic regression analysis)

	Model 1		Model 2	
	OR (95% CI)	*P*-value	OR (95% CI)	*P*-value
Male				
China				
Income	0.23 (0.12–0.46)	0.00	0.31 (0.13–0.71)	0.01
Education	0.28 (0.13–0.61)	0.00	0.50 (0.19–1.36)	0.18
Occupation	0.59 (0.31–1.12)	0.11	1.40 (0.63–3.12)	0.41
Identification	0.33 (0.17–0.65)	0.00	0.47 (0.22–1.01)	0.05
Japan				
Income	0.75 (0.27–2.08)	0.58	2.62 (0.69–9.89)	0.16
Education	0.66 (0.27–1.59)	0.35	1.55 (0.36–6.73)	0.56
Occupation	0.49 (0.18–1.36)	0.17	0.57 (0.14–2.27)	0.42
Identification	0.21 (0.09–0.52)	0.00	0.14 (0.04–0.57)	0.01
South Korea				
Income	0.22 (0.08–0.57)	0.00	1.05 (0.26–4.18)	0.94
Education	0.23 (0.09–0.60)	0.00	0.29 (0.07–1.32)	0.11
Occupation	0.33 (0.11–1.03)	0.06	0.87 (0.20–3.73)	0.85
Identification	0.16 (0.06–0.42)	0.00	0.45 (0.12–1.66)	0.23
Taiwan				
Income	0.26 (0.11–0.61)	0.00	0.47 (0.14–1.61)	0.23
Education	0.15 (0.06–0.38)	0.00	0.30 (0.07–1.27)	0.10
Occupation	0.48 (0.18–1.28)	0.14	1.42 (0.40–5.07)	0.59
Identification	0.17 (0.07–0.39)	0.00	0.14 (0.04–0.46)	0.00
Female				
China				
Income	0.27 (0.16–0.45)	0.00	0.33 (0.17–0.66)	0.00
Education	0.53 (0.28–1.02)	0.06	1.66 (0.68–4.06)	0.27
Occupation	0.41 (0.23–0.71)	0.00	0.62 (0.29–1.31)	0.21
Identification	0.36 (0.22–0.60)	0.00	0.45 (0.24–0.85)	0.01
Japan				
Income	0.48 (0.18–1.32)	0.15	0.27 (0.05–1.33)	0.11
Education	0.67 (0.27–1.66)	0.39	0.89 (0.18–4.46)	0.89
Occupation	0.86 (0.28–2.65)	0.79	1.84 (0.44–7.67)	0.40
Identification	0.28 (0.12–0.64)	0.00	0.13 (0.03–0.63)	0.01
South Korea				
Income	0.44 (0.21–0.93)	0.03	2.31 (0.63–8.52)	0.21
Education	0.41 (0.17–0.98)	0.04	0.82 (0.19–3.63)	0.80
Occupation	0.82 (0.28–2.37)	0.72	1.01 (0.30–3.37)	0.98
Identification	0.27 (0.13–0.55)	0.00	0.17 (0.05–0.54)	0.00
Taiwan				
Income	0.19 (0.09–0.39)	0.00	0.46 (0.15–1.43)	0.18
Education	0.23 (0.10–0.52)	0.00	0.77 (0.19–3.07)	0.71
Occupation	1.12 (0.46–2.73)	0.80	3.23 (0.95–10.95)	0.06
Identification	0.10 (0.04–0.22)	0.00	0.13 (0.04–0.42)	0.00

documented a psycho-social process through which people lower on the social ladder reduce their health by comparing themselves with higher social classes. Class identification, as a subjective index of SES, can be considered to be a measurement that reflects the psycho-social process better than other objective indices such as income or education.

Occupational classifications

As typified by the 'Black Report' in the UK, occupational class often has been used in studies as a standard for social gradients in health because it accurately reflects social classes in Western societies. However, in the present study the relationship between occupational class and SRH was unclear and showed a moderate gradient compared to other SES indices. Although it is possible that the result might be caused by a validity of the scoring procedure of ISEI, the result was basically the same when we used other classifications (the results are not shown).

Another possible explanation may be that occupational classifications do not fully reflect social classes in an East Asian context. 'Occupation' as referred to here indicates, 'what they do at work' and is generally understood as the division between white-collar/blue-collar or manual/non-manual labour. However, factors other than occupation might be important for reflecting East Asian social classes, especially compared to Western societies, because company size, position at work, employment period or types of job contract may affect workers' income, job security, benefits and social security. Arita[30] made cross-national comparisons of occupation and social stratification in Japan, South Korea and Taiwan based on data surveyed in 2005. He discovered that employment status as well as the size and type of company are as important as occupation for understanding social stratification in East Asia. For the status and identity of workers, 'which company they belong to' might be more important than 'what they do at work.'

Japan

Compared with samples from the other three countries, the social gradient in SRH was moderate in Japan, except for the case of class identification. Several possibilities might account for this.

One possible explanation, at least from a comparative perspective, may be that social inequalities and their influence on health in Japan have remained low. In the past, Japan has been regarded as an egalitarian country that has achieved the world's highest standards in longevity. According to Kagamimori *et al.*,[15] who reviewed previous studies regarding SES and health in Japan, socio-economic differences in mortality, morbidity and risk factors are not uniformly small in Japan, but they do occur to a smaller degree than in the US or Europe. Results of our study indicate that Japan exhibits relatively small health inequalities, not only in comparison with the US and Europe but also among East Asian countries.

However, it must be noted that the response preference to SRH may vary between countries. It is believed that the Japanese generally prefer to

give a midpoint or close-to-the-middle response rather than express definite agreement or disagreement.[31] The wording of the response categories from 'Very good' to 'Very bad' with the qualifier 'very' might have biased the response toward the midpoint especially for Japanese respondents.

In fact, table 1 shows that SRH was the 'best' in Japan, however if we used a different cut-off point (only responses 1 and 2 representing 'good'), Japan would be the 'worst' because of the larger share of response 3 (midpoint). The weakest association of SRH and SES in Japan was the same; even if we used a different cut-off point (the result is not shown). Therefore, the Japanese response preference might explain both the 'best' SRH status and its weakest association with SES.

However, considering the observed strong association in class identification, this response preference alone is not convincing enough to explain the results. We need further research on the effect of response scale for an analysis of SRH, especially in cross-national comparison.

Limitations

Low response rate, especially in China and Taiwan, was a limitation of this study, although the age distribution of the respondents was very similar to that of the national population in China and Taiwan (the difference was up to the 3.1 percentage point at 10 years intervals of age). In general, it can be considered that the samples with low SES may tend to have a lower response rate, thus causing the SES gradient in health to be underestimated. However, this tendency cannot explain why Japan exhibits the weakest association, because the response rate in Japan was relatively high among the four countries.

Another limitation in the present study may be that the target population for analysis was limited to 20- to -69-year olds. The older people might exhibit a different pattern in the relationship between SRH and SES (cf. Nakaya and Dorling[32]), and the country differences in life expectancy may also influence the result. This needs to be assessed in the future by using the upcoming EASS data set.

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Key points

- Although a social gradient in health has been well-studied in Western societies, little is known about how it varies between countries and SES indices in the current East Asian context.
- From the EASS 2006, which is a cross-national comparative data set, it is evident that Japan has relatively low levels of health inequality compared to China, South Korea and Taiwan.
- Using standardized SES indices, this study revealed that occupational class has the weakest relationship with SRH as compared to income, education and class identification, suggesting that an index of occupational classes may be insufficient to explain health inequalities in East Asia.

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Positive health, cardiorespiratory fitness and fatness in children and adolescents

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Background: Positive health is likely a buffer against physical and mental illness. Positive health may explain some of the health benefits associated with increasing cardiorespiratory fitness and decreasing fatness in youth. We examined the association of cardiorespiratory fitness and fatness with positive health indicators in 684 (365 boys and 319 girls) Spanish children aged 6–17.9 years. **Methods:** Positive health indicators were self-reported using items of the Health Behavior in School-aged Children questionnaire. The study health indicators were: perceived health status, life satisfaction, quality of family relationships, quality of peer relationships and academic performance. Weight and height were measured and body mass index was computed. We also measured triceps and calf skinfolds thickness and body fat percentage was estimated. Cardiorespiratory fitness was measured by the 20 m shuttle-run test. **Results:** Cardiorespiratory fitness was positively associated with life satisfaction in children and adolescents. Fatness was inversely associated with perceived health status in children and adolescents, whereas fatness was inversely associated with life satisfaction, quality of family relationships and academic performance only in children. **Conclusion:** These findings suggest a link between cardiorespiratory fitness and fatness and positive health indicators, suggesting that improving both fitness and fatness could exert a favourable effect on positive health during childhood and adolescence.

Introduction

Positive health is a multifactor construct that describes a state beyond the mere absence of disease. Positive health-related constructs include life satisfaction, social relationships, self-esteem, vigour, self-image and physical health status. Several studies suggested that positive health alleviates depression,[1] promotes better relationships,[2] produces higher self-esteem,[3] acts as preventive against of the common influenza,[4] protects against cardiovascular events[5] and is a predictor of mortality.[6] The use of positive health indicators as an additional outcome measure in medical research has increased during past years. Assessment of positive health is typically based on reports and they can provide valid information about patient's experience that complements clinical measures.

Cardiorespiratory fitness is a direct indicator of individual's physiological status and reflects the overall capacity of the cardiovascular and respiratory system.[7] Findings from cross-sectional studies showed that children and adolescents with high levels of cardiorespiratory fitness have also a more favourable cardiovascular profile compared with their unfit counterparts.[8] Likewise, low levels of cardiorespiratory fitness during childhood and adolescence seems associated with later cardiovascular risk factors such as hyperlipidaemia, hypertension and obesity.[8,9]

Paediatric obesity is nowadays an important public health threat. Paediatric overweight/obesity is strongly associated with adult overweight.[10] Adults who were overweight in childhood have higher levels of blood lipids and lipoproteins (i.e. dyslipidemia), blood pressure (i.e. hypertension) and fasting insulin levels (i.e. type 2 diabetes), and thus are at increased risk for cardiovascular disease compared with adults who were thin as children.[9]

Studies examining the relationship between positive health and cardiorespiratory fitness in children and adolescents are scarce and are mainly focused on self-esteem,[11,12] and academic performance.[13–15] There are, however, more studies examining the association between positive health and obesity in children and adolescents, yet the results are inconclusive.[16–19] More research is needed before a determination of whether, and to what extent, positive health may be responsible for some of the health benefits associated with increasing cardiorespiratory fitness and decreasing fatness.

The aim of the present study was to examine the associations of cardiorespiratory fitness and fatness with positive health indicators in Spanish children and adolescents.

Methods

Subjects

A sample of 684 (365 boys and 319 girls) healthy Caucasian children and adolescents (6–17.9 years age) participated in the study. The sample was randomly selected using a two phases, proportional cluster sampling using as a reference the database of the census of the province of Cádiz (Spain). In the first phase, the school was selected from the stratum. The different strata were selected according to the geographical localization,