Association of physical activity, waist circumference and body mass index with subjective health among Belgian adults

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Background: The present study aimed to explore associations of physical activity (PA), waist circumference (WC) and body mass index (BMI) with subjective health in a nationally representative sample of Belgian adults.

Methods: Data from the 2004 Belgian Food Consumption Survey were used. A face-to-face questionnaire about sociodemographic and socioeconomic characteristics, general health, subjective health, lifestyle and PA was completed. Weight and height were self-reported, and WC was measured in orthostatic position. PA was assessed by the short International PA Questionnaire. Results: In total, 3208 individuals (49.9% women) were included in the study. About 41.3% of the Belgian population did not meet the minimum recommendations for PA, whereas 24.8% of the population engaged in health-enhancing PA. In total, 29.5% of the population was overweight, 10.1% was obese and 33.2% of the population had an excessive WC. About 23.6% of the population rated their health as poor. Obese individuals were significantly less likely to report good subjective health than those with normal BMI [odds ratio (OR) = 0.538; 95% confidence interval (CI): 0.390–0.742]. This association was also identified for men and women separately. Further, both individuals who participated in health-enhancing PA and those who participated in recommended PA reported significantly better subjective health than insufficiently active individuals (OR = 2.533; 95% CI: 1.952–3.287 and OR = 1.543; 95% CI: 1.256–1.894, respectively). Conclusions: A strong association was found between PA and subjective health, and in addition, a significant negative association was found between BMI and subjective health. There was no relationship between WC and subjective health among Belgian adolescents and adults.

Introduction

The World Health Organization (WHO) predicts that by 2015, about 2.3 billion adults will be overweight and >700 million people will be obese.1 Obesity and overweight are major public health concerns, and currently in Europe, it is estimated that 30–70% of the adult population is overweight and 10–30% is obese.2 Further aggravating this somber picture, about 35% of European adults did not meet the physical activity (PA) recommendations in 2008.3 Overweight, obesity and the lack of PA contribute to the problematic high incidence of diabetes mellitus (i.e., 55 million European adults aged 20–79 years).4 Furthermore, these factors are associated with an increased risk for some types of cancer.5 Other serious health risks of obesity, overweight and physical inactivity are high blood pressure and raised blood cholesterol levels, and hence premature death, and higher prevalence of asthma, sleep apnoea and arthritis.6 Apart from the clear relationship between body weight status and physical health, professionals agree that a relationship probably exists between body weight status and subjective health, which is the subjective perceptions about one’s health.7,8

The concept of subjective health includes the complete health of an individual, including dimensions of physical, social and emotional health, as well as the concept of health-related quality of life.9 As such, subjective health may be influenced by impressions and opinions of others (e.g. physician’s diagnosis), but the final assessment is the product of the individual’s own systematic cognitive analysis and information processing.

Hence, emotional and cognitive elements are involved in the judgement of one’s general subjective health, and the final assessment is aligned with the attitudes and beliefs of the individual.9 Subjective health is acknowledged as one of the best health indicators at both individual and population level, revealing important details regarding the health needs, and the expectancy of morbidity, functional status, disability and health consumption of a population.10–12

An impressive amount of scientific evidence shows a clear relationship between PA and several aspects of health such as cardiovascular health, metabolic function, mental health and resilience against chronic conditions such as cancer and arthritis.13,14 Furthermore, Hamer and Stamatakis14 found that objectively measured moderate-to-vigorous PA was associated with good subjective health, independently from physical fitness. This is in line with a knowledge base showing that PA makes people feel better about themselves, enhancing their perceptions of health and well-being.15

Concerning the measure of overweight and obesity, some favour body mass index (BMI),16 whereas others consider waist circumference (WC) a better choice. Most national and international health agencies (e.g. WHO, Centers for Disease Control and Prevention and National Institutes of Health) use BMI as a measure of overweight and obesity, owing to its easy measurement, which
makes it highly accessible to both professionals and the general public. Generally for adults, overweight means a BMI greater or equal to 25 kg/m² and obesity means a BMI greater or equal to 30 kg/m². Nonetheless, others criticize BMI as being only a rough and often flawed guide for overweight and obesity. Indeed, BMI may not correspond to the same degree of fatness in different individuals, whereas WC can discriminate among persons misclassified by the rough measure of BMI. In addition, BMI fails to inform about fat distribution such as abdominal fat, which is important because visceral adipose tissue has more severe health consequences than general body fat. Abdominal fat is a more significant risk factor for heart disease, myocardial infarction and diabetes than BMI. For instance, increased abdominal obesity increases the risk of myocardial infarction, accounting for 63% of heart attacks in Western Europe and 28% of heart attacks in Central and Eastern Europe. Therefore, several professionals consider BMI a good measure of general obesity, but one that requires WC as an additional measure for abdominal obesity, which is likely a better predictor of the metabolic syndrome, diabetes, cardiovascular disease and all-cause mortality than BMI. High WC includes borderline WC, that is, WC of at least 80 cm in women and 94 cm in men, and an excessive WC, that is, WC of at least 88 cm in women and 102 cm in men. The latter cutoff points can identify increased risks for developing obesity comorbidities in most adults.

Given the previously outlined evidence of clear interconnections between PA, BMI and WC on one hand, and various aspects of health and subjective health on the other hand, the present study aimed to explore associations of PA, WC and BMI with subjective health in a nationally representative sample of Belgian adults.

Methods

Subjects and design

The first Belgian Food Consumption Survey (BNFCS) was conducted in 2004–2005 and was supported by the Ministry of Health, Food Chain Safety and Environment. The main objective of the BNFCS was to monitor the adequacy of the food and nutrient intake in Belgium. The design of the BNFCS followed the recommendations of the European Food Consumption Survey Method group, advocating the harmonization of methodology requirements for collecting comparable food consumption data across Europe.

The protocol of the BNFCS was approved by the Ethical Committee of the Belgian Scientific Institute of Public Health. All subjects provided oral and written informed consent for participation in the study. The detailed description of the multi-stage stratified sampling procedure of participants is presented elsewhere. The aim was to include 3200 participants, 400 per sex–age group. Trained dieticians visited the participants twice to assess their food intake through a computerized 24-hour dietary recall. During the first visit, participants also completed a face–to–face questionnaire about sociodemographic characteristics and socioeconomic status. Additional information on general health, lifestyle and PA was collected. Weight and height were self-reported, and WC was measured in orthonastic position, with the feet at a 20 cm distance. Belts and thick clothing were removed, and the measuring tape was placed horizontally on the line crossing from the uppermost lateral border of the right iliac crest intersecting the midaxillary line. The survey was conducted all year round, ensuring equal distribution over all days of the week and all seasons of the year. For the present study, participants with complete data on subjective health (i.e., the dependent variable), on PA, WC and weight–height, hence BMI (i.e., the independent variables), were included. These were 3208 individuals, including 1601 women and 1607 men.

Subjective health was assessed by asking respondents to rate their health in general using an adapted version of the original WHO question (WHO, 2002): ‘How is your health in general? Is it … Very good (1), Good (2), Fair (3), Bad (4), or Very bad (5)’. This question was previously found to be a robust predictor of mortality and correlated strongly with objective health indicators, especially in developed countries such as Belgium. A dichotomous subjective health indicator denoting poor subjective health (0), including the categories ‘fair’, ‘bad’ and ‘very bad’, and good subjective health (1), including the categories ‘good’ and ‘very good’, was used in the analyses.

Participation in PA was assessed by the short International Physical Activity Questionnaire (IPAQ), about the previous week. The IPAQ produces repeatable data and is acknowledged as a valid measure for monitoring population levels of PA among adults aged 18–65 years in diverse settings. Participants reported days, hours and minutes of vigorous-intensity PA, moderate-intensity PA and walking during the past week. Total amounts of minutes spent in each of these activities were computed. The broad concept of PA was applied here, including household, workplace and transportation activities along with leisure time PA. Three levels of PA were obtained following the official Guidelines for Data Processing and Analysis of the IPAQ (2005): insufficient PA (i.e. no or some PA that is insufficient to meet the recommendations), recommended PA (20-min vigorous PA at least 3 days/week, or 30-min moderate-intensity PA/walking at least 5 days/week) and health-enhancing PA (vigorous PA accumulating 1500 Metabolic Equivalent of Task min/week, or a combination of vigorous PA, moderate-intensity PA and walking on a daily basis accumulating 3000 Metabolic Equivalent of Task min/week).

Data analysis

SAS 9.2 statistical software was used for the analyses. Three successive logistic regression models were created, trying to explain the influence of BMI, WC and PA on subjective health. One independent variable was added in the model, whereas the remaining two independent variables were added through forward stepwise selection. The first model started with WC and added BMI and PA; the second model started with BMI and added WC and PA and the third model started with PA and added WC and BMI. In the models combining variables this way, multiple logistic regression analyses were conducted to obtain odds ratios (ORs) with 95% confidence intervals (CIs), and log likelihood ratio tests were run to compare the goodness-of-fit in the different models. The models were adjusted for age, gender and socioeconomic status.

Results

Table 1 presents the number of participants in all subjective health, BMI and WC categories, across gender groups. In total, 3245 individuals participated in the survey, and for 3208 individuals, data on all variables of interest were available. In total, 41.3% of the Belgian population did not meet the recommendations for PA and was insufficiently physically active, whereas 24.8% of the population engaged in health-enhancing PA. In total, 29.5% of the population was overweight, 10.1% was obese and 33.2% of the population had an excessive WC. In total, 23.6% of the population rated their health as poor. The percentage of men in good subjective health was greater than the percentage of women (table 1).

The log likelihood ratio tests comparing the fit of the different models including the independent variables in forward stepwise selection showed that the contribution of BMI (P < 0.05) and especially that of PA (P < 0.00005) to subjective health was greater than the contribution of WC (P > 0.1). More specifically, although WC did not significantly contribute to the PA model, BMI model or PA + BMI model, BMI added some information to both the WC and the PA models, as well as to the PA + WC model. Conversely, PA contributed significantly to both models and to the model combining them.
Table 2 presents the results of the logistic regression analyses examining associations between subjective health and BMI, WC and PA at different levels, in the total sample and across gender groups. Obese individuals were significantly less likely to report good subjective health than those with normal BMI (OR = 0.538; 95% CI: 0.390–0.742). This association remained significant after including PA in the model, and for men and women separately.

Further, both individuals who participated in health-enhancing PA and those who participated in recommended PA reported significantly better subjective health than insufficiently active individuals (OR = 2.533; 95% CI: 1.952–3.287 and OR = 1.543; 95% CI: 1.256–1.894, respectively). These associations were significant in both gender groups.

**Discussion**

The present study examined associations between PA, WC and BMI with subjective health, in a nationally representative sample of
et al. find the findings of Hu et al. in influencing subjective well-being more than their visceral weight, expressed through BMI, had a greater impact on participants’ subjective well-being than their general body weight. Furthermore, general body weight, expressed through BMI, had a greater influence on participants’ subjective well-being than their visceral adiposity, expressed through WC.

These findings inform about the differential contribution of PA, WC and BMI to subjective health, and they are in line with the findings of Hu et al. according to whom, in both women and men, PA is strongly associated with health, independently from BMI and WC. The researchers concluded that both regular participation in PA and maintaining a normal weight are crucial for health (especially cardiovascular health); however, the lack of PA is likely an independent health risk factor, whereas overweight and obesity seem to increase health risks by modifying other risk factors (e.g., sedentary behaviour, smoking, high cholesterol and hypertension). Reasons why these findings are valuable include the fact that PA fulfills crucial roles in all aspects of weight management (weight loss, healthy weight maintenance and the prevention of weight gain).

Accordingly, solid evidence shows that the high prevalence of overweight and obesity is, at least in part, attributable to insufficient PA participation, as PA is associated with less overall adiposity and less visceral adiposity. Moreover, the knowledge base indicates a dose–response relationship between PA and overweight and obesity, namely, more PA results in healthier weight for a longer time. More specifically, Lee, et al. found that 1 hour moderate-to-vigorous PA resulted in maintaining a steady weight over 13 years, in a sample of 34,000 adult women. Referring to the general population, Saris et al. concluded that moderate-intensity PA of at least 45–60 minutes per day is required to prevent the transition to overweight or obesity. Among formerly obese individuals, at least 60–90 minutes of moderate-intensity PA, or lesser amounts of vigorous-intensity PA per day, are necessary for the prevention of weight regain.

The evidence base leaves little room for doubt regarding the positive impact of PA on weight management. On the other hand, as outlined in the Introduction, unhealthy weight—in the sense of overweight and obesity—bears serious health consequences, representing a major public health issue. Consequently, the present findings showing that PA may have a greater impact on subjective health than body weight confirm the improvement of PA as a public health priority. Increases in PA trigger a positive impact on weight management, whereas in parallel directly enhancing subjective well-being. In other words, PA provides solutions for the major problem of overweight and obesity, while simultaneously making people feel better, and feel better about themselves. This, in the context of 'how well society functions depends on how people feel about themselves, as how society works at every level influences the way people feel' (Scottish Development Centre for Mental Health Services, 2007), entails the tremendous potential of PA to improve the human existence.

An additional point brought up by our findings is the need to encourage PA at levels higher than the recommended minimum. The present results showed that health-enhancing PA was associated with significantly better subjective health, whereas the fulfillment of the PA recommendations seemed insufficient to positively influence subjective health. In the same line, health-enhancing levels of PA, which are above the minimum recommended regarding both duration and intensity of PA (i.e., at least 150 minutes of vigorous-intensity PA and 300 minutes of moderate-intensity PA), are most effective in weight management, even though any amount of PA will deliver some health benefits in both normal-weight and overweight individuals.

Strengths of this study are the originality of the research question and the rigorous care with which the study design and the data collection were executed. On the other hand, the cross-sectional nature of the findings prevents us from ascertaining the direction of causality in the associations. Nevertheless, the cross-sectional observation of associations facilitates understanding and creates knowledge base for future research, likely representing the best way to identify associations worth of further—ideally longitudinal—scrutiny. Another limitation includes that the potential influence of unidentified confounding factors (such as smoking) has not been taken into account in this study. Weight and height were self-reported, and there may have been a tendency to underreporting, especially for overweight and obese individuals. It is however uncertain how this relates to subjective health reporting. Moreover, although the self-report nature of the PA data may present social desirability bias and recall problems, acknowledged advantages of PA questionnaires come from their ability to permit data collection from a large number of individuals at relatively low costs. In addition, recent data show robust associations between objectively assessed moderate-to-vigorous intensity PA and good subjective health, independently from physical fitness. Such reports are important because they eradicate the potential conceptual overlap problem created when both a socially approved (and rewarded) healthy activity and one’s own self-rated well-being are reported. As described in the Introduction, subjective well-being is a complex measure comprising physical, mental and social constructs, which can overlap with the concept of leading a physically active lifestyle.

Future research should continue the work done in this study by examining the longitudinal impact of health-enhancing PA on subjective well-being, independently or directly, and through weight management. Worthwhile endeavours would be also randomized controlled trials aimed at weight loss, the prevention of weight gain and the maintenance of healthy weight, where the differential contribution of dietary adjustments and PA would be explored. This recommendation for future research entails a concern for the popularity of weight-loss programs that rely exclusively on dietary adjustments, while neglecting the tremendous impact of PA on weight, health and well-being.

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Conflicts of interest: None declared.

Key points

- A strong positive association was found between PA and subjective health among Belgian adults.
- A significant negative association was found between BMI and subjective health among Belgian adults.
- No significant association was found between WC and subjective health among Belgian adults.

References
