CLINICAL STUDY

Impaired quality of life and sexual function in overweight and obese men: the European Male Ageing Study

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Abstract

Background: Few published data link overweight and obesity with measures of quality of life (QoL) including sexual health in men.

Objective: To assess the association of overweight/obesity with impairment of physical and psychological QoL and sexual functions in men.

Design and setting: Cross-sectional, multicentre survey of 3369 community-dwelling men aged 40–79 (mean ± s.d., 60 ± 11) years randomly selected from eight European centres.

Outcomes: Adiposity was assessed by body mass index (BMI) and waist circumference (WC). QoL and functional impairments by physical and psychological function domains of the Short Form-36 questionnaire, Beck’s Depression Inventory and the European Male Ageing Study sexual function questionnaire.

Results: Complete data on sexual activities and erectile function were available in 2734 (92%) and 3193 (95%) of the participants respectively. From the population studied, 814 men were obese (BMI ≥ 30 kg/m²) and 1171 had WC ≥ 102 cm, 25% of all men were unable to do vigorous activity and 2–13% reported depressive symptoms. Symptoms of sexual dysfunction ranged between 22% (low sexual desire) and 40% (infrequent morning erections) of the participants. Among obese men with both BMI ≥ 30 kg/m² and WC ≥ 102 cm, at least one symptom of impaired physical, psychological and sexual function was reported by 41, 43 and 73% of the participants respectively. Compared with the reference group of non-obese men (BMI < 30 kg/m² and WC < 102 cm), men with BMI ≥ 30 kg/m² and WC ≥ 102 cm more frequently reported at least one symptom of impaired physical function (odds ratio (OR)=2.67; confidence interval (CI): 2.07–3.45, P<0.001), impaired psychological function (OR=1.48; CI: 1.14–1.90, P<0.01) and impaired sexual function (OR=1.45; CI: 1.14–1.85, P<0.01). These functional impairments were also more prevalent in men who had WC ≥ 102 cm even with BMI < 30 kg/m², but those with BMI ≥ 30 kg/m² and WC < 102 cm generally did not suffer from increased impaired physical or sexual health. Men with high BMI and WC were at even greater likelihood of having a composite of two or more or three or more symptoms compared with those with normal BMI and WC.

Conclusions: Men with high WC, including those who are ‘non-obese’ with BMI < 30 kg/m², have poor QoL with symptoms of impaired physical, psychological and sexual functions. Health promotion to improve QoL should focus on prevention of obesity and central fat accumulation.

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Introduction

Links between adverse adiposity and chronic illnesses are well documented (1), but surprisingly, little is published on its association with quality of life (QoL) including sexual health, especially in men. Overweight/obesity, indicated by high body mass index (BMI) or waist circumference (WC), has reached an epidemic proportion worldwide. Between the 1980s and the mid-2000s, the prevalence of obesity (BMI ≥ 30 kg/m²) has approximately doubled in Europe (2), Australia (3) and the United States (4, 5) with no sign of abating (6), and highest rates occur among South Asians, African Americans and Hispanics as well as the socioeconomically disadvantaged (7–9). In 2002, the World Health Organization reported between 25 and 75% of European adults in both non-transitional and transitional countries to be overweight and up to 20% of men and 30% of women to be obese (10). By 2004, 66% of American adults were overweight and 32% obese (8). Over the 10 years to 1999–2000, morbid obesity (BMI ≥ 40 kg/m²) increased from 0.8 to 2.2% (11). In Scotland, 1.4% of men and 3.5% of women reach BMI > 40 kg/m² (12). Longitudinal studies have shown that the fastest weight increases were in young adults with little increase beyond the 5th decade (8, 13). This pattern may change as the obesity epidemic progresses.

Obesity exerts major burdens on health care in many ways, from obviously obesity-related conditions (14–16) to the hidden costs of personal care and indirect costs associated with absenteeism, disability, premature mortality and workers’ compensation (17). The health care costs of obesity extend well beyond the conventional costs of obesity-related diseases, with increased prescribing costs in almost all drug classes (18). In the United States, health care spending in 2002 for obese adults was 56% higher than that for normal-weight adults, an excess of US $1244 per person per annum (19). Expenditure on obesity-related conditions reached US $147 billion in 2008, representing 9.1% of all medical spending compared with 6.5% in 1998 (20), reflecting disproportionate of the most expensive drug group for a variety of conditions (18).

The present analysis of the European Male Ageing Study (EMAS) database of European Union men aged 40–79 years aims to define the extent to which a range of common ‘QoL’ symptoms usually attributed to ageing, including impaired physical, psychological and sexual functions, are associated with overweight/obesity, as indicated by a high BMI and WC.

Methods

Subjects and study design

A total of 3369 men aged 40–79 (mean ± S.D.: 60 ± 11) years were recruited from population registers in eight European centres, including centres from five non-transitional (Florence, Italy; Leuven, Belgium; Malmö, Sweden; Manchester, UK; Santiago de Compostela, Spain) and three transitional countries (Lodz, Poland; Szeged, Hungary; Tartu, Estonia). For the baseline survey, stratified random sampling was used with the aim of recruiting equal numbers of men in each centre and into each of four age bands (40–49, 50–59, 60–69 and 70–79 years). After completing a postal questionnaire including information about smoking habits, alcohol consumption and the presence of morbidities (hypertension, cardiovascular disease (CVD), stroke, cancer, bronchitis, asthma, peptic ulcer, epilepsy, diabetes mellitus, hepatic, renal and prostate diseases), subjects attended research clinics for a health screen as described previously (21). Each participant completed interviewer-assisted questionnaires and underwent clinical assessments including anthropometry (weight, height, WC). The questionnaires included the Short Form-36 (SF-36) health survey (22) and Beck’s Depression Inventory (BDI) (23). Subjects then privately completed the EMAS sexual function questionnaire (EMAS-SFQ) (24) (Supplementary Table 1, see section on supplementary data given at the end of this article). The two physical function and psychological function domains comprising 27 dimensions from SF-36 and BDI questionnaires and the one sexual function domain comprising five dimensions were used for analysis in this study. Ethics approval for the study was obtained in accordance with local institutional requirements in each centre and participants gave informed consent.

Statistical analysis

Individuals were categorised according to their BMI (< 25, 25–30 and BMI ≥ 30 kg/m²) or the previously defined WC ‘action levels’ (< 94, 94–102 and ≥ 102 cm) (25, 26). For the purpose of this analysis, smoking status was categorised as either current or ever smoker; alcohol intake as frequent (5 days a week or more) and infrequent (< 5 days/week) drinkers and co-morbidity as none or at least one of the health problems (hypertension, heart conditions, stroke, cancer, bronchitis, asthma, peptic ulcer, epilepsy, diabetes, liver, kidney and prostate diseases).

The χ² test of independence was used to assess the associations between items of impaired physical, psychological or sexual function and BMI or WC. Multivariable logistic regression analysis, with or without adjustments for potential confounding factors (age, smoking status, alcohol intake and centre), was used to estimate the likelihood of having symptoms of impaired physical, psychological and sexual functions (dependent variables) in obese men with BMI ≥ 30 kg/m² and/or WC ≥ 102 cm (independent variables). We decided that the results should be presented without adjusting for ‘co-morbidity’ because the ‘co-morbidities’ are in part secondary to adiposity, and we are interested in the...
overall effect of adiposity. Finally, the same regression approach was used to assess the likelihood of having at least one symptom within each of the three domains (physical, psychological or sexual function) in different groups of men classified according to their various combinations of adiposity (BMI < 30 or ≥ 30 kg/m² and WC < 102 or ≥ 102 cm). To assess the burden of symptoms met by individuals, composites of two or more or three or more symptoms compared with none were also analysed in men across different categories of adiposity.

Robust standard errors were used to adjust for recruitment centre, which takes into account the hierarchy of the study design (individuals nested within centres). Results from the logistic regression models are expressed as odds ratios (ORs) and 95% confidence intervals (CIs).

Receiver operating characteristic (ROC) analysis was used to evaluate the predictive power of BMI and WC on the outcomes (impaired symptoms) in the regression models. The higher the area under the curve, i.e. the greater the curvature bowing away from the 50% line (zero prediction), the greater the predictive power. All statistical analyses were conducted using Intercooled STATA version 9.2 (Stata Corp, College Station, TX, USA).

Results

A total of 3369 (mean ± s.d. age: 60 ± 11 years) men participated in the EMAS study. Complete data concerning frequency of sexual activities (excluding men without a sexual partner) and erectile function were available in 2734 (92%) and 3193 (95%) of the participants respectively. Demographics of the EMAS sample are shown in Table 1. With regard to physical and psychological functions (Supplementary Table 2, see section on supplementary data given at the end of this article), 25% of men were unable to do vigorous activity and 2–13% reported depressive symptoms. Symptoms of impaired sexual function affected between 22% (low sexual desire), 30% (erectile dysfunction) and 40% (infrequent morning erections) of the participants. Functional impairment in these domains was consistently more prevalent in men who had either high BMI (Table 2) or WC (Table 3). Among those who had both high BMI and high WC, 41% had at least one impaired physical function (Fig. 1a), 43% had at least one symptom of impaired psychological function (Fig. 1b) and 73% had at least one of the symptoms of impaired sexual function (Fig. 1c).

Multivariable logistic regression models (Table 2) show that compared with the reference group of lean men (based on BMI < 25 kg/m²), obese men (BMI ≥ 30 kg/m²) were more likely to report impaired physical function (ORs range 2.2–3.3), impaired psychological function (ORs up to 2.7) and erectile dysfunction (OR 1.8, 95% CI: 1.4–2.3). Similar patterns emerged in men with high WC (≥ 102 cm) (Table 3).

The symptoms from the three domains found to be associated with BMI and/or WC were further analysed in different categories of obese men and non-obese men to explore potential interaction effects of BMI and WC (Table 4). Compared with the reference group of non-obese men (BMI < 30 kg/m² and WC < 102 cm), men with BMI ≥ 30 kg/m² and WC ≥ 102 cm were more likely to have symptoms of impaired physical and psychological function and more likely to have erectile dysfunction. These relationships persisted, only slightly less strongly, even in men with WC ≥ 102 cm but BMI < 30 kg/m². By contrast, apart from tiredness, generally there was no increased risk in these health impairments in men with high BMI but with WC < 102 cm (Table 4). All the above relationships were independent of age and lifestyle factors.

Finally multivariable logistic regression was used to test the association between the presence of at least one symptom or composites of two or more and three or more symptoms within each of the three domains in men with adverse adiposity (Tables 2–4). Different combinations of groups of men with varying degrees of obesity (BMI < 30 or ≥ 30 kg/m² and WC < 102 or ≥ 102 cm) were used as independent variable. Table 4 shows that compared with the reference group of non-obese men (BMI < 30 kg/m² and WC < 102 cm), obese men with BMI ≥ 30 kg/m² and WC ≥ 102 cm had higher likelihood of reporting at least one symptom of

Table 1 Characteristics of 3369 European Union men.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years; mean (s.d.))</td>
<td>60.0 (11.0)</td>
</tr>
<tr>
<td>Height (cm; mean (s.d.))</td>
<td>173.6 (7.3)</td>
</tr>
<tr>
<td>Weight (kg; mean (s.d.))</td>
<td>83.5 (14.0)</td>
</tr>
<tr>
<td>BMI (kg/m²; mean (s.d.))</td>
<td>27.7 (4.1)</td>
</tr>
<tr>
<td>Waist circumference (cm; mean (s.d.))</td>
<td>98.5 (11.1)</td>
</tr>
<tr>
<td>Quality of life (SF-36)a; mean (s.d.)</td>
<td>7.0 (6.5)</td>
</tr>
<tr>
<td>Physical function domain</td>
<td>27.1 (3.8)</td>
</tr>
<tr>
<td>Physical role domain</td>
<td>17.2 (3.8)</td>
</tr>
<tr>
<td>Body pain domain</td>
<td>9.3 (2.4)</td>
</tr>
<tr>
<td>General health domain</td>
<td>17.9 (4.0)</td>
</tr>
<tr>
<td>Vitality domain</td>
<td>14.9 (3.0)</td>
</tr>
<tr>
<td>Social function domain</td>
<td>8.9 (1.5)</td>
</tr>
<tr>
<td>Emotion domain</td>
<td>13.4 (2.5)</td>
</tr>
<tr>
<td>Mental domain</td>
<td>20.3 (3.5)</td>
</tr>
<tr>
<td>Depressive symptoms (BDI)b; mean (s.d.)</td>
<td>1629 (49.2)</td>
</tr>
<tr>
<td>BMI n (%)</td>
<td>30 kg/m²</td>
</tr>
<tr>
<td>≥ 25 and &lt; 30 kg/m²</td>
<td>1629 (49.2)</td>
</tr>
<tr>
<td>≥ 30 kg/m²</td>
<td>814 (24.6)</td>
</tr>
<tr>
<td>Waist circumference n (%)</td>
<td>94 and &lt; 102 cm</td>
</tr>
<tr>
<td>≥ 102 cm</td>
<td>1171 (35.5)</td>
</tr>
<tr>
<td>Current smokers (n (%)</td>
<td>705 (21.1)</td>
</tr>
<tr>
<td>Alcohol intake ≥ 5 days/week (n (%)</td>
<td>762 (22.8)</td>
</tr>
</tbody>
</table>

*Rhigher scores indicate better quality of life.
|Lower scores indicate greater depressive symptoms.

*56 men had missing BMI data and 50 men had missing waist circumference data. The remaining men with BMI < 25 kg/m² were 870 and waist circumference < 94 were 1142.
impaired physical function (OR 2.67; CI: 2.07–3.45, \(P<0.001\)), at least one symptom of impaired psychological function (OR 1.48; CI: 1.14–1.90, \(P<0.01\)) and at least one symptom of impaired sexual function (OR 1.45; CI: 1.14–1.85, \(P<0.01\)). These health impairments persisted in men with BMI < 30 kg/m\(^2\) and WC ≥ 102 cm. By contrast, men with BMI ≥ 30 kg/m\(^2\) and WC < 102 cm generally did not show significant association with the above health impairments except for impaired psychological function (and low sexual satisfaction). Further analysis revealed that men with BMI ≥ 30 kg/m\(^2\) and WC ≥ 102 cm were at even greater likelihood of having a composite of two or more and three or more symptoms compared with those with BMI < 30 kg/m\(^2\) and WC < 102 cm (Table 4).

The areas under the ROC curves in the prediction of three or more symptoms of physical, psychological and sexual dysfunction respectively, were 0.60, 0.55 and 0.55 by BMI and were 0.64, 0.58 and 0.60 by WC. Adding BMI to WC in the regression model did not change the power of prediction (areas under the ROC curves 0.65, 0.58 and 0.60 respectively).

### Table 2: Prevalence and odds ratios to estimate the risk of symptoms from three domains of physical function (Short Form-36, SF-36), psychological function (SF-36 and Beck’s Depression Inventory (BDI)) and sexual symptoms (European Male Ageing Study sexual function questionnaire, EMAS-SFQ) in different categories of body mass index (BMI).

<table>
<thead>
<tr>
<th>Physical function</th>
<th>BMI (kg/m(^2); OR (95% CI))(^a)</th>
<th>Psychological function</th>
<th>BMI (kg/m(^2); OR (95% CI))(^a)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;25 ≥ 25 and &lt;30 ≥ 30 (\chi^2) test(^b)</td>
<td>≥25 ≥ &lt;25 ≥ 30</td>
<td>≥25 &lt;30 ≥ 30</td>
</tr>
<tr>
<td>Unable to do vigorous activity</td>
<td>164 (19.0) 376 (23.3) 275 (34.0) &lt;0.001</td>
<td>1.18 (0.92, 1.53) 2.23 (1.59, 3.13)(^f)</td>
<td>1.38 (0.87, 2.17) 2.85 (1.76, 4.63)(^f)</td>
</tr>
<tr>
<td>Unable to do moderate activity</td>
<td>24 (2.8) 49 (3.0) 30 (3.7) 0.51</td>
<td>0.89 (0.39, 2.00) 1.20 (0.79, 1.80)</td>
<td>0.78 (0.39, 1.54) 1.53 (0.68, 3.42)</td>
</tr>
<tr>
<td>Unable to carry heavy weights</td>
<td>23 (2.7) 38 (2.4) 34 (4.2) 0.03</td>
<td>0.78 (0.39, 1.54) 1.53 (0.68, 3.42)</td>
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</tr>
<tr>
<td>Unable to climb one flight of stairs</td>
<td>15 (1.7) 25 (1.6) 19 (2.4) 0.37</td>
<td>0.81 (0.47, 1.42) 1.29 (0.59, 2.80)</td>
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</tr>
<tr>
<td>Unable to climb several flights of stairs</td>
<td>41 (4.8) 109 (6.7) 98 (12.1) &lt;0.001</td>
<td>1.38 (0.87, 2.17) 2.85 (1.76, 4.63)(^f)</td>
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</tr>
<tr>
<td>Unable to bend</td>
<td>32 (3.7) 87 (5.4) 93 (11.5) &lt;0.001</td>
<td>1.34 (0.74, 2.40) 3.27 (1.80, 5.95)(^f)</td>
<td>1.34 (0.74, 2.40) 3.27 (1.80, 5.95)(^f)</td>
</tr>
<tr>
<td>Unable to feeding yourself</td>
<td>13 (1.5) 16 (1.0) 17 (2.1) 0.08</td>
<td>0.59 (0.25, 1.37) 1.30 (0.55, 3.07)</td>
<td>0.59 (0.25, 1.37) 1.30 (0.55, 3.07)</td>
</tr>
<tr>
<td>Unable to rise from a chair</td>
<td>10 (1.2) 14 (0.9) 13 (1.6) 0.26</td>
<td>0.67 (0.21, 2.16) 1.20 (0.59, 2.44)</td>
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</tr>
<tr>
<td>Unable to walk in your home</td>
<td>10 (1.2) 10 (0.6) 7 (0.9) 0.36</td>
<td>0.49 (0.22, 1.09) 0.59 (0.27, 1.32)</td>
<td>0.49 (0.22, 1.09) 0.59 (0.27, 1.32)</td>
</tr>
<tr>
<td>Unable to bath yourself</td>
<td>10 (1.2) 21 (1.3) 9 (1.1) 0.91</td>
<td>0.98 (0.51, 1.85) 0.90 (0.38, 2.17)</td>
<td>0.98 (0.51, 1.85) 0.90 (0.38, 2.17)</td>
</tr>
<tr>
<td>Unable to walk more than 1 km</td>
<td>37 (4.3) 112 (6.9) 91 (11.3) &lt;0.001</td>
<td>1.62 (0.93, 2.84) 2.99 (2.05, 4.36)(^f)</td>
<td>1.62 (0.93, 2.84) 2.99 (2.05, 4.36)(^f)</td>
</tr>
<tr>
<td>Reduced work</td>
<td>37 (4.3) 73 (4.5) 71 (8.8) &lt;0.001</td>
<td>1.08 (0.68, 1.72) 2.30 (1.22, 4.34)(^f)</td>
<td>1.08 (0.68, 1.72) 2.30 (1.22, 4.34)(^f)</td>
</tr>
<tr>
<td>≥1 impaired physical function</td>
<td>182 (21.3) 410 (26.0) 311 (39.4) &lt;0.001</td>
<td>1.22 (0.93, 1.58) 2.56 (1.87, 3.50)(^f)</td>
<td>1.22 (0.93, 1.58) 2.56 (1.87, 3.50)(^f)</td>
</tr>
<tr>
<td>≥2 impaired physical function</td>
<td>68 (8.0) 188 (11.9) 153 (19.4) &lt;0.001</td>
<td>1.55 (1.00, 2.39)(^*) 3.57 (2.36, 5.40)(^f)</td>
<td>1.55 (1.00, 2.39)(^*) 3.57 (2.36, 5.40)(^f)</td>
</tr>
<tr>
<td>&gt;3 impaired physical function</td>
<td>49 (5.7) 95 (6.0) 96 (12.2) &lt;0.001</td>
<td>1.05 (0.64, 1.73) 3.31 (1.92, 5.09)(^f)</td>
<td>1.05 (0.64, 1.73) 3.31 (1.92, 5.09)(^f)</td>
</tr>
</tbody>
</table>

\^aP < 0.05, \(^P < 0.01, \(^P < 0.001.\)

\(^*\)Multivariable logistic regression adjusted for age, smoking status, alcohol intake and centre (reference group: BMI < 25 kg/m\(^2\)).

\(^{b}\)P values for \(\chi^2\) test of independence.
symptomatic functional impairments even in men who predict poor QoL, as evident by the multidomain age and lifestyle factors. A large WC plays a key role as a sexual domains that can diminish QoL independent of symptoms encompassing physical, psychological and

This study has shown that obese men, with high BMI and/or high WC, are at greater risk for a range of symptoms encompassing physical, psychological and sexual domains that can diminish QoL independent of age and lifestyle factors. A large WC plays a key role as a predictor of poor QoL, as evident by the multidomain symptomatic functional impairments even in men who are not considered to be ‘obese’ based on BMI ≥ 30 kg/m². This is likely to be because in subjects with similar BMI, variations in WC also reflect differences in intra-abdominal fat mass. High BMI has been shown to associate with erectile dysfunction in previous cross-sectional and prospective studies (27, 28), and WC has been shown to be a better predictor of erectile dysfunction than BMI (29, 30). These findings are particularly important because the prevalence of obesity indicated by high BMI, which is equally matched impaired sexual function 635 (59.9) 590 (63.5) 777 (72.8) !<0.001 1.14 (0.97, 1.33) 2.04 (1.74, 2.38)†

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public health preventative measures in combating the rising prevalence of obesity, providing additional incentivisation for individuals to improve QoL. Weight management should target younger age groups when fat accumulation is most rapid (13), particularly those who are approaching WC action level 1 (WC = 94 cm) (25) and high-risk groups such as those with strong family history of obesity and related complications more commonly observed in ethnic groups. The public is now increasingly informed of obesity-related health risks through education and health promotion programmes but the people at highest risk are those in lower socioeconomic/education levels (8).

In epidemiological studies, BMI is widely used as a proxy for body fatness, and it is also influenced by muscle mass. WC also correlates highly with total body fat and with intra-abdominal fat when the relationship is not overwhelmed by variations in total body fat (35). WC is associated with a range of health consequences including hypertension, diabetes mellitus, coronary heart disease, respiratory disease, musculoskeletal disorders, cancers and premature death (36–39). The initial observations in cross-sectional studies have all been confirmed in longitudinal cohort studies (40–42). WC generally shows less stronger associations with health outcomes than BMI, possibly because it is not influenced by variations in muscle mass. Greater muscle mass is likely to reflect better health and greater physical activity but tends to elevate BMI in certain individuals. The confounding effect of variations in muscle mass on BMI is likely to be particularly important in studies involving ageing where sarcopenia may increasingly influence BMI relationships.

The main strengths of our study are that it is based on a large population-based sample that used uniform methods to assess depressed mood, physical activity and physical function. Methodological limitations inherent to the EMAS study have previously been described in detail (21), although a number of specific factors need to be considered in interpreting the results presented here. The overall response rate for participation in the study was 43%. Those who participated may have differed with respect to symptoms and anthropometric measures from those who did not participate, thus some caution is needed in interpreting the data. The main findings, however, were based on an internal comparison of responders, and therefore any selection factors were unlikely to have had any important effect on these data. The results were obtained from predominantly Caucasian European men and should be extrapolated beyond this setting with care. The findings from this cross-sectional study cannot be assumed to be causal because poor health per se can lead to obesity and central fat accumulation, but a causal relationship is at least very plausible, as supported by the longitudinal studies cited earlier (37, 38). In this study, categorisation of BMI and WC was based on conventional cut-offs used for clinical and health promotion purposes worldwide, as defined by the World Health Organization (43) for BMI (25 and 30 kg/m²) and by the National Cholesterol Education Program (26), as originally proposed by Lean et al. (25) for WC action levels (94 and 102 cm) respectively.

Figure 1 Proportions (numbers in brackets) of men with at least one symptom of impaired physical function (a), and at least one symptom of impaired psychological function (b) and at least one symptom of impaired sexual function (c) in different categories according to the degrees of their adiposity assessed by BMI and by waist circumference. Full colour version of this figure available via http://dx.doi.org/10.1530/EJE-10-1129.
Application of other statistical cut-off levels such as tertiles of BMI and WC was examined and did not change their patterns of relationships with symptoms of impaired QoL. ROC analysis showed that the power of change their patterns of relationships with symptoms of ageing, which indicates that the impact of individual co-morbidities is relatively slight. By using the outcome ‘at least one symptom’ of this analysis has assumed equal importance of all the symptoms. This is unlikely to be true for any individual. It is also possible that certain specific symptoms could dominate the associations described. Men with high indices of adiposity were shown to have exaggerated risk of having composites of two or more symptoms could dominate the associations described. Analysis with adjustments for co-morbidities showed no significant change in the relationships between adiposity and symptoms of ageing, which indicates that the impact of individual co-morbidities is relatively slight. 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and three or more symptoms of impaired functions. It is of interest that indices of adiposity tend to associate more strongly with the ‘physical’ items (e.g. tiredness or worn out) of the psychological domain than the ‘emotional’ items (e.g. loss of interest or change in sleep). The present EMAS data did not show correlations between age and BMI or WC probably because the rates of increases in adiposity are most rapid in younger adults and rather less so up to age 60 years, and also in part, because of reduction in muscle mass from age-related muscle atrophy.

In conclusion, many of the complaints and health problems commonly associated with impaired QoL in older men are accounted for by increased body fat, including those with large waists who are not considered to be ‘obese’ according to BMI. There is a substantial increase in symptoms as people range from BMI <25 to ≥25–30 categories. WC is a more telling physical measure: lower WC appears to be protective against these health complications even in the presence of high BMI. Health promotion should focus on prevention of excess adult fat accumulation, to reduce burdens of ill health, and weight management should focus on improving the impaired QoL of overweight and obese people.

Supplementary data
This is linked to the online version of the paper at http://dx.doi.org/10.1530/EJE-10-1129.

Declaration of interest
The authors declare that there is no conflict of interest that could be perceived as prejudicing the impartiality of the research reported.

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References
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