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Personal factors associated with health-related quality of life in persons with morbid obesity on treatment waiting lists in Norway

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Abstract
Purpose To explore relationships of socio-demographic variables, health behaviours, environmental characteristics and personal factors, with physical and mental health variables in persons with morbid obesity, and to compare their health-related quality of life (HRQoL) scores with scores from the general population.

Methods A cross-sectional correlation study design was used. Data were collected by self-reported questionnaire from adult patients within the first 2 days of commencement of a mandatory educational course. Of 185 course attendees, 142 (76.8%) volunteered to participate in the study. Valid responses on all items were recorded for 128 participants. HRQoL was measured with the Short Form 12v2 from which physical (PCS) and mental component summary (MCS) scores were computed. Other standardized instruments measured regular physical activity, social support, self-esteem, sense of coherence, self-efficacy and coping style.
Results Respondents scored lower on all the HRQoL subdomains compared with norms. Linear regression analyses showed that personal factors that included self-esteem, self-efficacy, sense of coherence and coping style explained 3.6% of the variance in PCS scores and 41.6% in MCS scores.
Conclusion Personal factors such as self-esteem, sense of coherence and a high approaching coping style are strongly related to mental health in obese persons.

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Keywords Obesity · Health-related quality of life · Personal factors · Coping · Self-esteem · Sense of coherence · Patient education

Abbreviations

BACQ	Brief approach/avoiding coping questionnaire
GSE	General perceived self-efficacy scale
HRQoL	Health-related quality of life
MCS	Mental component summary (of SF-12)
PCS	Physical component summary (of SF-12)
RSES	Rosenberg self-esteem scale
SOC	Sense of coherence
SF-12v2	Short Form 12, version 2

Introduction

Obesity is an increasing public health problem in most parts of the world [1]. In the USA, an epidemiological study from 2000 to 2005 showed that persons with morbid obesity (having a body mass index [BMI] of 40 kg/m^2 or greater) is a rapidly growing segment of the obese population [2]. Morbid obesity is a risk factor for chronic illnesses and for co-morbidities such as diabetes, musculoskeletal pain, hypertension, obstructive sleep apnoea, heart disease, stroke and cancer [3–5]. Morbid obesity is also related to lower physiological and psychological well-being, including lower self-esteem [6]. Studies have shown that the severity of obesity is related to the individual's self-reporting of physical health [7] and mental health [7, 8].

In Norway, patients on waiting lists for treatment of their morbid obesity are required to attend a comprehensive patient education course at a Patient Education Resource Centre. This 40-h mandatory course has been developed by health-care professionals in co-operation with previous course participants. The course covers major subjects that include available treatments and their intended and unintended consequences, necessary lifestyle changes, and subsequent changes in mind and body. The course is grounded in cognitive behaviour theory. It emphasizes the participants' work in uncovering hidden resources, strengthening self-concept and social skills and raising consciousness of lifestyle choices. Important methods include developing individual action plans and participating in self-help groups throughout the course and following treatment. The combined educational course and subsequent treatment are assumed to help participants achieve a healthier lifestyle and thereby improve their health-related quality of life (HRQoL).

Wilson and Cleary [9] suggest that in addition to biological and physiological factors, symptoms, and functional status, personal factors and environmental characteristics are related to an individual's overall quality of life. A published review concluded that there is a lack of knowledge regarding the role of personal factors in relation to quality of life among obese individuals [10].

Therefore, the aims of the study were twofold: (1) to explore the relationship between socio-demographic variables, health behaviour (level of physical activity), characteristics of the environment (social support) and personal factors (self-esteem, self-efficacy, sense of coherence and coping style) in relation to physical and mental health at the very beginning of the educational course and (2) to compare HRQoL scores of participants in the mandatory course with norms from the general population.

Methods

This article reports findings from a correlational cross-sectional study. Data were collected by means of questionnaires.

Sampling of participants

Participants were recruited at three different sites on the first or second day of 10 mandatory courses held in the spring of 2009. All 185 participants attending the courses were given verbal and written information about the study and invited to participate in the study. Those who had given their written consent (142) completed the questionnaire in a secluded room on-site and returned it in a sealed envelope. The project representative collected the envelopes.

Measurements

Health-related quality of life (HRQoL)

HRQoL was measured with the Short Form 12, version 2 (SF-12v2), a widely used abbreviated form of the SF-36 [11]. The 12 items assess eight dimensions of HRQoL [12, 13]. The raw scores on the eight dimensions are converted to scales from 0 (lowest QoL) to 100 (highest QoL). Norm-based scoring was computed for all eight dimensions based on the norm-based scoring from the 1998 general US population [12]. A physical component summary (PCS) and a mental component summary (MCS) score were computed [12].

Socio-demographic variables

Data for age (years), sex, marital status (married/cohabitant versus not married/not cohabitant), cohabitating children and employment status were collected. The highest recorded level of a participant's formal education was used as a continuous variable (scored from 1 to 5). Response categories were primary school education (7–9 years), 1 or 2 years of secondary school (10–11 years), three years of secondary school (12 years), lower university (13–15 years) and higher university ($\geq$16 years).

Health behaviour

Level of physical activity was measured by two items on the Norwegian "HUNT-2" survey [14]. Table 1 describes the items, response alternatives and scoring. Items were scored by the current published definition [15]. One

Table 1 The scoring of items measuring self-reported level of activity

Response categories	Hours per week			
	a *No*	*b* *<1*	*c* *1–2*	*d* *≥3*
1. Low-level activity (not sweaty/breathless)	0	1	2	3
2. High-level activity (sweaty/breathless)	0	2	3	4

Question How much physical activity do you have in leisure time? Travel to work is regarded as leisure. State approximately how many hours per week you are physically active. Choose a number of hours that may apply to a typical week last year

missing response on item 1 and eight missing responses on item 2 were interpreted as 'not relevant' and coded as 'none'.

Environmental characteristics

Social support was assessed through respondents' responses to the statement: "I think I have enough support from people with whom I have a close relationship". Responses were recorded on a 5-point Likert-type scale, ranging from 'totally agree' to 'totally disagree'. High scores indicated a 'very satisfied' assessment of the support received.

Personal factors

The Rosenberg Self-Esteem Scale (RSES) [16] was used to assess participants' global self-esteem. Rosenberg [17] proposes the attributes of a person with high self-esteem are: "self-respect, considers himself a person of worth".

The original RSES consists of ten statements with responses ranked from 1 'strongly agree' to 4 'strongly disagree'. Our study used a Norwegian abbreviated 4-item version, selected by linear regression analysis (RSES-4) and showing high correlation ($r = 0.95$) with the full 10-item version [18]. The sum-scores for participants ranged from 4 to 16 with higher scores representing lower self-esteem. The Cronbach's α of 0.81 for this study was close to that of another Norwegian study [19].

The General Perceived Self-Efficacy Scale (GSE) [20] measures optimistic self-belief in coping with the demands of life. It consists of 10 statements that respondents rate on a scale from 1 'completely disagree' to 4 'completely agree'. A GSE score is calculated by summing each individual's scores for the items. Internal consistency was $\alpha = 0.91$.

This study also used the short version of the Sense of Coherence (SOC-13) [21]. The SOC-13 measures coherence, or perceived capacity to cope with difficult situations. Responses are recorded on a 7-point Likert-type scale. The sum score of the SOC-13 ranges from 13 to 91, with a high score indicating a strong sense of coherence. This scale has been reported as a reliable and valid instrument [22]. Cronbach's α-values range from 0.72 to 0.92. Cronbach's α in our study was 0.84.

Coping style was assessed with the Brief Approach/Avoiding Coping Questionnaire (BACQ) [23]. The 12-item BACQ measures the diametrically opposed approach and avoidance styles of coping with challenging situations. Items consist of statements on coping styles and are scored on a 5-point Likert scale from 'disagree completely' to 'agree completely'. The BACQ score is calculated by summing the six avoidance items reversed, and range from 12 (low approach/high avoidance) to 60 (high approach/low avoidance). Internal consistency was $\alpha = 0.62$.

Ethics

The Regional Medical Research Ethics Committee of Norway, the Norwegian Data Inspectorate and the Ombudsman of Oslo University Hospital approved the study. Informed written consent was received from all participants.

Statistical analysis

Data were analysed using SPSS for Windows (version 17.0; SPSS Inc., Chicago, IL). *T*-tests were used to analyse continuous variables. Ordinal and categorical data were analysed using chi-square. Pearson's correlation coefficient (r) was used for correlation analysis. In order to compare participants' scores from the different HRQoL domains, each scale was standardized with scales from a survey of the general US population. A score of 50 corresponded to the mean score and a deviation of 10 corresponded to one standard deviation in relation to the US-derived standard [12]. The 95% CI for the mean scores were calculated.

Two separate stepwise hierarchical linear regression analyses were performed. The participants' PCS scores were included in the first analysis and the MCS scores as dependent variables in the second. The following independent variables were included in the analysis: step (1) *Demographic variables*, age, sex, level of formal education, marital status, living with children, and employment status; step (2) *Health behaviour variables*, physical exercise; step (3) *Environmental characteristics*, social support; and step (4) *Personal factors*, self-esteem, self-efficacy, sense of coherence and coping style. Because all bivariate correlations between variables used in the analysis were $r < 0.7$, we assumed no multi-collinearity of variables. Independent variables with a covariate relationship ($r > 0.15$) to the self-esteem variable were assessed as possible moderators for the relationship between

self-esteem and PCS. Separate linear regression analyses were performed assessing one possible moderator at a time. A similar analysis was performed in order to analyse possible mediators of the relationship between self-efficacy and MCS. Cronbach's α [24] was used to assess the internal consistency of the scales. The level of significance was set at $P < 0.05$. All tests were two-tailed.

Results

Study population and sample

Of the 185 individuals invited to participate in the study, 142 (76.8%) consented. Fourteen participants with missing scores on one or more variables were excluded, leaving a representative sample of 128 participants. There were no differences in the proportion of women ($n = 90$, 70.3%) in the study sample compared with the group of non-participants/excluded participants ($n = 35$, 63.2%, $P = 0.34$). The mean age of the participants in the sample ($M = 42.4$, SD = 10.4) did not differ significantly from that of the study population not included in the sample ($M = 43.9$, SD = 9.6, $P = 0.35$).

Demographic characteristics of the sample

The socio-demographic characteristics of the participants are presented in Table 2. The men who participated were older than the women. No other sex differences were found. Participants and non-participants did not differ in their backgrounds.

The mean scores of the variables in the study in relation to sex are shown in Table 3. Men scored higher on sense of coherence than women ($P = 0.05$, $d = 0.37$). Otherwise, no sex differences were detected on other personal factors, or on PCS or MCS.

The bivariate analyses showed that younger participants, those in paid employment and those with higher levels of physical activity had higher PCS scores than those who were older and not in paid employment (see Table 4).

No relationships between the socio-demographic variables and participants' MCS scores were indicated. High satisfaction with social support from close persons was related to higher MCS scores. Self-esteem, self-efficacy, sense of coherence and coping style did not show a bivariate relationship with the PCS score, while all these variables showed high bivariate correlations with the MCS score. Scores on the PCS was not related to the scores on the MCS ($r = -0.01$).

Results of the linear regression analyses (Table 4) showed that a lower age and being in paid employment were directly related to higher PCS. After controlling for socio-demographic variables, level of physical activity, social support and other personal factors, higher self-esteem was related to higher PCS. The socio-demographic variables (step 1) explained 20.8% of the variance in the PCS, while the whole model explained 27.6% of the variance. Because of the direct relationship between

Table 2 Socio-demographic characteristics of study participants ($n = 128$)

	Study participants				
	All $N = 128$	Men $N = 38$ (29.7%)	Women $N = 90$ (70.3%)	t	P
Age (years) M (SD)	42.4 (10.4)	45.4 (9.4)	41.2 (10.6)	2.12	0.04
	N (%)	N (%)	N (%)	χ (df)	
Level of formal education				3.2 (4)	0.52
7–9 years	24 (16.9)	4 (10.5)	16 (17.8)		
10–11 years	49 (26.5)	17 (44.7)	29 (32.2)		
12 years	23 (12.4)	4 (10.5)	16 (17.8)		
13–15 years	31 (16.8)	8 (21.1)	20 (22.2)		
16 years or more	15 (8.1)	5 (13.2)	9 (10.0)		
Marital status					
Married/cohabitating	73 (51.4)	29 (76.3)	55 (61.1)	2.73 (1)	0.10
Living with children <16 years	84 (65.6)	17 (44.7)	49 (54.4)	1.01 (1)	0.32
Employment status					
Paid work	68 (53.1)	21 (55.3)	47 (52.2)	0.10 (1)	0.75

No statistical significant differences between men and women on any of the variables by Chi square or t-tests analysis

Table 3 Health behaviour, environmental, personal factors and health-related characteristics among men and women in the study ($N = 128$)

Variable groups	Scales	Men ($N = 38$) M (SD)	Women ($N = 90$) M (SD)	P	Effect size d
Health behaviour					
Physical activity	0–4	1.2 (1.0)	1.3 (1.0)	0.32	0.10
Environmental characteristics					
Social support	1–5	2.2 (0.9)	2.0 (1.0)	0.28	0.21
Personal factors					
Self-esteem (RSES-4) (high scores = lower self-esteem)	4–16	10.7 (2.5)	10.2 (2.7)	0.28	0.19
Self-efficacy (GSE)	1–40	27.2 (6.1)	26.3 (6.3)	0.43	0.15
Sense of coherence (SOC)	13–91	56.4 (11.4)	52.2 (11.3)	0.05	0.37
Coping style (BACQ)	12–60	38.1 (6.4)	38.1 (5.9)	0.98	0.00
HRQoL-sub-domains: (high scores = better health)					
Physical functioning	1–100	40.1 (33.7)	40.3 (31.8)	0.98	0.01
Role physical	1–100	46.1 (31.0)	47.5 (31.8)	0.81	0.04
Bodily pain	1–100	49.3 (33.6)	48.3 (34.1)	0.88	0.03
General health	1–100	29.7 (27.5)	32.8 (28.4)	0.58	0.11
Vitality	1–100	22.4 (21.6)	23.3 (23.9)	0.83	0.04
Social functioning	1–100	63.2 (35.7)	61.4 (32.5)	0.79	0.05
Role emotional	1–100	67.4 (26.9)	68.9 (30.3)	0.80	0.03
Mental health	1–100	60.5 (25.3)	59.2 (21.5)	0.76	0.06
HRQoL–component scores					
Physical health	1–100	33.2 (11.8)	33.6 (12.1)	0.85	0.02
Mental health	1–100	45.0 (12.0)	44.8 (12.1)	0.93	0.01

Data are study mean values SD, P values of test of differences between men and women by t-tests and the effect size of the differences by Cohen's d

self-esteem and PCS identified in the regression analysis, this relationship was assessed for possible moderating factors. Self-esteem showed the strongest bivariate relationship with work status ($r = -0.17$, $P = 0.05$), self-efficacy ($r = 0.60$, $P < 0.001$), sense of coherence ($r = 0.65$, $P < 0.001$) and coping style ($r = 0.54$, $P < 0.001$). When the bivariate relationship between self-esteem and PCS ($r = 0.01$) was analysed controlling for other independent variables' relationship with PCS in separate regression analyses, the analyses showed a tendency of higher self esteem (lower scores) $\beta = -0.05$, $P = 0.61$ when controlling for work status, $\beta = -0.14$, $P = 0.22$ when controlling for self-efficacy, $\beta = -0.05$, $P = 0.65$ when controlling for sense of coherence and $\beta = -0.07$, $P = 0.49$ when controlling for coping style, indicating that all these variables had a tendency of moderating the relationship between self-esteem and PCS.

In the second linear regression analysis, low self-esteem, high sense of coherence and a high approach/low avoidance coping strategy showed significant and direct relationships with higher MCS scores. Personal factors (step 4) explained 41.6% of the variance in MCS, while the whole model explained 57.4% of the variance. The relationship between physical activity and MCS and between social support and MCS shown in the bivariate analyses vanished when we controlled for socio-demographic and personal factors. Both regression models shown in Table 4 were tested for the following possible two-way interactions: age and any of the personal factors, sex and any of the personal factors, or in any combinations of the personal factors. The analyses did not reveal any statistically significant two-way interaction effects.

Further, the association between self-efficacy and MCS was assessed for possible mediating factors. The bivariate relationship between self-efficacy with physical exercise was $r = 0.31$, self-esteem $r = 0.60$, sense of coherence $r = 0.52$ and coping style $r = 0.46$ (all $P < 0.001$). When the relationship between self-efficacy and MCS ($r = 0.52$) was further analysed in separate regression models, the analysis showed a weaker relationship when controlling for physical activity ($\beta = 0.31$, $P < 0.001$), self-esteem ($\beta = 0.12$, $P = 0.013$), sense of coherence ($\beta = 0.28$, $P = 0.001$) and coping style ($\beta = 0.29$, $P < 0.001$), indicating that all these variables had a tendency of mediating the relationship between self-efficacy and MCS.

Participants' scorings on the HRQoL sub-domains and the PCS and the MCS scores based on the normal US population are shown in Fig. 1.

Table 4 Univariate relationships (Pearson's *r*) and stepwise multivariate linear regression analysis (standardized beta coefficients) with SF-12 physical component summary (PCS) and mental component summary (MCS) scores as dependent variables ($N = 128$)

Independent variables	PCS			MCS		
	r	*B*	*p*	*r*	*B*	*p*
Step 1. Socio-demographic variables						
Age	−0.32*	−0.23	0.019	−0.16	−0.11	0.12
Sex (male as ref.)	0.02	−0.06	0.45	−0.01	0.04	0.53
Level of education (1–5)	0.05	0.04	0.60	−0.08	−0.09	0.15
Marital status (not married/cohabitating as ref.)	−0.14	−0.17	0.05	−0.01	−0.03	0.64
Living together with children (no as ref.)	0.16	0.08	0.34	−0.02	−0.02	0.83
Work status (paid work as ref.)	−0.31*	−0.28	0.002	−0.12	−0.04	0.56
Explained variance (R^2)		20.8%	<0.001		5.2%	0.37
Step 2. Health behaviour						
Levels of physical activity	0.31*	0.14	0.13	0.27*	0.01	0.88
Explained variance (R^2)		23.8%			10.3%	
Change of variance (R^2 change)		3.0%	0.03		5.1%	0.01
Step 3. Environmental characteristics						
Social support (from close persons)	0.01	0.08	0.36	−0.29*	−0.06	0.36
Explained variance (R^2)		24.0%			15.8%	
Change of variance (R^2 change)		0.2%	0.68		5.5%	0.006
Step 4. Personal factors						
Self-esteem (RSES-4) (high scores = lower self-esteem)	0.01	−0.26	0.04	0.64*	0.28	0.003
Self-efficacy (GSE)	0.16	0.15	0.15	0.52*	0.08	0.31
Sense of coherence	0.06	0.01	0.92	0.60*	0.23	0.016
Coping style (BACQ) (avoidance as ref.)	0.11	0.15	0.21	0.63*	0.26	0.004
Explained variance (R^2)		27.6%			57.4%	
Change of variance (R^2 change)		3.6%	0.23		41.6%	<0.001

* $P < 0.05$

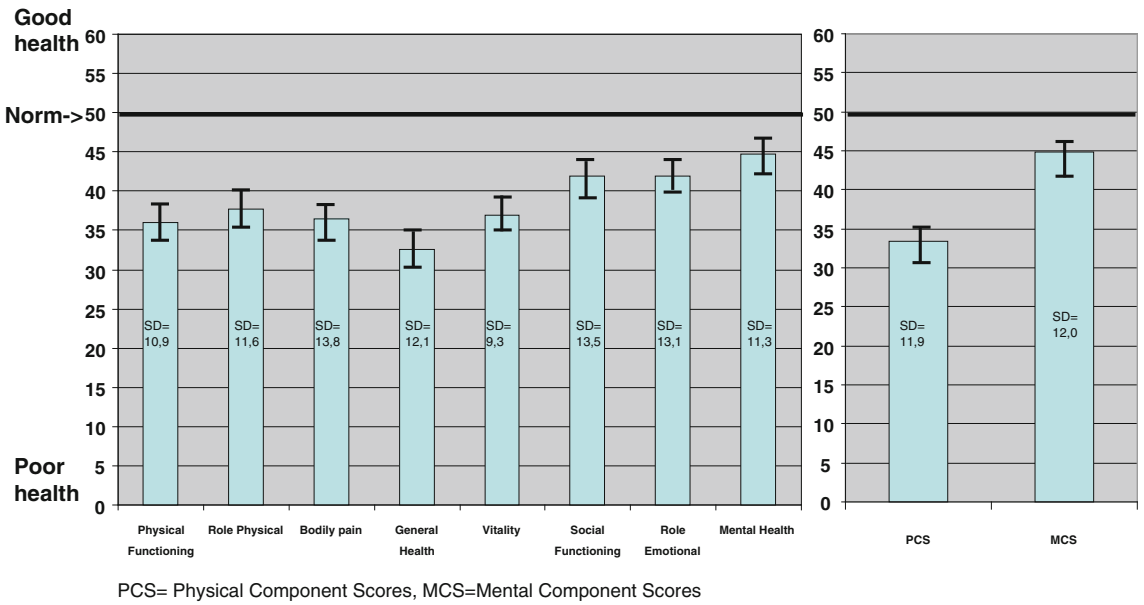

Fig. 1 Norm-based scoring of SF-12-profile (HRQoL) for the participants with obesity (Mean scores, SD and 95% CI, $N = 128$). Scores from the 1988 general US population used as norms: (mean score = 50, SD = 10). *PCS* physical component scores, *MCS* mental component scores

Participants scored lower on all the HRQoL domains and particularly on the general health sub-domain and the PCS.

Discussion

This study showed that personal factors contribute substantially to variations in HRQoL among obese persons, specifically the MCS. Personal factors largely explained variance in MCS scores, in particular self-esteem, sense of coherence, and coping style with relatively large effect sizes [25, 26]. Socio-demographic variables were less important in explaining the variance in MCS than in PCS. Our findings suggest that the factors related to the physical health of obese persons are different from those related to their mental health. Further, they indicate that addressing the personal factors in intervention studies might contribute to improving the mental health of this population.

The stepwise regression analyses revealed a direct relationship between higher self-esteem and higher PCS. After controlling the other variables in the regression model, it also showed that lower self-esteem was directly related to higher MCS. Self-esteem also showed the strongest correlation with PCS and MCS scores of all the independent variables. It is therefore reasonable to propose that persons with good physical health experience higher self-esteem than those with more limitations due to physical health, since less physical limitation may be a reason for experiencing higher self-esteem. However, it is not easy to explain why patients with low self-esteem report better mental health than those with high self-esteem. Previous research has shown that low self-esteem is related to avoidance coping and unhealthy eating behaviour [27]. If this were the case among participants in our study, perhaps the persons with higher self-esteem are in transition to implementing a healthier eating behaviour and therefore reporting a current lower mental health than those who have not started to change their eating behaviour or are using emotional eating to cope with their situation [27]. This hypothesis needs to be explored in future studies. Although there is a considerable body of literature on self-esteem and obesity, self-esteem also often forms a subscale in an obese-specific quality of life instrument [28], the issue of the predictive value of self-esteem on HRQoL in obese persons remains virtually unaddressed. Studies of self-esteem and psychological well-being among obese or overweight persons reveal inconsistent or small associations between weight status and self-esteem [6, 29]. According to Crocker and Wolfe's model of global self-esteem [30], self-esteem in individuals remains quite stable over time. However, momentary judgements of states of self-esteem may fluctuate. Further, Gordijn [31] revealed that individuals who are dissatisfied with their body weight and are in a social context where they believe their appearance is being evaluated tend to activate and apply negative thinking or meta-stereotyping, which results in lowering their self-esteem. Our analyses revealed that all the personal factors assessed in the regression model tended to have a moderating effect on the relationship between self-esteem and PCs and identified self-efficacy as the variable with the strongest moderating effect. This finding may be interpreted as a support to Gordijn's hypothesis as described above, assuming that other personal factors impact on the effect of self-esteem and on the individuals' physical health.

Our respondents completed the questionnaires on the very first or second day of a course, when the conditions may have been perceived as emotionally stressful. Accordingly, the inverse relationship between self-esteem and the MCS in the present study could be interpreted as the influence of situational self-esteem.

The self-efficacy of participants was strongly related to MCS in the bivariate analysis. Contrary to expectations, when controlling for the other variables included in the model, this relationship vanished. However, further analyses showed that this may be explained by mediating variables entered into the multivariate regression analysis, in particular the individuals' level of self-esteem. Self-efficacy is a social cognitive theory concept that represents one's sense of autonomy and mastery of the environment. Unless people believe they can produce desired effects through their actions, they have little incentive to act or to persevere in the face of difficulties [32]. Previous research supports self-efficacy as a theoretical model and a possible mediator in improving lifestyle change for obese persons [33]. However, morbid obesity has a long history of great disappointments in dieting and weight loss [34]. It could be speculated that our participants doubted they could solve their excess weight problems on their own. Furthermore, theoretically self-efficacy is assumed to arise from a sense of self-worth [35–37]. It may be that our participants believed in solutions offered by health care, and thus, self-efficacy was outweighed by other personal factors. The vanished bivariate relationship between self-efficacy and the MCS scores when controlling for other independent variables may indicate that other personal factors are more important than self-efficacy in the HRQoL of these obese persons. The role of the different personal factors in relation to their HRQoL and change in HRQoL over time needs to be studied further in prospective longitudinal studies.

SOC showed a strong bivariate relationship with the MCS, which is consistent with previous reports [38, 39] that sense of coherence is a strong predictor of quality of life. According to estimates of sense of coherence scores

[40, 41], our participants reported a moderate sense of coherence, with significantly higher scores among men compared to women. This finding corresponds to results in a Swedish study [42].

In our study, the participants with an approach coping style reported better mental health than those with an avoidance coping style. Previous studies have suggested that an avoidance coping style is related to unhealthy eating in adolescents [27].

In our study, the variables of lower age, being in paid employment and being physically active explained variation in respondents' PCS. All these relationships showed medium effect sizes [25, 26]. For obese persons, being physically active may be a requirement in some forms of employment. Studies have found obesity to be associated with an increased risk of receiving a disability pension [43], as well as increased risk for occurrence and duration of sick leave [43]. The direction between quality of life and work may be bidirectional, as doing paid work may influence HRQoL positively, and having poor HRQoL may lead to an inability to engage in paid work [44].

An unexpected finding of this study was that there was no difference in HRQoL between men and women. The literature shows lower quality of life reports in women [45, 46]. Our finding of a lower quality of life among participants who are waiting for treatment compared to the general population is consistent with findings from previous studies [47, 48]. The mean PCS and MCS scores of our study participants were quite similar to those reported previously [7, 8, 48] using the Medical Outcomes Study Short Form-36. In particular, the PCS was lower than the US norm, indicating the major impact of obesity on physical health in these persons.

Strengths and limitations

Based on analysis of the socio-demographic characteristics of the non-participants, we found no differences in the study sample in relation to age and proportions of men and women. Other strengths of the study were that we used standardized and validated instruments and that the participants responded by questionnaire which has been found less biased to social desirable responses than other modes such as face-to-face interviews [49]. Since this is a cross-sectional study, we cannot assume any causal relationships among the variables. Furthermore, we do not know the long-term impact of the different personal factors on the participants' HRQoL. This should be explored in a longitudinal study.

Since we recruited participants from the health promotional context of learning centres, we avoided asking them about their experiences of negative symptoms, concomitant diseases and weight at the first data collection time points in order to avoid interfering with the educational programme. However, such factors may be mediators and/or modifiers of the relationship between personal factors and the patients' physical and mental health [7, 8]. A recent study showed that physical and mental illnesses were factors related to the mental HRQoL in persons with obesity [7]. Since the degree of obesity is associated with HRQoL [39], data on the participant's BMI may have explained the contribution of BMI to the variance in HRQoL, as well as other relationships discussed in this study. The relationship between self-esteem and mental health might well be confounded by depression. A recent study examined relationships of weight status on body image and depression in youth and found higher depression scores and lower scores of self-efficacy among obese persons [50]. Further, the 4-item version of RSES has been used in a small number of studies, and no cut off for low or high self-esteem is established, which makes comparisons difficult.

Individuals in the present sample might not be representative of all obese persons. Those who are on the waiting list for treatment for their morbid obesity may be a self-selected sample, especially troubled by their weight, or especially susceptible to developing problems that may result from their excess weight.

Implication for future studies of behavioural change and for patient education

In future studies, there is a need to explore if and to what degree an educational programme can contribute to improved self-esteem, sense of coherence and an approach coping style among morbidly obese persons seeking treatment. We may believe that if these factors [51] are targeted in an educational programme, they might contribute to improvement in HRQoL [52, 53]. The results from this study suggest that providers of educational courses designed for medical and surgery preparation, as well as lifestyle changes in obese persons, should pay attention to the low HRQoL, and take into consideration the body and mind factors of participants in these programmes.

Conclusions

The relationship between older age and low-paid work with lower PCS underscore the importance of early intervention in trying to prevent unemployment and a consequential negative development of PCS.

The finding that personal factors account for 41.6% of the variance of the MCS in contrast with 3.6% of the variance in the PCS enhance our understanding of the

dynamics of quality of life among obese persons. These findings indicate that self-esteem, sense of coherence and coping style are important factors related to HRQoL in obese men and women seeking treatment for morbid obesity. Recognizing this influence of personal factors in HRQoL may enrich clinical research and may be crucial when designing interventions aimed at treatment effectiveness, including educational courses. Further research is needed to examine what other personal factors contribute to quality of life. Long-term data are also needed to study possible changes in personal factors and HRQoL in this population.

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