Psychosocial Predictors of Work Ability in Morbidly Obese Patients: Results of a Cross-Sectional Study in the Context of Bariatric Surgery

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Keywords

Obesity · Work ability · Psychosocial predictors · Bariatric surgery

Abstract

Background: Obesity is associated with a higher risk of work disability and premature early retirement. **Objective:** The aim of this study was to examine psychosocial predictors for work ability prior to surgery. **Methods:** Based on a sample of 197 surgery-seeking obese patients (preoperative body mass index [BMI] above 35 kg/m²) from a German bariatric surgery unit, the present cross-sectional study examined based on standardized self-rating measures whether depressive symptoms, dysfunctional eating behaviors, relationship satisfaction, and life satisfaction have a predictive value for work ability. **Results:** Considerable impairment of work ability was found in 51.8% of morbidly obese participants ($n = 102$). Multiple regression analyses revealed that older age, greater depressive symptoms, and lower life satisfaction were significant predictors of preoperative work ability. BMI, gender, relationship satisfaction, and dysfunctional eating behaviors did not predict work ability. **Conclu-**

sions: Our findings might indicate the use of further psychosocial measures following bariatric surgery to increase work ability.

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Introduction

Obesity is a chronic disease, one that impairs quality of life as well as physical and mental health [1]. Obese people show a high prevalence of additional psychiatric disorders [2, 3]. For, example, anxiety and depression are 3–4 times higher among the obese than normal-weight individuals [4]. Additionally, health-related quality of life is significantly impaired in the obese population with respect to social interaction, psychosocial functioning, and depression [5]. Yet health-related quality of life may improve after bariatric surgery intervention, with effects that can last for >10 years [6]. Following bariatric surgery, 20–51% of patients mentioned positive postoperative changes on relationship satisfaction and functioning indices; only 3–10% mentioned a negative impact [7].

The negative consequences of obesity can also include loss of work ability. Several studies have outlined an association between overweight and the inability to work due to illness [8]. For example, bariatric surgery candidates miss an average of 33 workdays due to illness or injury in the year prior to surgery, compared with only 3 days lost by a typical US worker for the same reason [9]. In a long-term, nationwide US study, Tunceli et al. [10] documented an association between being overweight and reduced employment, as well as self-reported work impairment. Bariatric surgery aims to reduce the risk of work disability and premature early retirement [11]. Work ability is associated with physical and mental health and is therefore compromised among the obese population. Previous studies reported negative effects of high physical workload and obesity on work ability [12, 13]. Several studies investigated not only the psychosocial outcome variables after bariatric surgery, but also looked at their predictive value for work ability in obese subjects. Depression was identified as a strong independent predictor for work ability, while morbid obesity was revealed as a strong predictor of work impairment [14].

Depressive tendencies and quality of life were identified as significant psychosocial predictors for increased labor productivity and reduction of work-related impairment after bariatric surgery [15]. Only a few studies have investigated the work ability of bariatric candidates as a primary outcome, and these have only rarely reported any psychosocial predictors of work ability before and after bariatric surgical intervention [6, 7, 15–17]. Thus, it is still unclear which psychosocial factors can influence or predict work ability prior to bariatric surgery. Characteristics like reduced depressiveness or increased health-related quality of life are increasingly considered as success criteria after bariatric surgery. Further, positive couple relationships can enhance the health and wellbeing of all family members, whereas poor partnerships can increase suffering and negatively affect the health of all concerned [18].

The present study examines whether depressive symptoms, dysfunctional eating behavior, relationship satisfaction, and life satisfaction have predictive value for work ability. The impact of these factors on work ability in bariatric surgery candidates has not been assessed in previous studies to date. The predictive value of further variables such as age, body mass index (BMI), and gender on work ability are also investigated in the present study. We assumed that work ability is low in the obese population. Because mental health has an important impact on work ability, we hypothesized that such mental health

predictors as level of depressive symptoms and of dysfunctional eating behavior would show a negative association with work ability, while social health predictors such as couples' relationship and life satisfaction would demonstrate a positive association. Finally, we hypothesized that the demographic variables age and BMI would show a negative association with work ability.

Materials and Methods

Study Design

The present work is part of an investigation performed according to a longitudinal design within General, Abdominal, and Bariatric Surgery Unit of Herzogin Elisabeth Hospital in Brunswick, Germany. Data were collected between September 2015 and June 2016. The total sample included 200 patients seeking bariatric surgery at the hospital. Patients scheduled for gastric bypass or sleeve gastrectomy were asked to complete several self-report questionnaires during preoperative visits to the surgical department.

All study participants received a comprehensive explanation of the surgery and were given a written informed consent form. Participation was completely voluntary. The study was approved by the Institutional Ethics Committee of the University of Brunswick (M-2015-07). Patients received no compensation for study participation. Inclusion criteria were as follows: age between 18 and 65 years, and preoperative BMI above 35 kg/m² (obesity grade 2 or 3). Exclusion criteria for participating in the assessment were insufficient German language skills, intellectual disability, developmental or learning disorders, a history of prior bariatric surgery, and current substance abuse. Three subjects were excluded because >30% of the answers on their self-report questionnaires were missing. Self-reported sociodemographic variables such as age, sex, weight, height, and marital status are listed in Table 1.

Work ability, depressive symptoms, dysfunctional eating behavior, relationship satisfaction, and life satisfaction were assessed with the following standardized self-report measures. The work ability index (WAI) [19] is a questionnaire to assess work ability in the employed population. It is based on 10 items focusing on individual work ability, workload, and consequences of strain. The total score of the items forms a work ability index, that is, classified into four categories: bad, moderate, good, and very good. The WAI is one of the most-used and best-accepted instruments to measure work ability, as demonstrated by its availability in 21 languages [20]. Radkiewicz and Widerszal-Bazyl [21] found an acceptable internal consistency of Cronbach's $\alpha = 0.72$. Symptoms of depression were assessed with the German version of the 9-item Patient Health Questionnaire-Depression Scale (PHQ-9). Each item is scored from 0 to 3 (not at all, on certain days, on more than half the days, and nearly every day), yielding a total score between 0 and 27. A total score ≥ 10 indicates the presence of a major depressive disorder. Kroenke et al. [22] reported a good internal consistency of Cronbach's $\alpha = 0.86$ to 0.89. Abnormal eating behavior belongs usually to typical characteristics of obese patients. In our study, this was assessed with the screening measure for Detecting Abnormal Eating Behavior (KFzE) [23]. This questionnaire consists of 8 items with a range from 0 (never) to 6 (always). These assess 3 core symptoms (1, uncontrollable urge to eat; 2, thinking of food; 3,

Table 1. Sociodemographic characteristics

	<i>n</i> = 191–197		<i>n</i>	%
	M	SD		
Women			162	82.2
Age, years	44.86	11.44	197	
Marital status				
Single			31	15.7
In relationship			32	16.2
Married			113	57.4
Divorced/widowed			21	10.6
Children			143	73.0
Years of education				
8 or less			7	3.7
9			72	37.5
10			79	41.1
13			8	4.2
17 or more			13	6.8
Professional training			157	82.2
Current professional training			120	62.5
BMI, kg/m ²	47.70	7.45	191	
Psychotherapeutic treatment				
Former			93	47.9
Current			31	15.8

The sample size varies because of missing data. M, mean; SD, standard deviation; *n*, sample size; %, percentile ranks.

feeling of satiety) and 5 symptoms with nonspecific aspects of eating abnormalities. A total score ≥ 25 points to abnormal eating behavior. The KFzE was developed for German clinical populations and showed good psychometric characteristics such as test-retest reliability ($r = 0.92$) and internal consistency values (Cronbach's $\alpha = 0.87$) [23]. The relationship quality was assessed using the well-known Relationship Questionnaire (PFB) [24]. The short form of the PFB (PFB-K) comprises 9 items reflecting the 3 scales: Conflict Behavior, Tenderness, and Communication [25]. Item values are categorized into “never/nearly never,” “infrequently,” “often,” and “very often” with a range from 0 to 3. Additionally, there is an item assessing the global relationship quality (how happy one is with his or her relationship) ranging from 0 to 6. A total score of fewer than 12 points indicates a low relationship quality. Kliem et al. [25] found a good internal consistency value of Cronbach's $\alpha = 0.84$ for the total PFB-K score. The Life Satisfaction Questionnaire^{Modules} (FLZ^M) was used to measure current general life satisfaction [26]. This short measure comprises 8 items with values from 0 (unhappy) to 4 (very happy) and includes aspects such as friends, leisure activities, health, income and financial security, work, living situation, family life and children, relationship, and sexuality. A high score points to high life satisfaction. The internal consistency value turned out to be good (Cronbach's $\alpha = 0.82$) [27].

Data Analysis

Data analyses were performed using the IBM Statistical Package for Social Sciences (IBM SPSS, version 26). A hierarchical multiple regression analysis was calculated to investigate the predictive

value of self-rated depressive complaints, dysfunctional eating behavior, relationship satisfaction, life satisfaction, age, sex, and BMI as indicative of patients' ability to work. An analysis of missing values with SPSS (Missing Value Analysis) investigated the structure of missing data. It showed that up to 22% of the data were missing. The Little MCAR Test found that incomplete information was missing at random ($n = 197$, $\chi^2(5,986) = 612,698$, $p = 0.10$). To compensate for the loss of information, these data were substituted through a multiple imputation method [28]. According to this method, 10 imputed datasets were calculated to estimate the parameters of the missing values and fill them in to complete the dataset. Results are based on this imputed dataset.

Results

Table 2 presents the descriptive statistics of the WAI, PHQ-9, KFzE, PFB-K, and FLZ^M scores. In the present study, internal consistency values varied between 0.76 and 0.85 and are classified as good psychometric characteristics. The mean value of the WAI-Index for all participants was found in the lower fourth (≤ 25 th percentile) indicating poor work ability [29]. More than half ($n = 102$) of the participants were classified as being in this category. The evaluation of PHQ-9 showed no evidence of depressive disorders in 31.5% ($n = 62$), mild symptoms

Table 2. Descriptive data of the self-rating measures

Measures	M	SD	α	Range of values		Skewness
				possible	available	
WAI	26.10	9.30	0.85	7–49	7–48	–0.25
PHQ-9	8.63	5.14	0.85	0–27	0–23	0.59
KFzE	23.07	8.01	0.80	0–48	4–43	–0.13
PFB-K	17.15	5.54	0.84	0–27	4–27	–0.33
FLZ ^M	49.98	13.88	0.76	0–100	21.40–93.58	0.25

M, mean; SD, standard deviation; α , internal consistency coefficient Cronbach's α ; WAI, Work Ability Index; PHQ-9, Patient Health Questionnaire-Depression Scale; KFzE, Measure for Detecting Abnormal Eating Behavior; PFB-K, Short Relationship Satisfaction Questionnaire; FLZ^M, Life Satisfaction Questionnaire^{Modules}. KFzE, PFB-K, and FLZ^M are German abbreviations.

Table 3. Intercorrelation matrix

Measures	WAI	PHQ-9	KFzE	PFB-K	FLZ ^M
WAI	–				
PHQ-9	–0.45**	–			
KFzE	–0.10	0.45**	–		
PFB-K	–0.26**	–0.22*	–0.08	–	
FLZ ^M	–0.54**	–0.43**	–0.17*	0.31**	–

Pearson correlation coefficients * $p < 0.05$, ** $p < 0.01$. WAI, Work Ability Index; PHQ-9, Patient Health Questionnaire-Depression Scale; KFzE, Measure for Detecting Abnormal Eating Behavior; PFB-K, Short Relationship Satisfaction Questionnaire; FLZ^M, Life Satisfaction Questionnaire^{Modules}. KFzE, PFB-K and FLZ^M are German abbreviations.

in 36.5% ($n = 62$), and severe symptoms in 32.0% ($n = 63$) of patients. Seventy-nine participants (40.1%) achieved the cut-off value of the KFzE and were associated with abnormal eating behavior. In terms of relationship satisfaction, 44 participants (22.3%) did not reach the cut-off value of the PFB-K and were classified as unsatisfied with their relationship. The average raw value of 50.05 points of the FLZ^M in the current study corresponds to a percentile rank of 40 of a representative standard sample [27] pointing to less general life satisfaction in the sample of obese patients compared with the general population. The highest Pearson correlation coefficients of WAI was found with FLZ^M and PHQ-9 followed by a smaller correlation coefficient with PFB-K and a very small correlation coefficient with KFzE (see Table 3).

To detect the predictive value of the single items in determining the work ability of patients, a hierarchical multiple regression was performed. In the first block, the demographic variables age, sex, and BMI were taken gradu-

ally into the model as controls, to detect a possible influence on WAI. In the second block, the values of the FLZ^M, KFzE, PHQ-9, and PFB-K were included in the stepwise multiple regression to investigate a possible influence on WAI. Tests of multicollinearity showed a variance inflation factor between 1.00 and 1.26, which is far below the critical value of 10 and so fulfils the statistical condition of no evidence of high multicollinearity of variables among them [30]. Furthermore, there was no evidence for a suppressor effect of any variable in the hierarchical model. Three variables predict the patients' work ability (WAI): age, life satisfaction (FLZ^M), and depressive complaints (PHQ-9). All other variables (sex, BMI, KFzE, and PFB-K) revealed no sufficient variance explanation for the dependent variable "work ability"; thus, these variables were excluded as predictive values. Table 4 summarizes, and Figure 1 visualizes the results of the multiple regression analysis.

Table 4. Hierarchical multiple regression analysis of demographic and self-rating measures variables on work ability

Independent variables	Dependent variable WAI						
	B	B (SE)	β	<i>t</i>	<i>p</i> value	<i>R</i>	model (ΔR^2)
Age, years	-0.25	0.05	-0.31	-5.614	0.000	0.682	
FLZ ^M	0.31	0.04	0.46	7.503	0.000	0.325	
PHQ-9	-0.41	0.11	-0.28	-3.737	0.000	0.652	
							0.46***
Sex			0.048	0.906	0.366		
BMI			-0.073	-1.370	0.172		
KFzE			0.087	1.493	0.137		
PFB-K			0.051	0.912	0.363		

*** $p < 0.001$. B, regression coefficient; B (SE), standard error of regression coefficient; β , standardized prediction value; *t*, test value of prediction value; *p*, significance value; *R*, correlation coefficient; ΔR^2 , corrected R^2 , value for the explained variance of all significant variables together in the hierarchical model; WAI, Work Ability Index; PHQ-9, Patient Health Questionnaire-Depression Scale; KFzE, Measure for Detecting Abnormal Eating Behavior; PFB-K, Short Relationship Satisfaction Questionnaire; FLZ^M, Life Satisfaction Questionnaire^{Modules}. KFzE, PFB-K and FLZ^M are German abbreviations.

Fig. 1. Hierarchical multiple regression analysis of demographic and self-rating measures variables on work ability. Boxes display independent variables; the middle box includes criterion variable. Influences of non-significant variables on criterion variable are marked with dashed arrows and of significant (predictor) variables are marked with solid arrows. B, regression coefficient; β , standardized prediction value; ΔR^2 , corrected R^2 = value for the explained variance of all significant variables together in the hierarchical model. *** $p < 0.001$.

Discussion

The study results point to the predictive effects of age, life satisfaction, and depressive states on the work ability of morbidly obese subjects seeking bariatric surgery.

Other potential predictors such as BMI, sex, dysfunctional eating behavior, and relationship satisfaction showed no significant effects on work ability. These findings are partly in line with the theoretical background. Obese subjects usually suffer from poor physi-

cal, mental, and social health [31]. This leads to lower subjectively experienced life satisfaction and to co-occurring mental disorders [2]. About half of the participants included in the present study had already been in psychotherapeutic treatment because of depressive complaints. Furthermore, 36.5% of them reported a mild level of depressive symptoms, and 32% a severe level. Our findings were consistent with the meta-analysis of Dawes et al. [32], who reported a 23% prevalence rate of any mood disorder among bariatric patients; hence, we found a higher number than the estimated rate of 10% in the general US population [33]. The prevalence rate of depression (19%) was also higher among bariatric patients than in the general US population (8% for depression) [34].

In scoring the WAI, we found that 51.8% of the participants in the present study reached a value that had to be classified as poor. According to a German reference group [29], the mean value of WAI of all participants is in the category of the lowest 15% (≤ 25 percentile). These findings replicate previous investigations showing considerable impairment of work ability in the obese population [35]. In our sample, there is a high association between WAI and depression states. Also, Sockalingam et al. [15] reported a high impact of life satisfaction and depressive states on obese employees' work ability. The authors were able to show that improvements in depression and quality of life were significant predictors of work-related impairment and productivity and concluded that patients who experienced psychiatric distress prior to bariatric surgery had greater employment impairment and worse productivity. As a significant predictor of work ability, older age seems to have a negative effect on obesity and indicates high risk for premature work disability. This finding has also been demonstrated by van den Berg et al. [12] within a systemic literature review. Deficient work ability on the part of the obese leads to increased costs for employers, and reduced productivity in comparison to that of normal-weight workers [36]. Therefore, these obese individuals need to be treated at an early stage of the disease to maintain work ability. A return-to work program has shown small to moderate effects on the work ability of depressive patients [37]; this, too, could be implemented. Overall, there is only a limited body of knowledge in the literature that discusses the relationship between work ability and relationship satisfaction in the obese population. Among these, a French study reported impaired sexual behavior in the obese population [38]. Another study [39] described two large Swedish prospective cohorts with long-term fol-

low-up assessments in which bariatric surgery was associated with increased incidence of divorce and separation, as well as increased incidence of marriage and new relationships; in summary, large changes in relationships at all levels. Against our hypothesis, and in contrast to the predictive value of life satisfaction, our study did not find an association between relationship satisfaction and work ability. Although relationship satisfaction is associated with health and wellbeing [18] and may be seen among the positive changes after bariatric surgery [7], the results of our study point to no significant correlation between relationship satisfaction and work ability. This fact is in line with the well-known work-family conflict investigated early on by Kahn et al. [40], and later postulated by Greenhaus and Beutell [41]. According to this theory, higher work engagement (for example) can increase work ability, but can concurrently decrease relationship satisfaction because of time-based, strain-based, or behavior-based conflicts.

Similar study results might indicate the predictive value of dysfunctional eating behavior on work ability. This association was hypothesized due to the positive changes in eating behavior following bariatric surgery [6, 7, 15, 17]. Yet, no impact of dysfunctional eating behavior on work ability was indicated in our findings, and to date, there is no study reporting any association between the two. To the best of our knowledge, this is the first study of bariatric surgery patients in which work ability predictors were examined in relation to psychosocial and sociodemographic factors. The strength of the present study rests on the inclusion of a homogenous study group of pre-bariatric candidates, along with recommended standardized measures.

There were several limitations that must be taken into consideration. First, we examined individuals seeking bariatric surgery only, and there was no normal-weight group that served as a control. Second, all participants attended a 6-month pre-surgery training program as a health insurance eligibility requirement for bariatric surgery reimbursement. Earlier research has demonstrated that individuals tend to underreport symptoms on diagnostic interviews relative to self-report inventories [42], and it is possible that participants underestimated their mental health symptoms in order to be reimbursed. Hence, our findings should be validated using other recruitment strategies, which may lead to different sample characteristics. Future research could examine both obese and normal-weight employees in terms of depressive complaints and days of incapacity to work, using expert-ratings and occupational health data, respectively. Third,

we used a correlational design to study the relationship between the self-reported work ability and associated characteristics. Inferences of causality are unwarranted; hence, other study designs might complement our cross-sectional study. For example, longitudinal data would better enable the exploration of the causal direction of effects. Finally, all the patients were living in Germany, and whether the results can be generalized to other countries and cultures is unknown. In addition, participation was completely voluntary and not representative of the entire obese population in Germany.

In summary, the results of our study support the thesis of considerable impairment of self-reported work ability in morbidly obese subjects. Furthermore, it was shown that depressive complaints, life satisfaction, and age could predict the level of work ability in this cohort. Against our hypotheses, relationship satisfaction and dysfunctional eating behavior could not predict work ability as well as it could indicate different levels of obesity within the morbidly obese group. The results of the current study lend additional support to the growing body of literature demonstrating the negative impact of morbidly obese subjects on work-related disability. Future studies are needed to clearly identify psychopathological and demographic predictors for work ability in the morbidly obese population in order to respond adequately and at an early stage of the disease.

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Statement of Ethics

All procedures were in accordance with good clinical practice and within the Declaration of Helsinki. Written informed consent was obtained from all patients. The study was approved by the Institutional Ethics Committee of the University of Brunswick (M-2015-07).

Conflict of Interest Statement

The authors declare that they have no conflict of interest.

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Author Contributions

H.K.: concept of study design, data acquisition, drafting of manuscript. V.M.: statistical analysis, drafting of manuscript. K.G.-L. and A.W.: data acquisition, critical revision of manuscript. C.B. and J.M.: concept of study design, critical revision of manuscript. C.K.: concept of study design, statistical analysis, critical revision of manuscript, data postprocessing. We confirm that the final version of this paper was read and approved by all of the authors.

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