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The Impact of Body Weight and Depression on Low Back Pain in a Representative Population Sample

Winfried Häuser, MD,*† Gabriele Schmutzer, PhD,‡ Elmar Brähler, PhD,‡§ Marcus Schiltenwolf, MD,¶ and Anja Hilbert, PhD‡

*Department of Internal Medicine I, Klinikum Saarbrücken, Saarbrücken; †Department of Psychosomatic Medicine, Technische Universität München, München; ‡Department of Medical Psychology and Medical Sociology, Universität Leipzig, Leipzig; §Department of Psychosomatic Medicine and Psychotherapy, Universal Medical Center Mainz, Mainz; ¶Clinic for Orthopaedics and Traumatology, University Hospital of Heidelberg, Heidelberg, Germany

Reprint requests to: Winfried Häuser, MD, Department Internal Medicine 1, Klinikum Saarbrücken gGmbH, Winterberg 1, Saarbrücken D-66119, Germany. Tel: +49-681-9632020; Fax: +49-681-9632022; E-mail: whaeuser@klinikum-saarbruecken.de.

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Abstract

Objective. Low back pain (LBP), obesity, and depression are highly prevalent health conditions. We assessed the relative impact of body weight and depression on different types of LBP in a representative population sample.

Design. This is a cross-sectional study.

Setting and Patients. Two thousand five hundred ten subjects aged 14–90 years were randomly selected from the German general population in 2012.

Measures. Pain sites and duration of pain were assessed by the Widespread Pain Index(WPI), depression by the Beck Depression Inventory Primary Care Questionnaire, disability by the European Organization for Research and Treatment of Cancer questionnaire, and current body mass index (BMI, kg/m^2) by self-reported body weight and height. Widespread pain was defined by ≥7/19 pain sites in the WPI. Hierarchical logistic regression analyses were performed with different types of LBP as the dependent variable, and age, gender, lifetime employment status as a worker, number of pain sites, BMI, and depression as independent variables.

Results. One thousand six hundred eighty-seven (67.1%) of participants reported no pain. Five hundred six (20.2%) reported chronic LBP and 84 (3.3%) reported disabling chronic LBP. Age (odds ratio [OR] 1.05 [95% confidence interval {CI} 1.04–1.06]), BMI (OR 1.08 [95% CI 1.05.–1.11]), and depression (OR 1.38 [95% CI 1.30–1.49]) independently predicted chronic LPB compared with persons without pain. Age (OR 1.07 [95% CI 1.05–1.09]), BMI (OR 1.07 [95% CI 1.03–1.13]), and depression (OR 1.71 [95% CI 1.55–1.88]) independently predicted disabling chronic LPB compared with persons without pain. Age (OR 1.03 [95% CI 1.01–1.05]), widespread pain (OR 5.23 [95% CI 3.04–9.00), and depression (OR 1.34 [95% CI 1.16–1.55]) independently predicted disabling chronic LPB compared with persons with nondisabling chronic LBP.

Conclusion. BMI and depression are modifiable risk indicators for chronic disabling LBP.

Key Words. Back Pain; Depression; Obesity

Introduction

Low back pain (LBP), depression, and obesity are highly prevalent conditions and represent major socioeconomic burdens for the Western societies [1–3]. The relationships between these three conditions gained recently growing attention in epidemiology research and require clarification [4].

The observed point-prevalence rates of LBP in Western countries vary between approximately 5% and 45%, depending largely on the definition of pain and the wording of questions [5]. Most forms of acute LBP (<7 days) are self-limiting. However, up to 10–15% of patients with acute LBP develop chronic relapsing or chronic (>3 months lasting) LBP. Up to 10% of the German population reported disabling chronic LBP in a survey [6]. Recent longitudinal population-based studies raised questions about standard divisions into acute and chronic back pain. A distinction between mild (nondisabling) chronic LBP and severe (disabling) LBP has been suggested [7]. In addition, the concept of chronic LBP as a discrete entity has been challenged by recent population-based and clinical samples-based studies. Chronic LPB might be one pain site of chronic widespread pain (CWP) [8,9]. CWP is associated with higher impairment compared with chronic LBP only [8,9].

Obesity (body mass index [BMI] ≥30.0 kg/m^2) is a prevalent health condition affecting up to 36% of adults in Western industrialized countries associated with a range of physical and mental comorbidities [10]. A systematic review reported a pooled prevalence of depression in general Western population samples of 17% (95% confidence interval [CI] 14–19) [11]. In addition, depression and obesity were frequently found to be associated with each other [12]. Depression [13] and obesity [14,15] were found to be associated with disabling LBP. However, the relative impact of obesity, depression, and widespread pain compared with demographic variables on the different types of LBP (acute, chronic, and chronic disabling LBP) has not been studied in the same population sample to our knowledge.

In this study, we used data from a large sample of the general population. A population-based data set offers the most robust assessment of these associations because clinic-based data sets are subject to selection bias due to treatment-seeking.

Methods

Design and Subjects

A representative sample of the German population was selected with the assistance of a demographic consulting company (USUMA, Berlin, Germany). The random selection was based on multistage sampling. First, 320 sample point regions were randomly drawn from the last political election register, covering rural and urban areas from all regions in Germany. The second stage was a random selection of households using the random route procedure (based on a starting address). The third stage was a random selection of household respondents with the Kish selection grid. The sample was aimed to be representative in terms of age, gender, and education for the German population. The inclusion criteria for the study were age at or above 14 and the ability to read and understand the German language.

All subjects were visited by a study assistant and informed about the investigation. Subjects were presented with self-rating questionnaires. The survey included several questionnaires on somatic and psychological symptoms (health survey) as well as questionnaires on eating behavior, political attitudes, and media use. The assistant waited until the participants answered all questionnaires and offered help if persons did not understand the meaning of questions.

Data collection took place between May and June 2012. A first attempt was made at 4,448 addresses and 2,515 (56.7%) persons participated fully. Reasons for nonparticipation included the following: three unsuccessful attempts to contact the household or selected household member (12.9%), the household or selected household member declined to participate (13.7%), or the household member was on a holiday break (1.1%). Furthermore, 0.5% of the participants were excluded because they were not able to follow the interview because of illness, as well as 3.3% who refused to finish the interview.

Ethics

All participants were informed about the study procedures and signed an informed consent form. Participants were not compensated for their participation. There were no other incentives for participating. The study was approved by the institutional ethics review board of the University of Leipzig (Az 092-12-05032012).

Questionnaires

We assessed current body weight and height, marital status, educational status, current professional status, and family income by a sociodemographic questionnaire. We used a slightly modified social class index that is used in rehabilitation care and surveys in Germany [16].

The Regional Pain Score (RPS) was developed for survey research in rheumatic diseases [17]. Participants were asked for pain in 19 body sites (right and left jaw, right and left shoulder, right and left upper arm, right and left lower arm, right and left hip, right and left upper leg and right and left lower leg; upper back, low back, chest, abdomen, neck) in the last 7 days. Furthermore, participants were asked if the pain was generally present for at least 3 months. We used the validated German version of the regional pain scale [18]. Acute LBP was assumed if participants reported LBP in the last 7 days but did not report that pain was generally present for at least 3 months. Chronic LBP was assumed if participants reported LBP in

the last 7 days and that pain was generally present for at least 3 months. Widespread pain was defined by ≥7/19 pain sites in the Widespread Pain Index (WPI).

Disability was assessed by the validated German version of the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire (EORTC QLQ-C30) Version 3.0 [19,20]. The EORTC QLQ-C30 includes five functioning scales, which cover the dimensions physical functioning (five items), role functioning (two items), emotional functioning (four items), cognitive functioning (six items), and social functioning (two items). In addition, the questionnaire contains a scale for global health status (two items) and symptom scales that are relevant to patients with cancer and other chronic somatic diseases (e.g., pain, nausea, fatigue, dyspnea). For functional and global quality of life scales, higher scores indicate a better level of functioning. For symptom-oriented scales, a higher score indicates more severe symptoms [21]. Data of samples of the general population are available [20,22]. Disability was defined by a response of 2 (medium) or 3 (much) on the scale physical functioning [22]. Disabling LBP was assumed if participants reported LBP in the last 7 days and that pain was generally present for at least 3 months and scored 2 and above on the scale physical functioning of the EORTC QLQ-C30.

The Beck Depression Inventory Primary Care (BDI-PC) version questionnaire captures depression symptoms by seven questions, each with a score of 0–3. A score of 4 to 6 indicates mild, a score of 7 to 9 moderate, and a score of 10–21 severe depression symptoms. The internal consistency of the BDI-PC was high ($\alpha = 0.86$) [23]. A BDI-PC cutoff score of 4 and above yielded the maximum clinical efficiency with both 82% sensitivity and specificity rates related to the mood module from the Primary Care Evaluation of Mental Disorders [24]. We used the validated German version of the BDI-PC [25].

Statistical Analysis

According to our clinical experience, a missing response in the RPS for most patients is in the clinical setting synonymous with no pain site. Therefore, missing data in the RPS were coded with 0. Up to one missing item in the EORTC 30 subscale physical functioning and in the BDI-PC were replaced by the individual mean.

Statistical analyses were conducted with the SPSS 18.0 statistical package (SPSS, Inc., Chicago, IL, USA). Absolute values and percentages were used for descriptive statistics of categorical data and means with standard deviations for descriptive statistics of continuous data. The association between demographic (age, gender, lifetime professional status) and clinical predictor variables (BMI, depression, number of pain sites) with LBP was examined using binary logistic regression; therefore, results are expressed as odds ratio (OR) with 95% CI. We used hierarchical logistic regression analyses to test the relative impact of obesity and depression on the different types of chronic LBP. Specifically, we tested if the impact of obesity on LBP was independent or not from the impact of depression. In addition, we tested if the impact of obesity and depression on the different types of LBP depended on the reference group (e.g., persons with no pain or persons without disabling pain). Male gender was defined as reference category. Lifetime professional status as a worker was defined as dummy variable. We ran one stepwise hierarchical logistic regression analysis each with chronic LBP and chronic disabling LBP as dependent variables. No pain was defined as reference category. Potential demographic predictors were entered in the first block, BMI in the second block, and depression in the third block. We ran one stepwise hierarchical logistic regression analysis with disabling LBP as dependent variable and LBP without disability as reference category, and one stepwise hierarchical logistic regression analysis with chronic LPB as dependent variable and acute LBP as reference category. Potential demographic predictors were entered in the first block, number of pain sites in the second block, BMI in the third block, and depression in the fourth block. We applied Cohen's classification of the effect sizes of R^2 (small 0.01, moderate 0.09, large 0.25) [26] to evaluate the meaning of delta R^2 for each block of the regression analyses. We applied the general rules of thumb that ORs close to 1.0 represent a weak relationship between variables, whereas ORs over 3.0 for positive associations indicate strong relationships [27].

The clinical predictor variables were entered as continuous variables [28]. We performed supplementary regression analyses with dichotomized clinical predictor variables (BMI ≥30 vs <30 kg/m^2, BDI-PC score ≥4 vs <4, and number of pain sites ≥6 vs <6) in order to evaluate the predictive value of obesity and potential depressive disorder.

The calibrative ability of the models was assessed with the Hosmer–Lemeshow test. A nonsignificant Hosmer–Lemeshow test is indicative for a good calibration [26]. The level of significance was set to alpha < 0.05.

Results

Demographic and clinical characteristics of the whole study sample are presented in Table 1. The study population was representative for the German population as to sex ratio, age, and education [29].

One thousand six hundred eighty-seven (67.1%) of participants reported no pain. Ninety-five (5.6%) reported acute LBP (LBP within the last 7 days) and 506 (20.2%) reported chronic LBP, of which 84 (5.0% of the total study population and 16.6% of persons with LBP) reported disabling chronic LBP. Age (OR 1.05 [95% CI 1.04–1.06], BMI (OR 1.08 [95% CI 1.05.–1.11]), and depression (OR 1.38 [95% CI 1.30–1.49]) independently predicted chronic LPB compared with persons without pain. The significant association between age and chronic LBP remained after including BMI and depression into the models. The significant association between age and BMI with chronic LBP remained after including depression into the model.

Table 1 Demographic and clinical data of the population sample (N = 2,510)

Marital Status (N [%])	
Living alone	507 (20.2)
Married/partnership	1,461 (58.2)
Separated/divorced/widowed	542 (21.6)
Educational Status (N [%])	
No school finished	108 (4.3)
Primary school degree	936 (37.3)
Secondary school degree	956 (38.1)
Secondary school degree	956 (38.1)
Lifetime Employment Status (N [%])	
Never worked	44 (1.9)
Worker	664 (28.7)
Employee/civil servant	1,398 (60.5)
Self-employed/freelancer	204 (8.8)
Monthly Family Net Income (€) (N [%])	
<1,250	436 (17.8)
1,250–2,000	751 (30.7)
>2,000	1,259 (51.5)
Social Class Index (N [%])	
Low class	191 (8.4)
Middle class	1,458 (64.5)
Upper class	613 (27.1)
Body Mass Index, kg/m^2 (N [%])	
Underweight (<18)	18 (0.7)
Normal weight (18–24.9)	1,302 (52.5)
Overweight (25–29.9)	931 (37.6)
Obesity class I and II (30–39.9)	215 (8.7)
Obesity class III (≥40)	12 (0.5)
Depression (BDI total score; 0–21); mean (SD)	1.2 (2.1)
Potential depressive disorder (total score ≥ 4); (N [%])	265 (10.6)
Number of Pain Sites (N [%])	
None	1,684 (67.1)
Local pain (1 pain site)	222 (8.8)
Regional pain (2–5 pain sites)	458 (18.2)
Widespread pain (6–19 pain sites)	146 (5.8)

BDI = Beck Depression Inventory; SD = standard deviation.

The explained variance increased from 15% to 18% after including BMI into the model (small effect size) and increased from 18% to 27% (moderate effect size) after including depression into the model (see Table 2). The final model generated by the logistic regression was significant ($\chi^2 = 366$, degrees of freedom [df] = 5; $P < 0.0001$). The level of significance in the Hosmer–Lemeshow test was above the predefined P value of 0.05, thus confirming the adequacy of the model. In the supplementary analysis, age (OR 1.05 [95% CI 1.04–1.06], obesity (OR 1.99 [95% CI 1.36–2.91]), and potential depressive disorder (OR 4.71 [95% CI 3.29–6.71]) independently predicted chronic LPB compared with persons without pain (see Table 3).

Age (OR 1.07 [95% CI 1.05–1.09]), BMI (OR 1.07 [95% CI 1.03–1.13]), and depression (OR 1.71 [95% CI 1.55–1.88]) independently predicted disabling chronic LPB compared with persons without pain. The significant associations between age and disabling chronic LBP remained after including BMI and depression into the models. The significant association between age and BMI with disabling chronic LBP remained after including depression into the model. The explained variance increased from 15% to 18% (small effect size) after including BMI into the model and increased from 18% to 44% (large effect size) after including depression into the model (see Table 4). The final model generated by the logistic regression was significant ($\chi^2 = 238$, df = 5, $P < 0.0001$). The level of significance in the Hosmer–Lemeshow test was above the predefined P value of 0.05, thus confirming the adequacy of the model. In the supplementary analysis, age (OR 1.07 [95% CI 1.05–1.10]) and potential depressive disorder (OR 24.20 [95% CI 13.67–42.77]), but not obesity (OR 2.00 [95% CI 0.94–4.24]), independently predicted chronic LPB compared with persons without pain (see Table 5).

Age (OR 1.03 [95% CI 1.01–1.05]), number of pain sites (OR 1.32 [95% CI 1.23–1.43)]), and depression (OR 1.34 [95% CI 1.16–1.55]) independently predicted disabling chronic LPB compared with persons with nondisabling chronic LBP. BMI did not predict disabling chronic LPB. The significant associations between age and disabling chronic LBP remained after including number of pain sites and depression into the models. The significant associations between age and number of pain sites with disabling chronic LBP remained after including depression into the models. The explained variance increased from 2% to 20% (moderate effect size) after including number of pain sites and to 32% (moderate effect size) after including depression into the models (see Table 6). The final model generated by the logistic regression was significant ($\chi^2 = 119$, df = 6, $P < 0.0001$). The level of significance in the Hosmer–Lemeshow test was above the predefined P value of 0.05, thus confirming the adequacy of the model. In the supplementary analysis, age (OR 1.02 [95% CI 1.00–1.04]), widespread pain (OR 3.86 [95% CI 2.15–6.93]), and potential depressive disorder (OR 3.66 [95% CI 1.52–8.88]) independently predicted chronic LPB compared with persons without pain (see Table 7).

Number of pain sites (OR 1.37 [95% CI 1.20–2.00)]) and depression (OR 1.21 [95% CI 1.05–1.40]), but not age and BMI, independently predicted chronic LPB compared with

Table 2 Stepwise hierarchical logistic regression analyses of biopsychosocial predictors of chronic low back pain (N = 506 persons) (reference category: no pain; N = 1,261 persons)

Dependent Variable Chronic Low Back Pain	Independent Variable	OR	95% CI	ß	*P* Value	Explained Variance Negel-kerkes R^2	Δ R^2
Step 1	Age	1.05	1.04–1.06	0.05	<0.0001	0.150	
	Gender	1.04	0.83–1.29	0.04	0.75		
	Lifetime employment as worker	1.002	0.84–1.19	0.002	0.99		
Step 2	Age	1.05	1.04–1.06	0.05	<0.0001	0.175	0.025
	Gender	1.14	0.91–1.43	0.13	0.26		
	Lifetime employment as worker	1.01	0.85–1.20	0.01	0.92		
	Body mass index	1.09	1.06–1.12	0.09	<0.0001		
Step 3	Age	1.04	1.04–1.05	0.04	<0.0001	0.268	0.093
	Gender	1.06	0.84–1.34	0.06	0.62		
	Lifetime employment as worker	1.08	0.90–1.30	0.08	0.40		
	Body mass index	1.08	1.05–1.12	0.08	<0.0001		
	Depression	1.38	1.30–1.47	0.33	<0.0001		

CI = confidence interval; OR = odds ratio.

persons with acute back pain. The significant association between number of pain sites and chronic LBP remained after including depression into the model. The explained variance increased from 2% to 10% (small effect size) after including number of pain sites and to 13% (small effect size) after including depression into the models (see Table 8). The final model generated by the logistic regression was significant ($\chi^2 = 47$, df = 6, $P < 0.0001$). The level of significance in the Hosmer–Lemeshow test was above the predefined *P* value of 0.05, thus confirming the adequacy of the model. In the supplementary analysis, widespread pain (OR 4.90 [95% CI 1.48–16.25]) and potential depressive disorder (OR 3.66 [95% CI 1.52–8.88]), but not age (OR 1.01 [95% CI 0.99–1.03]), independently predicted chronic LPB compared with persons without pain (see Table 9).

Discussion

Summary of Main Findings

Age, BMI, and depression independently predicted chronic LBP and disabling chronic LBP if compared with persons without pain in a representative German population sample. Age, number of pain sites, and depression, but not BMI, predicted disabling chronic LBP if compared

Table 3 Stepwise hierarchical logistic regression analyses of biopsychosocial predictors of chronic low back pain (N = 495 persons) (reference category: no pain; N = 1,235 persons)

Dependent Variable Chronic Low Back Pain	Independent Variable	OR	95% CI	ß	*P* Value	Explained Variance Negel-kerkes R^2	Δ R^2
Step 1	Age	1.05	1.04–1.06	0.05	<0.0001	0.149	
	Gender	1.03	0.82–1.28	0.03	0.82		
	Low social class index	1.02	0.69–1.49	0.02	0.94		
Step 2	Age	1.05	1.04–1.06	0.05	<0.0001	0.162	0.023
	Gender	1.02	0.82–1.28	0.02	0.83		
	Low social class index	1.00	0.68–1.48	0.004	0.99		
	Obesity	2.23	1.55–3.23	0.80	<0.0001		
Step 3	Age	1.05	1.04–1.06	0.05	<0.0001	0.217	0.045
	Gender	1.00	0.80–1.26	–0.001	0.99		
	Low social class index	0.81	0.55–1.21	–0.21	0.30		
	Obesity	1.99	1.36–2.91	0.69	<0.0001		
	Potential depressive disorder	4.70	3.29–6.71	1.55	<0.0001		

CI = confidence interval; OR = odds ratio.

Table 4 Stepwise hierarchical logistic regression analyses of biopsychosocial predictors of disabling chronic low back pain (N = 84 persons) (reference category: no pain; N = 1,261 persons)

Dependent Variable Chronic Low Back Pain	Independent Variable	OR	95% CI	ß	*P* Value	Explained Variance Negel-kerkes R^2	Δ R^2
Step 1	Age	1.07	1.05–1.09	0.07	<0.0001	0.154	
	Gender	1.16	0.73–1.84	0.15	0.54		
	Lifetime employment as worker	1.05	0.74–1.49	0.05	0.78		
Step 2	Age	1.07	1.05–1.09	0.07	<0.0001	0.177	0.023
	Gender	1.20	0.75–1.92	0.18	0.44		
	Lifetime employment as worker	1.08	0.76–1.53	0.08	0.68		
	Body mass index	1.09	1.04–1.15	0.09	<0.0001		
Step 3	Age	1.07	1.05–1.09	0.07	<0.0001	0.436	0.259
	Gender	1.13	0.65–1.95	0.12	0.67		
	Lifetime employment as worker	1.27	0.85–1.88	0.24	0.25		
	Body mass index	1.07	1.01–1.13	0.07	0.015		
	Depression	1.70	1.54–1.87	0.53	<0.0001		

CI = confidence interval; OR = odds ratio.

with persons with nondisabling chronic LBP. Number of pain sites and depression, but not age and BMI, predicted chronic LBP compared with acute LBP.

Comparison with Other Studies

In the 7,124 adult Germans (34%), one in three experienced back pain during the 7 days prior to being interviewed in the National German Health Survey conducted from October 1997 to March 1999 [30]. The point prevalence of any back pain (excluding neck) in a large German population-based sample with 9,263 respondents was 37%. Nine percent of participants reported disabling LBP [6]. The 1-month period prevalence of all reported spinal pain in a UK sample of general practices with 5,752 persons was 29% (95% CI 27–31%), of which half was chronic, 40% was disabling, and 20% was intense, disabling, and chronic [14]. The rates of chronic (at least 3 months) (20%) and disabling (3%) LBP were lower in our study than in the German and UK sample probably because of the different definitions of chronic LPB and disability.

Our results are in line with one of the previously referenced studies, in which most people with LBP report other pain sites. In the UK sample, 75% of people with back pain also reported pain at other sites [14]. In a Swedish primary care-based sample, 28% of women met the American

Table 5 Stepwise hierarchical logistic regression analyses of biopsychosocial predictors of disabling chronic low back pain (N = 83 persons) (reference category: no pain; N = 1,235 persons)

Dependent Variable Chronic Low Back Pain	Independent Variable	OR	95% CI	ß	*P* Value	Explained Variance Negel-kerkes R^2	Δ R^2
Step 1	Age	1.07	1.05–1.09	0.07	<0.0001	0.164	
	Gender	1.10	0.69–1.76	0.10	0.68		
	Low social class index	1.55	0.82–2.92	0.44	0.17		
Step 2	Age	1.07	1.05–1.09	0.07	<0.0001	0.183	0.019
	Gender	1.09	0.68–1.74	0.08	0.74		
	Low social class index	1.51	0.80–2.86	0.41	0.21		
	Obesity	2.96	1.58–5.54	1.09	0.001		
Step 3	Age	1.07	1.05–1.09	0.07	<0.0001	0.407	0.224
	Gender	0.95	0.55–1.64	–0.05	0.86		
	Low social class index	1.05	0.51–2.19	0.05	0.89		
	Obesity	2.00	0.94–4.24	0.69	0.07		
	Potential depressive disorder	24.20	13.69–42.77	3.19	<0.0001		

CI = confidence interval; OR = odds ratio.

Table 6 Stepwise hierarchical logistic regression analyses of biopsychosocial predictors of disabling chronic low back pain (N = 84 persons) (reference category: low back pain without disability; N = 517 persons)

Dependent Variable Chronic Low Back Pain	Independent Variable	OR	95% CI	ß	*P* Value	Explained Variance Negel-kerkes R^2	Δ R^2
Step 1	Age	1.03	1.01–1.05	0.03	0.002	0.033	
	Gender	1.23	0.77–1.98	0.21	0.39		
	Lifetime employment as worker	1.05	0.73–1.52	0.05	0.79		
Step 2	Age	1.01	0.99–1.03	0.01	0.19	0.199	0.166
	Gender	0.99	0.59–1.65	–0.01	0.96		
	Lifetime employment as worker	1.18	0.80–1.73	0.16	0.40		
	Number of pain sites	1.32	1.22–1.42	0.28	<0.0001		
Step 3	Age	1.01	0.99–1.03	0.01	0.19	0.203	0.004
	Gender	0.99	0.59–1.66	–0.009	0.97		
	Lifetime employment as worker	1.18	0.80–1.73	0.16	0.41		
	Number of pain sites	1.32	1.22–1.42	0.28	<0.0001		
	Body mass index	1.03	0.98–1.08	0.03	0.23		
Step 4	Age	1.01	1.00–1.04	0.02	0.12	0.323	0.120
	Gender	0.96	0.55–1.66	–0.05	0.87		
	Lifetime employment as worker	1.23	0.81–1.86	0.21	0.33		
	Number of pain sites	1.22	1.13–1.32	0.20	<0.0001		
	Body mass index	1.03	0.98–1.08	0.03	0.20		
	Depression	1.37	1.25–1-50	0.31	<0.0001		

CI = confidence interval; OR = odds ratio.

Table 7 Stepwise hierarchical logistic regression analyses of biopsychosocial predictors of disabling chronic low back pain (N = 83 persons) (reference category: low back pain without disability; N = 506 persons)

Dependent Variable Chronic Low Back Pain	Independent Variable	OR	95% CI	ß	*P* Value	Explained Variance Negel-kerkes R^2	Δ R^2
Step 1	Age	1.03	1.01–1.04	0.03	0.005	0.045	
	Gender	1.22	0.76–1.96	0.20	0.41		
	Low social class index	1.72	0.91–3.24	0.54	0.09		
Step 2	Age	1.02	1.00–1.04	0.02	0.05	0.148	0.103
	Gender	1.14	0.69–1.87	0.13	0.62		
	Low social class index	1.31	0.66–2.58	0.27	0.44		
	Widespread pain	5.44	3.17–9.32	1.69	<0.0001		
Step 3	Age	1.02	1.00–1.04	0.02	0.04	0.153	0.005
	Gender	1.13	0.69–1.86	0.12	0.63		
	Low social class index	1.32	0.67–2.62	0.28	0.42		
	Widespread pain	5.23	3.04–9.00	1.65	<0.0001		
	Obesity	1.52	0.79–2.94	0.42	0.21		
Step 4	Age	1.02	1.00–1.04	0.02	0.04	0.281	0.128
	Gender	1.02	0.60–1.74	0.02	0.94		
	Low social class index	0.98	0.47–2.02	–0.03	0.95		
	Widespread pain	3.86	2.15–6.93	1.35	<0.0001		
	Obesity	1.29	0.63–2.64	0.26	0.49		
	Potential depressive disorder	6.72	3.93–11.50	1.91	<0.0001		

CI = confidence interval; OR = odds ratio.

Table 8 Stepwise hierarchical logistic regression analyses of biopsychosocial predictors of chronic low back pain (N = 506 persons) (reference category: acute low back pain; N = 95 persons)

Dependent Variable Chronic Low Back Pain	Independent Variable	OR	95% CI	ß	*P* Value	Explained Variance Negel-kerkes R^2	Δ R^2
Step 1	Age	1.01	1.00–1.03	0.01	0.07	0.017	
	Gender	1.23	0.79–1.93	0.21	0.36		
	Lifetime employment as worker	1.27	0.90–1.80	0.24	0.18		
Step 2	Age	1.00	0.99–1.02	0.003	0.67	0.101	0.084
	Gender	1.06	0.67–1.68	0.06	0.81		
	Lifetime employment as worker	1.38	0.95–1.99	0.32	0.09		
	Number of pain sites	1.37	1.20–1.57	0.32	<0.0001		
Step 3	Age	1.003	0.99–1.02	0.003	0.72	0.107	0.006
	Gender	1.13	0.70–1.80	0.12	0.62		
	Lifetime employment as worker	1.40	0.96–2.02	0.33	0.08		
	Number of pain sites	1.37	1.20–1.58	0.32	<0.0001		
	Body mass index	1.05	0.99–1.11	0.05	0.13		
Step 4	Age	1.00	0.99–1.02	0.003	0.07	0.129	0.022
	Gender	1.13	0.70–1.82	0.12	0.36		
	Lifetime employment as worker	1.41	0.98–2.04	0.35	0.18		
	Number of pain sites	1.29	1.12–1.48	0.25	<0.0001		
	Body mass index	1.05	0.98–1.12	0.05	0.13		
	Depression	1.21	1.05–1.40	0.19	0.009		

CI = confidence interval; OR = odds ratio.

Table 9 Stepwise hierarchical logistic regression analyses of biopsychosocial predictors of chronic low back pain (N = 495 persons) (reference category: acute low back pain; N = 94 persons)

Dependent Variable Chronic Low Back Pain	Independent Variable	OR	95% CI	ß	*P* Value	Explained Variance Negel-kerkes R^2	Δ R^2
Step 1	Age	1.01	1.00–1.03	0.01	0.08	0.012	
	Gender	1.27	0.82–1.98	0.24	0.29		
	Low social class index	0.90	0.44–1.82	–0.11	0.77		
Step 2	Age	1.01	0.99–1.03	0.01	0.21	0.053	0.041
	Gender	1.21	0.78–1.90	0.19	0.40		
	Low social class index	0.75	0.36–1.55	–0.29	0.44		
	Widespread pain	5.97	1.83–19.53	1.79	0.003		
Step 3	Age	1.01	0.99–1.03	0.01	0.22	0.053	0.000
	Gender	1.21	0.77–1.90	0.19	0.40		
	Low social class index	0.75	0.36–1.55	–0.29	0.43		
	Widespread pain	6.03	1.84–19.78	1.80	0.003		
	Obesity	0.90	0.47–1.74	–0.10	0.76		
Step 4	Age	1.01	0.99–1.03	0.01	0.24	0.084	0.031
	Gender	1.19	0.76–1.87	0.17	0.45		
	Low social class index	0.60	0.28–1.26	–0.52	0.18		
	Widespread pain	4.90	1.48–16.25	1.59	0.009		
	Obesity	0.85	0.44–1.65	–0.17	0.63		
	Potential depressive disorder	3.66	1.52–8.81	1.30	0.004		

College of Rheumatology 1990 criteria for widespread pain. When widespread pain was present, patients reported significantly more impaired body functions, more severe activity limitations, and participation restrictions [8]. In a recent population-based German studies with persons with unspecific chronic LBP, back pain was part of CWP in 24.3% of participants and of extreme CWP in 13.9% of participants. Increasing pain extent was significantly associated with higher distress, as reflected by sociodemographic (e.g., lower education, lower social class, and higher application rate for disability pension) and clinical variables (e.g., higher pain intensity, more pain medication, more consultations, higher impairment, and lower quality of life) [9]. In summary, our findings on chronic LBP with and without disability and with and without widespread pain support the demands of previous studies of a new taxonomy of chronic LBP [7,9]. The distinction of these subgroups of chronic LBP pain has been suggested: strict local LBP, LBP as part of a regional pain syndrome (e.g., low back and hip pain), and LBP as part of CWP. Widespread pain can be defined by ≥7/19 pain sites in the WPI or by the application of the American College of Rheumatology 1990 criteria of CWP [31] to a pain diagram [9].

Our findings of an association between age and disabling LBP confirm data of previous cross-sectional studies in Germany [6] and the UK [14].

Consistent with prior research [4], BMI contributed to chronic LBP (compared with persons with no pain). A previous German cross-sectional population survey found an association between acute LBP and body weight [30]. The association between BMI and disabling LBP has previously been described in cross-sectional studies of population samples [14] and twin studies [32] as well as in one prospective study: In a Norwegian population sample, high values of BMI predisposed to chronic LBP 11 years later [33]. In contrast, a Danish study with newly educated female health care workers without prior history of LBP found no association between BMI at baseline but with high physical work load and the development of LBP [34]. This finding provided the rationale to include physical work load as a control variable, however, without predictive value of lifetime employment status as a worker in our representative population survey.

The association of depression with disability in chronic LBP of a cross-sectional sample of US patients recruited from family physicians' offices [13] was confirmed in our general population sample. The World Health Reports detected in cross-sectional studies an association of depressive and anxiety disorders with back/neck pain, which showed a consistent pattern across both developed and developing countries [35]. Therefore, we conclude that the association between depression and disability in chronic LBP is assured.

The impact of BMI and depression on LBP with and without disability compared with persons without pain was independent from one another. Likewise, in a community-based US twin registry cross-sectional study, the association of overweight and obesity with LBP remained significant after adjusting for depression [32]. Our study demonstrated that depression, but not BMI, predicted disabling LBP if the reference category was persons with LPB reporting no disability. In accordance with Young and coworkers [13], it is plausible to assume that depression, but not body weight, contributes to disability perception in chronic LBP. This hypothesis is strengthened by a systematic review of prospective cohort studies in which psychological factors (notably distress, depressive mood, and somatization) were implicated in the transition to chronicity/disability in LBP [36]. Even if body weight and depressed mood predicted chronic LBP independently from a statistical point of view, shared biological factors such as genes [21], chronic inflammatory states [37], and psychological mechanisms such as sedentary lifestyle and psychological stress [38] must be taken into consideration as risk factors of LBP. In addition, longitudinal studies demonstrated that the relationships between LBP and obesity are mutual: The 1958 British birth cohort women with chronic pain gained more weight between ages 23 and 33 than those with no pain. Women who were obese at age 23 years had an elevated risk of subsequent back pain onset (32–33 years) (adjusted OR 1.78), while no significant relationships were found for men [39].

Strengths and Limitations

The strengths of the study are as follows: large representative population sample [29], the use of validated questionnaires, and sufficient power to test a number of predefined demographic and clinical predictors of different types of LBP.

The limitations of the study are as follows: 1) The cross-sectional design of the study does not allow any assumptions of causal relationships between risk indicators and LBP. 2) Some potentially important predictors of LBP, e.g., physical activity [40], job satisfaction [41], and physical work load [33], were not assessed. 3) The RPS does not capture a pain site, which is associated with LBP, namely headache [41]. 4) Our self-report diagnosis of LBP was not as robust as that of a clinical assessment. Furthermore, we could not make a distinction between specific and unspecific LBP. 5) The definition of overweight and obesity was based on self-reported height and weight. Self-report commonly leads to an underestimation of height and weight and, consequently, of prevalence rates of obesity, comorbidities, and mortality [42,43]. Indeed, in this study, as body weight was likely underreported, less overweight and obese persons were identified than suggested by current epidemiological data [44]. 6) The response rate of the survey was 57%, which is satisfactory compared with other large-scale population-based studies in Western Europe and the United States [41]. However, we cannot exclude a selection bias, as very ill persons do not participate in the survey. On the other hand, persons

affected with pain may tend to participate more eagerly than healthy persons [6,41]. Due to German laws of data protection, we have no data available on nonrespondents.

Conclusions

Clinical practice: Patients reporting LBP should be screened by a pain diagram or the WPI for widespread pain [9] and by a screening questionnaire for depression. Widespreadness of pain and depression is associated with additional somatic and psychological symptoms as well as with disability [9,45,46], and may require multicomponent therapy with emphasis on psychological therapy and exercise rather than local therapies (e.g., injections) [47].

Health care policy: As obesity is an independent predictor of LBP, primary prevention of obesity may also contribute to the reduction of the prevalence of chronic LBP [48]. The prevalence of LBP with disability continues to rise into old age. Multicomponent treatments adapted to seniors with disabling LBP should be designed.

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