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Utilization and effectiveness of medical rehabilitation in foreign nationals residing in Germany

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Abstract

In Germany, the proportion of foreign national residents receiving an invalidity pension is higher than that of Germans. Lower utilization and effectiveness of medical rehabilitation are presumed to be the main reasons. We aimed to examine whether differences in utilization and effectiveness of medical rehabilitation between Germans and foreign nationals are attributable to differences in socio-demography, socio-economic background and health status. Utilization of rehabilitation was analyzed for household members aged 18 years or above enrolled in the German Socio-Economic Panel in 2002-2004 (n=19,521). Effectiveness of rehabilitation was defined by the occupational performance at the end of rehabilitation. It was examined by using an 80% random sample of all completed medical rehabilitations in the year 2006 funded by the German Statutory Pension Insurance Scheme (n=634,529). Our study shows that foreign nationals utilize medical rehabilitation less often than Germans (OR=0.68; 95%-CI=0.50;0.91). For those who do, medical rehabilitation is less effective (OR for low occupational performance=1.50; 95%-CI=1.46;1.55). Both findings are only partially attributable to socio-demographic, socio-economic and health characteristics: After adjusting for these factors, ORs for utilization and low occupational performance were 0.66 (95%-CI=0.49;0.90) and 1.20 (95%-CI=1.16;1.24), respectively. It can be concluded that differences in the utilization and effectiveness of medical rehabilitation between Germans and foreign nationals cannot be explained only by socio-economic differences or poorer health before rehabilitation. In addition, factors such as the ability of the rehabilitative care system to accommodate clients with differing expectations, and migrant-specific characteristics such as cultural differences, seem to play a role.

Keywords

Effectiveness, foreign nationals, Germany, migrants, rehabilitation, utilization

Introduction

About 7.3 million people residing in Germany (9% of the total population) have a foreign nationality [1]. They or their parents have migrated to Germany, many as “guest workers”, in the 1950s and 1960s. Foreign nationals differ from Germans in different health aspects, for example because of the more straining jobs many of them held, but also because they face barriers to access in the health care system [2]. The consequences are evident from the higher proportion of foreign nationals receiving an invalidity pension, compared to the proportion of Germans of a similar age [3]. Aside from different working conditions, two explanations have been proposed for this finding. First, utilization of medical rehabilitation – a measure of tertiary prevention aiming to mitigate consequences of disease and disability – is considerably lower in foreign as compared to German nationals [4-7]. Second, those foreign nationals who attend medical rehabilitation do not benefit by this health care intervention in the same way as Germans do: On average, effectiveness of medical rehabilitation is lower for foreign nationals than it is for Germans [8-11].

However, previous results have shortcomings which possibly limit their validity. As regards utilization, the studies either do not adjust for confounding factors such as age differences [6;7], do only use data from particular regions of Germany [4], or restrict their analyses to selected diagnostic groups [5]. Available studies on the effectiveness of rehabilitation face similar limitations. All have small sample sizes, and in some, patients were sampled from one rehabilitation clinic only [6;8;10]. Another study used representative routine data but operationalized the effectiveness of rehabilitation by means of treatment progression [9] which is an indicator prone to social desirability

bias and ceiling effects [12]. In addition, these studies only controlled for a limited set of confounding variables.

Considering the shortcomings of previous research, our study had two objectives. First, we wanted to assess possible differences in utilization and effectiveness of medical rehabilitation between Germans and foreign nationals by using a national sample and representative data as well as a more robust indicator of rehabilitation effectiveness. Second, we aimed to examine whether possible differences in these outcomes are solely attributable to differences in the socio-demography, socio-economic background and health status of the two population groups or whether there are additional determinants that need to be considered.

Methods

We used two different data sources to examine determinants of the utilization and effectiveness of medical rehabilitation.

Utilization of medical rehabilitation

The utilization of medical rehabilitation was analyzed using data from the German Socio-Economic Panel (SOEP). The SOEP is a national longitudinal household survey which was set up in 1984. The initial sample contained approximately 12,000 adults in 6,000 households, among which households headed by a foreign national were oversampled. Later on, several additional samples were added. Wagner et al. provide further information on the SOEP, its data quality and the methods used [13]. In the current analysis, we included household members aged 18 years or above who took part in the survey during the years 2002 and 2004 (n=19,521). Choosing a three-

year study period was necessary in order to use information on the utilization of medical rehabilitation in the year before the survey (i.e. 2003) as well as to consider potentially influencing variables prior to rehabilitation (i.e. 2002). Our outcome measure was the utilization of medical rehabilitation in the year 2003.

Socio-demographic and socio-economic status (SES) was assessed by *age* (in years), *sex* as well as educational, professional and income status. *Educational status* was measured by the Comparative Analyses of Social Mobility in Industrial Nations (CASMIN) classification [14] and categorized as “high”, “intermediate”, “low”, “still in school” and “not specified”. The International Standard Classification of Occupations from 1988 (ISCO-88) [15] was used to measure *professional status*, categorized as “white collar”, “blue collar” and “not applicable”. Members of armed forces were coded as not applicable and not included in the analysis. *Income status* was defined as the annual net equivalence income (adjusted for the rental value of owner occupied housing) according to the modified OECD-scale [16]. Missing values for income status had been imputed by the SOEP Study Group prior to the data release [17]. For analysis, we log-transformed the income variable in order to obtain a normal distribution. Self-rated health (based on a five-point Likert scale ranging from “very good” to “bad” following the example of the SF-36 Health Survey questionnaire [18]) was used as a measure of *health status* and was dichotomized for analysis into “good” (comprising the categories “very good”, “good” and “satisfactory” health) and “poor” health (comprising the categories “poor” and “bad” health).

Effectiveness of medical rehabilitation

In order to examine effectiveness of medical rehabilitation, we used a dataset provided by the *German Statutory Pension Insurance Scheme* (Deutsche Rentenversicherung) which accounts for about two-thirds of all medical rehabilitations provided in Germany [19] and is considered highly valid [20]. The dataset contained information on all individuals (n=794,163) who completed medical rehabilitation in the year 2006 granted by this insurer (pensioners and insurees not participating in the labor market are usually not provided with rehabilitation services from this insurance scheme). For reasons of data protection, an 80% random sample of this dataset has been made available for analysis (n=634,529). Aside from a comparison of German and foreign nationals, the data allowed to stratify foreign nationality by different countries of origin, comprising Turkey, Former Yugoslavia and the Mediterranean countries Portugal, Spain, Italy and Greece. The assessment of the outcome variable *rehabilitation effectiveness* was based on a medical judgment regarding the occupational performance at the time the rehabilitation was completed. This judgment tells about the average number of hours per day the patient is able to work in his or her former occupation. It is documented using a categorical three-point scale: full performance (≥ 6 hours/day), medium performance (3 to < 6 hours/day), low performance (< 3 hours/day). The judgment is part of a medical discharge summary that is issued by a physician for each patient who completes medical rehabilitation [21].

The variables used to assess socio-demography, socio-economic (SES) and health status differed from those available in the SOEP dataset. Information on *age* (in years), *sex*, *marital status* (single, married, divorced/widowed), *employment status* (full-time, part-time, unemployed, not applicable), *occupational position* (skilled

labor, semi-skilled/unskilled labor, trainee/unemployed) and *type of occupation* (15 types using the Blossfeld classification [22]: e.g. agricultural occupation, engineering) were used to operationalize socio-demographic characteristics and SES. ICD-10 major *diagnostic categories* and *time absent from work due to illness in the last 12 months* (0 months, <3 months, 3 to <6 months, \geq 6 months, not employed) were used to account for differences in health status. There were no missing values within the data.

Statistical analysis

The datasets on utilization and effectiveness of medical rehabilitation were analyzed separately using similar approaches. First, for both datasets, descriptive statistics stratified by nationality were calculated. Second, block-wise logistic regression was used to analyze the relationship between nationality (exposition) and the utilization as well as the effectiveness of medical rehabilitation (outcomes). Model 1 presents the crude relationship between the exposition and the outcome. In a second block, socio-demographic and SES variables were entered into the model as potential confounding variables, resulting in model 2. In a third block, in addition to socio-demographic/SES variables, health variables were included to control for differences in health before rehabilitation, resulting in model 3. For all models, odds ratios (OR) and 95% confidence intervals (95%-CI) are provided. We applied the *Hosmer-Lemeshow goodness-of-fit test* as a measure of model calibration, comparing predicted and observed probabilities for each of the two outcomes. As a measure of discrimination, i.e. in order to test how well the two models distinguish between the two outcome groups, we assessed the *area under the receiver operator characteristic curve (c-statistic)* [23]. All analyses were performed using SPSS Statistics 17 [24].

Results

Utilization of medical rehabilitation

Regarding utilization of medical rehabilitation, data for 19,521 SOEP household members aged 18 years or above was available. Of these, 7.4% had a foreign nationality. Tab. 1 shows the characteristics of the study sample stratified by nationality. Of the 19,521 respondents, 896 (4.6%) had used medical rehabilitation in the year 2003. The rate of utilization was 3.2% for foreign nationals as compared to 4.7% for German nationals. Furthermore, foreign nationals were on average about 5 years younger than Germans and overall had a lower social status. For instance, their average net equivalence income was €17,665 whereas it was €22,685 for German nationals. In terms of health status, 18.7% of foreign nationals rated their health as poor, while only 15.2% of the German nationals did so.

Tab. 2 shows the results of the block-wise logistic regression model with utilization of medical rehabilitation in 2003 as the dependent variable. In the crude model (model 1), the chance of using medical rehabilitation is decreased by 32% in foreign as compared to German nationals (OR=0.68). After adjusting for age, sex, education, profession and income, the chance slightly changes to 30% (OR=0.70) (model 2). Aside from foreign nationality, significant effects can be identified for age (OR=1.02) as well as for being a blue collar worker (OR=1.46). Including self-rated health in addition to the variables in model 2, reduces the odds ratio for foreign nationality to 0.66 (model 3). In model 3, age (OR=1.02), being a blue collar worker (OR=1.47),

and poor self-rated health (OR=2.76) are significantly associated with the utilization of medical rehabilitation.

Effectiveness of rehabilitation

Information on 634,529 subjects was available who completed medical rehabilitation funded by the German Statutory Pension Insurance Scheme in 2006. Of these, 5.5% held a foreign nationality. Tab. 3 summarizes their socio-demographic, SES and health characteristics stratified by nationality. The proportion of rehabilitation clients with a lower occupational position (semi-skilled and unskilled labor) as well as of those without employment is higher among foreign nationals than among Germans. Also, the distribution of underlying diseases that led to rehabilitation differs between the two populations. The proportion of mental diseases as well as diseases of the skeletal system is higher, while the proportion of neoplasms is considerably lower in foreign as compared to German nationals. Tab. 3 also shows that foreign nationals undergoing rehabilitation are quite heterogeneous since values of many independent variables differ between the nationalities included.

Effectiveness of medical rehabilitation as measured by the degree of occupational performance at the time the rehabilitation was completed is lower in foreign than in German nationals: 78.9% of all German patients who completed medical rehabilitation were judged by physicians as being fully able to work in the position they had occupied prior to rehabilitation. This proportion was considerably lower in foreign nationals (70.1%) and lowest for the subgroup of rehabilitation clients from Former Yugoslavia (66.3%). Correspondingly, the proportion of low and medium occupational performance was higher in all foreign national groups than in Germans.

Tab. 4 shows the results of the logistic regression model with low occupational performance as the outcome variable. Patients of all foreign nationalities, as compared to Germans, have a 1.3 to 1.8 higher chance of completing medical rehabilitation with less favorable results. The strength of this association is reduced in all groups when socio-demographic/SES and health variables are adjusted for. In all foreign nationality strata, the chance of completing medical rehabilitation with less favorable results is higher for men than women, for persons working in semi-skilled/unskilled positions and for persons working in part-time employment. Also, it increases with longer absence from work in the last 12 months. However, except for patients originating from Portugal/Spain/Italy/Greece, the effects of foreign nationality are still significant, ranging from OR=1.2 for Turks and 1.5 for rehabilitation clients from Former Yugoslavia.

The logistic model for utilization had a borderline acceptable discrimination between the outcomes groups. For the second and third model, the c-statistic was 0.61 and 0.66 respectively (Tab. 2). It was higher for the model on rehabilitation effectiveness (0.71 and 0.80 for the second and third model in each nationality stratum), suggesting an acceptable to excellent discrimination (Tab. 4). As regards model calibration, the observed and expected probabilities showed only slight differences in the full models on utilization and effectiveness of rehabilitation, indicating a sufficient model fit (the significant Hosmer-Lemeshow test statistic in the models on rehabilitation effectiveness is most likely the result of overpowering given the very large sample size – a well known limitation of this goodness-of-fit test [25]).

Discussion

Migrants frequently have poorer health outcomes than the majority population of the host country. A pertinent question in migrant research is to what degree barriers in the health care system are contributing to this health inequality. In particular, health services research needs to establish whether migrants utilize existing services according to their health needs, and whether outcomes are equal to those of non-migrant patients.

In this study, we analyzed the utilization and effectiveness of medical rehabilitation in foreign nationals living in Germany. Using national level and representative data, we confirmed the results of previous, smaller studies showing that both the utilization [4;5;9] as well as the effectiveness of medical rehabilitation [8;9;11] is lower in foreign as compared to German nationals. A new finding of our study is that these differences are only in part attributable to a different distribution of socio-demographic and socio-economic variables, and of health status before rehabilitation, between the two population groups. In addition, we showed that rehabilitation effectiveness does not only differ between Germans and foreign nationals but also among foreign nationals themselves. Our study indicates that the way rehabilitation services are organized plays a role in this difference; most likely, there is a mismatch between existing services and the needs of migrants.

Interpretation of result

The inclusion of variables on socio-demographic status/SES and health status in the regression model reduced the difference in the effectiveness of medical rehabilitation as defined by occupational performance between foreign and German nationals. However, the difference remained significant for all foreign national groups except for rehabilitation clients from Portugal/Spain/Italy/Greece. This finding is in line with results from other studies. Maier et al. [9] compared rehabilitative treatment outcomes between Turkish and non-Turkish migrants undergoing medical rehabilitation in North Rhine-Westphalia, Germany, and found that Turkish migrants diagnosed with skeletal or mental disorders have a higher chance of completing the program without any substantial improvement in their medical condition. Odds ratios, adjusted for age, sex and occupation, were 2.1 and 1.8, respectively. No differences were found among patients with diseases of the circulatory system. We can confirm these results using a more robust indicator of rehabilitation effectiveness and data that is representative for Germany. We also show that the difference between foreign nationals and Germans is substantially reduced when additional confounders are taken into consideration.

Our study indicates that socio-demographic/SES and health variables do not fully explain the association between foreign nationality and utilization and effectiveness of rehabilitation, respectively. This can have two reasons. First, although we included variables in the model allowing to control for confounding by socio-demographic/SES and health factors, residual confounding by these factors cannot be ruled out. This might in particular be the case for the analysis of rehabilitation effectiveness because no information on the level of education and health status or disease severity prior to rehabilitation was available. Since many migrants experience barriers to rehabilitative services, those migrants utilizing rehabilitation despite these barriers might have a

higher objective need and suffer from more severe conditions than non-migrants. Consequently, their likelihood for less favorable outcomes and reduced effectiveness of rehabilitation might be higher. We tried to account for this distortion by controlling for different disease patterns and time absent from work.

Second, the results could indicate that factors related to the rehabilitative care system, as well as migrant-specific characteristics that go beyond differences in education, age, occupation and health patterns, may play a role. Particularly, this may be true for the utilization of rehabilitation, since the effect of foreign nationality did not decrease when socio-demographic/SES and health variables were accounted for in the respective multivariate model. For both utilization and effectiveness of rehabilitation, this assumption is supported by previous research. In a qualitative study using focus group discussions and expert interviews with patients, caregivers and decision makers within the rehabilitative care system, our group identified different obstacles to access and effectiveness of medical rehabilitation for migrants residing in Germany [26]. Among others, these obstacles comprise cultural differences, communication problems and a disadvantageous attitude of rehabilitative care institutions towards the diversity of migrants' subjective and objective needs [26]. Other studies showed that the expectations of patients attending rehabilitative care, their motivation, as well as their desire for early retirement, may influence outcomes of rehabilitation [10;27]. A strong desire for early retirement may reduce the motivation of individuals to complete rehabilitation services successfully since early retirement in Germany cannot be granted for persons unless their potential for rehabilitation is fully exhausted (the so-called principle of "rehabilitation before retirement" [*Reha vor Rente*]),

Strengths and limitations of the study

The strengths of our study are the use of a national sample and of representative routine data to examine utilization and effectiveness of medical rehabilitation. Unlike other studies, we were able to control for different confounding variables that may disguise differences in these outcomes between Germans and foreign nationals. Also, for the analysis of rehabilitation effectiveness, we were able to stratify for different countries of origin.

Our study also has weaknesses. As regards the analysis of utilization, it was not possible to consider heterogeneity in countries of origin, levels of acculturation and German language proficiency. Also, differences in utilization of medical rehabilitation between Germans and foreign nationals as well as among foreign nationals themselves may depend on the kind of treatment and may differ between in-patient and out-patient care. Furthermore, the possible role of the funding institution (statutory health insurance, pension fund or accident insurance) on the utilization of rehabilitation among foreign nationals could not be taken into account. As for the analysis of rehabilitation effectiveness, the level of education as an important SES factor is missing in our analysis. Finally, foreign nationality is not equivalent to migrant status – but it is the best proxy available in the large datasets of the funders of rehabilitation in Germany. In the SOEP dataset, where it was possible to compare populations with migration background by nationality or country of origin, no relevant differences were found (data not shown).

Conclusion

Our study showed that foreign nationals living in Germany utilize medical rehabilitation less often than Germans, in spite of a higher expected need. For those who do, medical rehabilitation is less effective. Both findings are only partially attributable to differences between the two groups in socio-demographic variables, socio-economic status, and health status before undergoing rehabilitation. Our study supports suggestions of qualitative research indicating that both factors related to the rehabilitative care system and migrant-specific characteristics could influence differences in the utilization and effectiveness of medical rehabilitation between Germans and foreign nationals. Also, it gives evidence of the heterogeneity of foreign nationals. Together, these findings highlight the increasing need to consider diversity management that allows to address heterogeneity in subjective and objective needs an integral part of medical rehabilitation in Germany.

Conflict of interests

This study was part of a project funded by the German Federal Ministry for Labor and Social Affairs (BMAS). The Ministry had no role in analyzing the data, interpreting the results and drawing the conclusions.

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Tables

Tab. 1: Study sample used to analyze the utilization of medical rehabilitation (sample of all household members aged 18 years or above living in Germany, German Socio-Economic Panel Study, wave 2002-2004, n=19,521).

	Total (n=19,521)		Germans (n=18,068)		Foreign nationals (n=1,453)	
<i>Age in years (mean; SD)</i>	48.3 (16.4)		48.7 (16.5)		43.9 (14.8)	
<i>Gender (n, %)</i>						
Male	9,345	47.9	8,632	47.8	713	49.1
Female	10,176	52.1	9,436	52.2	740	50.9
<i>Education (n, %)</i>						
High	3,944	20.2	3,792	21.0	152	10.5
Intermediate	7,208	36.9	6,922	38.3	286	19.7
Low	7,854	40.2	6,926	38.3	928	63.9
Still in school	67	0.3	63	0.3	4	0.3
Missing*	448	2.3	365	2.0	83	5.7
<i>Profession (n, %)</i>						
White collar	7,945	40.7	7,606	42.1	339	23.3
Blue collar	3,424	17.5	2,925	16.2	499	34.3
Not applicable**	8,152	41.8	7,537	41.7	615	42.3
<i>Net equivalence income in Euro (mean; SD)</i>	22,311 (19,740)		22,685 (19,879)		17,665 (17,267)	
<i>Self-rated health (n, %)</i>						
Good	16,470	84.4	15,290	84.6	1180	81.2
Poor	3,026	15.5	2755	15.2	271	18.7
Missing*	25	0.1	23	0.1	2	0.1
<i>Use of medical rehabilitation (n, %)</i>						
Yes	896	4.6	849	4.7	47	3.2
No	18,518	94.9	17,118	94.7	1,400	96.4
Missing*	107	0.6	101	0.6	6	0.4

Note. SD: standard deviation. *All missing values are due to respondents not specifying the item. **Including 42 members of armed forces.

Tab. 2: Logistic regression models with use of medical rehabilitation in 2003 as dependent variable (sample of all household members aged 18 years or above living in Germany, German Socio-Economic Panel Study, wave 2002-2004, n=19,521).

	Model 1: Crude	Model 2: Adjusted for socio- demographic and SES variables	Model 3: Adjusted for socio- demographic, SES and health variables
	OR [95%-CI]	OR [95%-CI]	OR [95%-CI]
Nationality (Ref.: German)	0.68 [0.51; 0.92]	0.70 [0.52; 0.95]	0.66 [0.49; 0.90]
Sex (Ref.: Male)		1.12 [0.97; 1.29]	1.15 [1.00; 1.32]
Age		1.02 [1.02; 1.03]	1.02 [1.01; 1.02]
Education (Ref.: High)			
Intermediate		1.06 [0.87; 1.31]	1.03 [0.83; 1.26]
Low		0.99 [0.80; 1.22]	0.90 [0.73; 1.11]
Still in School		0.67 [0.09; 4.92]	0.68 [0.09; 4.97]
Not specified		1.04 [0.63; 1.74]	1.01 [0.60; 1.69]
Profession (Ref.: White collar)			
Blue collar		1.46 [1.17; 1.81]	1.47 [1.18; 1.83]
Not applicable		1.09 [0.90; 1.32]	1.00 [0.82; 1.21]
Net equivalence income (log.)		0.90 [0.78; 1.03]	0.95 [0.83; 1.10]
Self-rated health (Ref.: Good)			2.76 [2.37; 3.22]
N	19,346	19,346	19,346
c-statistic		0.61	0.66
Hosmer-Lemeshow goodness- of-fit test (p-value)		<0.05	0.59

Note. SES: socio-economic status; OR: odds ratio; CI: confidence interval; Ref.: reference category.

Tab. 3: Study sample used to analyze the effectiveness of medical rehabilitation (80% random sample of all individuals who completed medical rehabilitation in the year 2006 granted by the German Statutory Pension Insurance Scheme, n=634,529).

	Total		Germans		Foreign nationals									
	n=634,529		N=603,352		<i>All</i> n=31,177		<i>Turkey</i> n=8,854		<i>Former Yugoslavia</i> n=7,327		<i>P/E/I/GR</i> n=6,211		<i>Other</i> n=8,785	
<i>Age in years (mean; SD)</i>	48.6; 13.8		48.8; 14.2		48.2; 10.5		45.4; 11.0		51.6; 9.5		50.0; 10.1		47.8; 10.8	
<i>Sex (n, %)</i>														
Male	328,926	51.8	309,418	51.3	19,508	62.6	5,596	63.2	4,092	55.8	4,144	66.7	5,676	64.6
Female	305,603	48.2	293,934	48.7	11,669	37.4	3,258	36.8	3,235	44.2	2,067	33.3	3,109	35.4
<i>Marriage status (n, %)</i>														
Single	111,799	17.6	108,590	18.0	3,209	10.3	800	9.0	510	7.0	737	11.9	1,162	13.2
Married	389,350	61.4	365,328	60.5	24,022	77.1	7,126	80.5	5,893	80.4	4,801	77.3	6,202	70.6
Divorced/widowed	133,380	21.0	129,434	21.5	3,946	12.7	928	10.5	924	12.6	673	10.8	1,421	16.2
<i>Occupational position (n, %)</i>														
Skilled	364,369	57.4	352,649	58.4	11,720	37.6	2,705	30.6	2,774	37.9	2,297	37.0	3,944	44.9
Semi-skilled/unskilled	110,553	17.4	94,443	15.7	16,110	51.7	5,118	57.8	3,893	53.1	3,295	53.1	3,804	43.3
Trainee/not employed	159,607	25.2	156,260	25.9	3,347	10.7	1,031	11.6	660	9.0	619	10.0	1,037	11.8
<i>Employment status (n, %)</i>														
Full-time	331,074	52.2	310,252	51.4	20,822	66.8	5,686	64.2	5,152	70.3	4,452	71.7	5,532	63.0
Part-time	72,863	11.5	70,649	11.7	2,214	7.1	504	5.7	602	8.2	433	7.0	675	7.7
Unemployed	63,468	10.0	59,257	9.8	4,211	13.5	1,442	16.3	789	10.8	618	10.0	1,362	15.5
Other	167,124	26.3	163,194	27.0	3,930	12.6	1,222	13.8	784	10.7	708	11.4	1,216	13.8

Diagnosis at rehabilitation entry (n, %)

Skeletal system	250,064	39.4	235,658	39.1	14,406	46.2	3,812	43.1	3,778	51.6	3,018	48.6	3,798	43.2
Circulatory system	56,221	8.9	52,665	8.7	3,556	11.4	961	10.9	754	10.3	720	11.6	1,121	12.8
Endocrine, nutritional and metabolic	26,889	4.2	25,757	4.3	1,132	3.6	359	4.1	198	2.7	271	4.4	304	3.5
Respiratory system	24,896	3.9	24,091	4.0	805	2.6	224	2.5	150	2.0	162	2.6	269	3.1
Neoplasms	120,767	19.0	117,667	19.5	3,100	9.9	626	7.1	757	10.3	690	11.1	1,027	11.7
Genitourinary system	2,614	0.4	2,532	0.4	82	0.3	17	0.2	22	0.3	10	0.2	33	0.4
Nervous system	19,113	3.0	18,621	3.1	492	1.6	128	1.4	117	1.6	97	1.6	150	1.7
Skin and subcutaneous tissue	8,676	1.4	8,504	1.4	172	0.6	43	0.5	31	0.4	33	0.5	65	0.7
Alcohol, drugs	34,573	5.4	32,984	5.5	1,589	5.1	470	5.3	177	2.4	243	3.9	699	8.0
Mental disorders (without drugs)	72,335	11.4	67,830	11.2	4,505	14.4	1,876	21.2	1,061	14.5	711	11.4	857	9.8
Other	18,381	2.9	17,043	2.8	1,338	4.3	338	3.8	282	3.8	256	4.1	462	5.3

*Time absent from work in the last 12 months (n, %)**

None	116,035	22.5	110,745	22.7	5,290	18.5	1,583	19.7	1,041	15.4	959	16.8	1,707	21.3
<3 months	250,711	48.5	238,373	48.8	12,338	43.2	2,865	35.7	3,067	45.3	2,630	46.1	3,776	47.0
3-6 months	70,884	13.7	65,916	13.5	4,968	17.4	1,535	19.1	1,266	18.7	1,027	18.0	1,140	14.2
6+ months	79,133	15.3	73,201	15.0	5,932	20.8	2,041	25.4	1,400	20.7	1,087	19.1	1,404	17.5

*Occupational performance (n, %)**

Full (6+ hours/day)	407,048	78.3	386,250	78.8	20,798	70.6	5,791	69.2	4,667	66.3	4,274	72.8	6,066	74.0
Medium (3 to 6 hours/day)	30,559	5.9	28,249	5.8	2,310	7.8	660	7.9	604	8.6	447	7.6	599	7.3
Low (<3 hours/day)	82,224	15.8	75,858	15.5	6,366	21.6	1,923	23.0	1,764	25.1	1,150	19.6	1,529	18.7

Note. *Restricted to applicable cases. P/E/I/GR: Country group "Portugal, Spain, Italy, Greece"; SD: standard deviation. No missing values existed.

Tab. 4: Logistic regression models with low occupational performance (<3h/day) after rehabilitation completion as dependent variable. Odds ratios (OR) and 95% confidence intervals [95%-CI] (80% random sample of all individuals who completed medical rehabilitation in the year 2006 granted by the German Statutory Pension Insurance Scheme; cases with available data on occupational performance, n=519,831).

	All foreign nationals			Turkey			Former Yugoslavia			Portugal/Spain/Italy/Greece		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
	OR [95%-CI]	OR [95%-CI]	OR [95%-CI]	OR [95%-CI]	OR [95%-CI]	OR [95%-CI]	OR [95%-CI]	OR [95%-CI]	OR [95%-CI]	OR [95%-CI]	OR [95%-CI]	OR [95%-CI]
Nationality (Ref.: German)	1.51 [1.46;1.55]	1.35 [1.31;1.40]	1.20 [1.16;1.24]	1.63 [1.55;1.72]	1.54 [1.46;1.63]	1.23 [1.16;1.30]	1.82 [1.73;1.93]	1.59 [1.50;1.68]	1.47 [1.38;1.56]	1.33 [1.25;1.42]	1.18 [1.10;1.26]	1.06 [0.98;1.14]
Sex (Ref.: male)		0.67 [0.66;0.68]	0.57 [0.56;0.58]		0.67 [0.65;0.68]	0.56 [0.55;0.58]		0.66 [0.65;0.67]	0.56 [0.55;0.57]		0.66 [0.65;0.68]	0.56 [0.55;0.57]
Age		1.04 [1.04;1.04]	1.03 [1.03;1.03]		1.04 [1.04;1.04]	1.03 [1.03;1.03]		1.04 [1.04;1.04]	1.03 [1.03;1.03]		1.04 [1.04;1.04]	1.03 [1.03;1.03]
Marriage status (Ref.: single)												
Married		0.90[0.88;0.92]	0.86 [0.84;0.89]		0.90 [0.87;0.92]	0.86 [0.84;0.89]		0.90 [0.87;0.92]	0.86 [0.84;0.89]		0.89 [0.87;0.92]	0.86 [0.84;0.89]
Divorced/widowed		0.88[0.86;0.91]	0.93 [0.90;0.96]		0.88 [0.85;0.91]	0.94 [0.91;0.96]		0.88 [0.85;0.91]	0.94 [0.91;0.97]		0.88 [0.85;0.91]	0.94 [0.91;0.97]
Occupational position (Ref.: Skilled)												
Semi-skilled/unskilled		1.21 [1.19;1.24]	1.29 [1.26;1.32]		1.22 [1.20;1.25]	1.30 [1.27;1.34]		1.22 [1.20;1.25]	1.31 [1.28;1.34]		1.23 [1.20;1.25]	1.31[1.28;1.34]
Trainee/not employed		1.94 [1.87;2.01]	1.07 [1.03;1.12]		1.95 [1.88;2.02]	1.08 [1.04;1.13]		1.95 [1.88;2.02]	1.09 [1.04;1.13]		1.95 [1.88;2.01]	1.08 [1.04;1.13]
Employment status (Ref.: Fulltime)												
Part-time		2.17 [2.10;2.24]	1.81 [1.74;1.88]		2.18 [2.11;2.26]	1.82 [1.75;1.89]		2.20 [2.13;2.28]	1.82 [1.75;1.89]		2.20 [2.12;2.27]	1.82 [1.75;1.90]
Unemployed		1.08 [1.05;1.12]	1.11 [1.08;1.15]		1.09 [1.06;1.13]	1.12 [1.09;1.16]		1.10 [1.06;1.13]	1.13 [1.09;1.16]		1.10 [1.06;1.13]	1.13 [1.09;1.16]
Other		2.67 [2.61;2.73]	3.09 [3.02;3.17]		2.71 [2.65;2.77]	3.14 [3.06;3.22]		2.74 [2.68;2.80]	3.16 [3.08;3.24]		2.73 [2.67;2.80]	3.16 [3.08;3.24]
Diagnosis at rehabilitation entry (Ref: Skeletal system)												
Circulatory system			1.78 [1.73;1.83]			1.77 [1.72;1.82]			1.79 [1.74;1.84]			1.78 [1.73;1.84]
Endocrine,nutritional, metabol.			0.92 [0.87;0.96]			0.91 [0.87;0.96]			0.91 [0.87;0.96]			0.91[0.87;0.96]
Respiratory system			1.60 [1.52;1.68]			1.59 [1.51;1.68]			1.57 [1.49;1.66]			1.59 [1.51;1.68]
Neoplasms			2.06 [2.01;2.12]			2.06 [2.01;2.12]			2.07 [2.01;2.12]			2.07 [2.01;2.12]

Genitourinary system	1.58 [1.40;1.79]				1.57 [1.38;1.78]				1.56 [1.38;1.77]			1.56 [1.38;1.77]
Nervous system	3.61 [3.47;3.77]				3.63 [3.48;3.79]				3.64 [3.49;3.80]			3.64 [3.48;3.79]
Skin and subcutaneous tissue	0.55 [0.49;0.62]				0.55 [0.48;0.62]				0.54 [0.48;0.62]			0.54 [0.48;0.62]
Alcohol, drugs	1.35 [1.29;1.41]				1.35 [1.29;1.41]				1.34 [1.28;1.41]			1.35 [1.29;1.41]
Mental disorders (w/o drugs)	0.47 [0.45;0.49]				0.48 [0.46;0.50]				0.48 [0.46;0.50]			0.48 [0.46;0.50]
Other	1.24 [1.21;1.28]				1.24 [1.21;1.28]				1.25 [1.21;1.29]			1.26 [1.22;1.30]
Time absent from work in the last 12 months (%) (Ref.: None)												
<3 months	0.92 [0.89;0.94]				0.92 [0.89;0.95]				0.92 [0.90;0.95]			0.93 [0.90;0.95]
3-6 months	2.38 [2.30;2.45]				2.40 [2.33;2.48]				2.41 [2.34;2.49]			2.43 [2.35;2.51]
6+ months	5.28 [5.13;5.43]				5.34 [5.19;5.50]				5.38 [5.22;5.55]			5.42 [5.26;5.59]
N	519,831; 0.01	519,831; 0.14	519,831; 0.26	498,731; 0.01	498,731; 0.14	498,731; 0.27	497,392; 0.01	497,392; 0.14	497,392; 0.27	496,228; 0.01	496,228; 0.14	496,228; 0.27
c-statistic		0.71	0.80		0.71	0.80		0.71	0.80		0.71	0.80
Hosmer-Lemeshow goodness-of-fit test (p-value)		<0.05	<0.05		<0.05	<0.05		<0.05	<0.05		<0.05	<0.05

Note. Model 1: Crude; Model 2: Adjusted for socio-demographic and SES indicators; Model 3: Adjusted for socio-demographic, SES and health indicators. Models 2 and 3 are also adjusted for type of occupation (not shown); OR: odds ratio; CI: confidence interval; Ref.: reference category.