



## EMPLOYABILITY AND INTENTION TO APPLY FOR REHABILITATION IN PEOPLE WITH BACK PAIN: A CROSS-SECTIONAL COHORT STUDY

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**Objectives:** To analyse the association between self-reported prognosis of employability and health-related measures, and to clarify which determinants influence the intention to apply for medical rehabilitation.

**Design:** Cross-sectional study of a random sample of German employees.

**Participants:** A total of 6,654 participants (58% female) aged 45–59 years with back pain during the last 3 months.

**Results:** Out of a total of 6,654 persons, 4,838 had a positive self-reported prognosis of employability. Persons with positive and negative prognoses clearly differ with regard to health-related measures. Of 1,816 persons who reported a negative prognosis, 26% stated an intention to apply for rehabilitation. Intention was determined mainly by perceived social support from family and friends (odds ratio (OR) 1.87; 95% confidence interval (95% CI) 1.66–2.10), as well as physicians and therapists (OR 1.64; 95% CI 1.41–1.90).

**Conclusion:** A negative self-reported prognosis of employability is associated with self-reported health restrictions that may determine the need for rehabilitation interventions. A considerable proportion of persons with self-reported health restrictions do not plan to use medical rehabilitation. Perceived social support is an important facilitator of intention to apply for rehabilitation. However, this study needs to be replicated in other populations combining self-reported and administrative data.

**Key words:** rehabilitation research; self-reported prognosis; need for rehabilitation; intention; propensity score; back pain.

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Musculoskeletal diseases are a leading cause of work absenteeism and work disability (1). With a 12-month prevalence of more than 75% (2), back pain is a major health problem in Germany (3). National health service reports indicate that 25% of women and 17% of men reported experiencing chronic back pain, i.e. back pain almost every day for at least 3 months,

### LAY ABSTRACT

The approval of medical rehabilitation services in Germany is linked to personal requirements, including a significant reduction in work ability due to illness. The subjective prognosis of employability has been shown to be an indicator to operationalize these requirements. Application for medical rehabilitation presupposes an intention to apply for rehabilitation. This study, with over 6,000 German employees with back pain, indicated that a negative subjective prognosis of employability is associated with self-reported health restrictions that may determine the need for rehabilitation interventions. One out of 4 persons with a negative subjective prognosis of employability do not intend to use rehabilitation services. Intention to apply for medical rehabilitation was determined by social support experienced from family and friends or physicians and therapists, negative outcome expectations, and previous use of medical rehabilitation services. This indicates important facilitators to improve access to rehabilitation in employees with back pain.

during the last 12 months (4). Sickness absence, disability pensions (German: Erwerbsminderungsrente), and use of healthcare due to back pain are a high economic burden in Germany (3).

Rehabilitation is a key strategy to enable people with disabilities or chronic diseases to participate in work and society (5). Back pain is conceptualized as a biopsychosocial health problem, characterized by a range of physical, psychological and social dimensions (6). A Cochrane review has shown that rehabilitation programmes with a multidisciplinary biopsychosocial approach offer a chance to reduce pain and disability in persons with chronic low back pain (7). In Germany, rehabilitation for the working-age population is provided mainly by the German Pension Insurance (GPI), a compulsory pension insurance scheme. Workers pay pension contributions, which the GPI administers in order to refund retirement and disability pensions, and to fund rehabilitation services. The aim of rehabilitation is to maintain and restore work ability and to avoid disability pensions. Participation in a medical rehabilitation programme either requires a claim by the person in need or may be initiated directly by the acute care centre. The claim will be appraised by the GPI to determine the need for rehabilitation. Approval of a medical rehabilitation programme by the GPI is

linked to personal requirements, including a significant endangerment of work ability or a high risk of job loss due to illness or disability. A possible indicator for such an endangerment of work ability is the self-reported prognosis of employability of the individual (8). Cohort studies have shown the prognostic accuracy of this indicator for return to work, long-term work participation, and use of rehabilitation services (9–11).

Application for medical rehabilitation is preceded by a multistage process, which presupposes a need for rehabilitation and an intention to apply for medical rehabilitation (12, 13). A higher intention to apply for medical rehabilitation is associated with health impairment, better social support by physicians and therapists or family and friends, more previous experience with rehabilitation services, and expectations of a more favourable outcome of rehabilitation (13, 14). More than half of German disability pensioners did not use rehabilitation services (15), hence there seems to be underutilization of medical rehabilitation services.

The aim of the current study was to compare persons with a positive and negative self-reported employment prognosis. Furthermore, the analysis sought to clarify which determinants influence intention to apply for medical rehabilitation in persons with a negative employment prognosis, and to quantify the proportion of persons who do not intend to apply for rehabilitation even though the personal condition, i.e. endangerment of work ability, is probably present. This study attempts to extend previous research by analysing employed persons who have already reported a multidimensional health problem. Furthermore, propensity score-based methods were used to distinguish the influence of health-related factors, which primarily determines one's own employability prognosis, from the influence of other factors, in particular social factors that affect the intention to apply for rehabilitation in persons with self-reported endangered employability. This article has been prepared according to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement (16).

## METHODS

### *Setting and participants*

Data were collected from the baseline survey of a cohort study, which was established to analyse barriers to rehabilitation access and the effectiveness of medical rehabilitation services in persons with back pain (17). A sample of 45,000 people was drawn randomly from the pension agencies (GPI North and GPI Central Germany). Samples were stratified by sex (one-to-one) and sickness absence benefits. Persons receiving sickness absence benefits for less than one week and persons with at least one week of sickness absence benefit were sampled

two-to-one. Inclusion criteria were: employees aged 45–59 years who reported back pain at least once during the past 3 months. Exclusion criteria were: people who had applied for or used medical rehabilitation services during the previous 4 years or who had applied for or received disability pension benefits. The baseline questionnaires were sent in March 2017. If the participants gave their approval, questionnaire data were linked to selected administrative data from the GPI registers. The study protocol was approved by the ethics committee of the University of Lübeck (15-144) and Martin Luther University Halle-Wittenberg (2015-49). The study is registered in the German Clinical Trials Register (DRKS00011554).

### *Assessing the self-reported prognosis of employability*

The self-reported prognosis of employability was assessed by a 3-item scale. The brief self-report measure was developed by Mittag et al. (8). Feasibility and psychometric properties were tested in a cohort study of 4,279 blue-collar workers (8, 9). The authors showed satisfactory psychometric characteristics and recommend the scale in rehabilitation research to screen an endangerment of work ability. The scale comprised the following 3 items:

- Do you believe that you will be able to continue working until you reach retirement age (certainly, rather yes, uncertain, rather no, in no case)?
- Do you see your current state of health as a permanent threat to your general ability to work (no, yes)?
- Are you currently considering applying for a pension (disability pension) (no, yes)?

The items reflect the employment prognosis with increasing degrees of difficulty. Item 3 represents an intensification of the other 2 items. To prepare the scale, the first item was dichotomized summarizing the first 2 (certainly, rather yes) and the last 3 answer categories (uncertain, rather no, in no case). The binary raw scores were then totalled to give a total score ranging from 0 to 3 points, with higher values indicating a less favourable prognosis. Values of at least 2 points were defined as a negative self-reported prognosis of employability (9). Values of at least 2 points were associated with an increased risk of a pension request (9).

### *Intention to apply for medical rehabilitation*

The intention to apply for a medical rehabilitation programme was assessed by one dichotomous variable that was developed recently for the Third German Sociomedical Panel (12): Do you intend to apply for rehabilitation within the next 12 months (no, yes)?

### *Covariates*

The following variables were considered as covariates: sociodemographic characteristics (sex and age); self-reported measures that assessed back pain during the last 3 months and health: pain intensity (0–100 points), pain disability (0–100 points), disability days (18)), general health (0–10 points) (19), depressive symptoms (0–24 points) (20), fear avoidance beliefs (subscale: physical activity and work, 0–18 points) (21), comorbidity (0–15 points) (22); and sickness absence during the last 12 months. Cognition and experience of rehabilitation services were also assessed (i.e. previous medical rehabilitation services of the person themselves or of relatives (no, yes);

knowledge of rehabilitation application procedures (0–2 points); negative outcome expectations regarding family (0–2 points) and work (0–3 points); and social support for the rehabilitation request from family and friends (0–3 points) and physicians and therapists (0–3 points)) (12).

#### Statistical analysis

The group differences of people with a positive and negative prognosis of employability were calculated using t-tests and  $\chi^2$  tests. Cohen's *d* was standardized using the pooled standard deviation and interpreted as suggested by Cohen (23) (small effect,  $d \geq 0.2$ ; medium effect,  $d \geq 0.5$ ; and large effect,  $d \geq 0.8$ ). Scalability was tested with Guttman scale-analysis. To clarify the determinants that influence the intention to apply in persons with a negative self-reported prognosis, propensity scores were calculated. The propensity score is the probability of receiving a treatment conditional on observed characteristics (24). In the current analysis, the propensity score was defined as the conditional probability of the intention to apply for a medical rehabilitation programme. Two logistic regression models with 18 variables in total were used to estimate the propensity score (24) (first model: age, sex, general health, depressive symptoms, comorbidity, fear avoidance beliefs (subscale: physical activity and work), pain intensity, pain disability, disability days, sickness absence during the last 12 months; additional variables in the second model: previous medical rehabilitation services (person themselves or relatives), knowledge of rehabilitation application procedures, work-related and family-related negative outcome expectations, social support for the application for rehabilitation from family and friends or physicians and therapists). The model fit was calculated using adjusted McFadden  $R^2$  (25). Inclusion of the variables in the logistic regression models was driven by the idea of considering those factors associated with the intention to apply for medical rehabilitation (12–14). The missing data analysis procedures used missing at random (MAR) assumptions. The multivariate imputation by chained equations (MICE) method of multiple multivariate imputations in STATA was used. In both models, the propensity scores were calculated from 5 multiple imputed data-sets and then averaged (26). Multiple imputation was chosen, as restricting the sample to complete cases only in a comprehensive regression model can reduce sample size substantially, even if the amount of missing data in single variables is low. Further analyses were performed with the averaged scores (26). Kolmogorov–Smirnov tests were used to compare the different propensity score distributions. We report adjusted predicted estimates and standard errors for the variables in the second logistic regression model to emphasize the practical implications of the findings (27). Estimates were averaged across the completed data-sets. Due to the large sample size the results of the statistical tests were regarded as significant if the 2-sided *p*-value of a test was  $< 0.001$ . All calculations were performed with Stata SE Version 15.1.

## RESULTS

### Recruitment and sample characteristics

Of 45,000 questionnaires mailed, a total of 10,734 persons (23.8%) completed the baseline questionnaire between March and August 2017. Data from 291 persons

were excluded since they did not consent to linkage of the questionnaire and administrative data. Another 3,273 people were excluded since they had not reported back pain during the last 3 months or were currently unemployed. Moreover, participants with missing data on the self-reported prognosis of employability were excluded. The final sample for analysis included 6,654 participants (62.0% of respondents). The mean age was 52.2 years (standard deviation (SD) 4.1); 57.6% were women. Sample characteristics are shown in Table I.

### Self-reported prognosis of employability

The self-reported prognosis of employability scale demonstrates a Guttman scale coefficient of reproducibility (Rep)=0.98, indicating excellent internal consistency (8). Of the participants, 72.7% ( $n=4,838$ ) reported a positive self-reported prognosis of employability. Age and sex showed no relevant differences among persons with positive and negative prognoses (Table I). As expected, clear group differences with medium and large effect sizes could be identified regarding health-related variables, pain intensity ( $d=0.67$ ), pain disability ( $d=0.85$ ), disability days due to back pain ( $d=0.54$ ), general health ( $d=-0.93$ ), depressive symptoms ( $d=0.91$ ), comorbidity ( $d=0.85$ ), and fear avoidance beliefs (physical activity:  $d=0.71$ ; work:  $d=1.00$ ). Moreover, a quarter of those persons with a negative and 7.7% of those with a positive prognosis of employability looked back on periods of sickness absence of at least 6 weeks during the last 12 months ( $d=0.47$ ).

### Determinants and the conditional probability of an intention to apply for rehabilitation

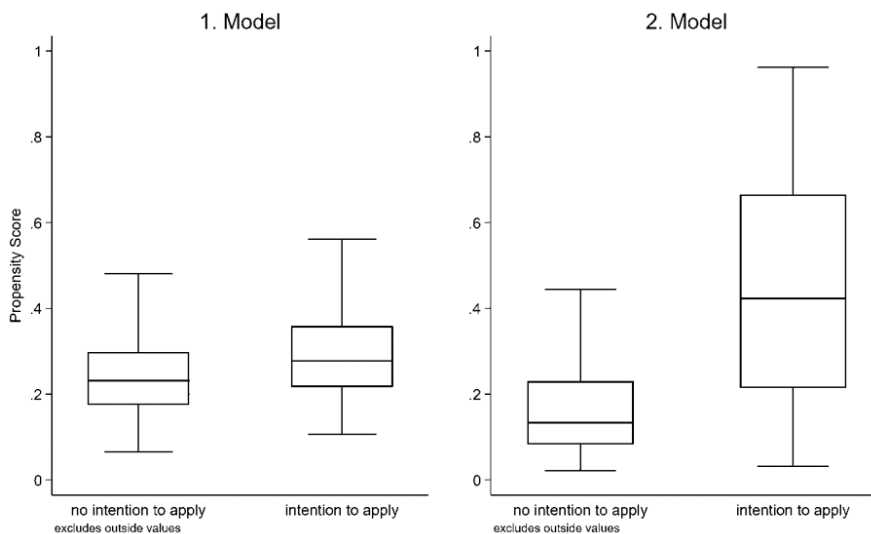
Of the 1,816 persons who reported a negative self-reported prognosis of employability, only 415 (25.6%) stated an intention to apply for rehabilitation in the next 12 months (Table II): 1,204 persons (74.4%) did not intend to request medical rehabilitation, although they reported a negative self-reported prognosis of employability. Health-related variables were hardly associated with the intention to apply for medical rehabilitation (first model: adjusted McFadden  $R^2=0.03$ ). The propensity score distributions of persons with and without an intention to apply for rehabilitation clearly overlapped (Fig. 1).

Based on the second model, adjusted for health- and pain-related variables of the first model, the distribution of the conditional probability of an intention to apply differed significantly for persons with (propensity score=0.45) and without (propensity score=0.19)

**Table I.** Characteristics of persons with a positive and negative self-reported prognosis of employability

Characteristics	Self-reported prognosis of employability				p-value	Cohens d
	Positive		Negative			
	n	Mean (SD) or %	n	Mean (SD) or %		
<i>Sociodemographic</i>						
Age, years, mean (SD)	4,838	52.1 (4.1)	1,816	52.4 (4.1)	< 0.001	0.12
Sex, %					< 0.001	0.09
Female	2,853	59.0	980	54.0		
Male	1,985	41.0	936	46.0		
Educational level, %					< 0.001	0.22
Low	800	16.7	394	22.0		
Medium	3,453	72.0	1,314	73.2		
High	543	11.3	87	4.8		
<i>Back pain</i>						
Pain intensity (0–100), mean (SD)	4,838	42.9 (17.9)	1,816	55.3 (17.6)	< 0.001	0.69
Pain disability (0–100), mean (SD)	4,830	22.7 (20.4)	1,813	40.4 (22.5)	< 0.001	0.85
Disability days (0–90), mean (SD)	4,838	3.3 (9.5)	1,816	9.9 (17.2)	< 0.001	0.54
<i>Health</i>						
General health (0–10), mean (SD)	4,788	6.8 (1.7)	1,794	5.2 (1.7)	< 0.001	-0.94
Depressive symptoms (0–24), mean (SD)	4,720	5.0 (3.9)	1,756	8.8 (5.0)	< 0.001	0.91
<i>Fear avoidance beliefs</i>						
Physical activity	4,727	6.8 (4.8)	1,766	10.3 (4.9)	< 0.001	0.72
Work	4,739	7.8 (4.7)	1,760	12.4 (4.2)	< 0.001	1.00
Comorbidity (0–15), mean (SD)	4,786	1.3 (1.4)	1,797	2.6 (1.9)	< 0.001	0.87
<i>Sickness absence during the last 12 months, %</i>						
None	1,742	36.7	411	23.5	< 0.001	0.47
< 6 weeks	2,645	55.6	929	53.0		
≥ 6 weeks	365	7.7	411	23.5		
<i>Experience with rehabilitation services</i>						
<i>Intention to apply for rehabilitation, %</i>						
No	3,255	88.3	1,204	74.4	< 0.001	0.36
Yes	431	11.7	415	25.6		
<i>Previous medical rehabilitation services, %</i>						
No	4,489	93.9	1,605	89.2	< 0.001	0.14
Yes	323	6.7	194	10.8		
Knowledge of rehabilitation (0–2), mean (SD)	4,573	0.4 (0.7)	1,715	0.4 (0.7)	0.074	0.05
<i>Negative outcome expectations, mean (SD)</i>						
Family (0–2)	4,380	0.4 (0.7)	1,611	0.6 (0.7)	< 0.001	0.16
Work (0–3)	4,335	1.0 (1.0)	1,576	1.3 (1.1)	< 0.001	0.27
<i>Social support, mean (SD)</i>						
From family and friends (0–3)	4,660	0.3 (0.8)	1,876	0.7 (1.1)	< 0.001	0.45
From physician and therapists (0–3)	4,666	0.2 (0.6)	1,751	0.4 (0.9)	< 0.001	0.32

SD: standard deviation.



**Fig. 1.** Probability of intention to apply for rehabilitation, based on observed variables.

**Table II.** Characteristics of persons with a negative self-reported prognosis of employability

Characteristics	Intention to apply for rehabilitation				p-value	Cohens d
	No		Yes			
	n	Mean (SD) or %	n	Mean (SD) or %		
<i>Sociodemographic</i>						
Age, years, mean (SD)	1,204	52.4 (4.1)	415	53.4 (3.7)	<0.001	0.25
Sex, %					0.315	0.05
Female	630	52.3	229	55.2		
Male	574	47.7	186	44.8		
Educational level, %					0.100	0.10
Low	274	23.0	75	18.3		
Medium	858	71.9	317	77.3		
High	61	5.1	18	4.4		
<i>Back pain</i>						
Pain intensity (0–100), mean (SD)	1,204	55.3 (17.5)	415	57.2 (17.8)	0.066	0.10
Pain disability (0–100), mean (SD)	1,203	39.6 (22.3)	414	46.0 (22.3)	<0.001	0.29
Disability days (0–90), mean (SD)	1,204	9.1 (16.5)	415	13.9 (19.9)	<0.001	0.28
<i>Health</i>						
General health (0–10), mean (SD)	1,189	5.3 (1.7)	411	4.8 (1.7)	<0.001	–0.31
Depressive symptoms (0–24), mean (SD)	1,167	8.6 (4.9)	403	10.0 (5.2)	<0.001	0.28
<i>Fear avoidance beliefs</i>						
Physical activity	1,172	10.3 (4.9)	402	10.8 (4.6)	0.115	0.09
Work	1,170	12.3 (4.3)	403	13.1 (4.1)	0.014	0.23
Comorbidity (0–15), mean (SD)	1,193	2.5 (1.9)	411	3.0 (1.9)	<0.001	0.23
<i>Sickness absence during the last 12 months, %</i>						
None	298	25.7	66	16.7	<0.001	0.25
< 6 weeks	622	53.6	205	51.8		
≥ 6 weeks	241	20.8	125	31.6		
<i>Experience with rehabilitation services</i>						
Previous medical rehabilitation services, %					0.003	0.15
No	1,077	90.0	350	84.5		
Yes	120	10.0	64	15.5		
Knowledge of rehabilitation (0–2), mean (SD)	1,119	0.2 (0.7)	406	0.5 (0.8)	<0.001	0.28
<i>Negative outcome expectations, mean (SD)</i>						
Family (0–2)	1,042	0.6 (0.7)	388	0.4 (0.6)	<0.001	–0.29
Work (0–3)	1,016	1.4 (1.1)	382	0.9 (1.0)	<0.001	–0.45
<i>Social support, mean (SD)</i>						
From family and friends (0–3)	1,148	0.4 (0.9)	404	1.5 (1.2)	<0.001	1.10
From physician and therapists (0–3)	1,157	0.2 (0.6)	404	1.0 (1.3)	<0.001	0.91

SD: standard deviation.

an intention to apply for rehabilitation ( $p<0.001$ ) (Fig. 1). Nevertheless, the propensity score distributions overlapped substantially: 29.5% of persons without an intention to apply had at least a similar propensity score to 75% of persons with an intention to apply (25<sup>th</sup> percentile: propensity score  $\geq 0.21$ ).

An intention to apply for rehabilitation was predicted by higher social support from family and friends (OR 1.87; 95% confidence interval (95% CI) 1.66–2.10) and from physicians and therapists (OR 1.64; 95% CI 1.41–1.90); less negative family-related (OR 0.76; 95% CI 0.61–0.95) and work-related outcome expectations (OR 0.68; 95% CI 0.59–0.79); and previous use of medical rehabilitation services (OR 1.60; 95% CI 1.06–2.41) (second model: McFadden  $R^2=0.20$ ). The probability of an intention to apply for rehabilitation increased with higher social support from family and friends, as well as physicians and therapists (Fig. 2). Overall, the probability from no perceived support to the highest level of social support by family

and friends, and from no perceived support to the highest level of support by physicians and therapists, increased by 34 ( $\Delta=0.341$ ; 95% CI 0.271–0.412) and 26 percentage points ( $\Delta=0.263$ ; 95% CI 0.175–0.351), respectively. Moreover, the lower the negative outcome expectations were, the higher was the probability of an intention to apply (Fig. 3). The probability increased by 7 percentage points ( $\Delta=0.073$ ; 95% CI 0.021–0.125) for highest to lowest expression of family-related outcome expectations, and by 16 percentage points ( $\Delta=0.160$ ; 95% CI 0.109–0.210) for highest to lowest negative work-related outcome expectations. Sensitivity analyses with persons with a positive self-reported prognosis of employability (values  $\leq 1$ ) showed the robustness of the results (Figs S1–S3<sup>1</sup>).

<sup>1</sup><https://doi.org/10.2340/16501977-2767>

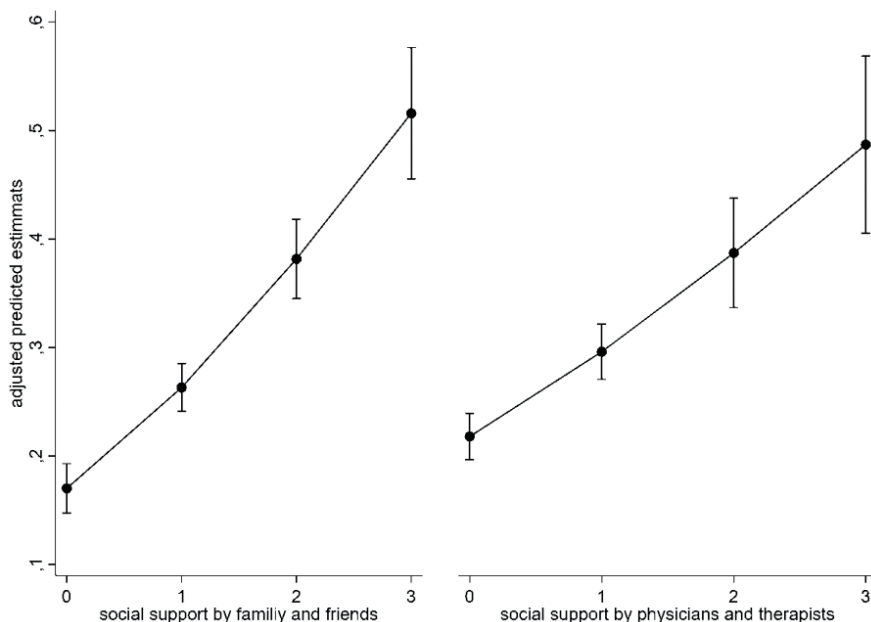


Fig. 2. Adjusted predicted estimates of social support for intention to apply for rehabilitation.

### DISCUSSION

Individuals with positive and negative self-reported prognoses of employability differed with respect to various self-reported health-related measures that may determine application for rehabilitation services in Germany. A negative self-reported prognosis of employability is associated with severe self-reported health-related restrictions, and can therefore be used as a tool to operationalize the personal requirement

for medical rehabilitation services. Intention to apply for rehabilitation was determined by social support experienced from family and friends or physicians and therapists, negative outcome expectations, and previous use of rehabilitation services.

Approximately a quarter of the sample reported a negative self-reported prognosis of employability. The association shown in the study between the self-reported prognosis of employability and various

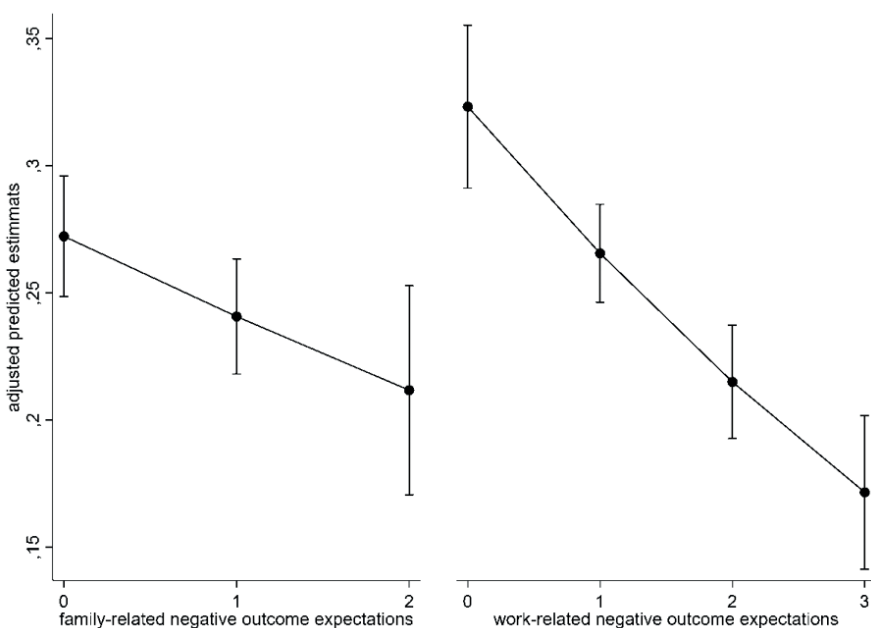


Fig. 3. Adjusted predicted estimates of negative outcome expectations of intention to apply for rehabilitation.

health-related characteristics supports previous findings (9, 11) and justifies the use of the short 3-item scale as a screening tool for need for rehabilitation (28). Of the 1,816 persons with a self-reported negative prognosis of employability indicating rehabilitation needs, only a quarter intended to apply for rehabilitation. The relatively low rate suggests underutilization of medical rehabilitation services (12, 14, 29). The lack of intention to apply for rehabilitation could hardly be explained by health impairments. Instead, cognition and experience of rehabilitation services were associated with intention to apply for rehabilitation. These results are in line with studies that analyse the multistage process of utilization of medical rehabilitation services in Germany (12–14, 29, 30).

An important factor in the intention to apply for rehabilitation was the social support of family and friends for the rehabilitation request. This resource is also an important determinant for other health-related behaviours and decisions (e.g. the beginning and maintenance of physical activity (31) or medication adherence (32)). Physicians and therapists also have an important intent-supporting function. They can inform patients about medical rehabilitation services. It is important that they provide information about the possibility of rehabilitation services, as well as impart explicit knowledge about the application process. In order to be able to advise patients adequately, knowledge about rehabilitation services is necessary (33). In addition, negative family- and work-related outcome expectations were associated with intention to apply for rehabilitation. This is line with earlier findings (29, 34), though not seen in more recent studies (12, 13). In particular, strong negative expectations of work-related outcomes (i.e. job insecurity, unfinished work, and others having to do my own tasks) were adversely associated with an intended rehabilitation request. This finding suggests that the restricted labour market and occupational conditions may reduce the use of rehabilitation services. To resolve discrepancies between the need for rehabilitation indicated by the negative self-reported prognosis of employability and the barrier to application, it is necessary that employers actively approach employees. A previous rehabilitation claim would also support the intention to apply, as it is linked with knowledge and expectations of positive outcome of medical rehabilitation services (14). Mittag et al. (11) described in this context that the application of rehabilitation services can be understood as a process in which the weighing of different options leads to a specific goal: if this phase has already been completed, it will be easier to submit another application for rehabilitation, as the consequences of the decision and the feasibility are already known.

Finally, these analyses reveal a further challenge for rehabilitation service research. Approximately one-third of those without an intention to apply for rehabilitation were so similar to those with an intention to apply that it was not possible to clarify which characteristics were responsible for the missing intention to apply. We suspect additional essential barriers for the development of intention that are beyond the constructs measured in this study. Further longitudinal studies are necessary to identify barriers to using rehabilitation services (17). When screening for persons with self-reported back pain in longitudinal studies, it is crucial to take into account that episodes of back pain often recover (6).

#### *Strengths and limitations*

The results of the current study must be interpreted in light of the following limitations. Firstly, the response rate of only approximately one-quarter was low, although this is common in postal surveys. There might be unobserved differences between responders and non-responders. Selection bias due to selective non-participation might have biased the estimates. Secondly, the data are cross-sectional. This limits conclusions on causality and the direction of associations. In epidemiology, an association of exposure and adverse effects is causal if the exposure precedes the adverse health effects (35). Furthermore, the current study cannot clarify why certain persons with back pain seek effective health interventions, while others with similar back pain cope without interventions, e.g. rehabilitation services (36). Thirdly, it cannot be ruled out that there are other variables determining the self-reported prognosis of employability and unobserved predictors of an intended request. This may have resulted in biased estimates in the regression model. The included variables were selected as known to be associated with the intention to apply. The substantial overlap of the propensity score distributions of persons with and without an intention to apply for rehabilitation suggests further variables influencing the intention to apply. Furthermore, our analysis was based on self-reported measures and lacked external validation.

Despite these limitations, the current analysis has several strengths. Firstly, the sample was randomly drawn from the register of the GPI. The sample was restricted to persons with back pain. Thus, we were able to analyse which factors determine a negative prognosis of employability and an intention to apply for rehabilitation for persons with a biopsychosocial health problem where evidence from systematic reviews indicates that rehabilitation improves functioning (7, 37). Secondly, the large sample size allowed

us to calculate precise estimates of the parameters. Thirdly, by calculating propensity scores, the conditional probability of the intention to apply for medical rehabilitation could be estimated and illustrated. By estimating propensity scores, comparable persons can be identified conditional on the observed variables. This could be an appropriate approach to generate a control group to estimate the effects of rehabilitation service in cohort studies (17, 38, 39). The stepwise inclusion of the variables in the logistic regression models could be a strategy for selection of variables of the propensity scores model (24).

### Conclusion

This study indicates that a negative self-reported prognosis of employability is associated with severe self-reported health-related restrictions that can determine the need for effective health interventions (40). In Germany, medical rehabilitation is the most common form of rehabilitative treatment, although the evidence on the effectiveness of medical rehabilitation is still unclear (17). Perceived social support from family and friends as well as physicians and therapists are an important facilitator of intention to apply for medical rehabilitation services. To validate the results of the current study it should be replicated in other populations combining self-reported and administrative data.

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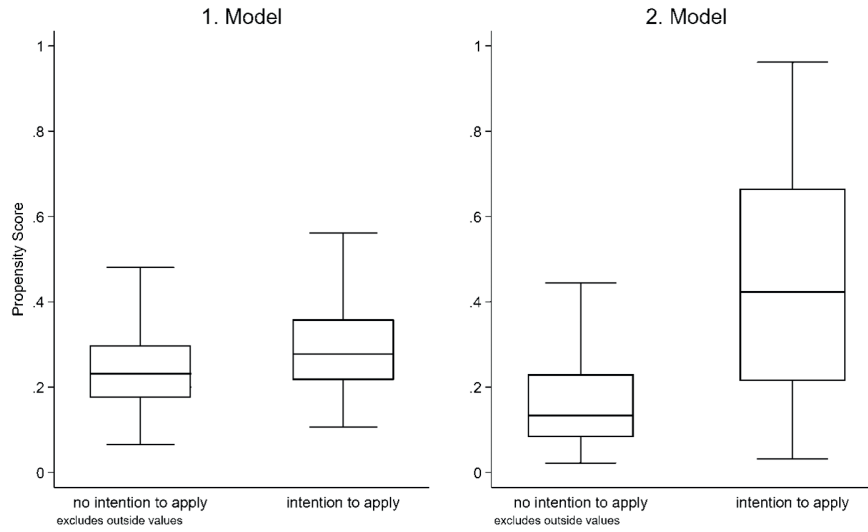
*The authors have no conflicts of interest to declare.*

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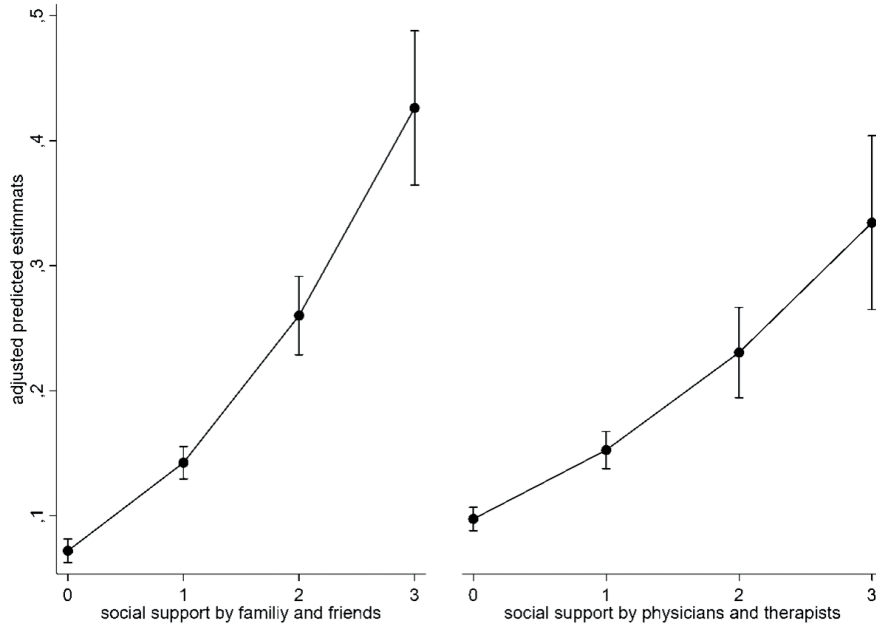
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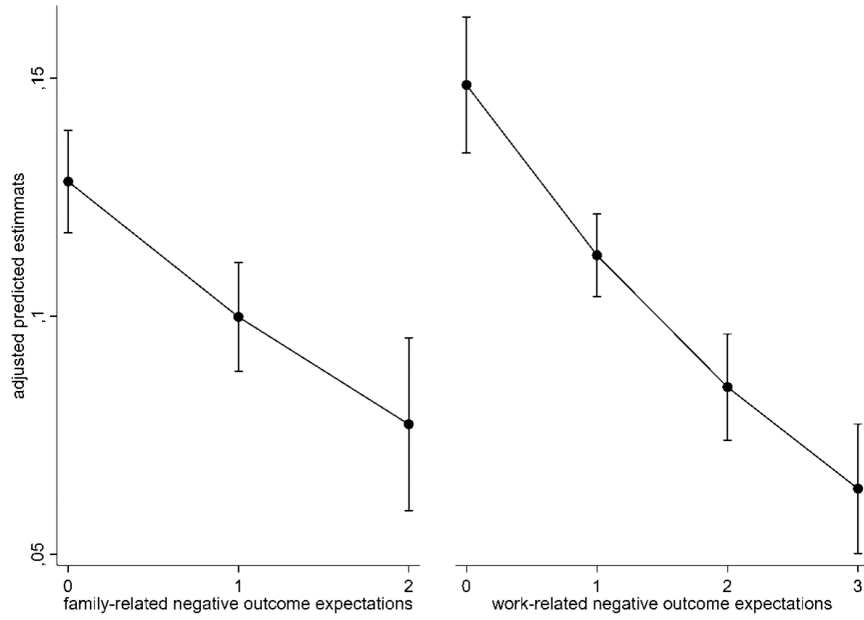
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**Fig. S1.** Probability of the intention to apply for medical rehabilitation based on observed variables in persons with a positive self-reported prognosis of employability.



**Fig. S2.** Adjusted predicted estimates of social support for intention to apply for rehabilitation in persons with a positive self-reported prognosis of employability.



**Fig. S3.** Adjusted predicted estimates of negative outcome expectations of intention to apply for rehabilitation in persons with a positive self-reported prognosis of employability.