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# Employment status and perceived health status in younger and older people with multiple sclerosis

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**This study explores how employment is associated with perceived physical and mental health status in people with multiple sclerosis (MS) adjusted for sociodemographic and clinical variables stratified by age. The sample consisted of 184 MS patients divided into a younger (<45 years) and an older (≥ 45 years) age group. Respondents underwent an interview, a neurological examination on disability [Expanded Disability Status Scale (EDSS)], and completed the Short Form-36 Health Survey. Of the respondents (mean age 40.5 ± 6.2 years), 43.5% were employed. Significant differences between younger and older patients were found in employment, EDSS, disease duration, and five Short Form-36 Health Survey dimensions. Block-step multiple regression explained 32.4% of the variance in physical health and 14.5% in mental health in the younger group. Being employed was significantly related to good physical health, whereas EDSS diminished the effect of being employed on physical health. The most important variable for mental health was employment status in the younger group. For the older age group, 19.1% of the variance in physical health and 14.0% of the variance in mental health was explained by the studied variables. Male gender and a lower EDSS were significant explanatory variables of better physical health. Male gender significantly explained mental health in the older age group. In conclusion, employment status was an explanatory variable for physical health and mental health in the younger patients. EDSS played a significant role in physical health for all patients. A vocational rehabilitation program could prevent eventual nonemployment and improve health outcomes in older MS people.**

**Die vorliegende Studie untersucht, wie die Erwerbstätigkeit mit dem empfundenen körperlichen und mentalen Gesundheitsstatus von Patienten mit multipler Sklerose (MS) verbunden ist, bereinigt nach soziodemografischen und klinischen Variablen stratifiziert nach Alter. Die Stichprobe setzte sich aus 184 MS-Patienten zusammen, unterteilt in eine jüngere (<45 Jahre) und eine ältere (≥ 45 Jahre) Altersgruppe. Die Befragten unterzogen sich einem Interview und einer neurologischen Untersuchung zum Grad der Behinderung [Leistungsskala Expanded Disability Status Scale (EDSS)] und füllten den Fragebogen zum Gesundheitszustand in der Kurzform 36 (SF-36) aus. 43.5% der Befragten (mittleres Alter 40.5 ± 6.2 Jahre) waren in einem Beschäftigungsverhältnis. Signifikante Unterschiede zwischen jüngeren und älteren Patienten wurden bei der Beschäftigung, EDSS, Krankheitsdauer und fünf Dimensionen des Fragebogens zum Gesundheitszustand in der Kurzform 36 (SF-36) festgestellt. Die schrittweise multiple Regression erklärt 32.4% der Varianz in der körperlichen Gesundheit und 14.5% in der mentalen Gesundheit in der jüngeren Gruppe. Ein Beschäftigungsverhältnis hatte einen signifikanten Bezug zu einer guten körperlichen Gesundheit, während der EDSS die Wirkung der Beschäftigung auf die körperliche Gesundheit wieder herabsetzte. Die wichtigste Variable für die mentale Gesundheit war der Beschäftigungsstatus in der jüngeren Gruppe. In der älteren Altersgruppe wurden 19.1% der Varianz der körperlichen Gesundheit und 14.0% der Varianz der mentalen Gesundheit durch die untersuchten Variablen erklärt. Mann zu sein mit einer niedrigeren EDSS waren signifikante erklärte Variablen einer besseren körperlichen Gesundheit, und Mann zu sein erklärte die mentale Gesundheit in der älteren Altersgruppe auf signifikante Weise. Abschließend lässt sich sagen, dass der Beschäftigungsstatus eine erläuternde Variable für die körperliche Gesundheit und mentale Gesundheit jüngerer Patienten war. Die EDSS spielte für alle Patienten eine signifikante Rolle in der körperlichen Gesundheit. Berufliche Rehabilitationsprogramme könnten eine mögliche Nichtbeschäftigung verhindern und die Gesundheitsergebnisse von älteren MS-Patienten verbessern.**

**Este estudio investigó la relación entre el estado laboral y la percepción del estado de salud física y mental en individuos con esclerosis múltiple (EM), de acuerdo con una serie de variables clínicas y sociodemográficas clasificadas según la edad. La muestra consistió en 184 pacientes con EM, divididos en un grupo joven (<45 años) y un grupo de mayor edad ( ≥ 45 años). Los sujetos participaron en una entrevista, fueron sometidos a un examen neurológico de discapacidad [Escala extendida del estado de discapacidad (EDSS)] y completaron el cuestionario de salud SF-36. De los participantes (edad media de 40.5 ± 6.2 años), el 43.5% poseía un empleo. Se observaron diferencias significativas entre los pacientes jóvenes y los de mayor edad con respecto al empleo, la EDSS, la duración de la enfermedad y cinco dimensiones del cuestionario de salud SF-36. Gracias a una regresión múltiple en bloque-fase (block-step multiple regression), se encontró una explicación para el 32.4% de la varianza de**

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**la salud física y el 14.5% de la varianza de la salud mental del grupo más joven. La posesión de un empleo mostró una relación significativa con una buena salud física, mientras que la EDSS disminuyó el efecto causado por el empleo en la salud física. En el grupo más joven, la variable más importante para la salud mental fue el estado laboral. En el grupo de mayor edad, las variables analizadas explicaron el 19.1% de la varianza de la salud física y el 14.0% de la varianza de la salud mental. Se observó que el sexo masculino y una EDSS más baja constituían variables explicativas significativas de un estado más óptimo de salud física. Asimismo, se demostró que la salud mental en el grupo de mayor edad dependía de forma significativa de la variable de sexo masculino. En conclusión, el estado laboral constituyó una variable explicativa de la salud física y mental en los pacientes más jóvenes. La EDSS desempeñó un papel significativo en la salud física de todos los pacientes. Los programas de rehabilitación vocacional podrían evitar el desempleo y mejorar la salud de las personas de edad avanzada que padecen EM.**

**Cette étude explore comment l'association avec l'état de santé physique et mentale perçu chez les personnes atteintes de sclérose en plaques (SEP), évolue selon les variables sociodémographiques et cliniques par tranches d'âge. L'échantillon se composait de 184 patients atteints de SEP divisés en un groupe d'âge plus jeunes (<45 ans) et un groupe plus âgé (≥ 45 ans). Les répondants ont subi un entretien, un examen neurologique du handicap [Expanded Disability Status Scale (EDSS)] et ont rempli le formulaire d'enquête de santé court Short Form-36 Health Survey (SF-36). Parmi les répondants (âge moyen 40.5 ± 6.2 ans), 43.5% avaient un emploi. Des différences significatives entre les patients jeunes et âgés ont été identifiées en termes d'emploi, d'EDSS, de durée de la maladie et de cinq dimensions du formulaire d'enquête de santé SF-36. La régression multiple en plusieurs étapes-bloc a expliqué 32.4% de la variance pour la santé physique et 14.5% pour la santé mentale parmi le groupe des plus jeunes. Le fait d'avoir un emploi était significativement lié à une bonne santé physique, tandis que l'échelle EDSS diminuait l'effet de l'emploi sur la santé physique. La variable la plus importante pour la santé mentale était la situation professionnelle chez le groupe des plus jeunes. Pour la tranche d'âge plus âgée, 19.1% de la variance de la santé physique et 14.0% de la variance de la santé mentale étaient expliquées par les variables étudiées. Le fait d'être de sexe masculin et d'afficher un score EDSS plus bas constituait des variables explicatives significatives d'une meilleure santé physique, le fait d'être de sexe masculin expliquait de façon significative la santé mentale parmi le groupe plus âgé. En conclusion, le statut professionnel constituait une variable explicative de la santé physique et de la santé mentale chez les patients les plus jeunes. L'EDSS jouait un rôle important dans la santé physique pour tous les patients. Un programme de rééducation axé sur l'emploi pourrait éventuellement prévenir un chômage potentiel et améliorer les résultats de santé chez les personnes plus âgées souffrant de SEP.** ***International Journal of Rehabilitation Research*** **35:40–47 © 2012 Wolters Kluwer Health | Lippincott Williams & Wilkins.**

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## Introduction

The associations between employment status and the incidence and prevalence of chronic diseases and mortality have been previously discussed (Mackenbach *et al.*, 2008; Clougherty *et al.*, 2010). Minis *et al.* (2010) reported that employed patients with neuromuscular diseases had better perceived health status than nonemployed patients. Evidence regarding whether two different pathways, employment–health status or health status–employment, actually do exist in the chronically ill has been described in an extensive review by Clougherty *et al.* (2010).

The terms 'unemployment status' and 'nonemployment status' have two different meanings. Unemployed people are comprehended as those who are looking for a job and are available for work, but who are not active in paid work. In contrast, nonemployed people are comprehended as those who are jobless and have the intention to work but are unable to work because of serious impairments or disabilities due to chronic disease (Sleskova, 2006; Thomas *et al.*, 2007).

Multiple sclerosis (MS) is a chronic and unpredictable neurological disease varying from a mild course with minimal disabilities to a rapidly progressing or fluctuating course resulting in severe disabilities. MS is the most common cause of neurological disability in young adults. People with MS show lower scores than the general population for both the perceived physical health status (PPHS) and the perceived mental health status (PMHS) in the Short Form-36 Health Survey

(SF-36) (Ritvo, 1996; Aronson, 1997; Nortvedt *et al.*, 2000).

Previous studies showed relationships between employment and health status outcomes in people with MS. Employment was found to be a significant and independent predictor for the PPHS and PMHS of people recently diagnosed with MS (Patti *et al.*, 2007). Furthermore, higher physical disability, disease progression, longer disease duration, and older age were associated with nonemployment (Nortvedt *et al.*, 1999; Grima *et al.*, 2000). Problems related to physical disabilities, concentration deficits and transportation were the most important predictors of adjustment to work among the chronically ill, including neurological diseases (Baanders *et al.*, 2001).

Age is a factor that might play a role in being employed, in functional disability, and in perceived health status in people with MS. The study focuses on the association of employment status with perceived health status in different age groups and includes the following research questions: (a) Is employment status associated with PPHS and PMHS in MS patients? (b) Do differences exist between younger and older people with MS regarding the association between employment status and PPHS and PMHS?

## Methods

### Patients and procedures

People with MS from Neurology Outpatient Departments and members of MS Societies were included in the study on a voluntary and anonymous basis. They were recruited in the eastern part of Slovakia from among those who were eligible to participate. Inclusion criteria required diagnosis in accordance with the McDonald criteria (McDonald *et al.*, 2001). Data were collected from 2003 to 2006.

Questionnaires, invitation letters, and written informed consent forms were sent to participants by post. After 2 weeks, a trained interviewer spoke to the persons with MS at a neurological outpatient clinic. One neurologist carried out the neurological examination immediately after each interview. Exclusion criteria were as follows: non-Slovak-speaking patients, cognitive impairment determined by a Mini-Mental State Examination score of less than 24 (Folstein, 1975), a history of medical conditions affecting the outcomes of the study, and pregnancy. Eleven people with MS were excluded by the exclusion criteria; two were non-Slovak-speaking patients, four were excluded due to a Mini-Mental State Examination score of less than 24, and five people with MS suffered from difficult medical conditions not associated with MS.

Regarding the overall response rate, 184 out of the 389 MS patients addressed represent a response rate of 47.3%. Nonrespondents ($44.9 \pm 10.7$ years) were significantly older than the participants ($40.3 \pm 9.5$ years) ($P < 0.05$). There were no statistically significant differences between nonrespondents and participants regarding sex.

Each patient provided a signed informed consent form prior to the study. The local Ethics Committee of the University Hospital approved the study on 17 December 2002.

### Measures

This cross-sectional study consisted of sociodemographic data, including age, sex, education, employment status, and disease history and perceived health status gathered from the self-reported questionnaires. Clinical data, including functional disability, Expanded Disability Status Scale (EDSS) and disease duration, were evaluated by the same neurologist for all patients.

#### *Sociodemographic data*

Information regarding age, sex, education (elementary, secondary, and university) and employment status were compiled from the self-reported questionnaire. The study sample consisted of two age subgroups of people with MS: a younger group aged 18–44 years (< 45 years) and an older group aged 45–61 years (≥ 45 years). The age cut-off point of 45 years in this sample was based on previous studies in people with MS in age cohorts 18–45 and 45–90 years (Garcia and Finlayson, 2005; Krokavcova *et al.*, 2008), and on the study mode (range 18–61 years).

Employment status was divided into four groups: (a) employed, full time or part-time ($n = 80$ people with MS, receiving a salary); (b) nonemployed, not employed or disabled due to MS ($n = 104$ people with MS, receiving a full state disability pension); (c) unemployed for reasons other than MS ($n = 16$ people with MS, receiving state unemployment benefits) and (d) a group consisting of students ($n = 13$ people with MS, financially supported by parents), housewives, and those on maternity leave ($n = 6$, receiving social benefits) and retired persons ($n = 4$, receiving an old-age pension). Each patient marked the employment status category in which he or she was active during this study. Employment was defined as the state of being engaged in an activity or service for salary and thus focused on the first two groups. Therefore, groups 3 and 4 were excluded from the analysis because they did not meet these criteria.

#### *Clinical data*

The Kurtzke EDSS is based on the neurological testing of functional systems: pyramidal, cerebellar, brainstem, sensory, bowel and bladder, visual, mental, and other. The EDSS is the most frequently used scoring system in MS in neurological practice. Disability caused by MS is graded on a continuum from 0 (normal neurological examination) to 10 (death caused by MS) (Kurtzke, 1983).

Disease duration was assessed in years as the time since initial diagnosis.

### *Perceived health status*

The SF-36 was originally used as a generic indicator of health status in population surveys (Ware and Sherbourne, 1992). The SF-36 includes the measurement of the eight dimensions of health: (a) physical functioning; (b) role limitation due to physical health; (c) bodily pain; (d) social functioning; (e) general health; (f) mental health, covering psychological distress, and well-being; (g) role limitations due to emotional problems; and (h) vitality, energy, or fatigue. In addition, one item covers changes in health status over the past year. We used PPHS and PMHS. All item scores were coded and transformed into a scale of 0 (poor health) to 100 (optimal health) (Freeman *et al.*, 2000). Cronbach's $\alpha$ for the SF-36 total score in the present sample was 0.93, for PPHS it was 0.90, and for PMHS it was 0.88.

### Statistical analysis

Descriptive statistics are presented separately for all variables of younger (< 45 years) and older (≥ 45 years) people with MS. An independent *t*-test was carried out to determine the differences in scores between the younger and older age subgroups in clinical variables (EDSS, disease duration), and PPHS and PMHS. Differences in categorical sociodemographic variables (sex, education, employment status) between the younger and older age subgroups were calculated using a difference of proportions test (Newcombe and Altman, 2005) (Table 1). The Pearson correlations were used for testing the associations between the continuous variables, and the Spearman correlations were used where one variable was continuous and the other was dichotomous (Table 2). Multiple regression analyses, with a block-step enter design, were carried out in order to identify how much of the variance of the dependent variables (PPHS and PMHS) may be explained by independent variables separately in the younger and older subgroups. The independent variables were as follows: step 1, employment status; step 2, age; step 3, sex; step 4, education; step 5, EDSS; and step 6, disease duration. Employment status was added at the beginning of this model to clearly show its contribution to the explained variance, whereas controlling for basic sociodemographic and clinical variables (Tables 3 and 4). Assessing multicollinearity between the dependent variable and independent variables was carried out for the both age groups. Variation inflation factor did not prove bias in the studied regression models. Multicollinearity did not increase the variance of the regression coefficient.

Data were analyzed using the Statistical Package for the Social Sciences [(SPSS Inc., Chicago, Illinois, USA) v.16.0 for Windows].

## Results

The main study variables, with means and SD for the total sample and for the two age subgroups of people with MS are presented in Table 1.

**Table 1 Differences in sociodemographic data, clinical data, and perceived health status in younger (<45 years) and older (≥ 45 years) people with multiple sclerosis**

| Variable | Total sample ($n$=184) $n$ (%) or mean ± SD | <45 age group ($n$=115) $n$ (%) or mean ± SD | ≥ 45 age group ($n$=69) $n$ (%) or mean ± SD | $P$-value[a] 95% CI[b] |
|---|---|---|---|---|
| Age | 40.5 ± 6.2 | 34.4 ± 6.2*** | 50.6 ± 4.4*** | **0.000** |
| Sex | | | | |
| Female | 122 (66.3%) | (80) 69.6% | (42) 60.9% | −0.06–0.23 |
| Education | | | | |
| Elementary | 48 (27.2%) | (28) 25% | (20) 30.8% | −0.18–0.09 |
| Secondary | 93 (52.5%) | (58) 51.8% | (35) 53.8% | −0.15–0.15 |
| University | 36 (20.3%) | (26) 23.2% | (10) 15.4% | −0.03–0.19 |
| Employment | | | | |
| Gainful employment | 80 (43.5%) | (60) 47.8%** | (20) 29.0%** | **0.09–0.37** |
| Nonemployed | 104 (56.5%) | (55) 52.2%** | (49) 71.0%** | |
| EDSS | 3.2 ± 1.4 | 2.9 ± 1.4 | 3.7 ± 1.2 | **0.000** |
| Disease duration (in years) | 6.4 ± 5.2 | 5.6 ± 4.6 | 7.7 ± 6.0 | **0.017** |
| SF-36 dimensions[c] | | | | |
| Physical functioning (PF) | 48.7 ± 27.9 | 56.2 ± 27.9 | 36.0 ± 23.1 | **0.000** |
| Role physical (RP) | 34.9 ± 38.9 | 38.0 ± 38.4 | 29.7 ± 39.6 | 0.063 |
| Bodily pain (BP) | 58.8 ± 27.3 | 64.2 ± 26.5 | 49.8 ± 26.5 | **0.001** |
| General health (GH) | 38.6 ± 19.3 | 41.0 ± 20.0 | 34.6 ± 17.4 | **0.047** |
| Vitality (VT) | 43.9 ± 18.5 | 46.6 ± 18.0 | 39.6 ± 18.6 | **0.007** |
| Social functioning (SF) | 63.2 ± 26.0 | 68.2 ± 24.2 | 54.9 ± 27.0 | **0.002** |
| Role emotional (RE) | 60.7 ± 42.4 | 59.1 ± 42.6 | 63.2 ± 42.4 | 0.531 |
| Mental health (MH) | 62.8 ± 16.6 | 63.1 ± 17.8 | 62.3 ± 14.7 | 0.524 |
| Physical Summary (PPHS) | 45.9 ± 19.9 | 50.8 ± 20.0 | 37.6 ± 16.9 | **0.000** |
| Mental Summary (PMHS) | 56.0 ± 15.8 | 57.8 ± 16.6 | 53.1 ± 14.1 | **0.047** |

CI, confidence interval; EDSS, Expanded Disability Status Scale; SF-36, Short Form-36 Health Survey.
[a]For testing of significant differences between age subgroups an independent sample *t*-test was used, where means for each variable are displayed; significant differences are in bold.
[b]Difference of proportions test; significant differences are in bold.
[c]Higher scores indicate 'better functioning' on a scale of 0–100.
*$P$<0.05; **$P$<0.01; ***$P$<0.001.

**Table 2 Correlations between the studied variables**

| Reference categories | 1. | 2. | 3. | 4. | 5. | 6. | 7. |
|---|---|---|---|---|---|---|---|
| 1. Sex | – | 0.05 | −0.14 | −0.03 | 0.27* | −0.15 | −0.30* |
| 2. Education | 0.04 | – | 0.23 | −0.09 | 0.10 | 0.18 | 0.09 |
| 3. Employment | 0.12 | 0.49*** | – | −0.42*** | −0.21 | 0.24* | 0.18 |
| 4. EDSS | −0.08 | −0.29** | −0.47*** | – | 0.28* | −0.35** | −0.24* |
| 5. Disease duration | −0.06 | −0.08 | −0.36*** | 0.44*** | – | 0.05 | 0.01 |
| 6. SF-36 PPHS | 0.00 | 0.29** | 0.44*** | −0.53*** | −0.23* | – | 0.65*** |
| 7. SF-36 PMHS | −0.03 | 0.21* | 0.32*** | −0.16 | 0.05 | 0.60*** | – |

Results for less than 45 years age subgroup are under diagonal, results for 45 years or more age subgroup are above diagonal.
Reference categories: sex 1 = male, 2 = female; education 1 = elementary, 2 = secondary, 3 = university; employment 1 = nonemployed, 2 = employed.
EDSS, Expanded Disability Status Scale; PPHS, perceived physical health status; PMHS, perceived mental health status; SF-36, Short Form-36 Health Survey.
*$P<0.05$; **$P<0.01$; ***$P<0.001$.

**Table 3 Block-step multiple regression analyses to predict perceived physical health status for younger and older age groups of people with multiple sclerosis**

| | Age groups | | | | | |
|---|---|---|---|---|---|---|
| | <45 | | | ≥45 | | |
| PPHS | Explained variance (%) | β | 95% CI | Explained variance (%) | β | 95% CI |
| Step 1 | 20.7 | | | 00 | | |
| Employment | | 0.46*** | 11.91–25.63 | | 0.12 | −4.35–12.36 |
| Step 2 | 21.3 | | | 0.01 | | |
| Employment | | 0.45*** | 11.58–25.29 | | 0.12 | −4.65–12.17 |
| Age | | −0.12 | −0.93–0.17 | | −0.10 | −1.16–0.51 |
| Step3 | 21.2 | | | 0.00 | | |
| Employment | | 0.46*** | 11.90–25.70 | | 0.08 | −6.05–11.22 |
| Age | | −0.12 | −0.95–0.16 | | −0.08 | −1.09–0.59 |
| Sex | | −0.08 | −10.99–3.91 | | −0.15 | −12.17–3.31 |
| Step 4 | 21.5 | | | 0.03 | | |
| Employment | | 0.41*** | 8.69–24.43 | | 0.01 | −8.63–9.14 |
| Age | | −0.11 | −0.92–0.19 | | −0.16 | −1.4–0.35 |
| Sex | | −0.08 | −10.78–4.11 | | −0.17 | −12.43–2.79 |
| Education | | 0.11 | −2.3–8.97 | | 0.25 | −0.68–11.13 |
| Step 5 | 32.9 | | | 13.9 | | |
| Employment | | 0.24* | 2.00–17.78 | | −0.12 | −12.94–4.95 |
| Age | | −0.10 | −0.89–0.18 | | −0.11 | −1.19–0.49 |
| Sex | | −0.09 | −10.64–3.13 | | −0.20 | −12.89–1.57 |
| Education | | 0.10 | −2.31–8.14 | | 0.23 | −0.71–10.47 |
| EDSS | | −0.38*** | −7.75–2.89 | | −0.36** | −7.78 to −1.27 |
| Step 6 | 32.4 | | | 19.1 | | |
| Employment | | 0.25* | 2.14–18.07 | | −0.08 | −11.46–6.01 |
| Age | | −0.11 | −0.87–0.17 | | −0.13 | −1.24–0.40 |
| Sex | | −0.08 | −10.61–3.22 | | −0.26* | −14.55 to −0.21 |
| Education | | 0.10 | −2.44–8.07 | | 0.19 | −1.42–9.51 |
| EDSS | | −0.40*** | −8.21 to −2.95 | | −0.43** | −8.66 to −2.16 |
| Disease duration | | 0.05 | −0.60–1.01 | | 0.28 | −0.07–1.55 |

Reference categories: sex 1 = male, 2 = female; education 1 = elementary, 2 = secondary, 3 = university; employment 1 = nonemployed, 2 = employed.
CI, confidence interval; EDSS, Expanded Disability Status Scale; PPHS, perceived physical health status

Table 2 demonstrates the significant cross-sectional relationships between studied variables.

For the younger age group (< 45 years), a model consisting of age, sex, education, EDSS, and disease duration explained 32.4% of the variance of PPHS. Being employed was significantly related to good PPHS, despite controlling for other variables.

For the older age group (≥ 45 years), 19.1% of the variance in PPHS was explained by the same variables (Table 3). Being employed was not an explaining factor of PPHS. However, being male and having a lower EDSS score were significant explaining factors of better PPHS in the older age group.

For the younger age group (< 45 years), 14.5% of the variance in PMHS was explained by a model with the studied variables (Table 4). The main factor explaining most of the variance of PMHS was employment status. Age occurred as a less significant independent variable explaining PMHS in the younger group (Table 4).

For the older age group (≥ 45 years), 14.0% of the variance in PMHS was explained by the studied variables (Table 4). Being male played an important role in explaining the PMHS in this age group; however, being employed was not an explanatory variable for PMHS.

## Discussion

In the present study, employment status associated with PPHS and PMHS was studied in younger (< 45 years) and older (≥ 45 years) people with MS. Less than a half

**Table 4 Block-step multiple regression analyses to predict perceived mental health status for younger and older age groups of people with multiple sclerosis**

| | Age groups | | | | | |
|---|---|---|---|---|---|---|
| | <45 | | | ≥45 | | |
| PMHS | Explained variance (%) | β | 95% CI | Explained variance (%) | β | 95% CI |
| Step 1 | 10.1 | | | 1.0 | | |
| Employment | | 0.33*** | 5.01–17.19 | | 0.08 | −5.11–9.90 |
| Step 2 | 14.7 | | | 0.03 | | |
| Employment | | 0.32*** | 4.64–16.54 | | 0.07 | −5.4–9.55 |
| Age | | −0.23* | −1.11 to −0.15 | | −0.17 | −1.20–0.24 |
| Step3 | 14.3 | | | 9.6 | | |
| Employment | | 0.32*** | 4.80–16.78 | | −0.00 | −7.36–7.24 |
| Age | | −0.23* | −1.12 to −0.15 | | −0.13 | −1.05–0.34 |
| Sex | | −0.06 | −8.81–4.16 | | −0.34** | −14.96 to −2.10 |
| Step 4 | 13.5 | | | 9.0 | | |
| Employment | | 0.31** | 3.38–17.17 | | −0.03 | −8.42–6.75 |
| Age | | −0.23* | −1.12 to −0.14 | | −0.16 | −1.20–0.29 |
| Sex | | −0.06 | −8.81–4.23 | | −0.34** | −15.24 to −2.28 |
| Education | | 0.03 | −4.16–5.67 | | 0.11 | −3.08–7.10 |
| Step 5 | 12.7 | | | 11.0 | | |
| Employment | | 0.30** | 2.46–17.52 | | −0.10 | −10.90–5.07 |
| Age | | −0.23* | −1.12 to −0.14 | | −0.13 | −1.12–0.36 |
| Sex | | −0.06 | −8.87–4.24 | | −0.36** | −15.55 to −2.70 |
| Education | | 0.03 | −4.20–5.68 | | 0.10 | −3.16–6.92 |
| EDSS | | −0.02 | −2.52–2.07 | | −0.20 | −5.06–0.69 |
| Step 6 | 14.5 | | | 14.0 | | |
| Employment | | 0.32** | 3.19–18.18 | | −0.07 | −9.94–5.92 |
| Age | | −0.25** | −1.18 to −0.19 | | −0.16 | −1.18–0.28 |
| Sex | | −0.06 | −8.59–4.40 | | −0.40** | −16.71 to −3.80 |
| Education | | 0.02 | −4.50–5.30 | | 0.08 | −3.51–6.45 |
| EDSS | | −0.09 | −3.51–1.40 | | −0.25 | −5.66–0.15 |
| Disease duration | | 0.18 | −0.08–1.43 | | 0.23 | −0.10–1.22 |

Reference categories: sex 1=male, 2=female; education 1=elementary, 2=secondary, 3=university; employment 1=nonemployed, 2=employed.
CI, confidence interval; EDSS, Expanded Disability Status Scale; PPHS, perceived physical health status; PMHS, perceived mental health status

of the total sample consisted of people with MS who were gainfully employed, which is comparable with the unemployment rate of 49.1% in study by Miller and Dishon (2006). When comparing younger and older MS groups, older people with MS were significantly more often nonemployed. The results are consistent with a study indicating that middle-aged patients were more likely to be employed than older MS patients (Larocca *et al.*, 1985). As expected, younger people with MS had a lower EDSS score and shorter disease duration than older people with MS. The older age group reported worse PPHS and PMHS than the younger group. Our findings are in line with earlier results about people with MS of 45 years old or more that showed that functional abilities, years since diagnosis and self-rated health, are related to mental health challenges (Garcia and Finlayson, 2005).

### Younger than 45 years

Younger people with MS were more often employed and reported significantly better PPHS and PMHS than the older group. Being employed was found to be an important factor contributing to a better PPHS and PMHS status only in the younger group of people with MS. After adding EDSS into the model explaining PPHS in younger MS people, the effect of employment decreased but remained significant. It can be assumed that for the younger group, being employed is significantly related to their physical health status, and EDSS is a more influential factor responsible for worsened physical health than being employed. Being employed was revealed to be also the strongest factor related to PMHS in the younger age group in the studied model, contributing even more than EDSS. After adding further variables, age occurred as the second significant factor of this model explaining variance in PMHS. The effect of being employed on mental health decreased in the subsequent steps, however, always remained as a significant factor. Lower age was associated with better PMHS. Our findings are in accordance with previous studies about employment status and PMHS in people with MS (Miller and Dishon, 2006; Dayapoglu and Tan, 2011).

### Older than 45 years

Interestingly, employment did not contribute at all to PPHS in adults with MS of 45 years and over. Male sex and low EDSS were significantly associated with better PPHS in this group. In PMHS, only being male appeared to be a protective factor of good PMHS. This is consistent with other study findings that sexes differ in role emotional functioning and mental health (Pfennings *et al.*, 1999). Men as a group had a slightly higher quality of life measured by the SF-36 than women in the study by Miller and Dishon (2006). Age, being employed, and EDSS were not significant factors explaining variance in PMHS. Further factors might exist which contribute to

better PMHS in older MS people. Roughly 86% of the unexplained variance in PMHS model might be explained by other factors than those included in this study. It can be supposed that variables like depression, anxiety, cognitive impairments, fatigue, or pain explain a higher variance than employment and could be a foreshadow of the understanding of physical and mental functioning in older people with MS. Furthermore, it could be assumed that older age due to more MS symptoms could be a significant risk factor for losing a job. Busche *et al.* (2003) found that people with MS, who are over age 39 or have moderate disability and are still employed, can now be identified as at risk of becoming nonemployed over the next 2.5 years.

### Strengths and limitations

The outcomes of this study cannot be causally determined because of its cross-sectional design. Longitudinal data are needed to further unravel the complex interplay between changes in employment status and health status outcomes in people with MS. People with MS participating in this study were significantly younger than the nonrespondents. We may assume that the nonrespondents were largely members of the older MS group and had the longest disease duration, and that they were possibly the most disabled group, a fact that might have prevented them from participating in the study. Regrettably, we don't have this information; however, it might affect the generalization from our findings, especially in the older group.

### Implication for research

A study including variables focused predominantly on improving mental health of older MS people might be an interesting topic of future research. Older people with MS and those more restricted in work participation should be included into MS inpatients rehabilitation programs as Khan *et al.* (2010) suggested in their pilot describing the effectiveness of rehabilitation interventions for patients with MS. More studies, if possible with a longitudinal design, should focus on unraveling the pathways between age groups, employment status, and health outcomes.

### Implication for practice

Following our results, rehabilitation services seem to be important for work adjustment in terms of supporting physical and mental health which are shown here to be closely associated (Baanders *et al.*, 2001). Considering the consequences of premature invalidity in the group of older people with MS and reduced participation in general in both groups, with respect to financial security, it may be far more beneficial to assist people with work adjustment using physical rehabilitation techniques and coping strategies than to advise them to leave employment due to disability (Johnson *et al.*, 2004). In this study, a lower number of employed MS people older than 45 years (29%) supports this previous finding. Younger people with MS should take into account the possibility of losing their job at an older age due to worsening health, whereas, in contrast, losing a job might worsen health status outcomes, mainly PMHS. A vocational rehabilitation program at the time of diagnosis may prevent eventual nonemployment (Rozin *et al.*, 1975; Khan *et al.*, 2010).

### Conclusion

Employment status in the association with the PPHS and PMHS, was studied in younger ($<$ 45 years) and $=$ older ($\geq$ 45 years) people with MS. The results suggested that employment status was an explanatory variable for PPHS and PMHS in the younger age group. Functional disability played a significant role in PPHS in both age groups, and only male sex appeared to be a protective factor of good PMHS in the older group. Measuring perceived health status can provide health care professionals with greater insight into the lives of patients in order to maintain or improve their work ability in consideration of age and functional disability.

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### Conflicts of interest

There are no conflicts of interest.

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