Possession of Assistive Devices Is Related to Improved Psychological Well-Being in Patients with Rheumatic Conditions

MARTINE VEEHOF, ERIK TAAL, JOHANNES RASKER, JOHANNES LOHMANN, and MART van de LAAR

ABSTRACT. ***Objective.*** To investigate the relationship between the possession of assistive devices and psychological well-being in patients with rheumatic conditions.

Methods. Patients with rheumatoid arthritis (RA) and psoriatic arthritis (PsA) were selected from rheumatology outpatient clinics in 2 adjacent regions in The Netherlands and Germany. A total of 142 patients completed a questionnaire on the possession of assistive devices and psychological well-being. Questions on sociodemographics, clinical status, and health status were included. Hierarchical multiple linear regression analysis was used to determine the unique association between the number of assistive devices per patient and psychological well-being, controlling for confounding variables.

Results. Univariately, the number of assistive devices per patient was negatively associated with psychological well-being. Multivariately, the number of assistive devices per patient was positively associated with psychological well-being. Functional status was a negative confounder of the relationship between the possession of assistive devices and psychological well-being.

Conclusion. The possession of assistive devices was positively related to psychological well-being of patients with rheumatic diseases, after controlling for differences in functional status. (J Rheumatol 2006;33:1679–83)

Key Indexing Terms:
ASSISTIVE DEVICES
RHEUMATOID ARTHRITIS
PSYCHOLOGICAL WELL-BEING
PSORIATIC ARTHRITIS

Rheumatologists and healthcare professionals (e.g., occupational and physical therapists) frequently recommend assistive devices to patients with rheumatic conditions[1]. Obviously their primary objective is to improve the patient's functionality in daily activities. The secondary goal is to maintain independence. Moreover, improving functionality and independence might positively affect quality of life (QOL). To justify the prescription of assistive devices from healthcare and health economic points of view, evidence on the effects of assistive devices is of great importance.

Most studies on assistive devices among patients with rheumatic conditions have focused on the possession and/or use of assistive devices[2-8]. A few studies have been performed to examine the effects of assistive devices on physical functioning. Nordenskiöld, *et al,* and Thyberg, *et al* investigated the effects of assistive devices on perceived difficulty with the performance of activities of daily living (ADL) in patients with rheumatoid arthritis (RA)[9-11]. Both studies reported a reduction of perceived difficulty with daily activities, measured with the self-administered Evaluation of Daily Activity Questionnaire (EDAQ). Nordenskiöld, *et a*l also reported a relief of pain when patients used assistive devices[9,12]. To our knowledge, no attention has been given to the psychological and social effects of assistive devices among patients with arthritic conditions. This is striking, given the increasing interest in the assessment of QOL as an outcome measure of the effectiveness of therapeutic interventions[13,14].

Studies have shown that assistive devices contribute to improved physical functioning. Moreover, functionality is related to psychological well-being. Our hypothesis was that psychological well-being among disabled patients would be improved if patients had assistive devices. We investigated the relationship between psychological well-being and the possession of assistive devices in patients with rheumatic conditions.

MATERIALS AND METHODS

Patients. We performed a cross-sectional study among adult patients with either RA, according to the 1987 American College of Rheumatology (ACR) criteria, or psoriatic arthritis (PsA), according to the clinical experience of the attending rheumatologist. Patients were randomly selected from the archive of charts of rheumatology outpatient clinics in 2 adjacent healthcare regions. The first were the districts of Borken, Steinfurt, and Grafschaft Bentheim, Germany, the other the Twente district of The Netherlands.

From the Institute for Behavioral Research, Faculty of Behavioral Sciences, University of Twente; Department of Rheumatology, Medisch Spectrum Twente, Enschede, The Netherlands; and Department of Rheumatology, Fachklinik Bad Bentheim, Bad Bentheim, Germany.

An Interreg II project funded by the European Union.

M.M. Veehof, MSc, OT; E. Taal, PhD; J.J. Rasker, MD, PhD, Professor, University of Twente; J. Lohmann, MD, Fachklinik Bad Bentheim; M.A.F.J. van de Laar, MD, PhD, Professor, University of Twente and Medisch Spectrum Twente.

Address reprint requests to M.M. Veehof, Institute for Behavioral Research, Faculty of Behavioral Sciences, University of Twente, PO Box 217, 7500 AE Enschede, The Netherlands.
E-mail: m.m.veehof@utwente.nl

Accepted for publication March 31, 2006.

Procedure. Selected patients were informed of the study by mail. Patients who gave informed consent were asked to fill in the Modified Health Assessment Questionnaire (MHAQ)[15]. The MHAQ is a short version of the Health Assessment Questionnaire (HAQ) to assess patient's ability to perform daily activities. Patients with MHAQ score of 0, which meant that they experienced no functional limitations, were excluded. Included patients received another self-administered questionnaire. The study was approved by the Ethics Committee of Medisch Spectrum Twente Hospital.

Questionnaire. The questionnaire contained questions on psychological well-being and the possession of assistive devices. Questions on sociodemographics, clinical status, and health status were included.

Psychological well-being. Psychological well-being was measured with the level of tension and mood scales of the Arthritis Impact Measurement Scales 2 (AIMS2)[16-18]. Both scales consist of 5 items, which are scored on a 5-point Likert scale, ranging from "always" (score 1 or 5) to "never" (5 or 1). Scale scores were calculated by summing the individual item scores and converting these sum-scores into a score ranging from 0 (bad health status) to 10 (good health status). According to the standard procedure for the calculation of AIMS2 component scores[16], psychological well-being was calculated by averaging the 2 scale scores of level of tension and mood.

Assistive devices. Seventeen common assistive devices, mainly derived from the HAQ, were included. The assistive devices could be divided into mobility devices (cane, crutches, walker, wheelchair, scooter, orthopedic footwear), small tools for ADL (special cutlery, special writing pen, dressing device(s), helping hand), housing adaptations (special kitchen, elevator, shower seat, grab bar(s) in bathroom or toilet, special tap(s), elevated toilet seat), and special furniture (special bed). We did not include consumer products assisting performance of household activities, because these are also often used by healthy people. We asked patients to indicate which of the devices they possess. We calculated the total number of assistive devices per patient.

Sociodemographics. Questions on sex, age, living status (alone or with partner), net yearly income [below or above đ18,000 (2002)], education (low: vocational training, medium: high school, or high: college or university), and country (Dutch versus German) were included.

Clinical status. A questionnaire on comorbidity was included. Patients were asked to indicate which of the following chronic conditions they had: hypertension, heart disease, stroke, epilepsy, diabetes, cancer, lung disease, kidney disease, liver disease, stomach or intestine disease, blood disease, and other diseases. We calculated the total number of comorbidities per patient. Further, we retrieved the rheumatological diagnosis (RA or PsA) and disease duration (years) from the patients' charts.

Health status. We included questionnaires on functional status, fatigue, and pain. Functional status was measured with the HAQ[19-21]. We assessed patients' ability to perform activities using a 4-point scale, ranging from "able to do without difficulty" (score 0) to "unable to do" (3). We calculated the Alternative Disability Index (ADI) by summing up the highest score on each scale and dividing this by the total number of scales. High HAQ scores represented low levels of physical functioning. Fatigue was measured by means of a 100 mm visual analog scale (VAS) with endpoints "no fatigue" (0) and "fatigue as bad as it could be" (100)[22]. Pain was measured using the pain scale of the AIMS2[16-18]. This scale consists of 5 items, which are scored on a 5-point Likert scale, ranging from "no pain" (score 1) to "severe pain" (5) or from "never" (1) to "every day" (5). Pain scores were calculated by summing the individual item scores and converting these sum-scores into a score ranging from 0 (no pain) to 10 (severe pain).

Statistical analysis. The normality of the distribution of the data was assessed with the Kolmogorov-Smirnov test. Correlation analyses were used to investigate the univariate relationship between psychological well-being and the number of assistive devices per patient and to investigate the univariate relationship of both variables with sociodemographic, clinical status, and health status variables. For the normally distributed variables, Pearson's correlation analyses were applied. For not normally distributed variables, Spearman's correlation analyses were applied. For dichotomous variables (sex, living situation, income, country, diagnosis), the significance results of correlation analyses are exactly the same as comparing means by independent t tests (in the case of normally distributed variables) or median scores by Mann-Whitney U tests (in the case of not normally distributed variables). Therefore, the results are reported in the correlational format for consistency.

The univariate relationship between the possession of assistive devices and psychological well-being might be affected by one or more confounding variables. Therefore, hierarchical multiple linear regression analysis with backward elimination of potential confounding variables was used to identify the unique association between the possession of assistive devices and psychological well-being. In the first block, the number of assistive devices per patient was entered. In the second block, potential confounding variables [variables that were univariately correlated ($p \leq 0.15$) with both psychological well-being and the number of assistive devices per patient] were entered. A p value of 0.15 was used to be sure that we did not miss any variables that might act as a confounder. Subsequently, all potential confounding variables were sequentially removed. The variable with the smallest partial correlation with psychological well-being was considered first for removal. If it met the criterion for elimination, that is, if it changed the regression coefficient (B) of the number of assistive devices per patient by less than 10%, it was removed. After the first variable was removed, the variable remaining in the equation with the smallest partial correlation was considered next. The procedure stopped if there were no variables in the equation that satisfied the elimination criterion. The remaining variables were considered to be confounders of the relationship between the possession of assistive devices and psychological well-being.

Data analysis was performed with the Statistical Package for the Social Sciences (SPSS for Windows, version 11.0).

RESULTS

We selected 327 patients. Two hundred eighteen (67%) responded and agreed to participate. Of them, 165 were eligible (MHAQ score > 0) for study and received a questionnaire. Completed questionnaires were returned by 142 patients. Patient characteristics are shown in Table 1.

The percentages of patients possessing specific assistive devices are summarized in Table 2. Seventy-eight percent of the patients possessed 1 or more assistive devices. On average, patients possessed 3 to 4 assistive devices (Table 1).

The findings of the correlation analyses are presented in Table 1. With the exception of psychological functioning, none of the variables was normally distributed. Therefore, we calculated Spearman's correlation coefficients. The data indicate that the number of assistive devices per patient was univariately negatively correlated with psychological well-being ($r = -0.18$; $p = 0.03$). Further, functional status, pain, fatigue, and comorbidity were correlated ($p \leq 0.15$) with both psychological well-being and the number of assistive devices per patient. These variables were considered potential confounders of the relationship between the number of assistive devices per patient and psychological well-being.

Results of the hierarchical multiple linear regression analyses are summarized in Table 3. The results show that only functional status was a confounder of the relationship between the number of assistive devices per patient and psychological well-being. Exclusion of functional status from the regression model decreased the magnitude of the regression coefficient (B) of the number of assistive devices per patient from 0.15 to –0.07. Exclusion of the remaining potential con-

Table 1. Patient characteristics and their correlation with the possession of assistive devices and psychological well-being (n = 142).

Patient Characteristics	Values†	Assistive Devices	Psychological Well-being
Sociodemographics			
Age, yrs	60.5 (12.1)	0.27***	0.03
Sex, %		–0.32***	0.10
Female (score 0)	66		
Male (score 1)	34		
Living situation, %		–0.07	–0.15*
Alone (score 0)	15		
With partner (score 1)	85		
Yearly net income (2002), %		–0.26***	0.04
Below d18,000, (score 0)	53		
Above d18,000, (score 1)	47		
Education level, %		–0.05	0.09
Low (score 1)	58		
Medium (score 2)	30		
High (score 3)	12		
Country, %		–0.31***	–0.08
The Netherlands (score 0)	60		
Germany (score 1)	40		
Clinical status			
Diagnosis, %		–0.36***	0.06
RA (score 0)	58		
PsA (score 1)	42		
Disease duration, yrs	15.5 (11.0)	0.41 ***	–0.04
Comorbidity, no.	1.4 (1.4)	0.22***	–0.29***
Health status			
Functional status (HAQ) (0–3)	1.3 (0.8)	0.72***	–0.41***
Fatigue (VAS) (0–100)	50.6 (23.9)	0.43***	–0.51***
Pain (AIMS2) (0–10)	6.4 (2.2)	0.33***	–0.50***
Psychological functioning (AIMS2) (0–10)	6.0 (1.7)	–0.18**	—
Assistive devices (number in possession) (0–17)	3.7 (3.6)	—	–0.18**

† Values are mean (SD) unless otherwise indicated. * p ≤ 0.15; ** p ≤ 0.05; *** p ≤ 0.01. HAQ: Health Assessment Questionnaire, VAS: visual analog scale, AIMS: Arthritis Impact Measurement Scales.

Table 2. Patients possessing assistive devices (N = 142).

	n (%)
Mobility devices	
Scooter	16 (11)
Walker	15 (11)
Cane	20 (14)
Crutch(es)	24 (17)
Wheelchair	25 (18)
Orthopedic footwear	56 (39)
Tools for ADL	
Helping hand	13 (9)
Special cutlery	13 (9)
Special pen	21 (15)
Dressing device(s)	26 (18)
Housing adaptations	
Elevator	10 (7)
Adapted kitchen	19 (13)
Shower seat	41 (29)
Grab bar(s) in bathroom/toilet	60 (42)
Special tap(s)	61 (43)
Elevated toilet seat	64 (45)
Special furniture	
Special bed	43 (30)

founding variables did not change the regression coefficient of the number of assistive devices per patient by more than 10% (data not shown). Therefore, these variables were not included in the final model. After controlling for confounding by functional status, the number of assistive devices per patient was significantly positively associated with psychological well-being ($r_{partial} = 0.22$; $p = 0.009$).

DISCUSSION

After controlling for differences in functional status, the possession of assistive devices was significantly positively associated with psychological well-being. Surprisingly, the number of assistive devices per patient was univariately negatively correlated with psychological well-being. This can be explained by the high correlations of functional status with the number of assistive devices per patient (r = 0.72) as well as psychological well-being (r = –0.41). These relationships suppress the positive relationship between the number of assistive devices per patient and psychological well-being, and therefore this univariate relationship becomes negative. This is a case of negative confounding, where the removal of a con-

Table 3. Results of hierarchical multiple linear regression analysis for psychological well-being.

	Block 1		Block 2	
	B (95% CI)	r	B (95% CI)	$r_{partial}$
Step 1				
Possession of assistive devices	–0.07 (–0.15 to 0.02)	–0.18	0.15 (0.04 to 0.26)*	0.22*
Step 2				
Functional status			–1.29 (–1.78 to –0.79)*	

B: regression coefficient; CI: confidence interval; r: correlation coefficient. * $p \leq 0.01$.

founding variable (functional status) from a regression equation decreases the magnitude of the relationship between an independent variable (number of assistive devices per patient) and a dependent variable (psychological well-being) or even changes the direction of the relationship[23].

A possible way to explain the relationship between the availability of assistive devices and improved psychological well-being is that the use of assistive devices leads to increased physical functioning and maintained independence. This may lead to decreased negative emotional reactions to disability and improved psychological well-being. On the other hand, psychological well-being may facilitate the use of assistive devices. The direction of this cause-effect relationship between the availability of assistive devices and psychological functioning cannot be deduced from the results of our cross-sectional study. Causality can be tested using only an experimental study design.

The positive relationship between assistive devices and psychological well-being was confirmed in previous studies with patients with nonrheumatic conditions. Tomita, *et al* investigated the relationship between the number of assistive devices per patient and psychosocial variables in a sample of physically impaired elderly people[24]. They found the number of assistive devices per patient to be inversely associated with depression, measured with the Center for Epidemiological Studies Depression Scale (CES-D), after adjusting for differences in sociodemographic variables and disability. Self-esteem, measured with Rosenberg's Self-Esteem Scale, was not independently associated with the number of assistive devices per patient. Jutai, et al investigated the psychosocial influence of the use of several single assistive devices (e.g., wheelchairs, computer-assisted writing aids, electronic aids to daily living) in patients with degenerative diseases and spinal cord and brain injuries[25,26]. They concluded that the psychosocial effect of assistive devices for ADL, measured with the Psychosocial Impact of Assistive Devices Scale (PIADS), was dependent on the type of device and the degree of disability. Overall, the psychosocial effect of assistive devices was positive.

To assess psychological well-being, we used the psychological component of the AIMS2. The AIMS2 is a disease-specific questionnaire designed to measure health-related quality of life in arthritis patients. The questionnaire is not specifically developed to measure the effect of a particular intervention, such as the prescription of assistive devices. Assistive devices might affect different aspects of psychological well-being than other interventions such as surgery or pharmaceutical treatments. Therefore, health-related quality of life measures, like the AIMS2, might not be sensitive enough to assess relatively small differences in psychological well-being associated with the use of assistive devices[27]. Thus the relationship we found between the possession of assistive devices and psychological well-being might be underestimated. Intervention-specific outcome measures, like the $PIADS_{27}$ and the QUEST (Quebec User Evaluation of Satisfaction with Assistive Technology)[28], for assistive devices are recommended in studies examining the effect of a particular intervention.

Device utilization is included in several frameworks for assistive device outcomes and is an important variable to consider when the effects of assistive devices are investigated[29,30]. In this study we assessed only the possession of a selection of commonly used assistive devices. We realize that some patients might not use the assistive devices they possess. Assistive devices that are not in use might not contribute to improved psychological well-being. So the relationship between assistive devices and psychological well-being might have been stronger if we had assessed the use, instead of the possession, of assistive devices. Although we cannot exclude the possibility that some patients might possess more or other devices, we do not consider it likely that these rare cases might have influenced our general conclusions.

Finally, we equated all assistive devices in this study and summed them up, despite their different functions and potential different enhancing effects on the stigma of disability. It is plausible that not all assistive devices have the same effect on psychological well-being. The magnitude of the relationship, as well as the direction of the relationship (positive or negative), might differ per assistive device. Nevertheless, we found a small positive overall relationship between the number of assistive devices patients possess and psychological well-being.

Our data show that the possession of assistive devices is positively related to psychological well-being of disabled patients with rheumatic diseases. More experimental studies are necessary to investigate this issue and confirm the hypothesis that psychological well-being is improved by the availability of assistive devices.

ACKNOWLEDGMENT

We thank all participating patients. We also thank rheumatologists H.J. Bernelot Moens, K.W. Drossaers-Bakker, R. Ernst, C.J. Haagsma, M.A. Hund, M.W.M. Kruijssen, G. Müller, J.C.M. Oostveen, U. Schoo, F. Schuhmann, and T.R. Zijlstra for their collaboration in this study including the selection of patients.

REFERENCES

1. Mann W. Assistive technology for persons with arthritis. In: Melvin J, Jensen G, editors. Rheumatologic rehabilitation series volume 1: Assessment and management. Bethesda, MD: American Occupational Therapy Association; 1998:369-92.
2. Hollings EM, Haworth RJ. Supply and use of aids and appliances. A study of 119 patients with rheumatoid arthritis. Occup Ther 1978;41:336-9.
3. Haworth RJ, Hopkins R. Use of aids following total hip replacement. Occup Ther 1980;43:398-400.
4. Rogers JC, Holm MB. Assistive technology device use in patients with rheumatic disease: a literature review. Am J Occup Ther 1992;46:120-7.
5. Rogers JC, Holm MB, Perkins L. Trajectory of assistive device usage and user and non-user characteristics: long-handled bath sponge. Arthritis Rheum 2002;47:645-50.
6. Sutton D, Gignac MAM, Cott CA. Medicalized and normalized assistive device use among older adults with arthritis. Can J Aging 2002;21:535-48.
7. Van der Esch M, Heijmans M, Dekker J. Factors contributing to possession and use of walking aids among persons with rheumatoid arthritis and osteoarthritis. Arthritis Rheum 2003;49:838-42.
8. Veehof MM, Taal E, Rasker JJ, Lohmann J, van de Laar MAFJ. What determines the possession of assistive devices among patients with rheumatic diseases? The influence of the country-related health care system. Disabil Rehabil 2006;28:205-11.
9. Nordenskiold U. Daily activities in women with rheumatoid arthritis. Aspects of patient education, assistive devices and methods for disability and impairment assessment. Scand J Rehabil Med Suppl 1997;37:1-72.
10. Nordenskiold U, Grimby G, Dahlin-Ivanoff S. Questionnaire to evaluate the effects of assistive devices and altered working methods in women with rheumatoid arthritis. Clin Rheumatol 1998;17:6-16.
11. Thyberg I, Hass UAM, Nordenskiöld U, Skogh T. Survey of the use and effect of assistive devices in patients with early rheumatoid arthritis: a two-year follow up of women and men. Arthritis Rheum 2004;51:413-21.
12. Nordenskiold U. Evaluation of assistive devices after a course in joint protection. Int J Technol Assess Health Care 1994;10:293-304.
13. Oldridge NB. Outcomes measurement: health related quality of life. Assist Technol 1996;8:82-93.
14. Scherer MJ. Outcomes of assistive technology use on quality of life. Disabil Rehabil 1996;18:439-48.
15. Pincus T, Summey JA, Soraci SA Jr, Wallston KA, Hummon NP. Assessment of patient satisfaction in activities of daily living using a modified Stanford Health Assessment Questionnaire. Arthritis Rheum 1983;26:1346-53.
16. Meenan RF, Gertman PM, Mason JH. Measuring health status in arthritis. The Arthritis Impact Measurement Scales. Arthritis Rheum 1980;23:146-52.
17. Jaeckel WH, Cziske R, Schochat T, Jacobi E. Assessing health status after inpatient rehabilitation in rheumatoid arthritis. Int Rehabil Med 1986;8:54-9.
18. Riemsma RP, Taal E, Rasker JJ, Houtman PM, van Paassen HC, Wiegman O. Evaluation of a Dutch version of the AIMS2 for patients with rheumatoid arthritis. Br J Rheumatol 1996;35:755-60.
19. Fries JF, Spitz PW, Young DY. The dimensions of health outcomes: the Health Assessment Questionnaire, disability and pain scales. J Rheumatol 1982;9:789-93.
20. Siegert CE, Vleming LJ, Vandenbroucke JP, Cats A. Measurement of disability in Dutch rheumatoid arthritis patients. Clin Rheumatol 1984;3:305-9.
21. Lautenschlager J, Mau W, Kohlmann T, et al. Comparative evaluation of a German version of the Health Assessment Questionnaire and the Hannover Functional Capacity Questionnaire. Z Rheumatol 1997;56:144-55.
22. Wolfe F. Fatigue assessments in rheumatoid arthritis: comparative performance of visual analog scales and longer fatigue questionnaires in 7760 patients. J Rheumatol 2004;31:1896-902.
23. MacKinnon DP, Krull JL, Lockwood CM. Equivalence of the mediation, confounding and suppression effect. Prev Sci 2000;1:173-81.
24. Tomita MR, Mann WC, Fraas LF, Stanton KM. Predictors of the use of assistive devices that address physical impairments among community based frail elders. J Appl Gerontol 2004;23:141-55.
25. Jutai J. Quality of life impact of assistive technology. Rehabilitation Engineering 1999;14:2-7.
26. Jutai J, Rigby P, Ryan S, Stickel S. Psychosocial impact of electronic aids to daily living. Assist Technol 2000;12:123-31.
27. Jutai J, Day H. Psychosocial Impact of Assistive Devices Scale (PIADS). Technol Disabil 2002;14:107-11.
28. Demers L, Weiss-Lambrou R, Ska B. The Quebec User Evaluation of Satisfaction with Assistive Technology (QUEST 2.0): an overview and recent progress. Technol Disabil 2002;14:101-5.
29. Fuhrer MJ, Jutai JW, Scherer MJ, DeRuyter F. A framework for the conceptual modelling of assistive technology device outcomes. Disabil Rehabil 2003;25:1243-51.
30. Jutai JW, Fuhrer MJ, Demers L, Scherer MJ, DeRuyter F. Toward a taxonomy of assistive technology device outcomes. Am J Phys Med Rehabil 2005;84:294-302.
31. Parette P, Scherer M. Assistive technology use and stigma. Educ Train Dev Disab 2004;39:217-26.