

Postprint Version	1.0
Journal website	<a href="http://onlinelibrary.wiley.com/doi/10.1111/j.1752-9824.2011.01080.x/abstract">http://onlinelibrary.wiley.com/doi/10.1111/j.1752-9824.2011.01080.x/abstract</a>
Pubmed link	
DOI	10.1111/j.1752-9824.2011.01080.x

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# Separate and joint effects of physical and mental health on participation of people with somatic chronic illness

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**Aim.** To examine the extent to which people with a somatic chronic illness participate in paid jobs, volunteer work, informal care and social activities, and to investigate the separate and joint effects of physical and mental health on participation.

**Background.** Compared with healthy people, people with a chronic illness experience more difficulties with respect to participation in several life domains. **Methods.** Data were collected within the National Panel of the Chronically Ill and Disabled by means of questionnaires. Data of 1456 panel members diagnosed with a somatic chronic disease(s) were used, and analysed using univariate, bivariate and multivariate analyses.

**Results.** About half of the working age people with a chronic illness were in paid employment, 25% carried out volunteer work, 18% performed informal care and

58% of the people participated in social activities. Main effects were found for physical functioning and pain on paid work, pain and mental health on volunteer work and physical functioning on informal care. An interaction effect was observed for pain and mental health on both paid and volunteer work; as mental health is better, less pain is associated with a greater chance of paid work and more pain is associated with a greater chance of volunteer work.

**Conclusions.** The findings emphasise the importance of mental health for participation in people with a chronic somatic illness, besides physical health.

**Relevance to clinical practice.** In contrast with many of their physical limitations, the mental health state of patients with a chronic illness could be improved. Health care providers, including nurses, should take into account patients' mental health states and make efforts to treat mental health problems.

## INTRODUCTION

In recent years, researchers and health agencies have stressed the growing burden that chronic diseases put on population health in Europe as well as worldwide (World Health Organization 2005, Mathers & Loncar 2006, Pomerleau et al. 2008). The increasing number of people diagnosed with one or more chronic diseases not only has consequences for the organisation and costs of healthcare, but will also affect social structures. Compared with healthy people, people with a chronic illness experience more problems with regard to participation in several life domains such as education, employment, social relationships and

leisure activities (Pinder 1995, Boonen et al. 2001, Calsbeek et al. 2002, Geuskens et al. 2007). Several studies have shown that labour participation is negatively affected by chronic illness (Baanders et al. 2002, Geuskens et al. 2008). Chronic illness has also been found to relate to lower participation in volunteer work (Baanders 2001, van den Brink-Muinen et al. 2009). Participation in life domains has been regarded as an important component of quality of life. It is therefore important to gain insight into the factors that promote or impede participation in people with a chronic illness.

## BACKGROUND

Participation in society of people with a chronic illness, for example, participation in paid work, appears to be strongly related to the severity of the physical limitations experienced (Baanders et al. 2002, Geuskens et al. 2008). Nevertheless, there are still considerable differences, for instance, in labour participation, between people suffering from similar levels of physical disability. Personal (such as age, motivation and competences) and environmental factors (such as attitude of colleagues and type of work) have been found to play a role (Chorus et al. 2001, Boot et al. 2008). At the same time, mental health may also be a factor of importance. There is considerable evidence that mental distress is associated with restrictions in the employment domain. Several studies have demonstrated that depression has a major impact on the ability to work (Kouzis & Eaton 1994, Kessler et al. 1999, 2003a). Ormel et al. (1994) found a consistent association between common mental disorders and limitations in diverse domains such as occupational role functioning, physical functioning, and disability days in a large primary care sample spanning 14 countries. A more recent study by Buist- Bouwman et al. (2006) showed that mental disorders are associated with a similar or even higher negative impact on daily functioning than arthritis and heart disease. Mental distress may result in participation restrictions via, for example, cognitive and motivational capacities, affect regulation, social perception and a tendency to amplify physical symptoms such as fatigue and pain (Alonso et al. 2004).

Several studies have demonstrated that people with somatic chronic illness are at an increased risk of mental distress (Wells et al. 1988, Verhaak et al. 2005, Harter et al. 2007), although the relationship is not straightforward and personality and disease characteristics have been found to interfere (Ormel et al. 1997, Hansen et al. 2001). It can be expected that mental distress in persons with a somatic chronic illness may affect their chances to participate, in addition to their physical limitations. For instance, Calsbeek et al. (2006) showed that besides physical complaints and disability in endurance, depressive symptoms obstruct adolescents and young adults with chronic digestive disorders to participate in social activities and education. Results of the National Comorbidity Survey, a nationally representative general population survey of Americans (aged 15–54 years), demonstrate that co-morbid physical and mental disorders are more role impairing (number of work loss and work cut-back days during 30 days) than either pure mental disorders or pure physical disorders (Kessler et al. 2003b). In the Netherlands Mental Health Survey and Incidence Study, a survey among adults in the general Dutch population (aged 18–64 years), mainly additive effects of physical/mental co-morbidity were found regarding work loss days (Buist- Bouwman et al. 2005).

## Aim

To our knowledge, no studies have been performed with regard to the joint impact of physical and mental health problems on broader aspects of societal involvement in people with a somatic chronic illness. The present study aimed to investigate these effects, not only on labour participation, but on participation in volunteer work, informal care and social activities as well. To investigate the joint impact, we assessed both additive and synergistic effects of physical and mental health on participation. The following research questions were formulated:

1. To what extent do people with a somatic chronic illness participate in paid jobs, volunteer work, informal care and social activities, and to what extent are sociodemographic and disease characteristics related to participation rates?
2. How do people with a somatic chronic illness experience their physical and mental health?
3. What are the separate and joint effects of physical and mental health on participation in paid jobs, volunteer work, informal care and social activities of people with a somatic chronic illness?

## METHODS

The study sample comprised a representative group of patients with a somatic chronic illness, derived from the National Panel of the Chronically Ill and Disabled (NPCD), a nationwide prospective panel-study in the Netherlands (Rijken et al. 2005). NPCD has been set up to provide information with respect to the consequences of chronic illness and disability from the patient's perspective. NPCD supplies core data on the health status, the use of health services and social participation. Panel members are people aged 15 years and older with one or more medically diagnosed somatic chronic disease(s), i.e. cardiovascular disease, diabetes mellitus and/or moderate-to-severe levels of physical disability. Participants fill in two or three postal questionnaires per year for maximally 5 years and are considered a representative sample of the Dutch population of adult, non-institutionalised people with a somatic chronic illness and/or physical disability. Every year, approximately 500 panel members with a somatic chronic disease are selected via a standardised procedure applied in a random sample of general practices throughout the country. Additional panel members are selected from several national population surveys on the basis of the presence of moderate-to-severe physical disability. NPCD is registered with the Dutch Data Protection Authority; all data were collected and handled according to the privacy protection guidelines of the Authority. In 2007, the panel consisted of more than 3000 participants with a chronic illness or disability. For the purpose of this study, we only used data of panel members diagnosed with somatic chronic disease(s) recruited via general practices, who filled in three questionnaires: one questionnaire in April 2007 (response rate 87%; 1679/1934) and two questionnaires in October 2007 (response rate 84%; 1536/1824, response rate 83%; 1515/1824). As subjects had to respond to all three questionnaires to be included in this study, the final sample consisted of 1456 people with a chronic illness.

## DATA COLLECTION

### Labour participation

Labour participation was defined in conformity with Statistics Netherlands (CBS), as performance of paid work for at least 12 hours per week. Participants were asked to indicate the number of hours per week spent on paid employment in October 2007. For the purpose of this study, the data were recoded into a dichotomous variable indicating whether or not respondents (aged 15–64 years) performed paid work for at least 12 hours per week.

### Volunteer work and informal care

Respondents were asked to indicate whether they performed volunteer work or informal care at the time of the survey (October 2007). Volunteer work was defined as carrying out volunteer work for an organisation, institution or society. Informal care was operationalised as care given to relatives or acquaintances (not members of the household) who are in need of help.

### Social participation

Respondents were asked in October 2007 to indicate on a four-point scale how often they participated in social activities (1 = weekly, 2 = monthly, 3 = a few times a year, 4 = (hardly) ever). Social activities were operationalised as: (1) practising sports in a sporting club at least once a week, (2) participating in societies such as a reading circle or hobby club for at least a few times a year, or (3) participating in religious meetings for at least a few times per year. Calculations resulted in one dichotomous variable indicating whether or not respondents participated in social activities.

### Physical and mental health

In April 2007, physical health and mental health were assessed by four scales of the Medical Outcomes Study 36-item Short Form Health Survey (SF-36): physical functioning, vitality, bodily pain and mental health (Ware & Sherbourne 1992, McHorney et al. 1994, van der Zee et al. 1996). The physical functioning scale consists of ten items. Participants were asked to indicate to what extent their health obstructs them in several daily activities (e.g. climbing several flights of stairs). Items were rated on a three-point scale (1 = yes, limited a lot, 2 = yes, limited a little, 3 = no, not limited at all). The vitality scale comprised four items (e.g. How much of the time during the past four weeks did you feel worn out?). Items were rated on a six-point scale (1 = all of the time to 6 = none of the time). Bodily pain was assessed by means of two items ['How much bodily pain have you had during the past four weeks?', 'During the past four weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?'].]

Items were rated on a six-point scale (1 = none to 6 = very severe) and a five-point scale (1 = not at all to 5 = extremely) respectively. The mental health scale consists of five items and contains questions on feelings of depression and nervousness (e.g. How much of the time during the past four weeks have you felt downhearted and blue?). Items were rated on a six-point scale (1 = all of the time to 6 = none of the time). The score of each scale was transformed into a 100-point scale (0–100) with higher scores signifying a more favourable health status. We calculated Cronbach's alpha for each of the four scales to explore the reliability (i.e. internal consistency) of the scales. Cronbach's alphas for the scales in the present study indicated good internal consistency: 0,94, 0,82, 0,88 and 0,87 for physical functioning, vitality, bodily pain and mental functioning respectively.

### **Sociodemographic and disease characteristics**

Sociodemographic characteristics included gender, age, educational level, living situation and degree of urbanisation. Educational level reflected the highest level of education completed and was classified as low (no, primary, or lower vocational education), intermediate (secondary or intermediate vocational education) and high level (higher vocational education or university). Living situation referred to whether or not one lived with a partner. Degree of urbanisation was calculated on the basis of the density of home addresses in the respondents' living environment, and was divided into five categories (extremely, strongly, moderately, hardly and not urbanised).

Disease characteristics were provided by the general practitioners (GPs) of the patients at inclusion. GPs registered the type of chronic disease(s) diagnosed (up to four chronic diseases) and the 'physician assessed' health status. Indicators of the physician-assessed health status included the extent to which the respondent's health condition was: (1) progressively deteriorating, (2) life threatening and (3) characterised by an episodic course. Diagnoses of chronic diseases were coded according to the International Classification of Primary Care (Lamberts & Wood 1987). In case of more than one chronic disease, the disease that had been diagnosed first (oldest diagnosis) was considered the index disease in this study (Schellevis & van Lisdonk 1993). For the purpose of this study, the index diseases were categorised into eight diagnostic categories (see Table 1). We also computed the number of chronic diseases per respondent on the basis of the diagnoses registered by the GPs (categories: one, two, and three or more chronic diseases).

### **Statistical analysis**

To answer the first research question, descriptive statistics were computed to describe the extent to which people with a chronic illness participate in paid jobs, volunteer work, informal care and social activities. Relationships between sociodemographic and disease characteristics on the one hand and participation on the other hand were assessed by means of chi-square tests. To answer the second research question, descriptive statistics were computed to assess the physical and mental health of the respondents. The third research question was answered by conducting logistic regression analyses, to assess the main effects of the indicators of physical and mental health on participation in the four domains (paid work, volunteer work, informal care and social participation) and to assess the interaction effects of the products of the mental health scale with the physical health scales on the four participation domains (using the logistic regression method described by Jaccard 2001). Sociodemographic and disease characteristics were included to control for their confounding effects on the four participation indicators.

### **[TABLE 1]**

## **RESULTS**

### **Sample characteristics**

Table 1 shows the sociodemographic and disease characteristics of the sample. The sample of 1456 chronic illness patients were aged between 18–92 years, with a mean age of 61,6 years (SD = 13,6 years). Fifty-seven per cent of the patients were female. Almost three quarters (72%) were living with a partner. Degree of urbanisation was differently distributed in our sample compared with the total population of the Netherlands in 2007 (Statistics Netherlands 2009a): our sample consisted of less people living in extremely urbanised areas (10,1% vs. 19,2% of the Dutch population) as well as less people living in non-urbanised areas (7,9% vs. 20,1% of the Dutch population), whereas the degrees of urbanisation in-between were

overrepresented in our sample. When considering the disease characteristics of the sample, most people suffered from asthma/chronic obstructive pulmonary disease (COPD), cardiovascular disease, musculoskeletal diseases or diabetes. These four categories together account for two-thirds (67%) of all index diseases registered by the GPs. About one-third of the sample had been diagnosed with more than one somatic chronic disease.

### **Labour participation**

Within the group of people of working age (15–64 years old), 50,5% of the people indicated to perform paid work for at least 12 hours per week ( $M = 30,80$  hours per week ( $SD = 10,26$ ), range = 12–60 hours per week). More men than women were employed (for at least 12 hours per week) (Table 2). Labour participation was higher among people aged between 15–39 years than among people in the age of 40–64 years, and the higher the educational level, the higher the employment rate. The results also showed an association between labour participation and the number of chronic diseases diagnosed: the employment rate was lower in respondents with more chronic diseases. Lastly, associations were found between labour participation and the extent to which the chronic condition had a progressive course and was life-threatening. Labour participation was lower among people whose condition was more progressive, and among people who had a condition that was life-threatening to a neutral extent (compared with those with a condition of lesser or greater life threat).

### **Participation in volunteer work**

Within the total group 25,2% of the respondents performed volunteer work. People with an intermediate/high level of education carried out volunteer work more often than people with a low level of education (Table 2). Furthermore, the results showed that people in the age of 75 years and older carried out volunteer work less often than people aged 15–74 years. No associations were observed with respect to disease characteristics and participation in volunteer work.

### **Participation in informal care**

Within the total group, 18,3% of the respondents carried out informal care. More women than men performed informal care (Table 2). People aged 15–64 years and people with an intermediate/high educational level performed informal care more often than people aged 65 years and older and people with a low level of education. No associations were found between specific disease characteristics of our respondents and whether or not they performed informal care.

### **Social participation**

More than half of the respondents (58,4%) participated in social group activities, which means that they practised sports in a sporting club on a weekly basis or took part in societies or religious meetings at least a few times per year. More women participated in social activities than men and people who were higher educated appeared to be involved in social activities more often than people with a low level of education (Table 2). Furthermore, the results showed that people living in less urbanised areas carried out social activities more often. Disease characteristics were not associated with social participation.

### **Physical and mental health**

#### **[TABLE 2, 3]**

Table 3 contains the means and standard deviations of the SF-36 physical functioning, vitality, bodily pain and mental functioning scores of the total sample. Furthermore, Table 3

contains reference scores of a random sample ( $N = 1063$ ) aged 18–89 years from a midsize town in the north of the Netherlands (van der Zee et al. 1996), and a nationwide random sample ( $N = 1742$ ) of Dutch citizens aged 16–94 years (Aaronson et al. 1998). Compared with the reference scores of the population samples, our sample of patients with a chronic illness had lower scores (less favourable) on all four scales, although the differences in mental health scores were small.

### **Predictors of participation**

The results of the multiple logistic regression analyses are shown in Table 4. We will describe the results predicting the four indicators of participation separately below.

### **Labour participation**

Model 1 in Table 4 explained a substantial part of the variance in labour participation: 42,4%. Sociodemographic characteristics appeared to be important predictors of labour participation in people with a chronic illness aged 15– 64 years; they accounted for 30,5% of the total explained variance (not shown in Table 4). Older age decreased the likelihood of having a paid job. Women are also less likely to participate in (paid) work. This also holds for people living in areas that are hardly urbanised compared with those living in extremely urbanised areas. People with a high educational level are more likely to have a paid job despite their chronic disease(s). Regarding the disease characteristics, having a chronic condition with a moderate life threat (compared with a less life-threatening condition) and having three or more chronic diseases (compared to one disease) significantly decreased the likelihood to be employed. The disease characteristics added 6,3% of explained variance, which was a significant contribution (not shown in Table 4).

When we consider the effects of the physical and mental health indicators, another 5,6% of the total variance was explained, which was also a significant contribution. A more favourable level of physical functioning (less physical disability) was significantly associated with having a paid job. In addition, a more favourable experience in terms of bodily pain (less pain) reduced the chances of having a paid job. The model also shows a significant interaction effect of pain and mental health: a more favourable score on the bodily pain scale (less pain) combined with a better mental health was positively related to labour participation. This finding can be interpreted as that a better mental health weakens the negative main effect of a more favourable pain state on performing a paid job.

### **Participation in volunteer work**

Table 4, model 2, displays the results of the regression analysis with volunteer work being the outcome variable. In contrast with the former model explaining labour participation, this model accounted for only 8,4% of the variance in the performance of volunteer work by patients with a chronic illness aged 15 years or older. The sociodemographic characteristics accounted for 3,5% of the variance, which was a significant contribution (not shown in Table 4). The disease characteristics did not significantly contribute to the model (non-significant increase of 1,1%). Of all sociodemographic and disease characteristics included in the analysis, educational level was the only significant predictor. People with an intermediate or high level of education are more likely to perform volunteer work. Adding the physical and mental health indicators increased the total explained variance significantly (to 8,4%). More favourable states of bodily pain and mental health increased the likelihood of performing volunteer work by people with a chronic illness. Also in this analysis, a significant interaction effect of pain and mental health was found, indicating here that when a more favourable bodily pain state (less pain) is combined with a better mental health, the positive separate (main) effects of bodily pain and mental health on performing volunteer work are weakened.

### **Participation in informal care**

Table 4, model 3, displays the results of the regression analysis with informal care being the outcome variable. This model explained 11,5% of the variance in the performance of informal care by patients with a chronic illness aged 15 years or older. Women are more likely to carry out informal care. Furthermore, the results showed that people with an intermediate level of education are more likely to perform informal care. None of the disease characteristics was significantly associated with the performance of informal care. The sociodemographic characteristics explained 6,4% of the variance (significant contribution) (not shown in Table 4). The disease characteristics added 1,3% of explained variance (non-significant increase). Adding the physical and mental health indicators to the model, the percentage of explained variance increased to 11,5%, which was a significant contribution. A more favourable state of physical functioning increased the likelihood of performing informal care by people with a chronic illness.

## Social participation

### [TABLE 4]

Table 4, model 4, presents the results of the regression analysis with social participation being the outcome variable. In this model, the sociodemographic variables accounted for the largest part of explained variance: 5,5% (significant contribution) of the 9,2% total explained variance (not shown in Table 4). Being older and being female both increased the likelihood of being socially active. Furthermore, social participation is more likely for patients with a chronic illness who are higher educated and for those who live in areas that are hardly urbanised or not urbanised (compared to extremely urbanised areas). Whether or not one lives together with a partner does not make a difference regarding social participation.

The disease characteristics did not significantly contribute to the model (non-significant increase of 1,6%), but the physical and mental health indicators taken together did (2,1%). Nevertheless, none of them made a significant contribution on its own. Neither main effects nor interaction effects with mental health were significant.

## DISCUSSION

The findings show that about half of the people with a chronic illness of working age had a paid job for at least twelve hours per week. To put this percentage into perspective, in 2007, approximately two of three people of the Dutch working age population participated in paid labour (Statistics Netherlands 2009b). Twenty-five per cent carried out volunteer work, 18% carried out informal care and 58% participated in social activities. According to Statistics Netherlands, in 2007, 44% of the adult Dutch population was involved in volunteer work and 28% carried out informal care (Statistics Netherlands 2010). No norm scores are available with respect to social activities. We wish to mention that our sample comprised more female and older persons than the total adult Dutch population in 2007. Notwithstanding that, our results suggest that labour participation and participation in volunteer work and informal care are indeed lower among people with a chronic illness than in the general population. The average scores on the physical and mental health scales we found in our study were also lower than the scores of Dutch general population samples, although the differences in mental health scores were small (van der Zee et al. 1996, Aaronson et al. 1998).

Before discussing the separate and joint effects of physical and mental health on participation, we wish to consider the adequacy of the total model to explain participation of people with a chronic illness in several domains of life. We were able to explain a substantial part of the variance in labour participation in our sample of people with a chronic illness, but the explanatory value of the model for the three other types of participation was rather low. This means that whether or not a person with a somatic chronic illness participates in volunteer work, informal care or social activities depends for the largest part on other factors not studied here, for instance, personality characteristics (e.g. personal goals, competences) or environmental factors (attitude of colleagues, available facilities). Apart from degree of urbanisation, we did not take environmental factors into account. We wish to state that providing a full explanatory model of participation was not the purpose of our study. Nevertheless, considering the total amount of explained variance is relevant to place our findings into context.

Sociodemographic characteristics such as age, gender, educational level and degree of urbanisation appeared to be all significant predictors of participation in both paid jobs and social activities, although their effects were different for these two types of participation. For instance, being older, being female and living in an area that is hardly urbanised (compared with extremely urbanised areas) reduced the likelihood of having a paid job, but increased the chances of being socially active. Educational level was the only consistently significant predictor of participation in all four domains. Our results also show that characteristics of the chronic illness were of low predictive value for participation. None of the disease characteristics (type and number of chronic diseases and physician assessed health status) was significantly related to participation in volunteer work, informal care or social activities. The type of chronic disease was not associated with labour participation either. Having three or more chronic diseases, however, reduced the likelihood of having a paid job. This was also the case for having a health condition which is life-threatening to a neutral extent (compared with a less life-threatening condition). We found that people who have an illness which is life-threatening were more likely to be employed than people who have a less life-threatening condition, although the result of the regression analysis was not significant. This finding

might be explained by the fact that the group of patients (aged 15–64 years) with a life-threatening illness was small ( $N = 41$ ). When interpreting these results, it should be emphasised that the study group comprised people who all suffered from a chronic illness; consequently, the results do not give an insight into the impact of having a chronic condition, compared with no chronic condition, on participation.

Considering the effects of the various aspects of physical and mental health, our findings show that these variables did not contribute to the explanation of being socially active by people with a chronic illness. With respect to labour participation, we found significant main effects of physical functioning and pain. A better physical functioning appeared to contribute to labour participation, which is consistent with previous findings (Baanders et al. 2002). A more favourable pain state (less pain), on the other hand, reduced the chances of having a paid job. Due to the design of our study, this finding could also be interpreted that having a paid job increased the likelihood of experiencing more pain (compared with not having a paid job). Mental health, however, appeared to interfere with pain. The significant interaction effect indicates that as mental health improves, a more favourable pain state (less pain) is associated with a greater chance of employment. Alonso et al. (2004) suggest that mental distress may lead to a tendency to amplify physical symptoms such as bodily pain, thus indicating an exacerbating effect of mental distress. Our results point to a positive effect of a good mental health on labour participation of people with a chronic illness, but only for those who experience low(er) levels of pain.

With respect to informal care, we also found a significant main effect of physical functioning. A better physical functioning appeared to contribute to the performance of informal care.

Less pain and a better mental health were predictive of participation in volunteer work (main effects). Again, we found a significant interaction effect of pain and mental health, but this time, the interaction negatively affected the chances of performing volunteer work. Thus, a better mental health weakened the main (positive) effect of a favourable bodily pain state (less pain) on performing volunteer work. Or otherwise, a more favourable bodily pain state (less pain) weakened the main (positive) effect of a better mental health on performing volunteer work. Performing volunteer work may function as a substitute for participation in a paid job for some people with a chronic illness. If these two ways of participation are substitutes, our result might be caused by the fact that people with a chronic illness who experience both a good mental health and less pain prefer paid work above volunteer work. To explore this possibility of substitution, we computed a cross-table of labour participation (yes/no) vs. participation in volunteer work (yes/no) for our respondents aged 15–64 years and performed a chi-square test. The result showed that people with a paid job participated less in volunteer work than people without a paid job. However, the difference between the groups did not reach the level of significance and therefore does not support the idea of substitution.

### **Strengths and weaknesses of the study**

It is important to note that the present study did not have a longitudinal design, which means that no conclusions can be drawn with respect to the causality of the found relationships. Consequently, it is not clear whether participation is a cause or a result of physical and mental health. A strong aspect of this study is that it was carried out within a large and heterogenic group of somatic chronic ill patients, which increases the ability to apply the study findings to the general population of people with a chronic illness.

### **Conclusion**

This study emphasises the relevance of considering mental health as an important factor in explaining participation rates among people with somatic chronic illness, besides their physical limitations. The relationship between mental health and participation of people with a chronic illness is not straightforward. A good mental health is of additive value to participation in volunteer work (in addition to less pain), but also interferes with the relationship between bodily pain and participation in paid or volunteer work.

### **Relevance to clinical practice**

Healthcare providers, including nurses, involved in care for people with a chronic somatic illness should be more aware of the mental health states of their patients. In contrast with many of their physical limitations, patients' mental health state could be improved. In the Netherlands, mental health is not yet a primary area of attention in clinical care for people with a chronic somatic illness. More efforts should be made to signal and treat mental health problems in people with somatic chronic illness. Use of screening instruments might be helpful to detect comorbid mental disorders in patients with chronic somatic diseases and identify patients in need of psychological treatment (Härter et al. 2006).



### Acknowledgements

This study was performed within the research programme 'National Panel of the Chronically ill and Disabled' (NPCD). Funding was provided by the ministry of Public Health, Welfare and Sports and the ministry of Social Affairs and Employment of The Netherlands.

### Contributions

DLJ performed the data analyses, made substantial contributions to interpretation of data and prepared the manuscript. MR was responsible for the study design, made substantial contributions to interpretation of data and has been involved in revising the manuscript critically for important intellectual content.

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## TABLES

Table 1 Sociodemographic and disease characteristics of the total sample (N = 1456)

	N	%
Sociodemographic characteristics		
Gender		
Female	834	57.3
Male	622	42.7
Age (years)		
15-39	99	6.8
40-64	719	49.4
65-74	364	25.0
≥75	274	18.8
Educational level		
Low	594	42.0
Intermediate	594	42.0
High	226	16.0
Living situation (with partner)	1041	72.0
Degree of urbanisation		
Extremely urbanised	147	10.1
Strongly urbanised	435	29.9
Moderately urbanised	310	21.3
Hardly urbanised	448	30.8
Not urbanised	115	7.9
Disease characteristics (registered by GP)		
Index disease		
Cardiovascular disease	259	17.8
Asthma/COPD	260	17.9
Musculoskeletal disease	233	16.0
Cancer	66	4.5
Diabetes mellitus	217	14.9
Neurological disease	109	7.5
Chronic digestive disorder	78	5.4
Other chronic disease	234	16.1
Number of chronic diseases		
One	923	63.4
Two	377	25.9
Three or more	156	10.7
Progressive deteriorating course		
To a less extent	680	46.9
Neutral	592	40.9
To a large extent	177	12.2
Life threat		
To a less extent	1011	69.8
Neutral	347	23.9
To a large extent	91	6.3
Episodic course		
To a less extent	617	42.7
Neutral	503	34.8
To a large extent	326	22.5

COPD, chronic obstructive pulmonary disease; GP, general practitioner.

Table 2 Chi-square statistics for the associations between labour participation, volunteer work, informal care, social participation and sociodemographic, disease characteristics

	Labour participation		Volunteer work		Informal care		Social participation	
	% (N)	$\chi^2$	% (N)	$\chi^2$	% (N)	$\chi^2$	% (N)	$\chi^2$
Sociodemographic characteristics								
Gender		22.55***		ns		21.85***		5.12*
Male	61 (193)				13 (78)		55 (330)	
Female	44 (214)				22 (181)		61 (481)	
Age (years)		24.00***		10.83*		41.10***		ns
15-39	74 (71)		29 (28)		22 (21)			
40-64	47 (336)		27 (188)		24 (172)			
65-74			27 (97)		11 (41)			
≥75			17 (45)		10 (25)			
Educational level		39.25***		23.36***		19.70***		12.62**
Low	36 (91)		19 (109)		13 (74)		54 (297)	
Intermediate	54 (205)		29 (166)		22 (130)		60 (342)	
High	66 (104)		33 (75)		22 (49)		67 (150)	
Degree of urbanisation		ns		ns		ns		19.25**
Extremely urbanised							49 (67)	
Strongly urbanised							53 (217)	
Moderately urbanised							59 (174)	
Hardly urbanised							64 (279)	
Not urbanised							65 (73)	
Living situation		ns		ns		ns		ns
Disease characteristics								
Number of chronic diseases		21.51***		ns		ns		ns
One	55 (322)							
Two	41 (69)							
Three or more	30 (16)							
Deteriorating, progressive course		24.77***		ns		ns		ns
To a less extent	58 (237)							
Neutral	46 (142)							
To a large extent	31 (26)							
Life threat		12.84**		ns		ns		ns
To a less extent	54 (321)							
Neutral	38 (62)							
To a large extent	54 (22)							
Episodic course		ns		ns		ns		ns
Index disease		ns		ns		ns		ns

\* $p < 0.05$ .

\*\* $p < 0.01$ .

\*\*\* $p < 0.001$ .

Table 3 Mean scores and standard deviations of physical functioning, vitality, bodily pain, and mental functioning, study sample and Dutch population samples

	Study sample		Norm scores*		Norm scores**	
	N	M (SD)	N	M (SD)	N	M (SD)
Physical functioning	1349	66.2 (28.7)	1063	81.9 (23.2)	1742	83.0 (22.8)
Vitality	1363	58.6 (19.9)	1063	67.4 (19.9)	1742	68.6 (19.3)
Bodily pain	1372	71.7 (25.0)	1063	79.5 (25.6)	1742	74.9 (23.4)
Mental functioning	1358	73.7 (17.4)	1063	76.8 (18.4)	1742	76.8 (17.4)

\*van der Zee *et al.* 1996.

\*\*Aaronsen *et al.* 1998.

Table 4 Multiple logistic regression models predicting labour participation, participation in volunteer work, informal care and social participation

	Model 1 Labour participation (N = 729, 15–64 years) Nagelkerke's R <sup>2</sup> = 42.4%, OR (95% CI)	Model 2 Volunteer work (N = 1260, 15 years or older) Nagelkerke's R <sup>2</sup> = 8.4%, OR (95% CI)	Model 3 Informal care (N = 1259, 15 years or older) Nagelkerke's R <sup>2</sup> = 11.5%, OR (95% CI)	Model 4 Social participation (N = 1232, 15 years or older) Nagelkerke's R <sup>2</sup> = 9.2%, OR (95% CI)
<b>Sociodemographic and disease characteristics</b>				
Age	0.901 (0.879–0.924)	1.003 (0.991–1.015)	0.988 (0.975–1.001)	1.024 (1.013–1.035)
Female (ref: male)	0.251 (0.167–0.376)	0.840 (0.631–1.119)	2.132 (1.516–2.999)	1.556 (1.200–2.017)
Educational level (ref: low)				
Intermediate	1.510 (0.997–2.287)	1.622 (1.193–2.207)	1.547 (1.092–2.191)	1.399 (1.068–1.832)
High	2.497 (1.445–4.312)	1.882 (1.279–2.769)	1.343 (0.849–2.124)	2.154 (1.487–3.120)
Living with a partner (ref: living without a partner)	1.265 (0.803–1.993)	0.891 (0.652–1.219)	1.386 (0.962–1.996)	0.898 (0.677–1.190)
Degree of urbanisation (ref: extremely urbanised)				
Strongly urbanised	0.682 (0.350–1.328)	1.537 (0.899–2.627)	0.786 (0.458–1.351)	1.183 (0.759–1.844)
Moderately urbanised	0.635 (0.314–1.283)	1.602 (0.926–2.772)	0.806 (0.457–1.420)	1.476 (0.927–2.352)
Hardly urbanised	0.372 (0.188–0.737)	1.599 (0.937–2.729)	0.735 (0.425–1.269)	2.096 (1.338–3.285)
Not urbanised	0.639 (0.271–1.510)	1.734 (0.903–3.333)	0.852 (0.427–1.699)	2.181 (1.224–3.886)
Index disease (ref: cardiovascular disease)				
Asthma/COPD	1.039 (0.510–2.117)	1.205 (0.728–1.995)	0.867 (0.488–1.541)	0.927 (0.595–1.444)
Musculoskeletal disease	0.805 (0.381–1.699)	1.536 (0.918–2.570)	0.629 (0.344–1.151)	0.919 (0.580–1.454)
Cancer	1.186 (0.430–3.271)	1.057 (0.508–2.199)	1.476 (0.690–3.157)	0.749 (0.394–1.423)
Diabetes mellitus	0.890 (0.420–1.887)	1.003 (0.605–1.661)	0.801 (0.453–1.414)	0.804 (0.517–1.252)
Neurological disease	1.124 (0.475–2.659)	1.407 (0.761–2.601)	0.885 (0.439–1.785)	0.765 (0.438–1.335)
Chronic digestive disorder	1.317 (0.542–3.199)	1.402 (0.692–2.840)	0.939 (0.435–2.023)	0.579 (0.307–1.091)
Other chronic disease	1.029 (0.520–2.037)	1.296 (0.795–2.111)	0.795 (0.458–1.381)	0.860 (0.555–1.332)
Deteriorating, progressive course (ref: less extent)				
Neutral	0.811 (0.525–1.253)	0.873 (0.636–1.198)	1.258 (0.880–1.798)	0.938 (0.704–1.248)
Large extent	0.514 (0.252–1.046)	0.833 (0.504–1.376)	1.040 (0.573–1.888)	0.811 (0.526–1.250)
Life threat (ref: less extent)				
Neutral	0.565 (0.337–0.947)	1.139 (0.804–1.616)	0.979 (0.656–1.460)	1.140 (0.831–1.563)
Large extent	2.387 (0.944–6.037)	0.753 (0.381–1.487)	0.528 (0.232–1.203)	0.764 (0.438–1.331)
Episodic course (ref: less extent)				
Neutral	1.193 (0.747–1.906)	0.842 (0.602–1.176)	0.882 (0.599–1.297)	1.239 (0.920–1.669)
Large extent	1.425 (0.830–2.447)	1.054 (0.710–1.563)	0.981 (0.626–1.536)	1.203 (0.840–1.723)
Number of chronic diseases (ref: one disease)				
Two diseases	0.831 (0.521–1.325)	1.097 (0.791–1.522)	0.993 (0.684–1.442)	0.785 (0.587–1.050)
Three or more diseases	0.378 (0.171–0.838)	1.045 (0.642–1.699)	0.986 (0.557–1.747)	0.744 (0.490–1.131)
<b>Perceived physical and mental health</b>				
Physical functioning	1.050 (1.006–1.096)	1.010 (0.983–1.037)	1.037 (1.008–1.067)	1.001 (0.980–1.023)
Vitality	1.040 (0.990–1.093)	1.000 (0.964–1.036)	0.988 (0.952–1.025)	1.031 (0.999–1.063)
Bodily pain	0.953 (0.911–0.997)	1.046 (1.012–1.080)	1.009 (0.976–1.044)	0.982 (0.957–1.008)
Mental functioning	1.009 (0.968–1.051)	1.032 (1.003–1.062)	1.003 (0.975–1.032)	1.001 (0.981–1.022)
Physical functioning × mental functioning	1.000 (0.999–1.000)	1.000 (1.000–1.000)	1.000 (0.999–1.000)	1.000 (1.000–1.000)
Vitality × mental functioning	1.000 (0.999–1.000)	1.000 (1.000–1.001)	1.000 (1.000–1.001)	1.000 (0.999–1.000)
Bodily pain × mental functioning	1.001 (1.000–1.001)	0.999 (0.999–1.000)	1.000 (0.999–1.000)	1.000 (1.000–1.001)

COPD, chronic obstructive pulmonary disease; OR, odds ratio; CI, confidence interval; Nagelkerke's R<sup>2</sup>, a pseudo measure for the proportion of explained variance and an analogy of R<sup>2</sup> in linear regression; bold type indicates a significant association.