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IS OPTIMISM SENSITIVE TO THE STRESSORS OF CHRONIC DISEASE? THE IMPACT OF TYPE 1 DIABETES MELLITUS AND MULTIPLE SCLEROSIS ON OPTIMISTIC BELIEFS

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The aim of the present study was to investigate longitudinally the sensitivity of optimistic beliefs (positive outcome expectancies, efficacy expectancies, and optimistic bias) to disease-related stress (measured by disease duration, depressive symptoms, physical symptoms, physical impairment, and life-events) in Type 1 diabetes (*n*=90) and multiple sclerosis (*n*=90). First, we examined whether chronically ill patients were less optimistic than a healthy control group (*n*=60), which showed that patients reported lower levels of optimistic bias but similar levels of the two other optimistic beliefs. Next, we analyzed the stability of the three types of optimistic beliefs across time (one year) for both disease groups, which demonstrated that optimistic bias in MS patients decreased. Finally, the impact of disease-related stressors on optimistic beliefs during a one-year period was determined, showing that all three optimistic beliefs decreased when patients reported depressive symptoms.

Together, these findings show that positive outcome expectancies and efficacy expectancies were unaffected by being ill and fairly stable unless patients reported depressive symptoms while optimistic bias appeared to decrease as a result of being ill. Results are discussed in terms of the role of control and depression in optimistic bias.

Optimistic beliefs play a significant role in adaptation to chronic disease (e.g., Taylor et al., 1991; Holman and Lorig, 1992; Carver et al., 1993), as they have been shown to exert positive effects on mental and physical health, directly and indirectly via active engagement (Taylor et al., 1991; Carver et al., 1993). Optimistic beliefs have been conceptualized as stable personality characteristics, resistant to downturn by adversity (Schwarzer, 1994; Carver and Scheier, 1998). However, optimistic beliefs may decrease when people are confronted with repetitive or major adversities (e.g., Janoff-Bulman, 1989; Burger and Palmer, 1992). As it is unknown whether optimistic beliefs also decrease when people are confronted with chronic illness, the aim of the present study is to examine the sensitivity of optimistic beliefs in response to chronic disease, and to determine the stressors which may be responsible for decreased optimistic beliefs.

Optimistic beliefs have been differently conceptualized in the literature. Earlier research showed that there are at least three different concepts, namely positive outcome expectancies, positive efficacy expectancies, and optimistic bias (Schwarzer, 1994; Fournier et al., 1999, 2002). In the present study, it is expected that the three types of optimistic beliefs will react differently to chronic disease, depending on their differential sensitivity to disease-related stressors.

Positive outcome expectancies, or 'the tendency to believe that one will generally experience good outcomes in life' (Scheier and Carver, 1985), represent positive expectancies about the future, generalized across a variety of situations and are assumed to remain stable over time (Scheier and Carver, 1985; Billingsley et al., 1993). According to the theory of behavioral self-regulation (Carver and Scheier, 1998), positive outcome expectancies will only decrease when an individual is confronted with a succession of severe adversities as he or she will start to doubt the expectancy that positive outcomes will happen (Carver and Scheier, 1998). Empirical evidence substantiates the stability of positive outcome expectancies in patients with Parkinson's disease across a period of two months, although outcome expectancies fluctuated on a daily basis (Shifren, 1996).

Positive efficacy expectancies, 'the global confidence in one's coping ability across a wide range of demanding situations' (Schwarzer, 1993), represent a trait-like version of self-efficacy as defined by Bandura (1988). According to the self-efficacy theory of Bandura (1988), self-efficacy beliefs entail a positive estimation of one's skills and are resistant to change in the face of difficulties, thus sustaining perseverant efforts to attain one's goals (Bandura, 1988; Maddux and Lewis, 1995). In line with the theory, positive efficacy expectancies have been shown to be stable across time in a number of chronic diseases, such as diabetes mellitus (Kavanagh et al., 1993), multiple sclerosis (Barnwell and Kavanagh, 1997), and rheumatoid arthritis (Taal et al., 1993).

The concept of *optimistic bias* refers to the tendency for people to report that they are less likely than others to experience negative events and more likely than other to experience positive events (see for a review, Armor and Taylor, 1998). The extent to which specific optimistic expectancies are biased may be determined by comparing them to actual outcomes ('reality'), the outcomes of other people, the expectations of other people, or by contrasting what people expect for themselves and what they expect for others (Armor and Taylor, 1998). The latter procedure has been employed in many studies, which have demonstrated that optimistic biases are quite often found in health domains as well as other life domains (see for a review, Armor and Taylor, 1998). Whereas positive expectancies about the future or about one's skills are believed to be fairly stable beliefs, optimistic biases are assumed to be sensitive to the experience of personal threat (Weinstein, 1987; Janoff-Bulman, 1989; McKenna, 1993; Van der Pligt, 1998). Cognitive adaptation theory (Taylor, 1989) states that the experience of adversity confronts people with their vulnerability and thus shatters the illusion of control which is inherent in optimistic bias (cf., Kos and Clarke, 2001). Indeed, many studies have shown that optimistic bias decreases when people are confronted with a personal experience of threat such as a road accident (McKenna and Albery, 2001), health problems (Weinstein, 1987) or natural disaster (Burger and Palmer, 1992; Helweg-Larsen, 1999). Cognitive adaptation theory also states that a decrease in optimistic bias is only temporary, as it motivates people to engage in active efforts to deal with their situation and to restore initial levels of optimistic beliefs by regaining control over the situation (Taylor et al., 1992; Taylor and Armor, 1996). However, findings regarding the course of optimistic bias after a personal experience of threat are mixed, as some studies show that optimistic bias increases again after some months (e.g., Burger and Palmer, 1992; Taylor et al., 1992), while others report continued low levels of optimistic bias (e.g., Helweg- Larsen, 1999). The reason for these apparently contradictory findings may be related to the specificity of optimistic biases, as it has been shown that the 'debiasing' effect of the experience of personal threat is domain-specific and does not generalize to other domains (Weinstein and Klein, 1995; McKenna and Albery, 2001). It has also been suggested that the way optimistic bias is measured is important in determining whether or not optimistic bias increases again after some time. A study by Weinstein and colleagues (Weinstein et al., 2000) demonstrated that individuals who had experienced a tornado reported decreased levels of optimistic bias if they were asked to compare their own risk directly with that of an average person but reported an increased bias when asked to compare these risks indirectly.

These findings suggest that positive outcome expectancies and efficacy expectancies are fairly stable beliefs even when confronted with adversity, while optimistic bias may be more sensitive to the experience of negative events due to the loss of control related to distress (see Helweg-Larsen and Shepperd, 2001; and Klein and Helweg- Larsen, 2002 for reviews on the role of control in optimistic bias). The critical theoretical difference between the concepts of outcome expectancies and efficacy expectancies on the one hand and optimistic bias on the other hand has been related to their potential to activate risk appraisal processes (Davidson and Prkachin, 1997). Whereas optimistic individuals, those with high expectancies of

positive outcome or self-efficacy, are believed to be willing to accept health risks and cope with these risks in an adaptive way, individuals who hold an optimistic bias may be less prepared to consider such health risks unless they are actually confronted with an experience of adversity which may motivate them to consider the reality of risks and engage in coping behavior (Davidson and Prkachin, 1997; Armor and Taylor, 1998).

In line with the foregoing, we hypothesize that the three optimistic beliefs will differently react to chronic illness and the accompanying disease-related stressors. We expect that positive outcome and efficacy expectancies will not decrease as a result of being chronically ill and will be similar to those of healthy people. We also expect that these expectancies will remain stable over time and will be unaffected by disease-related stressors (disease duration, depressive symptoms, physical symptoms, physical impairment, and life events). In contrast, we hypothesize that optimistic bias regarding the risk of disease-relevant events will decrease as a result of being ill. In addition to typical medical events, such as, for example, the risk of being admitted to hospital, disease-relevant events also include events in life domains which may be affected as a result of being ill, such as relationships with family and friends, work and career, and leisure activities (Bensing et al., 2002). We expect that especially when disease is uncontrollable, optimistic bias will be affected because patients are repeatedly reminded of reduced options for control.

In order to investigate these hypotheses, we will examine optimistic beliefs by comparing two chronic diseases which differ in controllability (Felton et al., 1984; Penninx et al., 1996), as well a comparison group of healthy individuals. By examining optimistic beliefs in diseases which differ to the extent that may be controlled, it is possible to determine whether decrease in optimistic beliefs – and, in particular, optimistic bias – is associated with disease controllability. Controllability has been defined as either the actual or perceived ability to determine outcomes of an event (Eitel et al., 1995). In the present study, actual controllability is determined by medical knowledge on the self-care options available to influence health status and course of illness, while perceived controllability is determined by the extent to which patients perceive that disease is controllable through self-care behaviors (Eitel et al., 1995).

The first kind of disease, Type 1 diabetes mellitus (IDDM), is characterized by a high level of controllability as IDDM-patients can regulate their disease by self-care behaviors (insulin use, diet, and exercise) in order to prevent complications (e.g., retinopathy, neuropathy) and fatal consequences (e.g., ketoacidosis, coma) (Gonder-Frederick and Cox, 1991). The second kind of disease, multiple sclerosis (MS), is characterized by a low level of controllability as MS has a progressive unpredictable course with few options for self-regulation. As a result, MS patients are often confronted with a wide range of physical symptoms which are independent of self-care behaviors (Paty and Poser, 1984).

The present study thus focuses on three issues. First, we will examine whether optimistic beliefs decrease as a result of being chronically ill by comparing optimistic beliefs of chronically ill patients with those of a healthy control group. Next, changes in optimistic beliefs over a one-year period will be examined in diabetic patients and MS patients to determine the impact of disease controllability on the stability of optimistic beliefs. Third, to substantiate the sensitivity of optimistic beliefs to diseaserelated stressors, the long-term impact of disease duration, physical symptoms, physical impairment, depressive symptoms, and life events on optimistic beliefs will be analyzed.

METHOD

Procedure

Chronically ill patients were recruited via their physicians at the outpatient department of four hospitals in the Netherlands. They were eligible for inclusion in the study if they met the following criteria: (1) diagnosis according current medical criteria (MS: Poser et al., 1983; IDDM: Expert Committee on the Diagnosis and Classification of Diabetes Mellitus, 1997); (2) age between 18 and 65 years; (3) being diagnosed at least one year ago. Patients were excluded when they met at least one of the following criteria: (1) severe disability due to disease (IDDM: retinopathy, neuropathy, renal disease, and macrovascular symptoms; MS: Expanded Disability Status Scale score 7.0 and higher); (2) severe comorbidity (e.g., asthma or cancer); (3) being involved in psychotherapy or psychosocial counseling, or using psychotropic medication at the time of the study.

Inclusion and exclusion criteria were chosen in order to make the phase of adaptation of the two diseases as comparable as possible. Patients in their first year of diagnosis were excluded because during that year, patients are confronted with different adaptive tasks: IDDM patients experience a ‘honeymoon’ period with

temporary recuperation of the metabolism system (Heinze and Thon, 1983), and MS patients experience temporary relief followed by an emotional collapse (Antonak and Livneh, 1995). One year postdiagnosis, most patients are aware of the irreversibility of their disease. By excluding severely impaired patients, only those patients were included who were not completely caught up by their disease and still had possibilities for coping.

Participants

Physicians handed out a leaflet describing the procedure of the study to 155 IDDM patients and to 155 MS patients. 104 IDDM patients and 98 MS patients agreed to participate in the study and gave informed consent. The first measure included a number of questionnaires and took place in the hospital. The second and third measure, six months and twelve months later, included questionnaires which were mailed to patients. In the present study, we will report on patients for whom complete data of the three measures are available: 90 IDDM patients (35 male and 55 female) and 90 MS patients (34 male and 56 female). More male than female IDDM patients dropped out of the study ($p<0.05$), while there were no differences in age, disease severity, disease duration, education level, marital status, employment status and the three optimistic beliefs in comparison with the full IDDM sample. More severely ill MS patients dropped out of the study ($p<0.05$) as well as patients with lower self-efficacy beliefs ($p<0.05$), while there were no further differences with the initial MS sample on the characteristics mentioned above.

Table I shows that male–female proportions were comparable in the IDDM and MS samples, as were the number of individuals with a partner. Significantly more IDDM patients than MS patients had a job, which is likely related to less physical impairment ($p<0.001$) in combination with their younger age ($p<0.001$). The exclusion of severely impaired patients resulted in a MS sample with relatively short disease duration, since impairment increases with disease duration (Barnwell and Kavanagh, 1997). Despite these differences, it appeared that the samples experienced a comparable phase of adaptation, as 80% of the IDDM patients and 84% of the MS patients indicated that they had accepted their illness (‘integration stage’). This information was obtained by asking patients to indicate their preference for one of five statements describing a different adaptation stage (denial, resistance, grief, acceptance, integration) (Zwanikken, 1997).

[TABLE 1]

Patients were compared to a control group of healthy individuals who were recruited via the directory of employees of Utrecht University. Out of a database of 216 individuals who responded to the questionnaire, those who reported having a chronic disease with severe consequences (e.g., asthma or rheumatoid arthritis) were excluded (n=69).

As the remaining control group (n=147) showed a very skewed male–female ratio compared to those in both disease groups, 87 male individuals were also removed from the control group. As a result, the control group of 60 healthy individuals was similar to the chronic disease samples on the characteristics of gender, age and partner status while it was inevitable (due to the recruitment procedure) that individuals in the control group reported a higher educational level and were more often involved in paid employment than the IDDM and MS patients (see Table I).

Measures

Perceived Disease Controllability

Perceived controllability of disease was measured by a Dutch version of the *Multidimensional Health Locus of Control scale* (MHLC) (Wallston *et al*., 1978; Halfens and Philipsen, 1988) consisting of 18 items measuring Internal Locus of Control (personal control), Powerful Others Control (control of medical professionals over health), and Chance Control (perceived importance of luck or fate). The original MHLC items were changed when they included words relating to health or preventing illness, and were replaced by terms referring to disease or preventing symptoms.

As such, the revised version of the MHLC does not measure a dispositional orientation toward control regarding health outcomes, but perceived control of specific diseaserelated events. Versions of the MHLC for chronically ill patients, revised in a similar way, have proven to be valid in patient populations (Christensen *et al*., 1991; Van Lankveld, 1993). Patients responded on a 6-point Likert scale ranging from strongly disagree (1) to strongly agree (6). A higher score indicates a higher level of the specific locus of

control. Cronbach's Alpha for the Internal scale, Powerful Others scale, and Chance scale were for the IDDM-sample 0.81, 0.75, and 0.55, respectively; and for the MS-sample 0.69, 0.78, and 0.59, respectively. The reliability scores for the Chance scale are borderline but the scale will be used in our analyses because it is considered theoretically relevant for categorizing disease according to controllability (Felton *et al*., 1984).

Optimistic Beliefs

Positive outcome expectancies were measured by the Revised Version of the Life Orientation Test (LOT-R) (Scheier and Carver, 1985; Scheier *et al*., 1994), consisting of six items and four filler items. Participants were asked to indicate their agreement with the items on a 5-point Likert scale ranging from strongly disagree (0) to strongly agree (4). Scheier *et al*. (1994) demonstrated that the LOT-R measures positive outcome expectancies in a valid and internally consistent way. Cronbach's Alpha in the present study varied from 0.77 (*t*1) and 0.72 (*t*2) to 0.79 (*t*3) for the IDDM sample, and from 0.65 (*t*1) and 0.83 (*t*2) to 0.87 (*t*3) for the MS sample. Cronbach's Alpha was 0.73 for the control group.

Positive efficacy expectancies were measured by the Generalized Self-Efficacy Scale (Schwarzer, 1993) consisting of ten items. A higher score reflects more confidence in one's ability to handle difficult situations. The scale is internally consistent and valid (Schwarzer, 1993). Cronbach's Alpha in the present study varied from 0.85 (*t*1) to 0.91 (*t*2, *t*3) for the IDDM sample, and from 0.87 (*t*1) and 0.85 (*t*2) to 0.91 (*t*3) for the MS sample, and was 0.89 for the control group.

Optimistic bias was measured by an adapted Dutch version of the Comparative Risk Judgment Rating Form (Otten and Van der Pligt, 1996). Patients were asked to judge their chances of experiencing 15 situations compared to an average person of the same age and sex, and with the same kind of disease (in case of MS patients and IDDM patients). These situations included events which referred to a number of life domains, which were important both for patients and healthy people (e.g., 'Need to ask for help as you can't cope on your own anymore'; see Appendix for a full listing of items). Items were slightly rephrased for healthy controls, when applicable. Possible responses ranged from _4 ('my probability is very much lower') to 4 ('my probability is very much higher'), and were transformed from 1 to 9 in the analyses. An averaged score of 5 indicates that a patient thinks that he or she is as likely to encounter these future life events as others from his or her reference group. Note that the score represents the sum of a number of separate risk judgments on specific events rather than a global tendency for optimistic bias (Weinstein, 1980; Hoorens, 1996; cf. Davidson and Prkachin, 1997).

Cronbach's Alpha's in the present study varied from 0.80 (*t*1) and 0.82 (*t*2) to 0.89 (*t*3) in the IDDM-sample, and from 0.71 (*t*1) and 0.92 (*t*2) to 0.84 (*t*3) in the MS sample. Cronbach's Alpha was 0.79 for the control group.

Disease-Related Stressors

Physical symptoms in the MS sample were measured by the MS-Related Symptoms Checklist (Gulick, 1988), consisting of 26 neurological symptoms (e.g., skeletal functions, kinaesthetic functions, and fatigue). In the present study, four emotion-specific items were removed from the scale to determine the number of physical symptoms.

Patients were asked to indicate the current frequency of experienced symptoms on a scale from never (0) to always (5). The MS-Related Symptoms Checklist has been shown to be a reliable and valid measure for measuring severity of MS (Gulick, 1988). In the present study, construct validity was checked in a subsample of patients (n=54) for whom the neurologist provided data on the Expanded Disability Status Scale (Kurtzke, 1983) (r=0.51; p<0.001).

Physical symptoms in the IDDM sample were measured by six items typical for less impaired diabetic patients (unstable blood glucose level, fungus, fatigue, skin disorder, deteriorating vision, and decreased sensation in feet or hands). Patients were asked to indicate the presence of each symptom by yes (1) *versus* no (0) response categories.

Construct validity of the symptom scale was checked in a subsample of patients (n=69) who provided data on the severity of hyperglycaemia in the last two months, indicated by the rate of Glycosylated Haemoglobin (r=0.25; p<0.05) (Gonder- Frederick and Cox, 1991). The symptom checklists of the IDDM and MS-sample were made comparable by transforming them to a 0–100 scale.

Disease duration was derived from the official date of diagnosis as described in the patient's status of the hospital.

Depression was measured by the Dutch version of the depression scale of the Hospital Anxiety and Depression Scale (HADS; Zigmond and Snaith, 1983; Spinhoven *et al*., 1997), consisting of seven items. The HADS is relatively free of criterion contamination by somatic items. Cronbach's Alpha varied from 0.69 (*t*1) to 0.83 (*t*2, *t*3) in the IDDM sample, and from 0.73 (*t*1) and 0.85 (*t*2) to 0.80 (*t*3) in the MS-sample. Cronbach's Alphawa s 0.77 in the control group.

Physical impairment was measured by the physical functioning scale of the Outcome Study 36-Item Short-Form Health Survey (SF-36) (Ware and Sherbourne, 1992). This scale consists of 10 self-report items and is consistent and valid (Van der Zee and Sanderman, 1993). A higher score means more limitations in physical activities (including mobility range and activity level). Cronbach's Alpha varied from 0.73 (*t*1) to 0.82 (*t*2) and 0.83 (*t*3) in the IDDM sample, and from 0.93 (*t*1, *t*2) to 0.94 (*t*3) in the MS sample; and was 0.83 for the control group.

Life events were measured by 15 items (e.g., job loss or financial problems; Mooren and Kleber, 1996). Participants were asked to indicate whether they had experienced these life events during the past year, and how much the life event(s) had affected them on a 4-point scale ranging from 'not at all' (0) to 'very much' (3). A higher score indicates that participants experienced more and/or more impressive events.

RESULTS

We will present our data in three sections. First, we will discuss optimistic beliefs of chronically ill patients compared to those of healthy people. Next, we will present preliminary analyses on optimistic beliefs, in two diseases by (a) presenting results on the differential controllability of diabetes and MS, (b) associations of patients' demographic characteristics with optimistic beliefs, and (c) the one-year course of optimistic beliefs. In the third part of the result section, we focus on the main issue of this study and present data on the pattern of associations between disease-related stressors and optimistic beliefs as well as the results of a series of regression analyses examining the one-year impact of those stressors on optimistic beliefs.

Changes in Optimism as a Result of Chronic Illness

To determine whether optimistic beliefs are affected by being chronically ill, optimistic beliefs of IDDM and MS patients were compared to those of healthy individuals by means of ANOVA, controlling for demographic characteristics (age, education level, and employment status). Table I shows that, compared to the healthy control group, IDDM and MS patients reported similar levels of positive outcome expectancies and positive efficacy expectancies but significantly lower levels of optimistic bias, corroborating our hypotheses that positive expectancies about the future or about one's skills are unaffected by being chronically ill and that optimistic bias regarding disease-relevant events decreases as a result of being ill.

Controllability of Chronic Disease

To corroborate medical assumptions about differences in controllability of IDDM and MS, we examined whether IDDM patients perceived more control over their disease than MS patients. Controlling for age, educational level, and employment status, IDDM patients reported a significant higher level of internal locus of control than MS patients (IDDM: M=25.9, SD=4.7; MS: M=20.3, SD=5.2; F=57.5, p<0.001) while MS patients reported a higher level of chance control (IDDM: M=16.5, SD=4.6; MS: M=22, SD=5.1; F=56.3, p<0.001). Data on the Powerful Others Scale were similar for both patients groups (IDDM: M=15, SD=4.8; MS: M=14.2, SD=5.4; F=1.3, ns). These results indicate that IDDM is indeed perceived as more controllable than MS, which is consistent with medical descriptions about the controllability of both diseases. In the regression analyses both samples will be analyzed together, controlling for perceived control of illness indicated by a dummy variable of the Chance LOC (with 1 indicating IDDM and 0 indicating MS). The Chance LOC was preferred as an indicator of perceived controllability of illness as it is primarily determined by environmental factors in contrast to both other scales which tend to be dispositional variables depending on genetic factors (Johansson *et al*., 2001; Fournier *et al*., 2002).

Associations of Optimistic Beliefs with Background Characteristics

Next, we examined the associations of optimistic beliefs with demographic characteristics of both patient groups. Both IDDM patients and MS patients with higher levels of education reported higher levels of optimistic bias (IDDM: r=0.31, p<0.01; MS: r=0.22, p<0.05). IDDM patients with higher levels of education also reported higher levels of efficacy expectancies (r=0.24, p<0.05). In addition, female IDDM patients reported lower levels of optimistic bias than male IDDM patients (r=_0.21, p<0.05). Associations

of optimistic beliefs with age, employment status, and marital status proved non-significant in both disease groups. We therefore decided to control for the impact of education and sex in the regression analyses (see Table IV).

Course of Optimistic Beliefs and Disease-related Stressors

[TABLE 2]

Next, we examined the stability of optimistic beliefs over a 12 month period in both disease groups. Table II shows that both IDDM patients and MS patients reported

stable levels of positive outcome expectancies and efficacy expectancies during the oneyear period. Table II also shows that optimistic bias in IDDM patients remained stable while MS patients reported significantly decreased optimistic bias. This result corroborates our hypothesis that in case of uncontrollable disease, optimistic bias will decrease as a result of the repeated confrontation with symptoms beyond control. Table II also provides an overview of the course of disease-related stressors during one year in both samples and shows that patients reported a similar level of depressive symptoms at *T*1, but that depressive symptoms increased for MS patients during the course of one year.

Therefore, we repeated the ANOVA of optimistic bias in MS patients, controlling for depressive symptoms. This analysis demonstrated that increased depression in MS patients explained the decrease in optimistic bias (F=4.65, p<0.05) The other disease-related stressors did not change significantly for both patient groups throughout the 12-month period.

Associations of Optimistic Beliefs with Disease-related Stressors

Before turning to the final issue of this study, which entails an analysis of the impact of disease-related stressors on optimistic beliefs over time, we will examine the pattern of associations between disease-related stressors at baseline and optimistic beliefs at two points in time (six and twelve months later, respectively) for the IDDM sample and the MS sample separately. Table III shows that in IDDM patients, disease duration, physical symptoms, depressive symptoms, physical impairment, and life events are related to a lower report of positive outcome expectancies at both *T*2 a nd *T*3, while depressive symptoms are related to lower reports of positive efficacy expectancies (*T*2 and *T*3) and of optimistic bias (*T*3). It thus appears that, in contrast to our hypothesis, optimistic bias is less strongly associated with the experience of disease-related stressors than positive outcome expectancies. The observed pattern for MS patients is rather similar to the one found in IDDM patients, with the exception that associations of physical impairment and optimistic beliefs were more outspoken in case of MS patients.

[TABLE 3]

In contrast to IDDM patients, disease duration was not associated with positive outcome expectancies in MS patients. We examined the possibility that positive outcome expectancies decreased during the first year of MS and then returned to previous levels by running ANOVA's for four categories of disease duration (<1 year, 1–2 years, 2–5 years, and >5 years). This analysis proved that there were no significant differences in positive outcome expectancies between categories of disease duration (F=2.06, ns). Taken together, the pattern of associations suggests that differences between the two types of diseases are minimal regarding the associations between disease-related stressors and optimistic beliefs, and that depressive symptoms are most strongly and most consistently associated with decreased optimistic beliefs. The pattern of associations also suggests that, contrary to our expectations, positive outcome expectancies and positive efficacy expectancies may be sensitive to the presence of depressive symptoms. In the next section, we will test the role of disease-related stressors in optimistic beliefs in a series of regression analyses.

Sensitivity of Optimistic Beliefs to the Impact of Disease-related Stressors

By means of a series of hierarchical regression analyses (one for each optimistic belief) we analyzed the sensitivity of optimistic beliefs to disease-related stressors over both a six-month period and a twelve-month period. The following model was tested: controlling for the initial level of the particular optimistic belief (Step 1), we assessed the impact of actual disease control (dummy for disease category) and perceived disease control (Chance LOC) (Step 2), relevant demographic characteristics (Step 3), and disease-related stressors (Step 4). Table IV shows that both for the prediction of optimistic beliefs six months later and twelve months later, optimistic beliefs at baseline were the most powerful predictor. The

introduction of variables representing disease controllability did not result in significant effects, either during six months or twelve months. However, disease-related stressors added significantly to the prediction of decreased optimistic beliefs, as far as they concerned the experience of depressive symptoms (both at asix- month period and atw elve month period).

Thus, in contrast to our hypothesis, disease controllability, either measured by actual control or perceived control, did not predict the one-year course of optimistic beliefs.

[TABLE 4]

Although an additional analysis proved that perceived disease control significantly predicted depressive symptoms (β=0.19, p<0.05 for the twelve month interval) and, in turn, depressive symptoms predicted optimistic beliefs (see Table IV), depressive symptoms did not mediate the effects of perceived disease control as the latter was not significantly related to optimistic beliefs – which would be required for mediation effects (Baron and Kenny, 1986). Nor did perceived disease control moderate the impact of depressive symptoms on optimistic beliefs when analyzing these relationships according to the criteria of Baron and Kenny (1986), defining a moderator as a variable which affects the relation between the predictor (depressive symptoms) and the dependent variable (optimistic beliefs). Additional analyses also proved that depressive symptoms did not mediate or moderate the impact of disease controllability on optimistic beliefs. Contrary to our assumption that optimistic bias may decrease due to lack of control options, these findings indicate that disease controllability does not affect optimistic bias directly or indirectly. In contrast, these findings demonstrate that the presence of depressive symptoms affects optimistic beliefs regardless the experience of control. Moreover, and different from what we expected, depressive symptoms appear to have the potential to reduce even optimistic beliefs which are considered rather stable (positive outcome expectancies and positive efficacy expectancies).

DISCUSSION

To determine the sensitivity of optimism to stressors of chronic disease, we studied the optimistic beliefs of IDDM patients and MS patients compared to those of healthy people, the course of optimistic beliefs during a one year period, and the role of disease- related stressors to determine which aspects of chronic illness may be responsible for decreased optimistic beliefs. Our findings clearly demonstrate that chronically ill patients and healthy people hold similar positive views of the future and of their skills to deal with adversity. Our findings also demonstrate that optimistic bias in chronically ill patients is lower compared to optimistic bias in healthy people. Our findings further demonstrate that optimistic beliefs in chronically ill patients are fairly stable during the course of one year, except for depressed MS patients who reported decreased optimistic bias. Trying to explain the role of disease-related stressors in the course of optimistic beliefs during one year, we found that the role of controllability was limited, since in both patients groups decreased optimism was explained by the presence of depressive symptoms only. Even though disease controllability and depressive symptoms were related, there was no evidence of a significant role of control in decreased optimistic bias, which is in contrast to our expectations. Instead, the presence of depressive symptoms appears to be important in predicting a decrease of optimistic bias. Moreover, depressive symptoms were also relevant in predicting a decrease in optimistic beliefs such as positive outcome expectancies and efficacy expectancies which are assumed to be rather immune to adversity.

A number of findings require further comment. First, the present study is consistent with the literature about stability of positive outcome expectancies and efficacy expectancies (Scheier and Carver, 1987; Schwarzer, 1994; Devine *et al*., 2000). We observed no differences in these optimistic beliefs between patients and healthy individuals. In fact, the present samples reported a similar extent of efficacy expectancies compared to norms for healthy populations (Schwarzer, 1993), and even higher positive outcome expectancies compared to norms for healthy students (Scheier *et al*., 1994). However, optimistic beliefs are threatened by the presence of depressive symptoms. Our study present strong evidence that optimistic beliefs are sensitive to depressive symptoms.

Similar findings have been reported for the role of sad mood in optimistic bias (see for a review, Helweg-Larsen and Shepperd, 2001), but they have not been reported for positive outcome expectancies or positive efficacy expectancies as most studies suggest that optimists tend to maintain a ‘rose-colored’ view of their situation (Shedler *et al*., 1993; Armor and Taylor, 1998; Carver and Scheier, 1998). One exception is a recent study by Shnek and colleagues (Shnek *et al*., 2001), reporting that depressive symptoms were

associated with decreased positive outcome expectancies one year later in patients with heart disease, although the authors caution that their study does not allow for a causal explanation of the role of depression in optimistic beliefs.

Although many authors consider optimistic beliefs and depression to be concepts of a different nature (Carver and Gaines, 1987; Scheier and Carver, 1992; see for a different view, Abramson *et al*., 1989), it may be argued that increased depression does not lead to decreased optimism but simply reflects it. However, it has been shown that depressed individuals are just as biased as nondepressed individuals when expectations are compared to actual outcomes (Dunning and Story, 1991). In addition, in a recent experimental study, it was demonstrated that optimistic individuals have a greater attention to and a better recall of self-relevant health risk information (Aspinwall and Brunhart, 1996), which suggests that optimists may be more attentive to depressive symptoms. Unfortunately, although we employed a longitudinal design, our study allows no causal interpretation of the role of depressive symptoms in decreased optimistic beliefs. Further research on the exact relationship between optimistic beliefs and depression should employ an experimental design (cf. Shnek *et al*., 2001).

Second, our study corroborates earlier findings that optimistic bias decreases as a result of the experience of adversity. Compared to healthy individuals, both MS patients and IDDM patients reported decreased optimistic bias. However, in contrast to assumptions held in cognitive adaptation theory (Taylor, 1989), in MS patients optimistic bias decreased even further during a one year period without returning to its previous level. Similar findings have been reported by Helweg-Larsen (1999) who demonstrated that optimistic bias remained low even five months after an earthquake experience. Taylor (1989) suggests that optimistic bias may return to its original level by employing coping strategies to regain control. In an uncontrollable disease such as MS, however, such attempts may be impossible as most life domains are affected and awkward to control. In such a case, it may be possible that optimistic bias may be permanently reduced in an effort to adopt a more realistic view of one's situation (Armor and Taylor, 1998). However, our findings are not convincing regarding the role of control in reduced optimistic bias. This may be related to the employment of the health locus of control scale which may provide only a global indication of perceived control instead of a detailed picture of actual control options regarding illness – although previous studies have demonstrated that perceived control was associated with optimistic bias regardless its exact assessment (see Helweg-Larsen and Shepperd, 2001 for a review).

Although we assumed that differential control was the most relevant difference between MS and IDDM, there may be other factors explaining why optimistic bias reduced further during the course of one year in MS but not in IDDM patients.

First, due to typical prevalence characteristics, IDDM patients in our study were younger and more often employed. As a result, IDDM patients may have been in a better position to deal with their illness. Moreover, both diseases may also differ in other characteristics than control. MS patients have higher chance for an unpredictable deterioration of their disease, causing many problems in interpersonal, vocational, sexual and family functioning (Murray, 1995), while IDDMpatients are not confronted with unpredictable complications with consequences for daily functioning. This difference may explain the sensitivity of MS patients for emotional consequences of their disease, and their decreased optimistic bias. The unpredictable nature of MS may evoke anxiety and depression which points to the critical role of negative affect which has been reported to be a significant moderator of optimistic bias (Helweg-Larsen and Shepperd, 2001). Sad mood has been shown to reduce optimistic bias by increasing personal risk estimates (Salovey and Birnbaum, 1989) because it increases self-focused attention and greater recall of negative events.

Although optimistic beliefs need not necessarily decrease in response to stress, they were found to be sensitive to emotional stressors (depressive symptoms) in the present study. This seems to be incompatible with the common definition of optimism as a personality disposition, although recent views of personality distinguish state and trait properties of optimism (Bolger and Zuckerman, 1995; Shifren, 1996). The sensitive state side of optimism may be considered relevant for therapeutic interventions. Since our findings suggest that a succession of adversities may ultimately result in decreased optimistic beliefs with negative consequences for adaptation, therapeutic attempts to increase optimism may be useful in promoting adaptation. Optimistic beliefs are supposed to change with cognitive techniques (Seligman, 1991; Riskind *et al*., 1996).

Employing such techniques may help patients to imagine future outcomes in a more positive perspective, and to identify something good in bad experience. As these techniques have until now not often been employed in interventions for chronically ill patients, further research is necessary to clarify their effectiveness to promote optimism and thereby adaptation to chronic disease. In addition, it appears relevant to diagnose and treat depression in chronically ill patients, as depression is a risk factor for optimistic beliefs.

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TABLES

TABLE I Baseline measures of demographic characteristics, optimistic beliefs, and disease-related stressors of IDDM sample, MS sample and healthy control group

	Healthy $n=60$ %		*IDDM* $n=90$ %		*MS* $n=90$ %		*F*	*p*
Demographic characteristics								
Sex (male : female)	40 : 60		39 : 61		38 : 62		0.4	ns
Partner	88		78		82		1.4	ns
Higher education (university degree)	62^{1}		36^{2}		42		5.3	< 0.01
Paid employment	100^{1}		82^{2}		$58^{2\,3}$		22.7	< 0.001
	m	*SD*	*m*	*SD*	*m*	*SD*	*F*	*p*
Age (years)	43^{2}	10	34^{1}	10	44^{2}	9	31.0	< 0.001
Optimistic beliefs								
Outcome expectancies	17.4	3.4	16.8	3.3	16.7	3.8	0.7	ns
Efficacy expectancies	30.5	4.8	30.8	4.3	29.7	5.4	1.2	ns
Optimistic bias	83.7^{1}	11.6	77.0^{2}	12.9	76.4^{2}	13.0	7.1	< 0.001
Disease-related stressors								
Disease duration			11.1^{1}	4.4	3.6^{2}	3.5	160.3	< 0.001
Physical symptoms			13.5^{1}	15.4	27.7^{2}	13.5	43.4	< 0.001
Physical impairment	28.7^{1}	2.1	28.9^{1}	1.7	21.8^{2}	5.7	95.6	< 0.001
Depressive symptoms	3.5	3.1	2.6	2.5	3.4	3.1	2.6	ns
Life events	4.8	7.1	3.8	4.4	5.8	7.2	2.3	ns

$^{12}/^{23}/^{13}$ significant difference with Scheffé test.

TABLE II One-year stability of optimistic beliefs and disease-related stressors in IDDM sample ($n = 90$) and MS sample ($n = 90$)

		Time 1		*Time 2*		*Time 3*		*ANOVA*	
		M	*SD*	*m*	*SD*	*m*	*SD*	*F*[a]	*p*
Optimistic beliefs									
Outcome expectancies	*DM:*	16.8	3.3	16.9	3.3	17.0	3.6	0.38	ns
	MS:	16.7	3.8	16.3	4.6	16.7	4.2	1.19	ns
Efficacy expectancies	*DM:*	30.8	4.3	30.4	4.7	29.9	5.0	1.89	ns
	MS:	29.7	5.4	29.5	5.0	29.4	4.9	0.21	ns
Optimistic bias	*DM:*	77.0	12.9	74.7	12.7	75.0	13.2	1.70	ns
	MS:	76.4[1]	13.0	74.6[1]	14.6	71.6[2]	14.0	4.94	< 0.01
Stressors[b]									
Physical symptoms	*DM:*	13.5	15.4	11.5	15.9	12.2	14.9	2.26	ns
	MS:	27.7	13.5	27.6	14.0	27.6	13.7	0.02	ns
Physical impairment	*DM:*	28.9	1.7	28.7	2.2	28.9	2.2	0.95	ns
	MS:	21.8	5.7	21.7	5.7	22.1	5.8	0.83	ns
Depressive symptoms	*DM:*	2.6	2.5	2.7	3.0	2.7	3.2	0.19	ns
	MS:	3.4[1]	3.1	4.1[2]	3.9	4.1[2]	3.3	3.83	< 0.05

[a]Change over time, analyzed separately for each sample; [b]Life events and disease duration are not included in this table as they were measured at *T*1 only. [1 2] significant difference between groups.

TABLE III Correlations of stressors at *T*1 with optimistic beliefs at *T*2 and *T*3 for IDDM sample ($n = 90$) and MS sample ($n = 90$)

	Time 2			*Time 3*		
	Outcome expectancies	*Efficacy expectancies*	*Optimistic bias*	*Outcome expectancies*	*Efficacy expectancies*	*Optimistic bias*
IDDM: Stressors at baseline						
Disease duration	−0.23*	−0.02	−0.05	−0.21*	−0.04	−0.11
Physical symptoms	−0.21*	0.03	−0.14	−0.22*	0.01	−0.16
Physical impairment	−0.37***	−0.18	−0.03	−0.17	−0.10	−0.05
Depressive symptoms	−0.51***	−0.23*	−0.16	−0.54***	−0.23*	−0.21*
Life events	−0.19*	−0.04	−0.15	−0.32**	−0.11	−0.19
MS: Stressors at baseline						
Disease duration	0.07	0.11	−0.04	0.15	0.04	−0.02
Physical symptoms	−0.12	−0.14	−0.19	−0.07	−0.10	−0.19
Physical impairment	−0.24*	−0.11	−0.28**	−0.21*	−0.07	−0.22*
Depressive symptoms	−0.59***	−0.34***	−0.40***	−0.44***	−0.22*	−0.31**
Life events	−0.29**	−0.16	−0.24*	−0.17	−0.21*	−0.16

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

TABLE IV Sensitivity of optimistic beliefs to disease-related stressors and disease controllability at 6-month and 12-month follow-up in IDDM patients and MS patients ($n = 180$)

Predictors at baseline	*Positive outcome expectancies*				*Positive efficacy expectancies*				*Optimistic bias*			
	T2		*T3*		*T2*		*T3*		*T2*		*T3*	
	β	R^2	β	R^2	β	R^2	β	R^2	β	R^2	β	R^2
Step 1		0.45***		0.42***		0.35***		0.35		0.26***		0.26***
Similar optimistic belief t1	0.51***		0.55***		0.55***		0.57***		0.46***		0.44***	
Step 2		0.46		0.42		0.35		0.36		0.27		0.28
Disease[a]	0.01		0.01		−0.08		−0.06		−0.11		0.08	
Chance LOC	−0.07		0.01		0.10		0.06		−0.07		−0.05	
Step 3		0.46		0.43		0.36		0.37		0.27		0.31*
Higher education	−0.08		−0.04		0.07		−0.01		−0.03		0.15*	
Sex (1 = male; 2 = female)	−0.07		−0.05		−0.10		−0.16*		−0.09		0.01	
Step 4		0.54***		0.46*		0.43**		0.41*		0.34**		0.34
Life events	−0.08		−0.05		−0.03		−0.11		−0.12		−0.05	
Disease duration	0.01		0.06		0.15		0.07		0.02		−0.01	
Physical symptoms	0.15		0.09		0.10		0.10		0.07		−0.01	
Physical impairment	−0.05		0.01		−0.10		−0.06		−0.05		0.03	
Depressive symptoms	−0.31***		−0.23**		−0.22***		−0.15*		−0.22**		−0.17*	
Total Adj. R^2		52%		43%		39%		37%		30%		30%

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$; [a]Dummy variable 0 = MS, 1 = IDDM.

APPENDIX

Measurement of optimistic bias by the Comparative Risk Judgment Rating Form, adapted from Otten and Van der Pligt (1996)

1. The purchase of an expensive TV turns out to be a mistake
2. To make and keep good friends on whom you can trust
3. To experience financial problems
4. To be offered an interesting position with flexible working hours (To be offered an interesting position which allows for a career move)[1]
5. Need to stay in hospital at least once some time next year
6. To be unable to go on holiday
7. To experience adrink ing problem
8. To fall ill having to stay in bed for at least one week next year
9. *To find affordable and handicap compliant housing (To find affordable housing)[1, 2]
10. To be considered ashow-o ff by people close to you
11. *To win 100.000 Euro in the lottery [2]
12. Need to ask for help as you can't cope on your own anymore
13. To be deceived by agood friend
14. Not having to stay in hospital next year
15. To be able to spend your holidays abroad every year

[1]Items between brackets refer to items presented to the healthy control group.
[2]After correcting for low (near zero) item-total correlation, items indicated by * were dropped.