

Patients with multiple sclerosis in a war zone: coping strategies associated with reduced risk for relapse

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Abstract

The objective of this article is to examine the role of coping strategies in multiple sclerosis outcomes among civilians under a military attack during the 2006 war between Hezbollah and Israel. Participants were 156 patients with relapsing–remitting multiple sclerosis. We analysed the relationships between coping and emotional distress and between coping and multiple sclerosis exacerbation. We also assessed a model of the relationship between perceived stress, event-related stress, and coping with increased risk of multiple sclerosis exacerbations using multivariate logistic regression. Ways of coping and subjective stress were evaluated by means of structured interviews using questionnaires previously validated. The more distressed our respondents were during the war, the more likely they were to employ a variety of ways of coping. Correlation coefficients between coping scores and perceived war stress ranged from 0.2 to 0.44 ($p < 0.001$ – 0.01). Correlation coefficients between the various coping scores and broader indices of distress ranged from 0.28 to 0.5 ($p < 0.001$). Of the remitting patients during and following the war, 47.1% reported the use of ‘direct coping and planning’, compared to 16.7% of patients who relapsed during the same period ($p = 0.014$). ‘Direct coping and planning’ was negatively related to exacerbation of multiple sclerosis symptoms ($OR = 0.1$, 95% $CI = 0.02$ – 0.5). The Nagelkerke R^2 was 0.26. Our findings point to an association between ‘direct coping and planning’ and reduced multiple sclerosis relapse rate during wartime. Further research should explore whether the employment of specific ways of coping can reduce the risk for relapse among patients with multiple sclerosis during periods of distress.

Keywords

coping, multiple sclerosis, relapse, stress, war

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Introduction

Flare-ups in multiple sclerosis (MS)¹ are known to have an unpredictable course that affects the health and well-being of afflicted young adults. Although there is currently no cure for MS,^{2,3} there is great value in identifying variables associated with relapse and remittance among relapsing–remitting multiple sclerosis (RRMS) patients.

Over time, several studies designed to test the alleged relationship between stressful life events, psychological distress, and MS exacerbations have been carried out, providing some evidence that stress can trigger an attack.^{4–7} Following a study conducted to evaluate the impact of war stress on MS patients, we recently reported findings indicating that civilian exposure to war stress is associated with an increased risk of MS relapse.⁸ As part of the said research project, a

complementary study was undertaken aimed at examining the role of coping in stress-related MS relapse and the findings are reported herein. The investigated stressor was the 2006 Second Lebanon War, a 33-day military conflict in Lebanon and northern Israel. The conflict started on 12 July 2006 and continued until a

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United Nations-brokered ceasefire went into effect on the morning of 14 August 2006. During the conflict, Hezbollah paramilitaries fired thousands of rockets onto populated regions of northern Israel resulting in considerable destruction, economic damage, and the displacement of hundreds of thousands of Israelis.⁹

Although coping processes have been examined in earlier research studies of MS patients, very few articles on stress and coping in conjunction with MS have been published. Studies that investigated stress and coping effects on MS symptom exacerbation focused mainly on daily stress such as hassles^{10,11} or disruption in routine.¹² To the best of our knowledge, there is no published research on coping strategies in an MS population exposed to severe stress.

Most studies on adjustment to MS have been based on the stress and coping model of Lazarus and Folkman.¹³ Coping is classified according to problem-focused strategies, with an active, direct attempt to change stressful situations, or emotion-focused coping styles that reduce negative emotions aroused by the stressor.¹⁴ Results suggest that perceived stress and coping strategies, such as emotion-focused coping, contribute to difficulties in adjusting to MS, while proactive and meaning-based coping strategies appear to enhance adjustment.^{15–21} While some data points to the positive effects that certain coping strategies might have on self-report measures of physical well-being (see, e.g., McCabe²²), little is known about the relationships between specific ways of coping and physician-verified MS relapse–remission.

Data demonstrating that post-traumatic war stress is associated with increased risk of MS exacerbations was presented in our first communication on this research project,⁸ in which we reported that during the month-long war there were 18 relapses among our patients, compared with 1–6 relapses in similar time periods over the 12 months prior to the war. We found no increase in relapse rate during the 3 months that followed the war. The percentage of patients reporting the experience of intense subjective stress during the hostilities was significantly higher among respondents with wartime relapse compared to the rest of the patients. The proportion of MS patients reporting high levels of distress associated with exposure to rocket attacks, displacement from home, and perceived life threat, was significantly higher in relapsing patients compared to those in remission.⁸

In this study, we aimed at identifying coping strategies among threatened MS patients associated with reduced MS symptoms. Since exposure to the stress of war has already been established as a potential risk factor for an MS relapse,⁸ it was important to ascertain the specific ways of coping that are best related to

positive MS outcome during a military attack. We hypothesized that problem-focused coping strategies would be related to MS remission, but that emotion-focused coping would not be associated with reduced MS symptoms.

Methods

Study population and procedure

Participants were 156 consecutive RRMS patients (121 women, 35 men) who attended an MS clinic for a pre-scheduled follow-up examination during the fourth month following the end of the war.⁸ All these visits were scheduled prior to the onset of the war as part of the MS clinic's routine clinical follow-up program. No 'emergency' (non-pre-scheduled) visits were included. Of 175 pre-scheduled visits, the 156 patients included in the study were those who actually attended the scheduled visit in the fourth month following the war. This constitutes 89% compliance and is within the 85–90% range of compliance at our MS centre. This indicates a low 'no-show' that defines our sample as an accurate representation of our MS clinic's patient population. All participants had been examined routinely at our clinic, in addition to assessments at disease exacerbations, during the 12 months preceding the war. They were all residents of northern Israel, and met the revised McDonald diagnostic criteria.²³ Consenting patients completed the research questionnaires immediately during their follow-up examination.

To trace all confirmed and significant relapses that took place during the wartime, and to avoid the inclusion of 'pseudo-relapses', we interviewed all patients using a validated questionnaire for MS symptoms and disability.²⁴ Only relapses that met the following three criteria were included in the analysis: those that were characterized by the emergence of new, or the worsening of existing, symptoms for more than 24 hours in the absence of fever or infection;²⁵ those that were described in the interview regarding the study period as inflicting 'considerable functional impairment'; those that were also documented in the patient's medical record as exacerbation that indicated corticosteroid treatment. We compared the number of confirmed relapses during and following the war to the number during the same time period in the preceding year. The dates of exacerbations in the 12 months prior to the war were extracted from the medical records. All of these relapses were confirmed by a neurologist and were treated by corticosteroids.

The Helsinki Committee of the Carmel Medical Center, Haifa, approved the study and all the participants provided informed consent.

Neurological impairment

Neurological impairment was assessed with Kurtzke's Expanded Disability Status Scale (EDSS).²⁶

Exposure measurement

Patients were presented with a list of potential wartime stressors and were asked to indicate if they had been exposed to each traumatic event during the war, and if so, how subjectively distressful was it on a four-point Likert scale (0 = not affected at all; 1 = slightly affected; 2 = moderately affected; 3 = severely affected). The inquired war stressors included: exposure to air raid sirens warning of incoming rockets; displacement from home; perceived life threat; hiding in bomb shelters; home damaged by a rocket hit; physical injury; financial loss because of disruption of business; forced separation from close relatives because of their military recruitment or displacement; and the death of a family member or a friend during a rocket attack.

Coping and stress-related measurement

For further assessment of subjective stress during the war, we used the abridged four-item version of the Perceived Stress Scale (PSS).²⁷ The PSS is designed to measure the degree to which situations in one's life are experienced as uncontrollable, unpredictable, and overwhelming and consequently stressful. Respondents were asked how often, during the 2006 war, they: 1) were unable to control the important things in their lives; 2) were confident about their ability to handle personal problems; 3) felt that things were going their way; and 4) felt difficulties were piling up so high that they could not overcome them. The score of the four items is a number between 0 and 4 (0 = never, 1 = almost never, 2 = sometimes, 3 = fairly often, 4 = very often). PSS scores are obtained by reversing responses (e.g. 0 = 4, 1 = 3, 2 = 2, 3 = 1, and 4 = 0) to the two positively stated items (items 2 and 3) and then averaging across all scale items. This scale has been shown to be reliable and was criterion-validated, demonstrating strong relationships with other measures of stress.¹ The Chronbach alpha for the PSS in our study was 0.73.

We also administered the Symptom Checklist 10 (SCL-10).^{28,29} The SCL-10 is a global index of psychopathology likely to measure dysphoria (e.g. having no interest in things, feeling blue), demoralization (e.g. feeling hopeless about the future, feeling worthless), and anxiety (feeling tense or keyed-up, feeling afraid of open spaces). The SCL-10 is measured on a five-point Likert scale with higher scores indicating elevated distress and with a reported alpha coefficient of 0.88. The Chronbach alpha for the SCL-10 in our study was also 0.88.

To control for adverse life events unrelated to the war, we asked our patients to indicate if they had experienced other specific life events during the said war or in the preceding year. We addressed events that had previously been shown to be related to MS exacerbations:³⁰ death in the family, marital and job conflicts, financial difficulties, major illness of self (other than MS) or of a close relative.

We used the Brief COPE questionnaire,³¹ an abbreviated, 28-item version of the COPE that Carver, Scheier, and Weintraub³² developed as a comprehensive questionnaire of 14 theoretically derived coping styles or strategies [e.g. I've been turning to work or other activities to take my mind off things (self-distraction); I've been concentrating my efforts on doing something about the situation I'm in (active coping); I've been saying to myself 'this isn't real' (denial); I've been trying to come up with a strategy about what to do (planning); I've been learning to live with it (acceptance)]. Respondents were explicitly instructed to address the recent war (not their illness) as the target stressor and were asked to what extent they had been doing what the items said.

In health psychology, the COPE and the Brief COPE have predicted clinically relevant outcome across many stressful situations and populations.^{31,33,34} The scales of the Brief COPE can be grouped into adaptive versus maladaptive, as well as emotion-focused versus problem-focused, scales.

Principal components factor analysis with varimax rotation was used to explore the factor structure of the Brief COPE. The result was a nine-factor structure accounting for 67% of the total variance. Following are the nine factors in descending strength: seeking social support (10.7%); positive reframing (8.9%); active distraction (7.9%); turning to religion (7.8%); denial of distress (7.4%); direct coping and planning (7%); self-blame and substance use (7%); acceptance (5.9%); behavioural disengagement and venting of emotions (4.5%). The numbers in parenthesis represent the percentage of the total variance attributable to each factor.

Internal consistency coefficients of all scales were acceptable; Chronbach alphas in our sample ranged between 0.60 and 0.79. Two coping styles—substance use and venting of emotions—were not sufficiently reliable (0.4); however, these unreliable subscales represented coping strategies that were used infrequently (Table 1). The coping score for each factor was determined by averaging the scores of its individual items. For further analysis, a dichotomous variable was created from each factor so that a coping score greater than 2 was considered an indication for the use of a particular coping style. Setting a cut-off

Table 1. Odds ratios (with 95% confidence intervals) of MS relapse by stress and coping variables; multivariate logistic regression model

			Univariate Analysis			Logistic Regression Model		
Variable	Relapse (n = 18)	Remission (n = 138)	OR	95% CI	p-value	OR	95% CI	p-value
High stress due to perceived life threat ^a								
No	66.7%	85.4%	1.0					
Yes	33.3%	14.6%	2.9	0.99–8.7	0.08	–	–	–
High stress due to rocket attacks ^a								
No	33.3%	57.7%	1.0					
Yes	66.7%	42.3%	2.7	1.0–7.7	0.05	–	–	–
High stress due to forced evacuation ^a								
No	66.7%	89.1%	1.0					
Yes	33.3%	10.9%	4.1	1.3–12.4	0.02	4.95	1.3–9.3	0.02
Perceived stress scale ^b								
Low Score	55.6%	80.4%	1.0					
High Score	44.4%	19.6%	3.3	1.2–9.1	0.02	3.27	1.0–8.8	0.05
Using direct coping and planning ^c								
No	83.3%	52.9%	1.0					
Yes	16.7%	47.1%	0.23	0.06–0.8	0.01	0.1	0.02–0.5	0.004
An MS relapse in the year before the war								
No	66.7%	84.1%	1.0					
Yes	33.3%	15.9%	2.63	0.9–7.77	0.1	3.8	1.1–3.1	0.035

^aSubjective stress was measured on a four-point Likert scale. A score greater than 2 was considered high subjective stress.

^bThe average score of the four-item Perceived Stress Scale (PSS) ranged between 1 and 4. An average higher than 2 was regarded as high subjective stress.

^cA score greater than 2 on a four-point scale was considered an indication for the use of active coping and planning.

OR: odds ratio, CI: confidence interval.

score for screening purposes is a matter of clinical or research judgment (e.g. see Sellick and Edwardson³⁵ and Smits et al.³⁶). To minimize false positives, we regarded 3 as the minimal score indicative of reasonable likelihood that a specific coping strategy had been employed.

Statistical analysis

Statistical analysis was performed using the SPSS 15.0 statistical package (SPSS, Chicago, Illinois, USA). Bivariate relationships between stress and coping were tested with Pearson's correlations for continuous data. Chi-square calculations were employed to assess the relationship between dichotomous variables: ways of coping, stress measures, and MS relapse. To assess the association of variables we found to be associated with increased risk of MS exacerbations during the war (perceived stress, event-related stress, and coping), a multivariate logistic regression model with a backward selection procedure was used. The independent coping variables were selected on theoretical grounds derived from the instrument's original factor analysis. Odds ratios (ORs)

and 95% confidence intervals (CIs) were calculated from the model.

Results

Patient characteristics

The study population consisted of 156 RRMS patients (Table 2), 121 (78%) women and 35 (22%) men, averaging 44 ± 12 years in age. Time since diagnosis was 10 ± 7 years with mean Kurtzke EDSS²⁶ of 2.8 ± 1.8 . The majority of our population (81%) was treated with disease modifying drugs, without interruption of treatment during the war. Most patients (82%) had not experienced a clinical relapse in the 12 months preceding the war, while the others had between one and four relapses. Seventy-seven percent of participants confirmed staying at home for at least one week after the war broke out and 72% stayed at home throughout the war period (Table 3). Patients who relapsed during the war were not significantly different from their counterparts with wartime remission in terms of age, gender, duration of illness, EDSS, relapses in the year previous to the war, treatment with

Table 2. Coping and emotional distress

Coping Style	Percent using coping style ^a			PSS ^c – Coping ^d scoring correlations	SCL-10 ^e – Coping ^d scoring correlations
	Female n = 121	Male n = 35	P value ^b		
Direct coping and planning	41%	32%	NS	0.22 ($p = 0.006$)	0.3 ($p < 0.001$)
Seeking social support	38%	15%	0.01	0.4 ($p < 0.001$)	0.4 ($p < 0.001$)
Turning to religion	35%	15%	0.03	0.2 ($p = 0.01$)	0.36 ($p < 0.001$)
Denial of distress	15%	9%	NS	0.31 ($p < 0.001$)	0.35 ($p < 0.001$)
Behavioral disengagement and venting of emotions	11%	9%	NS	0.44 ($p < 0.001$)	0.5 ($p < 0.001$)
Self-blame and substance use	2.5%	0	NS	0.28 ($p < 0.001$)	0.28 ($p < 0.001$)
Acceptance	45%	38%	NS	NS	NS
Active distraction	54%	29%	0.01	NS	NS
Positive reframing	32%	41%	NS	NS	NS

^aPercentage of participants who scored higher than 2 on a four-point scale, indicating use of the particular coping style.

^bp-value for the comparison of the proportions of female and male patients using a given coping mechanism.

^cThe score of the perceived Stress Scale (PSS) is a number between 0 and 4—a higher score denotes high subjective stress.

^dUse of the various coping styles on a four-point scale—a higher score indicates use of the coping style.

^eSymptom Checklist 10 (SCL-10) is a global index of dysphoria, demoralization, and anxiety, measured on a five-point Likert scale.

Table 3. Patients' characteristics

N		156
Gender	Women	121 (78%)
	Men	35 (22%)
Age	Mean \pm SD (range)	44 \pm 12 (17–71)
Duration of illness	Mean \pm SD (range)	10 \pm 7 (1–35)
EDSS	Mean \pm SD (range)	2.8 \pm 1.8 (0–6.5)
Relapses 6/05–6/06	None	128 (82%)
	One	18 (12%)
	2–4 relapses	10 (6%)
Disease modifying drugs	Number (percent)	126 (81%)
Stayed home during the war	At least a few days	144 (92%)
	More than 1 week	120 (77%)
	Throughout the war	113 (72%)

EDSS: Expanded Disability Status Scale.

immunomodulatory agents, or the duration of home stay during the war.

Coping and emotional distress

Positive and significant correlations were found between the use of various coping styles and measures of psychological distress, namely the PSS and the SCL-10 (Table 2). Correlation coefficients between the PSS and the various coping scores ranged from 0.2 to 0.44 ($p < 0.001$ –0.01). Correlation coefficients between the SCL-10 and the various coping scores ranged from

0.28 to 0.5 ($p < 0.001$). The more distressed our respondents were during the war, as indicated by increased difficulties with the threats of war (PSS) and by elevated psychopathology scores (SCL-10), the more likely they were to employ a variety of ways of coping. For example, distressed patients used not only more denial, disengagement, and venting, but also sought more social support and tended to use more active coping.

Coping and gender

Compared with men, women appeared to employ a variety of coping strategies more intensively; however, as shown in Table 2, three ways of coping were distinctly more likely to be utilized by women: seeking social support ($p = 0.01$), turning to religion ($p = 0.03$), and active distraction ($p = 0.01$).

Coping and MS

Patients who reported the use of 'direct coping and planning' (e.g. I did things to improve the situation; I tried to develop a strategy, an action plan) were more likely to have enjoyed a remission during and following the war. Of those patients who relapsed during the war, 16.7% received an average 'direct coping and planning' score that was greater than 2 (indicating use of this coping style) compared to 47.1% of those who were in remission ($p = 0.014$) (Figure 1). The use of other coping strategies was not related to MS relapse during the war. Although women differed from men in their ways of coping, their likelihood for MS

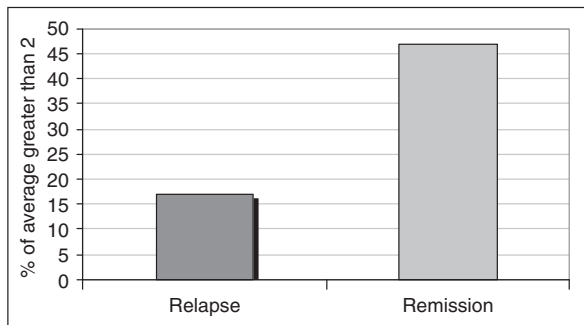


Figure 1. The use of direct coping and planning during the war by relapsing and remitting MS patients. Patients who reported the use of direct coping and planning were more likely to have enjoyed a remission during and following the war. Of those patients who relapsed during the war, 16.7% received an average direct coping and planning score that was greater than 2 (indicating use of this coping style) compared to 47.1% of those who were in remission ($p = 0.014$).

attack during the war was virtually identical (11.4% and 11.6%, respectively). No differences between men and women were noted with regard to the employment of direct coping and planning.

Logistic regression analysis

Independent variables shown by our univariate analysis to be associated with exacerbation of MS symptoms were included in a logistic regression analysis. These variables included four different perceived stressors (forced evacuation, life threat, rocket attack, and perceived stress), MS relapses during the year preceding the war, and Carver's active coping and planning. ORs and 95% CIs of MS relapse by stress and coping variables were calculated from the model and are summarized in Table 1. Perceived stress during the war independently affected the likelihood of an MS relapse (OR = 3.27, 95% CI = 1.0–10.8). Similarly, stress associated with displacement due to the bombing was also related to MS attack (OR = 4.95, 95% CI = 1.3–19.3). 'Direct coping and planning' was significantly related to lowered MS symptoms (OR = 0.1, 95% CI = 0.02–0.5). The Nagelkerke R^2 was 0.26.

Discussion

In a recently published parallel substudy,⁸ part of the same research project on the impact of war on MS, we found that war stress was associated with increased risk of exacerbations in patients with MS. The proportion of MS patients reporting high levels of distress associated with exposure to the war threats was significantly higher in relapsing patients compared with those in remission. In the present study on MS during war we

wished to explore the relationship between specific ways of coping with war and the effect of war stress on MS exacerbations. As previously indicated, the respondent group in our study was accurately representative of our MS clinic's patient population.

Primarily, our data suggest that the more distressed our respondents had been in reaction to the threats of war, the more likely they were to employ a variety of ways of coping. This outcome is in line with previous findings demonstrating that psychological coping can be positively related to stress: coping strategies tended to be more frequently employed under greater overall adversity and perceived stress during a terror campaign in Israel.^{37,38}

More women than men sought social support, turned to religion, and actively distracted from their sources of stress. Our results are consistent with findings showing that women made greater use of a variety of coping behaviours than do men^{39,40} and were better able to psychologically buffer the debilitating aspects of MS.⁴¹ Notably, however, despite previous findings suggesting that coping can moderate the relationship between stress and the MS disease activity¹² we found no evidence that women fared better than men on MS indices. A probable explanation for this finding is anchored in the fact that women did not differ significantly from men in their usage of 'direct coping and planning', a coping style found associated with MS remission. Another possible explanation for the seemingly ineffective coping is associated with the hypothesis that intensity of coping can sometimes be an expression of, rather than a buffer against, distress.

It seems that coping-outcome relationships may vary with the intensity of exposure to stress. As demonstrated by Suvak et al.,⁴² direct or problem-focused coping may be effective at moderate levels, however, at low levels it may be unnecessary, and at high levels, such as during the extreme threats of war, it may be irrelevant. During the war all ways of coping employed by our MS patients failed to shield them from emotional distress. However, patients who reported the use of 'direct coping and planning' were more likely to have enjoyed a remission from MS during and following the war. 'Direct coping and planning' is a style of coping that involves taking actions to change an uncomfortable or threatening situation. For example, facing the dangers of unpredictable rocket attacks, some of the challenges that were best handled by 'direct coping and planning' included the need to prepare bomb shelters for easy access and sustained stay, equipping shelters with supplies, or rescheduling of medical and other appointments. Patients who utilized emotion-focused coping when direct action was necessary suffered more MS relapses than patients who identified the challenges of the war as opportunities for appropriate planning and direct coping.

This finding is in line with data reported by Warren et al.,¹¹ suggesting that patients in an MS exacerbation group used more emotion-focused coping. Our results are also congruent with outcomes reported by Kroenke and Denny,¹⁰ according to which patients in an exacerbation phase of MS approached hassles with a form of coping that was more passive-avoidant or aggressive in style. MS patients have been reported to employ emotion-focused coping to regulate anxiety, depression, anger, and grief, emotions tied to the stressful conditions associated with having an incurable disease.^{43,44} When it is impossible to influence threats, in this case the course and the development of a potentially life-threatening disease, employing direct, active, problem-solving ways of coping to influence the development of the illness could be ineffective. Denial and restraint coping, also seen as an avoidance type of emotion-focused coping, may be a favourable strategy for some distressed MS patients as this can help them reduce emotional pain.^{45,46} On the other hand, avoidance may have a negative impact on a person's adaptation efforts, particularly in the face of life challenges that require direct engagement.

Finally, we believe that the relationships between external stressors, MS exacerbation, and suspected mechanisms such as hypothalamic-pituitary-adrenal (HPA) axis and autonomic nervous system activity, merit further investigation, primarily because of their involvement in the physiological response to psychological and physiological stressors and because of their suspected role in the dysregulation of the neuroendocrine-immune networks.⁴⁷⁻⁵⁰

Several limitations should be considered when assessing the outcome of this study. First, our data were collected during the fourth month following the end of the war. Ideally, psychological data should have been collected during the war crisis, though practically, in times of war this is extremely difficult. Although it is unlikely that patients had developed memory biases so soon after the dramatic experiences, our data should still be interpreted with this caveat in mind. Second, the present study focused on clinical assessment of MS disease activity. As the neurological events reported by our patients were confirmed by a medical examination and treated with steroids, it is highly likely that we correctly identified MS relapses. Still, further research should be planned to include biomarkers of the stress response and MRI parameters of disease activity. Third, our data suggest a relationship between planning and direct coping and a lowered risk for MS relapse. Such an association does not necessarily imply that specific behavior can reduce MS attacks. One could argue that patients in remission are better able to employ direct coping than the more dejected and fatigued relapsed patients or that patients

experiencing relapses used other strategies to cope with these events.

We are confident that responses represented a fair approximation of the coping employed during the war as participants were explicitly asked to report how they coped with the rocket fire. Nevertheless, it could still be argued that persons who experienced an exacerbation might remember feeling less able to perform active coping. Alternatively, it is conceivable that both outcomes reflect a common causal factor. For example, there could be a central nervous system mechanism that contributes to both an enhanced likelihood for direct coping and a favourable MS outcome. The possibility, however, that the two variables are causally related may open new prevention and intervention options for MS treatment.

Training in coping skills has been shown to be an effective strategy for improving performance and reducing symptomatology in a variety of conditions such as premenstrual symptoms,⁵¹ insulin-dependent diabetes mellitus,⁵² cancer,⁵³ or end-stage lung disease.⁵⁴ A 2-year randomized trial of MS patients revealed that coping skills intervention yielded gains in psychosocial role performance, coping behavior, and numerous aspects of well-being.⁵⁵ To the best of our knowledge, no studies on the effect of enhanced coping skills on health indices have been published to date. Our non-relapsing MS patients tended to identify environmental demands as controllable challenges rather than uncontrollable threats. Controllability awareness,⁵⁶ the ability to distinguish between uncontrollable and controllable situations and the proper application of the most effective coping style, should be investigated in future MS research to determine its effect on MS indices. Considered together, the present findings may serve as an additional step on the path of elucidation of coping strategies and their role in the response to stress, depending on the nature, degree, and duration of the stressor, and towards tailoring a multidisciplinary therapeutic approach to the individual patient.

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References

1. Cohen S, Williamson G. Perceived stress in a probability sample of the United States. In: Spacapan S, Oskamp S (eds) *The social psychology of health: Claremont symposium on applied social psychology*. Newbury Park, California: Sage, 1988, p.31-67.
2. Compston A, Coles A. Multiple sclerosis. *Lancet* 2002; 359: 1221-31.

3. Vermersch P, de Seze J, Delisse B, Lemaire S, Stojkovic T. Quality of life in multiple sclerosis: influence of interferon- β 1a (Avonex[®]) treatment. *Mult Scler* 2002; 8: 377–81.
4. Brown RF, Tennant CC, Sharrock M, Hodgkinson S, Dunn SM, Pollard JD. Relationship between stress and relapse in multiple sclerosis: Part II. Direct and indirect relationships. *Mult Scler* 2006; 12: 465–75.
5. Brown RF, Tennant CC, Sharrock M, Hodgkinson S, Dunn SM, Pollard JD. Relationship between stress and relapse in multiple sclerosis: Part I. Important features. *Mult Scler* 2006; 12: 453–64.
6. Buljevac D, Hop WC, Reedeker W, et al. Self reported stressful life events and exacerbations in multiple sclerosis: prospective study. *BMJ* 2003; 327: 646.
7. Mohr DC, Hart SL, Julian L, Cox D, Pelletier D. Association between stressful life events and exacerbation in multiple sclerosis: a meta-analysis. *BMJ* 2004; 328: 731.
8. Golan D, Somer E, Dishon S, Cuzin-Disegni L, Miller A. Impact of exposure to war stress on exacerbations of multiple sclerosis. *Ann Neurol* 2008; 64: 143–8.
9. Israel MFA. The second Lebanon War 2006. Retrieved from <http://www.mfa.gov.il/MFA/Terrorism-+Obstacle+to+Peace/Terrorism+from+Lebanon-+Hizbullah/>.
10. Kroencke DC, Denney DR. Stress and coping in multiple sclerosis: exacerbation, remission and chronic subgroups. *Mult Scler* 1999; 5: 89–93.
11. Warren S, Warren KG, Cockerill R. Emotional stress and coping in multiple sclerosis (MS) exacerbations. *J Psychosom Res* 1991; 35: 37–47.
12. Mohr DC, Goodkin DE, Nelson S, Cox D, Weiner M. Moderating effects of coping on the relationship between stress and the development of new brain lesions in multiple sclerosis. *Psychosom Med* 2002; 64: 803–9.
13. Lazarus RS, Folkman S. *Stress, appraisal, and coping*. New York: Springer, 1984.
14. Maes S, Leventhal H, DeRidder DTD. Coping with chronic diseases. In: Zeidner M, Endler N (eds) *Handbook of coping*. New York: Wiley, 1996, p.221–51.
15. Aikens JE, Fischer JS, Namey M, Rudick RA. A replicated prospective investigation of life stress, coping, and depressive symptoms in multiple sclerosis. *J Behav Med* 1997; 20: 433–45.
16. De Ridder D, Schreurs K, Bensing J. The relative benefits of being optimistic: optimism as a coping resource in multiple sclerosis and Parkinson's disease (Part 2). *Br J Health Psychol* 2000; 5: 141–55.
17. Jean VM, Paul RH, Beatty WW. Psychological and neuropsychological predictors of coping patterns by patients with multiple sclerosis. *J Clin Psychol* 1999; 55: 21–6.
18. Mohr DC, Cox D. Multiple sclerosis: empirical literature for the clinical health psychologist. *J Clin Psychol* 2001; 57: 479–99.
19. Mohr DC, Goodkin DE, Gatto N, Van der Wende J. Depression, coping and level of neurological impairment in multiple sclerosis. *Mult Scler* 1997; 3: 254–8.
20. Pakenham KI. Adjustment to multiple sclerosis: application of a stress and coping model. *Health Psychol* 1999; 18: 383–92.
21. Pakenham KI. Coping with multiple sclerosis: development of a measure. *Psychol Health Med* 2001; 6: 411–28.
22. McCabe M. Longitudinal study of coping strategies and quality of life among people with multiple sclerosis. *J Clin Psychol Med Settings* 2006; 13: 369–79.
23. Polman CH, Reingold SC, Edan G, et al. Diagnostic criteria for multiple sclerosis: 2005 revisions to the “McDonald Criteria”. *Ann Neurol* 2005; 58: 840–6.
24. Taillefer MV, Roulet E, Cesaro P, Alperovitch A. Validation of self-reported neurological disability in multiple sclerosis. *Int J Epidemiol* 1994; 23: 148–54.
25. McDonald WI, Compston A, Edan G, et al. Recommended diagnostic criteria for multiple sclerosis: guidelines from the International Panel on the diagnosis of multiple sclerosis. *Ann Neurol* 2001; 50: 121–27.
26. Kurtzke JF. Rating neurologic impairment in multiple sclerosis: an Expanded Disability Status Scale (EDSS). *Neurology* 1983; 33: 1444–52.
27. Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. *J Health Soc Behav* 1983; 24: 385–96.
28. Nguyen TD, Attkisson CC, Stegner BL. Assessment of patient satisfaction: development and refinement of a service evaluation questionnaire. *Eval Program Plann* 1983; 6: 299–313.
29. Strand BH, Dalgard OS, Tambs K, Rognerud M. Measuring the mental health status of the Norwegian population: a comparison of the instruments SCL-25, SCL-10, SCL-5 and MHI-5 (SF-36). *Nord J Psychiatry* 2003; 57: 113–18.
30. Brown RF, Tennant CC, Dunn SM, Pollard JD. A review of stress-relapse interactions in multiple sclerosis: important features and stress-mediating and -moderating variables. *Mult Scler* 2005; 11: 477–84.
31. Carver CS. You want to measure coping but your protocol's too long: consider the brief COPE. *Int J Behav Med* 1997; 4: 92–100.
32. Carver CS, Scheier MF, Weintraub JK. Assessing coping strategies: a theoretically based approach. *J Pers Soc Psychol* 1989; 56: 267–83.
33. Carver CS, Pozo C, Harris SD, et al. How coping mediates the effect of optimism on distress: a study of women with early stage breast cancer. *J Pers Soc Psychol* 1993; 65: 375–90.
34. Lowe R, Norman P, Bennett P. Coping, emotion and perceived health following myocardial infarction: Concurrent and predictive associations. *Br J Health Psychol* 2000; 5: 337–50.
35. Sellick SM, Edwardson AD. Screening new cancer patients for psychological distress using the hospital anxiety and depression scale. *Psychooncology* 2007; 16: 534–42.
36. Smits N, Smit F, Cuijpers P, De Graaf R. Using decision theory to derive optimal cut-off scores of screening instruments: an illustration explicating costs and benefits of mental health screening. *Int J Methods Psychiatr Res* 2007; 16: 219–29.
37. Somer E, Maguen S, Or-Chen K, Litz BT. Managing terror: Differences between Jews and Arabs in Israel. *Int J Psychol* 2007; 44: 138–46.

38. Somer E, Ruvio A, Soref E, Sever I. Terrorism, distress and coping: High versus low impact regions and direct versus indirect civilian exposure. *Anxiety Stress Coping* 2005; 18: 165–82.
39. Tamres L, Janicki D, Helgeson V. Sex differences in coping behavior: A meta-analytic review and an examination of relative coping. *Pers Soc Psychol Rev* 2002; 6: 2–30.
40. Sever I, Somer E, Ruvio A, Soref E. Gender, distress and coping in response to terrorism. *Affilia* 2008; 23: 156–66.
41. Miller A, Dishon S. Health-related quality of life in multiple sclerosis: The impact of disability, gender and employment status. *Qual Life Res* 2006; 15: 259–71.
42. Suvak MK, Vogt DS, Savarese VW, King LA, King DW. Relationship of war-zone coping strategies to long-term general life adjustment among Vietnam veterans: Combat exposure as a moderator variable. *Pers Soc Psychol Bull* 2002; 28: 974–85.
43. Lazarus RS. Evolution of a model of stress, coping and discrete emotions. In: Rice VH (ed.) *Handbook of stress, coping and health: implications for nursing research, theory and practice*. Thousand Oaks, California: Sage Publication, 2000, p.195–222.
44. Porter B, Keenan E. Nursing at a specialist diagnostic clinic for multiple sclerosis. *Br J Nurs* 2003; 12: 650, 652–6.
45. Cohen F, Lazarus RS. Coping with the stresses of illness. In: Stone GC, Cohen F, Adler NE, Associates (eds) *Health psychology: A handbook*. San Francisco: Jossey-Bass, 1979.
46. Pearlin LI, Schooler C. The structure of coping. *J Health Soc Behav* 1978; 19: 2–21.
47. Gold SM, Mohr DC, Huitinga I, Flachenecker P, Sternberg EM, Heesen C. The role of stress-response systems for the pathogenesis and progression of MS. *Trends Immunol* 2005; 26: 644–52.
48. Heesen C, Mohr DC, Huitinga I, et al. Stress regulation in multiple sclerosis: current issues and concepts. *Mult Scler* 2007; 13: 143–8.
49. O'Brien JT. The 'glucocorticoid cascade' hypothesis in man. *Br J Psychiatry* 1997; 170: 199–201.
50. Sapolsky RM, Romero LM, Munck AU. How do glucocorticoids influence stress responses? Integrating permissive suppressive stimulatory and preparative actions. *Endocr Rev* 2000; 21: 55–89.
51. Kirkby RJ. Changes in premenstrual symptoms and irrational thinking following cognitive-behavioral coping skills training. *J Consult Clin Psychol* 1994; 62: 1026–32.
52. Davidson M, Boland EA, Grey M. Teaching teens to cope: coping skills training for adolescents with insulin-dependent diabetes mellitus. *J Soc Pediatr Nurs* 1997; 2: 65–72.
53. Arathuzik D. Effects of cognitive-behavioral strategies on pain in cancer patients. *Cancer Nurs* 1994; 17: 207–14.
54. Blumenthal JA, Babyak MA, Keefe FJ, et al. Telephone-based coping skills training for patients awaiting lung transplantation. *J Consult Clin Psychol* 2006; 74: 535–44.
55. Schwartz CE. Teaching coping skills enhances quality of life more than peer support: results of a randomized trial with multiple sclerosis patients. *Health Psychol* 1999; 18: 211–20.
56. Todrank Heth J, Somer E. Characterizing stress tolerance: a new approach to controllability and its relationship to perceived stress and reported health. *Pers Individ Dif* 2002; 33: 883–95.