Pain coping and social support as predictors of long-term functional disability and pain in early rheumatoid arthritis

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Abstract

Pain-related avoidance factors and social resources, as assessed by pain coping and social support, are supposed to have lasting effects on functional disability and pain in chronic pain disorders. As a follow-up to a prospective study demonstrating short-term effects after one year (*Behaviour Research and Therapy*, *36*, 179–193, 1998), the role of pain coping and social support at the time of diagnosis was investigated in relationship to the long-term course of functional disability and pain after three and five years in 78 patients with rheumatoid arthritis (RA), taking into account personality characteristics of neuroticism and extraversion, clinical status and use of medication. In line with findings at the one-year follow-up, results showed that more passive pain coping predicted functional disability at the three-year, but not the five-year follow-up. In addition, low levels of social support at the time of diagnosis consistently predicted both functional disability and pain at the three and five-year follow-ups. Results indicate that pain coping and social support, assessed very early in the disease process, can affect long-term functional disability and pain in RA, and suggest that early interventions focusing on pain-related avoidance factors and social resources for patients at risk may beneficially influence long-term outcomes in RA.
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1. Introduction

Rheumatoid arthritis (RA), a chronic inflammatory disease affecting the joints, is one of the most costly musculoskeletal disorders, primarily due to the impairment of daily activities and loss of work as a consequence of functional disability and pain (Allaire, Prashker, & Meenan, 1994; Yelin & Callahan, 1995). In the first year of the disease, impaired functioning and elevated pain levels are already comparable to that of patients with longstanding RA (Evers, Kraaimaat, Geenen, & Bijlsma, 1997; Evers, Kraaimaat, Geenen, & Bijlsma, 1998; Meenan, Kazis, Anthony, & Wallin, 1991), about 40% of the patients face occupational disability, and 75% suffer from limitations affecting their leisure time and social activities (Albers et al., 1999; Fex, Larsson, Nived, & Eberhardt, 1998; van Jaarsveld et al., 1998). In addition, functional impairment in the first year of RA predicts future loss of employment, a worse long-term prognosis and mortality (Corbett, Dalton, Young, Silman, & Shipley, 1993; Eberhardt, Larsson, & Nived, 1993; Fex, Larsson, Nived & Eberhardt, 1998; Rasker & Cosh, 1989; Sherrer, Bloch, Mitchell, Young, & Fries, 1986). Consequently, medical treatment is increasingly geared toward more aggressive treatment in the initial stage of the disease to decrease unfavorable long-term disease outcomes (van Jaarsveld et al., 2000; van de Putte, van Gestel, & van Riel, 1998).

Irrespective of the influence of biomedical factors, chronic pain research has supplied relatively convincing evidence that psychosocial factors can affect the course of functional disability and pain in patients with RA and other chronic pain disorders (see for reviews e.g., Keefe et al., 2002; Linton, 2000; Turk & Okofuji, 2002). Specifically, fear-avoidance models have received wide attention and provided supportive evidence that pain-related avoidance factors, such as avoiding activity and catastrophic pain cognitions, are linked to future pain outcomes in chronic pain patients (e.g., Lethem, Slade, Troup, & Bentley, 1983; Linton, 1985; Philips, 1987; Vlaeyen, Kole-Snijders, Boeren, & van Eek, 1995; Vlaeyen & Linton, 2000). Fear-avoidance and the associated avoidance of activity are supposed to result in enhanced physical impairment, e.g. due to physical deconditioning processes, decreased muscular endurance and strength. Cognitive responses consisting of fearful, catastrophizing beliefs about pain are thought to bring about a preoccupation with bodily symptoms and avoidance of activity, which in turn exacerbate pain and functional disability. Besides cognitive-behavioral factors, social resources are assumed to have an impact on long-term chronic pain outcomes, including social networks and perceived support from close others, which may inhibit avoidance of physical and social activities, and have a beneficial impact on functional disability and pain (e.g., Cohen & Wills, 1985; Keefe et al., 2002; Uchino, Cacioppo, & Kiecolt-Glaser, 1996).

In addition to experimental and cross-sectional research, prospective studies have demonstrated the relevance of pain-related avoidance factors and social resources in various chronic pain populations, including RA patients (see e.g., Jensen, Turner, Romano, & Karoly, 1991; Keefe et al., 2002; Linton, 2000; Turk & Okofuji, 2002). For example, in one of the first prospective studies conducted by Brown and Nicassio (1987), passive coping with pain, including the restriction of activities and catastrophic pain cognitions, predicted functional disability and pain in RA patients after 6 months (Brown & Nicassio, 1987). Behavioral and cognitive factors also independently predicted future RA outcomes: avoidance of activity was related to increased functional disability after one year (Evers, Kraaimaat, Geenen, & Bijlsma, 1998; van Lankveld, Naring, van't Pad Bosch, & van de Putte, 1998), while worrying and catastrophic pain cognitions predicted func-

tional disability and pain after six months (Keefe, Brown, Wallston, & Caldwell, 1989) and functional disability after one year (Evers, Kraaimaat, Geenen & Bijlsma, 1998). In contrast, active coping with pain by ignoring pain sensations, using distraction or continuing activities in spite of pain have only incidentally been linked to more favorable future outcomes (e.g., Brown & Nicassio, 1987), suggesting that not using passive coping strategies may be more crucial than the use of specific active strategies (see e.g., Jensen, Turner, Romano & Karoly, 1991; Turk & Rudy, 1992). Apart from pain coping, there is also increasing evidence that social support, such as qualitative aspects of perceived social support and quantitative aspects of the size of social networks, affect future functional limitations and pain in chronic pain patients. For example, lower levels of perceived support have been shown to be prospectively related to more interference in daily activities in RA patients after one year (Smith & Wallston, 1992) and increased pain after one year (Waltz, Kriegel, & van't Pad Bosch, 1998), while less extended social networks predicted functional disability after one year (Evers, Kraaimaat, Geenen & Bijlsma, 1998).

In view of the empirical evidence on RA and comparable findings in other chronic pain disorders (see e.g., Jensen, Turner, Romano & Karoly, 1991; Keefe et al., 2002; Linton, 2000), there seems to be relatively clear support that pain coping and social resources affect future outcomes in chronic pain patients. However, prospective studies among RA and other chronic pain patients have generally assessed the impact of these factors on future outcomes over a relatively short period of time (no longer than one year), which can be considered rather short-term outcomes in the realm of chronic conditions. Fear-avoidance models usually propose that once avoidance mechanisms have been established they result in increasing detrimental effects over time and affect long-term outcomes (Lethem, Slade, Troup & Bentley, 1983; Philips, 1987; Vlaeyen, Kole-Snijders, Boeren & van Eek, 1995). However, relevant variables could differ for short-term and long-term outcomes. For example, solely the combination of cognitive-behavioral and social factors — and not single factors — could have an impact on long-term outcomes, e.g. for patients with more passive pain coping and less social support. In addition, personality characteristics and biomedical factors may have long-term modifying effects. For example, the personality characteristics of neuroticism and extraversion and patients' clinical status have been shown to possibly modify the relationship of pain coping and social resources to outcomes in chronic pain patients, suggesting that the detrimental effects of passive pain coping or fewer social resources might only occur in patients with more neuroticism, less extraversion and a worse clinical status (e.g., Brown, Wallston, & Nicassio, 1989; Phillips & Gatchel, 2000; Vlaeyen et al., 1999; Wade, Dougherty, Hart, Rafii, & Price, 1992). Finally, pain coping and social resources have been shown to affect first year outcomes (Evers, Kraaimaat, Geenen, & Bijlsma, 1998), and correspondence with findings for longstanding RA suggests that the same mechanisms are involved both early in the disease and later on. Since pain coping and social resources may be a focus of early intervention, it is particularly relevant to show whether these factors affect long-term functional disability and pain in RA patients at the earliest point in time for intervention—at diagnosis.

The object of the present study was to examine the long-term effects of pain coping and social support on functional disability and pain in patients with early RA. This study was conducted as a follow-up to the previously reported effects of pain coping and social support (Evers, Kraaimaat, Geenen & Bijlsma, 1998), showing that passive pain coping strategies, and to a lesser degree lower levels of social support, assessed at the time of diagnosis, predicted the course of functional disability in the first year. Additional analyses revealed that these factors did not predict the one-

year pain outcome in this sample. Our current study aims at follow-up results, studying the effects of active and passive pain coping and social support at the time of diagnosis on the course of functional disability and pain after three and five years. In line with the literature supporting short-term effects, less active and more passive pain coping and lower levels of social support were expected to predict a less favorable long-term course of functional disability and pain. In addition to these main effects, it was examined whether the personality characteristics of neuroticism and extraversion account for the relationship between pain coping, social support and the long-term outcome. The possible moderator effects of personality characteristics and clinical status on pain coping and social support were also explored, assuming that the effects of less active and more passive pain coping and lower levels of social support on functional disability and pain would be greater in patients with personality characteristics of more neuroticism and less extraversion and in patients with a worse clinical status at the time of diagnosis. Finally, the moderator effects of social support on pain coping were exploratively examined, predicting that the detrimental effects of less active and more passive pain coping are increased in patients with lower levels of social support.

2. Method

2.1. Sample and procedure

The sample consisted of outpatients with recently diagnosed RA from five hospitals in the Netherlands. All patients participated in one of two medical trials for second-line antirheumatic drugs (van Everdingen, Jacobs, van Reesema, & Bijlsma, 2002; van Jaarsveld et al., 2000). Inclusion criteria for the trials were a minimum age of 18 years, diagnosis according to the 1987 ACR criteria (Arnett et al., 1988), and a duration of disease of less than one year. Exclusion criteria were comorbid conditions that might interfere with one of the medication strategies (such as malignancy, cardiac, respiratory, hepatic, and renal insufficiency), previous or current treatment with second-line antirheumatic drugs, glucocorticoids, cytotoxic or immunosuppressive drugs, possible pregnancy or breast feeding, and psychiatric or mental disturbances that severely interfere with adherence to the study protocol. Patients were informed about this study by their rheumatologists when ACR criteria were assessed. About three weeks later (range 0–12 weeks), clinical and self-report data were assessed during their following visit. This visit was also the starting point for the prospective medical trials. Five patients did not return the questionnaires at this assessment point, resulting in the participation of 95 patients in the present study at the time of diagnosis. In addition to assessing clinical and self-report data at the beginning of the study and at the one-year follow-up (Evers, Kraaimaat, Geenen & Bijlsma, 1998), data on disease activity, functional disability, and pain was again collected at the 3 and 5-year follow-ups.

Of the 95 patients who correctly completed self-report data at the first assessment, 78 patients (82%) completed all assessment points during the five-year study period. In terms of dropouts, seven patients died, two moved, one was in remission and no longer treated by the rheumatology outpatient clinic and seven did not complete the questionnaires for the follow-up assessments. When entering the study, dropouts did not significantly differ from participants in terms of demographic variables (sex, age, marital status, educational level), disease activity, functional disability,

pain, the personality characteristic of extraversion, pain coping or social support. However, dropouts scored higher on the personality characteristic of neuroticism than patients who completed all assessment points ($t = 2.87$, $p < 0.01$).

Of the 78 participants in the follow-up, 69% were female, 76% married or living with a partner, and 32 and 57% had a primary or secondary educational level, respectively. Mean age at the time of entering the study was 57 years (range 20–82 years). The distribution of medication strategies was as follows: 30 and 23% of the patients used NSAID (nonsteroidal anti-inflammatory drugs) medication alone at first assessment and at the five-year follow-up, respectively; the other patients took NSAIDs in combination with methotrexate (30 and 49%, respectively), intramuscular gold (14% at both assessment points), hydroxychloroquine (15 and 9%, respectively), prednisone (11 and 1%, respectively) or other second-line medication, prescribed only for individual patients (4% at the five-year follow-up). At the five-year follow-up, 31% of the patients still used the initially prescribed medication, 65% used another medication strategy from the drug trial, and 4% of the patients used another second-line medication than that used in the medication trials.

2.2. Measures

Demographic variables were assessed with a general checklist, assessing patient gender, age and educational level. Educational level was measured with seven categories that can be classified as primary, secondary and tertiary educational levels, representing an average of 7, 12, and 17 years of education, respectively.

Disease activity was determined by ESR (Erythrocyte Sedimentation Rate; 1–140 mm 1st hr.), an indicator of inflammatory activity, and by joint score ratings of the simultaneous presence of swelling and tenderness in 38 joints (range 0–534) (Thompson, Silman, Kirwan, & Currey, 1987). A composite score of both measures was used as an indicator of disease activity, in accordance with regular use of composite scores of disease activity that consist of at least ESR or another acute-phase reactant and a joint score (van der Heijde et al., 1992; Prevoo et al., 1995). The composite score was calculated by adding the standardized scores (z-scores) of both indicators. A higher composite score indicates higher levels of disease activity.

Functional disability was assessed using a composite score of one clinical measure and two self-report measures (see Evers, Kraaimaat, Geenen & Bijlsma, 1998). The clinical measure consisted of grip strength assessments with a Martin vigorimeter (the mean of three measurements on both hands was calculated). Self-reported functional disability was assessed with the Mobility and Self-care scales of the IRGL (Impact of Rheumatic Diseases on General Health and Lifestyle) (Evers, Taal et al., 1998; Huiskes, Kraaimaat, & Bijlsma, 1990). The IRGL is derived from the AIMS and assesses physical, psychological and social health in patients with rheumatic diseases. Previous research has shown that the reliability and validity of the IRGL scales are highly satisfactory (Evers, Taal et al., 1998; Huiskes, Kraaimaat & Bijlsma, 1990). Items in the IRGL scales are scored on a 4-point or 5-point Likert scale. The Mobility and Self-care scales assess the functional capacities of the lower and upper extremities, respectively, over the last month (15 items). Cronbach's alpha in the present study was 0.89 for both scales. A composite score of the clinical measure and the two self-report scales was calculated by adding the standardized scores (z-scores) of all three indicators. A higher composite score indicates higher levels of functional disability.

Pain was assessed with the IRGL Pain scale (six items), measuring the severity and frequency of painful episodes and swollen joints and the duration of early morning stiffness in the last month. Cronbach's alpha in the present study was 0.88.

Personality dimensions, i.e. neuroticism and extraversion, were measured with a Dutch version of the Eysenck Personality Questionnaire (17 and 12 items, respectively) (Eysenck & Eysenck, 1991; Wilde, 1970). Cronbach's alphas in the present study were 0.90 for neuroticism and 0.79 for extraversion.

Pain coping was assessed by the Pain Coping Inventory (PCI; Kraaimaat, Bakker, & Evers, 1997; Kraaimaat & Evers, 2003), measuring active and passive coping strategies when dealing with pain. Active pain coping strategies reflect three cognitive-behavioral strategies, measuring patients' efforts to distract themselves from the pain (distraction, five items), to reinterpret and transform the pain (pain transformation, four items) and to function in spite of the pain (reducing demands, three items). Passive pain coping reflects three cognitive-behavioral strategies, assessing behavioral tendencies to restrict functioning (resting, five items), to avoid environmental stimuli (retreating, seven items) and catastrophic cognitions about the pain (worrying, nine items). A composite score of active and passive pain coping can be calculated by summing up the non-weighted scores of the three active and passive coping strategies (Kraaimaat, Bakker & Evers, 1997). Cronbach's alpha for the active and passive scales were 0.79 and 0.90, respectively, in the present study.

Social support in the past six months was measured with the IRGL social functioning scales, reflecting a quantitative and qualitative aspect of social support. The quantitative aspect was assessed by the size of the social network, i.e. the number of friends and family members with whom patients associate. The qualitative aspect was measured by the Perceived Support scale (five items), inquiring about the perceived availability of emotional and instrumental support (availability to share sad and pleasant events, obtain support when faced with stress and pain, get help for casual work). Cronbach's alpha for the Perceived Support scale in the present study was 0.88.

2.3. Statistical analyses

Mean linear changes in clinical status (disease activity, functional disability, pain) were studied by analyses of variance with repeated measurements, using the variables at the different assessment points as dependent variables, followed by post-hoc tests in the event of significant linear changes. To explore the relationship between predictors at the time of diagnosis and changes in functional disability and pain after three and five years, Pearson Correlation Coefficients were calculated between the predictors at the time of diagnosis and the residual gain scores for functional disability and pain at the three and five-year follow-ups (Kerlinger, 1975). Sequential regression analyses were then performed to examine the relative contribution of predictors on functional disability and pain at the three and five-year follow-ups. Functional disability and pain at the three and five-year follow-ups were used as dependent variables. In the first step, the baseline assessment of the dependent variable was entered, followed by the predictors significantly related to change in functional disability or pain at at least one follow-up assessment. Mediating effects were determined with the procedure described by Baron and Kenny (Baron & Kenny, 1986). Moderating effects were explored by calculating centered interaction terms between the

predictor and the moderator and entering them in the regression analyses, after controlling for their main effects. Due to the relatively high number of explorative tests performed in these moderator analyses, a more conservative threshold of $p < 0.01$ was used. Finally, to control for possible confounding effects of medication, Pearson Correlation Coefficients were calculated between the use (use vs nonuse) and duration (number of years) of every medication strategy separately and the residual gain scores of functional disability and pain at the three and five-year follow-ups. In the event of a significant correlation, the effects of the medication strategy were taken into account by entering the medication strategy at step 2, before the other predictors in the regression analyses.

3. Results

3.1. Change in clinical status during the study period

During the five-year period, there was a significant mean decrease in disease activity ($F(3,73) = 22.2$, $p < 0.001$ and $F(3,73) = 10.6$, $p < 0.01$ for the ESR and joint score, respectively). In addition, pain and one indicator of functional disability significantly decreased within five years after diagnosis ($F(3,75) = 9.6$, $p < 0.01$ for pain; $F(3,75) = 14.5$, $p < 0.001$ for grip strength). Post-hoc tests indicated that this improvement in clinical status was most obvious in the first year of the disease: all indicators markedly decreased in this year ($t = 3.06$, $p < 0.01$ for ESR; $t = 3.25$, $p < 0.01$ for the joint score; $t = 2.20$, $p < 0.05$ for pain; $t = 4.29$, $p < 0.001$ for grip strength; see also Evers, Kraaimaat, Geenen & Bijlsma, 1998), possibly due to the beneficial effects of medication (van Jaarsveld et al., 2000; van Everdingen et al., 2002). After the first year of the disease, clinical status remained relatively stable, as indicated by nonsignificant post-hoc tests between one and three and between three and five years, with one exception: an indicator of disease activity, ESR, significantly decreased further between the one and three-year follow-ups ($t = 3.11$, $p < 0.01$).

3.2. Predictors of functional disability at the three and five-year follow-ups

The results of the correlational analyses between predictors at the time of diagnosis and change in functional disability are presented in Table 1. The use of more passive pain coping strategies at the time of diagnosis was significantly related to an increase in functional disability after three years, but not after five years. In addition, both indicators of social support, perceived support and social networks were significantly related to less increase in functional disability at the three and the five-year follow-ups. No significant relationships were found between demographic variables, the personality characteristics of neuroticism and extraversion, disease activity, pain and active pain coping at the time of diagnosis and changes in functional disability at the three and five-year follow-ups.

Sequential regression analyses were then conducted with the predictors significantly related to the change in functional disability at at least one assessment point: passive pain coping and both indicators of social support. After controlling for baseline levels of functional disability at the first step, passive pain coping and social support indicators assessed at the time of diagnosis were

Table 1
Correlations between predictors at the time of diagnosis and changes in functional disability and pain after three and five years in 78 RA patients[a]

	Change in functional disability		Change in pain	
	3 yrs	5 yrs	3 yrs	5 yrs
Demographic variables				
Age	−0.03	0.07	−0.10	0.09
Sex	0.16	0.09	0.06	0.04
Educational level	0.01	−0.16	−0.02	−0.31**
Marital status	−0.11	−0.04	−0.11	0.15
Personality characteristics				
Neuroticism	0.21	0.21	0.15	0.11
Extraversion	−0.17	−0.04	0.02	0.14
Clinical status				
Disease activity	0.09	0.19	0.17	0.10
Functional disability	–	–	0.27*	0.26*
Pain	0.13	0.11	–	–
Pain coping				
Active	−0.17	0.00	−0.18	−0.10
Passive	0.24*	0.19	0.20	0.10
Social support				
Perceived support	−0.30**	−0.34**	−0.26*	−0.28*
Social network	−0.36**	−0.29*	−0.13	−0.14

[a] A positive correlation indicates that the predictor is related to an increase in functional disability and pain (residual gain scores)

* $p < 0.05$
** $p < 0.01$

entered in the following steps. As demonstrated in Table 2, passive pain coping significantly contributed 4% to functional disability at the three-year follow-up, but did not significantly add variance to functional disability at the five-year follow-up. In addition, lower levels of social support explained 12 and 11% additional variance in functional disability at the three and five-year follow-ups, respectively. Standardized beta coefficients indicated that passive coping with pain, lower levels of perceived support and a smaller social network at the time of diagnosis all significantly predicted functional disability at the three-year follow-up ($t = 2.49$, $p < 0.05$, $t = -2.20$, $p < 0.05$; $t = -2.98$, $p < 0.01$, respectively). Lower levels of perceived support and a less extended social network also predicted functional disability at the five-year follow-up ($t = -2.70$, $p < 0.01$; $t = -2.07$, $p < 0.05$, respectively).

To study whether the relationship between passive pain coping and increased functional disability at the three and five-year follow-ups was mediated by social support, the order of entering passive pain coping and social support was reversed, revealing overall the same results. Passive pain coping at step 3 still significantly predicted functional disability at the three-year follow-up but not at the five year follow-up, after controlling for social support at step 2, indicating that passive pain coping was an independent predictor of functional disability.

Table 2
Multiple regression analyses predicting pain at the three and five-year follow-ups from predictors at the time of diagnosis[a]

	Functional disability after 3 yrs		Functional disability after 5 yrs	
	β	$\Delta R2$	β	$\Delta R2$
1. Functional disability	0.52***	0.37***	0.51***	0.34***
2. Pain coping		0.04*		0.03
Passive	0.21*		0.17	
3. Social support		0.12***		0.11**
Perceived support	−0.18*		−0.24**	
Social network	−0.25**		−0.18*	
Total R2		0.53***		0.48***

[a] Selection criterion for predictor variables was a significant correlation with changes in functional disability at least at a single follow-up assessment (see Table 1)

* $p < 0.05$
** $p < 0.01$
*** $p < 0.001$

Analyses of the moderator effects of personality characteristics and clinical status on pain coping and social support and of pain coping on social support indicated that the interaction terms were not significantly related to changes in functional disability at the three and five-year follow-ups, failing to support any moderating function of the predictors for changes in long-term functional disability.

3.3. Predictors of pain at the three and five-year follow-ups

As presented in Table 1, correlational analyses between predictors at the time of diagnosis and changes in pain after three and five years revealed a significant relationship between lower educational level and an increase in pain at the five-year follow-up, but not at the three-year follow-up. In addition, higher levels of functional disability and lower levels of perceived support at the time of diagnosis were related to an increase in pain at the three and five-year follow ups. In contrast, demographic variables (sex, age, marital status), the personality characteristics of neuroticism and extraversion, active and passive pain coping, and the size of the social network were not significantly related to changes in pain at the three and five-year follow-ups.

When entering the predictors significantly related to changes in pain at at least one assessment point in sequential regression analyses, i.e. educational level, functional disability, perceived support, results indicated that perceived support significantly explained an additional 5% variance in pain at both assessment points, after controlling for baseline levels of pain, educational level and functional disability at the time of diagnosis (see Table 3). Standardized beta coefficients indicated that lower levels of perceived support at the time of diagnosis significantly predicted an increase in pain at the three and five-year follow-ups ($t = -2.34$, $p < 0.05$ and $t = -2.43$, $p < 0.05$, respectively).

Finally, analyses of the moderator effects of personality characteristics and clinical status on

Table 3
Multiple regression analyses predicting pain at the three and five-year follow-ups from predictors at the time of diagnosis[a]

	Pain after 3 yrs		Pain after 5 yrs	
	β	$\Delta R2$	β	$\Delta R2$
1. Pain	0.36**	0.17***	0.44***	0.20***
2. Demographic variables		0.00		0.08**
Educational level	0.03		0.25*	
3. Clinical status		0.06*		0.04
Functional disability	0.25*		0.19	
4. Social support		0.05*		0.05*
Perceived support	−0.23*		−0.23*	
Total R2		0.28***		0.37***

[a] Selection criterion for predictor variables was a significant correlation with changes in pain at least at a single follow-up assessment (see Table 1)
* $p < 0.05$
** $p < 0.01$
*** $p < 0.001$

pain coping and social support and of pain coping on social support were performed, indicating nonsignificant correlations between all interaction terms and changes in pain at the three and five-year follow-ups, failing to support any moderating function of the predictors for changes in long-term pain.

3.4. Confounding effects of medication

Correlation coefficients between the use (use/nonuse) and duration (number of years) of the different medication strategies and changes in functional disability and pain at the three and five-year follow-ups indicated nonsignificant correlations between all strategies and changes in long-term functional disability and pain, with one exception: the use and duration of taking NSAID was related to a decrease in functional disability at the three year follow-up ($r = 0.25$, $p < 0.05$ and $r = 0.24$, $p < 0.05$, respectively), but not at the five-year follow-up. However, when controlling for this medication strategy in the regression analyses by entering it at step 2 (see Table 2), passive pain coping and social support still significantly predicted functional disability at the three-year follow-up. In addition, standardized beta coefficients showed the same significant predictors as previously found, i.e. passive pain coping and both indicators of social support (see Table 2), indicating that their effects could not be ascribed to the medication usage.

4. Discussion

The role of pain coping and social support was examined in relationship to the long-term outcome of functional disability and pain in early RA. In line with previous results at the one-

year follow-up (Evers, Kraaimaat, Geenen & Bijlsma, 1998), passive pain coping assessed at the time of diagnosis still had a detrimental effect on functional disability at the three-year follow-up, but not at the five-year follow-up. In addition, social support consistently predicted a less unfavorable course of functional disability and pain at the three and five-year follow-ups, and these effects occurred irrespective of the personality characteristics of neuroticism and extraversion, clinical status and use of medication, generally suggesting that pain-related avoidance factors and social resources have a lasting impact on physical outcomes in early RA.

In patients with chronic pain, particularly RA, several studies supported the unfavorable effects of avoidance of activities and negative pain cognitions on future functional disability (Brown & Nicassio, 1987; Keefe et al., 1989; van Lankveld et al., 1998, Smith & Wallston, 1992; see also Jensen, Turner, Romano & Karoly, 1991; Linton, 2000; Vlaeyen & Linton, 2000; Turk & Okofuji, 2002). In line with these studies, assessing relatively short periods of time of a maximum of one year, our present study suggests that these effects are more long lasting than previously assessed. Passive pain coping, consisting of worrying cognitions about pain and the behavioral strategies of resting and retreating, assessed at the time of diagnosis still affected functional disability three years after diagnosis. Post-hoc analyses indicated that these effects could be largely ascribed to the behavioral component of avoidance of activity. When analyzing the different contribution of the two behavioral and the cognitive scales to future functional disability, only resting significantly predicted additional variance in functional disability at the three-year follow-up ($p < 0.01$). Worrying also tended to be related to functional disability at the three-year follow-up, but its effect was nonsignificant in regression analyses. While resting and worrying both contributed significantly to short-term functional disability after one year (Evers, Kraaimaat, Geenen & Bijlsma, 1998), the behavioral component of avoidance of activity appeared to be most crucial for more long-lasting effects on functional disability. These findings may support the assumption of fear-avoidance models that the most direct links to long-term functional disability are physiological disuse processes of deconditioning and reduced muscle strength and coordination (see e.g., Bortz, 1984; Steultjens, Dekker, & Bijlsma, 2002; Vlaeyen & Linton, 2000).

In contrast to expectations, passive pain coping did not predict long-term pain in this sample of patients with early RA. In fact, cognitive and behavioral pain coping strategies have been shown to predict future disability more consistently than future pain in chronic pain patients (see e.g., Evers, Kraaimaat, van Riel, Bijlsma, 2001), and as far as we know there are only two prospective studies that have found detrimental effects for passive pain coping or catastrophizing on future pain in RA patients (Brown & Nicassio, 1987; Keefe, Brown, Wallston & Caldwell, 1989). These studies were conducted with much larger sample sizes and a lack of power may be one reason for nonsignificant effects in the present study. In addition to cognitive-behavioral factors, our own research in longstanding RA indicated that self-reported physiological reactivity to pain was a better predictor than cognitive or behavioral pain coping for pain after one year (Evers, Kraaimaat, van Riel, & Bijlsma, 2001), suggesting that symptom-specific patterns of physiological pain reactivity or physiological fear reactions to pain may be more directly linked to changes in pain than cognitive and behavioral pathways (see e.g., Flor, Turk, & Birbaumer, 1990; Turk & Flor, 1999). Aside from physiological factors, possible cognitive mediators not assessed in the present study have been shown to be relevant in the relationship to functional disability and pain in chronic pain patients, such as pain-related fears, heightened attention to bodily symptoms due to hypervigilance or expectations of increased pain (see e.g., Vlaeyen &

Linton, 2000), and these factors may also be crucial for long-term functional disability and pain in this sample of patients with early RA.

Irrespective of pain coping, social support predicted long-term functional disability and pain in this sample of patients with early RA. Specifically, both indicators of social support, perceived support and the size of the social network, significantly predicted a less unfavorable long-term course of functional disability after three and five years. In comparison to the short-term follow-up after one year when only the size of the social network had a slight effect on future functional disability (Evers, Kraaimaat, Geenen, & Bijlsma, 1998), both indicators of social support were relatively strongly related to functional disability at the three and five-year follow-ups. In addition, in contrast to the nonsignificant effects of all predictors for pain at the one-year follow-up, lower levels of perceived support also consistently predicted pain at the three and five-year follow-ups, generally indicating that the effects of social support particularly affect the long-term outcome of functional disability and pain in RA. These effects seem to supplement findings in the RA litera-ture, showing that a lack of social support is prospectively related to greater interference in daily life after one year (Smith & Wallston, 1992) and to more pain after one year (Waltz, Kriegel & van't Pad Bosch, 1998).

Questions arise about possible cognitive-behavioral or physiological mediators in the relation-ship between social support and long-term outcomes. From a cognitive-behavioral perspective, perceived support from significant others has been shown to be linked to less pain behaviors and greater activity levels in heterogeneous groups of chronic pain patients (Jamison & Virts, 1990), as well as to more information seeking and cognitive restructuring in RA patients (Manne & Zautra, 1989). The latter study also revealed a path model, in which perceived support leads to more adaptive coping which in turn predicted better adjustment in RA patients (Manne & Zautra, 1989), suggesting that social support may figure as coping assistance (Thoits, 1986) and result in more adaptive pain coping and less withdrawal from (social) activities, which beneficially affect long-term functional disability and pain. Similar mechanisms may be responsible for the favorable effects of a larger social network on long-term functional disability in the present sample, e.g. stimulating participation in social activities, inhibiting avoidance behavior and offering coping assistance by generating multiple solutions to problems. Apart from cognitive-behavioral path-ways, physiological mediators in the relationship between social support and physical health have frequently been reported (see e.g., Uchino, Cacioppo & Kiecolt-Glaser, 1996), and altered auto-nomic and muscular reactivity or immunological function may be responsible for the favorable effects of social support on long-term outcomes. A major challenge for future research is to link various social support components to specific cognitive, behavioral and physiological pathways in their relationship to patient long-term functioning.

What might be the implications of our results with respect to fear-avoidance models for RA and other chronic pain patients? In line with assumptions of fear-avoidance models (e.g., Lethem, Slade, Troup & Bentley, 1983; Philips, 1987; Vlaeyen, Kole-Snijders, Boeren & van Eek, 1995), our study indicates that pain-related avoidance factors and social resources can have a lasting impact on patient functioning. In addition, these factors appear to be established at a very early stage of the disease, i.e. at the time of diagnosis, suggesting that they result from the patients' prior learning history, predispositional factors and/or cultural backgrounds (see e.g., Philips, 1987; Turk & Flor, 1999; Turk & Okofuji, 2002). Moreover, our results suggest that the relative contri-bution of pain-related avoidance factors and social resources changes between short and long-

term outcomes. The cognitive aspects of worrying and behavioral aspects of avoidance of activity seem to be especially relevant for short-term functional disability, with the behavioral component of avoidance of activity having a continuing effect on longer-term follow-ups. In contrast, social support appears initially to have only marginal effects, but its influence increases on long-term functional disability and pain outcomes, suggesting that the role of social resources may have been largely underestimated in chronic pain research.

Some limitations of this study have to be considered. Our sample consisted of patients with early RA, for whom pharmacological treatment appeared to have beneficial effects (van Jaarsveld et al., 2000, van Everdingen et al., 2002). Although our results correspond to findings for other chronic pain disorders, the extent to which our results can be generalized to other chronic pain patients or patients with longstanding RA is unclear. Our results may be also influenced by some selection bias, since all patients participated in a clinical trial and dropouts scored somewhat higher on neuroticism than participants. The relatively general assessment of passive pain coping and social support in our study limits the possibility of drawing conclusions about specific pathways for how these factors may affect long-term functional disability and pain in early RA, and it remains unclear to what extent they are a consequence of fear-avoidance beliefs or hypervigilance, as suggested by fear-avoidance theories (see e.g. Vlaeyen & Linton, 2000), or other more depressogenic cognitive processes, such as helplessness (Evers, Kraaimaat, van Lankveld et al., 2001). In addition to these cognitive pathways, future studies should include an examination of behavioral pathways, such as observed or self-monitored activity assessments (e.g., Linton, 1985), physiological pathways, such as physiological pain reactivity, generalized fear reactions and measures of muscle strength (Evers, Kraaimaat, van Riel et al., 2001; Flor, Turk & Birbaumer, 1990; Steultjens, Dekker & Bijlsma, 2002; Vlaeyen et al., 1999), as well as social pathways, including observed supportive and problematic indicators of social responses to pain (e.g., Flor, Kerns, & Turk, 1987; Manne & Zautra, 1989). Finally, multiple repeated measurements of pain coping, social support, pain and functional disability are needed to gain insight into possible reciprocal effects, in which pain-related avoidance factors, a lack of social resources and poorer physical functioning might enhance each other during the course of disease.

For clinical practice, tailored cognitive-behavioral treatment at an early stage of the disease, aimed at decreasing pain-related avoidance factors and increasing social resources in RA patients at risk, has recently been shown effective in producing beneficial changes in physical and psychological functioning at post-treatment and follow-up (Evers, Kraaimaat, van Riel & de Jong, 2002). Results of the present study suggest that this kind of tailored treatment for patients at risk not only induces short-term changes, but might also lastingly modify long-term functioning, particularly when systematically promoting patients' social support systems.

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