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The role of psychological factors in inflammatory rheumatic diseases: From burden to tailored treatment

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Inflammatory rheumatic diseases have a long-lasting effect on patients' physical and psychological functioning, for instance, due to disabling symptoms and unpredictable disease course. Consequently, many patients show adjustment problems such as depressed mood, which in turn can negatively influence their disease outcome. Specific biopsychosocial factors have shown to affect this outcome. For example, daily stress, cognitive-behavioral risk factors such as pain catastrophizing and avoidance, and resilience factors such as optimism and social support influence the quality of life, physical symptoms of pain and fatigue, and inflammatory markers. Psychological interventions tackling these factors can have beneficial effects on physical and psychological functioning. Recent advances in screening for patients at risk, tailored treatment, and eHealth further broaden the efficiency and scope of these interventions while simultaneously optimizing patient empowerment. This chapter describes the biopsychosocial risk and resilience factors related to disease outcome and the possible benefits of psychological treatment strategies in inflammatory rheumatic diseases.

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Strong evidence has demonstrated the substantial negative impact of inflammatory rheumatic diseases such as rheumatoid arthritis, psoriatic arthritis, and ankylosing spondylitis on everyday quality of life. Similarly, it has been well-documented that the manner in which patients deal with this chronic stressor affects their long-term physical and psychological functioning, indicating a number of biopsychosocial risk and resilience factors in these patient groups [1–7]. Tackling these biopsychosocial risk and resilience factors through psychological interventions has shown to have possible benefits for patients with inflammatory rheumatic diseases, with recent advances concerning screening, stepped care, tailoring, and eHealth providing new opportunities for optimizing patient care [2,3,8].

In this chapter, we describe the psychological burden reported by patients with inflammatory rheumatic diseases and the risk and resilience factors related to the quality of life (including physical and psychological functioning) and disease outcome according to prospective and experimental studies in inflammatory rheumatic diseases. In addition, we describe the effects of psychological interventions tackling these factors and outline implications for optimizing patient care in the future including recent advances of screening, stepped care, tailored treatment, and eHealth. Although this review aims to capture various inflammatory rheumatic diseases, it is relevant to mention that most of the studies have been performed in patients with rheumatoid arthritis. Therefore, although studies have shown that quality-of-life impairment and biopsychosocial risk and resilience factors are mostly comparable between diseases [9,10], generalizing the findings to all inflammatory rheumatic conditions should be performed with caution. In addition, we use evidence from healthy controls and patients with other chronic somatic conditions in the case of a lack of studies for inflammatory rheumatic diseases.

Psychological burden of inflammatory rheumatic diseases

Inflammatory rheumatic diseases such as rheumatoid arthritis and ankylosing spondylitis have a major and long-lasting effect on the quality of life of patients. Their chronic and progressive nature, accompanied by disabling symptoms of pain, stiffness, and fatigue; their need for long-term medication use with potential serious side effects; and their unpredictable disease course lead to patients requiring to adjust to functional disability, to limitations on almost all areas of daily life (such as work, leisure activities, and social and family life), and to a changed and uncertain future perspective [1–7,11–13]. In addition to the effect of the disease on daily life, the pathophysiological disease process itself, with chronic inflammatory activity, may further influence psychological functioning, for example, due to a direct link between inflammatory processes and depressive symptoms [2,8,14–16].

The level of psychological burden, which can vary from a mild to moderate level of psychological distress to clinical depression and anxiety, differs between diagnostic groups and individual patients and can vary over time [8]. The past decades have shown large improvements in disease activity control of inflammatory rheumatic diseases, as shown by the large decreases in the levels of physical disability, anxiety, and depression [17]. However, the quality of life of patients with inflammatory rheumatic diseases remains considerably lower than that in the general population [13] and is comparable to that in other chronic somatic diseases including cardiovascular conditions and diabetes [1]. Thus, many patients show some level of heightened psychological distress, with a substantial percentage developing clinically relevant levels of distress, such as depression and anxiety, with prevalence rates varying between 10% and 40% depending on the criteria and instruments used (e.g., clinical interviews show lower percentages than screening questionnaires) [7,8,17–19].

A high psychological burden has been shown to significantly impair the health-related quality of life of patients with inflammatory rheumatic diseases. In addition, it negatively affects disease outcomes including physical disability, remission scores, pharmacological treatment adherence and response, healthcare costs, and mortality [2,8,15,20–23]. Thus, trying to minimize the level of psychological burden of patients with inflammatory rheumatic diseases is of high clinical relevance, and knowing the factors influencing this burden and their effects on the quality of life and disease outcome will aid in the development and refinement of interventions for these patient groups.

To conclude, the psychological burden of inflammatory rheumatic diseases is substantial, which corresponds to the percentages reported in other chronic somatic conditions, and demands serious

attention by the healthcare professionals treating these patients because of its potentially adverse consequences for impaired quality of life and disease outcome.

Risk and resilience factors for quality of life and disease outcome in inflammatory rheumatic diseases

According to the biopsychosocial models of adjustment to disease, the long-term functioning of a person in response to an uncontrollable long-term stressor such as an inflammatory rheumatic disease is determined by a combination of biological, psychological, and social factors. Within such models, both risk factors associated with worse outcomes and resilience factors that protect an individual from potential negative consequences are included. These models mostly consist of a combination of relatively stable personality characteristics, external stressors, and social aspects and a variety of cognitive, emotional, and behavioral risk and resilience factors, which influence the quality of life and disease outcome [3,24,25].

The risk and resilience factors included in the biopsychosocial models as depicted in Fig. 1 could influence the quality of life and disease outcome in inflammatory rheumatic diseases through different routes of possible mediating or moderating effects. As an example of a mediating role, a person high on neuroticism, which is a general tendency to be sensitive and experience high negative affectivity, has a higher chance to cope with stressors in an avoidant manner, which in turn will negatively influence the disease outcome. A moderating effect is, for example, observed in the buffer effect of social support, showing that stressors unfavorably affect disease activity only in the event of low levels of social support. In contrast to irreversible stressors, relatively stable personality characteristics, and elusive social support networks, the cognitive, emotional, and behavioral risk and resilience factors are a focus of psychological interventions and can be changed more easily.

The impact of stressors combined with an individual's risk and resilience factors on the disease outcome in chronic inflammatory diseases is at least in part explained by psychophysiological responses. Psychological factors such as stressors activate or deactivate, depending on the specific constellation of risk and resilience factors, the stress response systems that show bidirectional relationships with the immune system (Fig. 2). These stress response systems consist of the autonomic

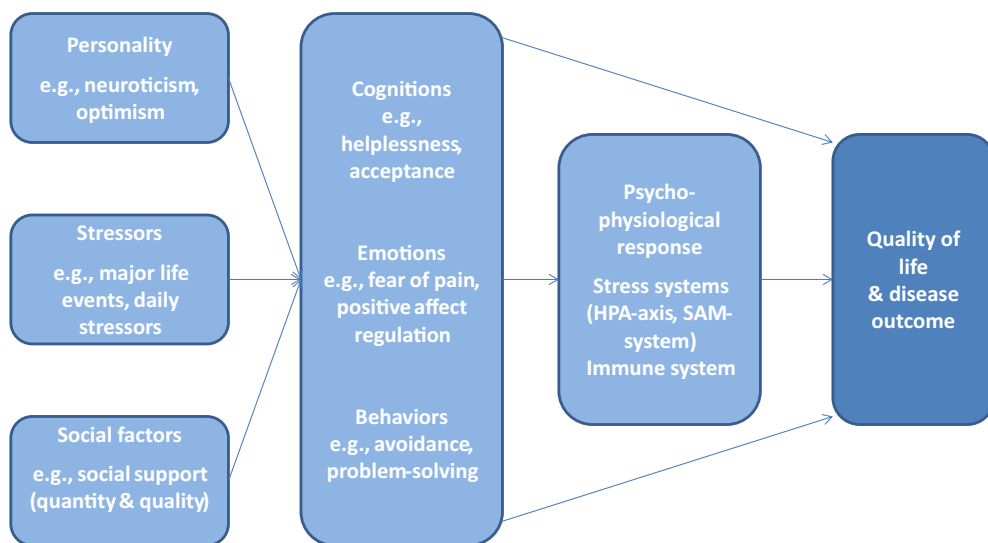


Fig. 1. Biopsychosocial adjustment model of risk and resilience factors affecting the quality of life and disease outcome in inflammatory rheumatic diseases.

nervous system (ANS), which includes the sympathoadrenal medullary (SAM) axis that secretes adrenaline and noradrenaline, and the neuroendocrine system, which includes the hypothalamic–pituitary–adrenal (HPA) axis that secretes cortisol, a major stress regulatory parameter. Because both pathways are connected with the immune system, influencing these pathways through psychological factors may influence disease processes in immune-mediated rheumatic diseases [23,26,27].

In research on adjustment to chronic diseases, including inflammatory rheumatic diseases, the main focus has traditionally been on the risk factors for a poor disease outcome, with far less research on resilience factors that prevent a poor outcome. However, both factors are essential to understand the relative risk of an individual for developing problems or to understand his or her potential for recovery [28,29]. Knowledge regarding the risk and resilience factors that influence the quality of life

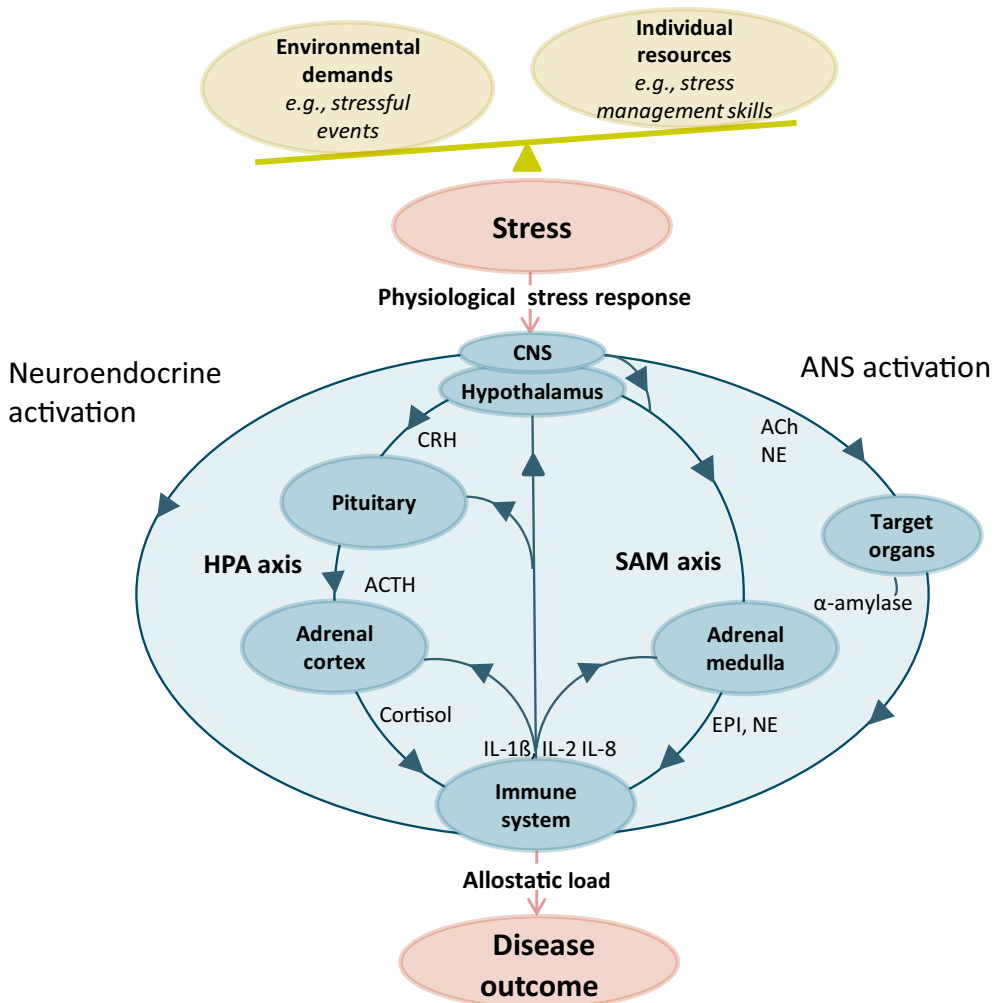


Fig. 2. Psychophysiological stress response with possible links to disease outcome [reprinted with permission from De Brouwer SJM. Psychophysiological stress reactivity in chronic inflammatory diseases: Stress exposure and stress management in rheumatoid arthritis and psoriasis (thesis). Enschede: Ipskamp; 2014]. ACh, acetylcholine; ACTH, adrenocorticotropic hormone; ANS, autonomic nervous system; CNS, central nervous system; CRH, corticotropin-releasing hormone; EPI, epinephrine; HPA axis, hypothalamic–pituitary–adrenal axis; IL, interleukin; NE, norepinephrine; SAM axis, sympathoadrenal medullary axis.

and disease outcome in inflammatory rheumatic diseases is crucial for developing screening instruments to identify patients at risk of poor outcome and for developing interventions tailored to specific risk profiles. In the following paragraphs, we provide an overview of the most consistent evidence regarding the predictive role of psychological factors on inflammatory rheumatic diseases, as demonstrated in prospective and experimental studies.

Prospective studies

Within this paragraph, risk and resilience factors that have shown a predictive value for the future physical or psychological functioning of patients with inflammatory rheumatic diseases in prospective studies are summarized.

Some studies have examined the prospective role of personality characteristics in inflammatory rheumatic diseases. These studies confirm the disease-generic finding that high neuroticism, which is characterized by negative affectivity and sensitivity, is a risk factor; in contrast, optimism, which is characterized by a general expectancy for positive outcomes, and extraversion, which is the tendency to be outgoing and energetic, are protective factors for psychological and physical quality of life [8,28,30–33].

Stressors have been relatively and consistently found to play a role in inflammatory rheumatic diseases, particularly in rheumatoid arthritis. Minor or daily stressors (for example, negative interpersonal events) are associated with more fatigue and pain, elevated immune activity, and disease exacerbations [2,11,15,23,27,34,35]. However, less clear are the results regarding major stressors, such as the death of a loved one. Some studies have indicated major stressors to be associated with the onset of rheumatoid arthritis, although this has been mostly concluded from retrospective studies, whereas other studies showed disease improvement and some studies found no associations [23,27,35]. The paradoxical effect of major stressors being associated with disease improvement in some studies has been proposed to be due to the effect of a major versus minor stressor on the psychophysiological stress system activity. For example, major, but not minor, stressors are supposed to lead to increases in cortisol release that dampens immune activity [35].

Social factors include both the availability and quality of social support by significant others [34]. Good quality social support has shown to protect against psychological distress and increase in physical symptoms [2,8,23]. It has, however, also been shown that problematic, unwanted, or stressful relationships lead to increased distress, higher symptom levels, and increased inflammatory activity in rheumatic diseases, thus indicating that the quality of social support is particularly important [2,11,23,34]. Regarding the social aspects within the healthcare context, a satisfactory relationship between the care provider and patient, which, for example, consists of mutual trust and active participation of the patient in treatment and decision making, has been shown to be an important predictor of high patient engagement and well-being in inflammatory rheumatic diseases. High patient engagement or empowerment has been shown to be related to improved treatment adherence, treatment satisfaction, and health-related quality of life [2].

Cognitive, emotional, and behavioral factors are believed to mediate or moderate the relationship of personality, stressors, and social factors with the quality of life and disease outcome and are frequently a focus of psychological interventions. Cognitive factors that have been found to be related to chronic somatic diseases in general and inflammatory rheumatic diseases in particular include illness perceptions, which are the ideas that patients create about their illness (e.g., disease controllability) [36], and illness cognitions, which result from an individual's cognitive evaluation of threatening aspects related to a disease and its consequences (e.g., helplessness and acceptance) [37]. Additional often-studied cognitive factors related to inflammatory rheumatic diseases include catastrophizing, which is the tendency to ruminate about and magnify pain, combined with a feeling of helplessness to manage it and self-efficacy, which is the confidence of a person in his or her ability to handle potential stressors [38,39]. Emotional factors encompass the general or situation-specific ways that individuals respond emotionally to stressful events (e.g., fear of pain or emotional suppression) [40,41]. Behavioral factors include the ways in which persons manage situations that they perceive as stressful or as taxing their resources, including general coping strategies or behaviors (e.g., problem-focused coping) [42] and pain-specific behavioral responses (e.g., avoidance) [39].

Of these factors, perceived helplessness, pain catastrophizing, excessive worrying, fear of pain, and passive avoidance coping have shown relatively consistent prospective associations with more severe psychological distress and physical symptoms and with a larger disease impact on daily life [2,8,11,22,35,43–49]. Some evidence in rheumatic diseases, which corresponds with evidence from other chronic illnesses, has also indicated that specific ways of regulating emotions, including difficulty in identifying and describing emotions (alexithymia) and emotional suppression, are predictive of impaired quality of life and increased self-reported disease activity, whereas other strategies, such as emotional expression, could be associated with improved functioning under specific circumstances [41,50–52]. Acceptance and self-efficacy have been shown to generally protect against psychological distress and increase in physical symptoms [2,8,23]. More recently, the role of expectancies has become a research topic of particular interest in the area of placebo effects, in which expectancies, for example, with regard to treatment effectiveness, have been shown to be a strong predictor of subsequent outcomes including pain. A recent large observational study in a varied chronic pain sample has shown that the expectancies of patients predict changes in pain intensity and interference [53].

Experimental studies

Prospective evidence of associations between psychological factors and changes in disease impact of inflammatory rheumatic diseases indicates potential causal relationships of risk and resilience factors for the quality of life and disease outcome in the future. However, causality cannot be ascertained as prospective associations could also be due to factors that are associated with both the risk or resilience factor and the change in quality of life or disease impact. Although the laboratory setting is not a natural environment, which may limit the generalizability of the findings to daily life settings, experimental studies that manipulate a psychological factor and examine its effect on functioning while controlling other key factors enable true causal conclusions [26]. Although not all psychological factors can (easily) be manipulated (e.g., personality characteristics) and not much experimental research has been conducted in patients with inflammatory rheumatic diseases, the following paragraphs will provide the current knowledge base in this or related fields (e.g., pain stimulation in healthy participants or other chronic pain populations).

Personality traits are relatively stable across time and situations, which makes it hard to manipulate them. Nevertheless, recent studies have shown that healthy participants could be trained to become more optimistic, which decreased the amount of pain experienced in response to an experimental pain stimulus [54] and decreased cognitive dysfunction due to pain [55].

An area in which most experimental evidence has been gathered in inflammatory rheumatic diseases is exposure to experimental stressors, including psychosocial stressors (e.g., public speaking, mental arithmetic), physical stressors (e.g., physical exercise, Valsalva maneuver), and physiological stressors (e.g., hypoglycemia, infusion of corticotropin-releasing hormone). These stressors have shown to induce stress-related SAM, HPA, and immune responses in patients with inflammatory rheumatic diseases, with the strongest effects shown in response to psychosocial stressors [26,27]. In inflammatory rheumatic diseases, immune responses that are similar to those in experimental stress in healthy individuals have been found; the exceptions are a lower Natural Killer (NK) cell cytotoxicity after stress in patients than in controls, potentially because of chronic immune activation due to the inflammatory disease [26], and an increased proinflammatory cytokine increase in response to a psychosocial stressor after controlling for elevated baseline levels of proinflammatory cytokines in patients with rheumatoid arthritis [56]. The link between real-life psychosocial stressors and psychophysiological and immune reactivity suggests a potential role of stressors in the maintenance or exacerbation of inflammatory rheumatic diseases, which is in line with the prospective evidence of a link between stressors and disease outcome [26,27].

Many studies have also focused on the role of expectancies in determining pain reports in both healthy and clinical populations. As determined from the broad placebo and nocebo literature, expectancies regarding the effectiveness or burden (e.g., side effects) of treatments have a major influence on actual treatment effects and treatment adherence. In healthy participants, it has consistently been found that manipulating expectancies by means of verbal suggestions or conditioning (e.g., through visual cues repeatedly associated with a specific pain stimulus) influences the amount of pain

that the participants report in response to an experimental pain stimulus, both decreasing (placebo) and increasing (nocebo) pain [57–59]. Although less often studied, evidence also suggests the pain-relieving effects of expectancy manipulations in clinical chronic pain populations [60,61].

In line with the consistent evidence of a prospective association between pain catastrophizing and disease burden in inflammatory rheumatic diseases, a recent study on both patients with chronic headache and healthy controls has shown that inducing a temporary state of catastrophizing led to increased levels of pain intensity and unpleasantness in response to an experimental pain stimulus. In addition, the level of change in catastrophizing was associated with the change in pain, which is suggestive of a direct pain-enhancing mechanism [62]. Moreover, a reduction in catastrophizing led to reductions in pain report in healthy individuals, which was found to be modulated at the supraspinal level [63]. Finally, providing failure feedback to healthy participants, which may be similar to creating a feeling of helplessness, has been shown to lead to an increase in pain reports [64].

Psychological interventions in inflammatory rheumatic diseases

Because of the psychological burden and impaired quality of life that many patients with inflammatory rheumatic diseases experience and the impact of biopsychosocial factors on a broad variety of quality-of-life and disease outcome measures, psychological interventions are relevant adjuncts to pharmacological therapies. Many psychological interventions for these patient groups have been developed and evaluated that tackle risk and resilience factors that have shown predictive values on patient outcomes, such as pain coping skills training, stress management training, and interventions that include patients' partners [3,8,65–67].

Interventions with most consistent evidence on effectiveness in rheumatic conditions are cognitive-behavioral interventions. These interventions are aimed at the modification of dysfunctional thoughts and pain-related behaviors through strategies such as cognitive restructuring, exposure, and behavioral experiments. Improvements have been found in several aspects of patient functioning, including depression and anxiety, pain and fatigue, medication adherence, and disability, although the evidence for long-term effectiveness has not consistently been studied [3,8,65–70]. Cognitive-behavioral interventions that have shown consistent small to moderate effects in patients with inflammatory rheumatic diseases include coping skills training, stress management training, motivational exercise interventions, and emotional disclosure or therapeutic writing interventions [50,71–75] in some studies, these interventions have shown to affect psychophysiological response systems and disease-relevant immune parameters such as proinflammatory cytokines [72,76,77].

A more recent category of interventions in chronic pain conditions consists of mindfulness- and acceptance-based interventions, such as mindfulness-based stress reduction and acceptance and commitment therapy [78]. These interventions that focus on nonreactivity, awareness, acceptance of physical and psychological states, and psychological flexibility have shown promising results in inflammatory rheumatic diseases or mixed chronic pain samples in improving the quality of life, decreasing pain, and decreasing perceived disease activity [79–83]. In addition, there are preliminary possible effects found on specific markers of inflammation (e.g., C-reactive protein); however, these have not been found in rheumatic diseases [82,84].

Thus, psychological interventions tackling various risk and resilience factors have generally shown small to moderate effects in patients with inflammatory rheumatic diseases, with most evidence accumulated in rheumatoid arthritis; however, the effects are relatively modest, sometimes short-lived, and vary considerably between individuals. Consequently, we propose a personalized healthcare approach in which psychological care may be further optimized for patients with inflammatory rheumatic diseases.

Psychological self-management in inflammatory rheumatic diseases: a stepped personalized healthcare approach for patients at risk

Most psychological interventions for patients with inflammatory rheumatic diseases consist of a standardized treatment package, including a diversity of techniques (e.g., education, self-management, and cognitive and behavioral exercises) and modules (e.g., focused on coping with pain and physical

disabilities, depressed mood, and social support) that are assumed to be relevant to and effective for most, if not all, patients. Because of large individual differences in the level of adjustment problems, disease outcomes, and risk and resilience factors, this “one-size-fits-all” idea does not provide optimal psychological healthcare. Likewise, not all patients with the same level of psychological burden will experience a similar need to improve their functioning, for example, because they do not prioritize that specific aspect of functioning that is impaired [3,85]. We propose a clinically realizable stepped healthcare approach in which the type and content of self-management support are tailored to the individual characteristics and needs of the patient while simultaneously broadening the outreach of psychological help in these patient groups without unrealistically increasing the costs for patients and society (Fig. 3).

Step 1: regular screening of adjustment problems as part of standard healthcare

As previously mentioned in this chapter, the psychological burden of inflammatory rheumatic diseases is relatively high, compared to percentages reported in other chronic somatic conditions, and demands serious attention by the healthcare professionals treating these patients. Consequently, it is of utmost relevance to include some standardized form of psychosocial screening to estimate the adjustment problems experienced by the individual patient and his or her need for support or health priorities. Subsequently, if substantial adjustment problems are found and patients indicate a need to improve these, screening could be elaborated by more specifically probing into those areas of functioning that appear most affected and by evaluating the presence of specific risk and resilience factors that could be used in treatment.

Recent advances have enabled periodic automated screening of the most relevant quality-of-life areas of patients through online screening instruments that provide the healthcare professional with a quick overview of (changes in) patient’s functioning in comparison to norm scores from the specific patient group or healthy participants [85,86]. Results of such screenings can be easily integrated into regular consultations through graphically attractive and easily understandable feedback options. For example, patient functioning can be visualized in patient profile charts, thus comparing a patient’s current functioning to his or her previous functioning or to relevant data from a norm group by traffic light colors, with green areas indicating no problems, orange indicating potential problems, and red indicating adjustment problems that need serious attention. This visualization can be used in the

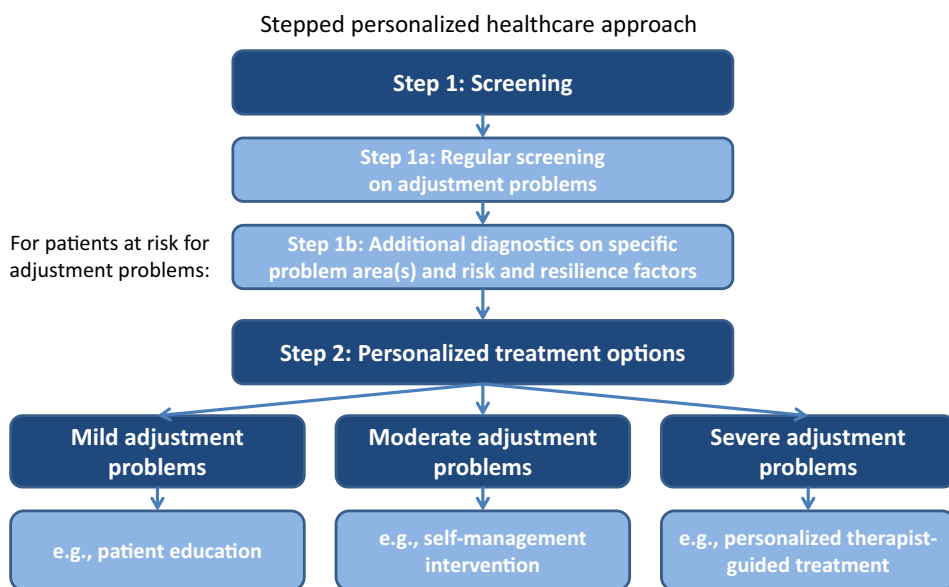


Fig. 3. A stepped personalized healthcare approach for patients with inflammatory rheumatic diseases.

consultation to discuss whether patients recognize their functioning, to discuss whether they would want to work on the aspects of functioning that are either orange or red, and to discuss how this could best be approached (e.g., varying from patient education to a referral to a psychologist for individual treatment).

For this screening, validated and reliable questionnaires that are responsive to change should be used. Starting with a brief and generic screening on psychological burden and quality of life indicating the presence or absence of adjustment problems, which can be filled out at home before the consultation with the healthcare provider, the requested additional time investment for both patients and healthcare personnel is minimal. Only in case of adjustment problems (i.e., a substantial psychological burden or quality-of-life impairment), additional diagnostics will be required to get a better idea of the problems (e.g., using a specific depression questionnaire when emotional functioning is found to be impaired) and potential underlying mechanisms (e.g., using an illness cognition or pain coping questionnaire). Thus, through such screening, healthcare could be optimized by only providing care to those individuals in need, without running the risk of overlooking patients who do not clearly state their need for help during regular consultations or offering treatments to those not in need. In addition, this offers the possibility to personalize treatment to the specific characteristics of the individual patient. Using screening tools regularly (e.g., every 6 months) in standard care can significantly contribute to efficient and personalized patient care [85,87].

Step 2: offering personalized treatment options

Depending on the outcome of the screening, different action plans are possible, varying from keeping a close watch to offering information or education and referral to another healthcare professional (e.g., nurse, medical social worker, or psychologist). For patients with mild adjustment problems or who are recently diagnosed, patient education will probably suffice [88]. In case of moderate adjustment problems, self-management interventions could sufficiently improve functioning by combining education with some cognitive-behavioral principles such as relaxation, problem solving, and goal setting [2]. For more severe adjustment problems, different evidence-based personalized therapist-guided treatments have become available for diverse patient groups and also include disease-generic approaches that encompass a broad variety of treatment modules of the most relevant areas of functioning across diseases and different cognitive-behavioral techniques and assignments that can be flexibly applied [68,89,90]. Within such tailored treatments, the content of the treatment (e.g., choice of modules to work on and specific topics or assignments within each module) is based on the elaborate screening in combination with the patient priorities and judgment of the therapist.

It has been shown that patient education or self-management is sufficient for patients in the early adjustment phase of the disease or who show mild adjustment problems and also strengthens patient empowerment [3,88], whereas more intensive treatments are most beneficial for patients who show heightened distress levels [68,85]. Likewise, there is some evidence that personalized or tailored treatment possibly leads to stronger and longer-lasting effects than standardized treatments in addition to increased treatment motivation, adherence, and patient satisfaction and decreased attrition rates in both mental and physical health conditions and in both face-to-face and internet-based interventions [3,85,89,91–93].

Providing psychological healthcare options through eHealth has shown an enormous rise in the past decades. Although eHealth applications of evidence-based treatments have shown to be mostly similar to face-to-face treatments in terms of effectiveness [94–96], they offer a number of advantages compared to face-to-face treatment options, particularly in chronic patient samples. First, it saves time and costs for both patients and healthcare professionals, for example, with respect to travel times and room rents. It also makes working on the treatment far more flexible for both patients and therapists, enabling both to invest time into the treatment at the time that best suits them. Furthermore, it may decrease the thresholds for patients to accept psychological treatment for problems (partly) associated with their physical condition and will facilitate uptake and generalization of the techniques learned in treatment in daily life as the treatment is already conducted within the home environment of the patient, which also increases patient empowerment. In the current technological era, most of the older patients also consider eHealth-based screening and treatment a viable option [97,98].

Internet-based personalized cognitive-behavioral treatment for patients with chronic somatic conditions screened for a heightened psychological burden, including trials on patients with psoriasis and with rheumatoid arthritis, have shown positive effects on psychological and physical functioning and on the effect of the disease on daily life, thus indicating the potential of evidence-based internet-based psychological treatments in inflammatory rheumatic diseases [89,93]. Thus, offering personalized treatment options through eHealth facilitates the treatment to reach a larger number of patients in need of help without necessarily increasing healthcare costs and offers a feasible and effective platform for personalized treatment options in inflammatory rheumatic diseases.

Summary

This chapter has provided an overview of three main themes concerning the role of psychological factors in inflammatory rheumatic diseases. First, the psychological burden, its origins, and its consequences in patients with inflammatory rheumatic diseases have been described, showing that many patients experience some psychological distress and a substantial minority suffers from clinical levels of distress. Because of this relatively high psychological burden, biopsychosocial risk and resilience factors that are most consistently associated with the quality of life and disease outcome in inflammatory rheumatic diseases are addressed by summarizing the evidence from prospective and experimental studies. In addition to more stable or irreversible factors such as personality characteristics, stressors, and social support, a variety of cognitive, emotional, and behavioral factors have been described that either directly or through psychophysiological responses influence the quality of life and disease outcome. Risk factors for impaired functioning include perceived helplessness, passive avoidance coping, pain catastrophizing, fear of pain, and excessive worrying, whereas resilience factors include acceptance, self-efficacy, and positive expectancies. Finally, building upon the knowledge on psychological burden and risk and resilience factors, evidence for and an outlook on different treatment options have been described. Although many psychological interventions, including cognitive-behavioral and mindfulness- and acceptance-based treatments, have shown beneficial effects in inflammatory rheumatic diseases, treatment and its reach can be optimized by integrating regular screening into standard healthcare, leading to personalized treatment options that can be offered through eHealth.

Conflict of interest statement

The authors declare no conflicts of interest.

Practice points:

- Regular screening of the psychological burden of patients with inflammatory rheumatic diseases will improve the detection of potential reasons for impaired quality of life or worse disease outcome.
- Insight into biopsychosocial risk and resilience factors enable stepped personalized treatment recommendations, thus preventing over- and undertreatment and enhancing effectiveness.
- Using eHealth screening and treatment broadens their efficiency and scope while simultaneously optimizing patient empowerment.

Research agenda:

- Insight into the specific mechanisms can provide in-depth knowledge of biopsychosocial risk factors for impaired quality of life and disease outcome in inflammatory rheumatic diseases.
- Treatment studies based on the biopsychosocial risk and resilience factors can directly compare personalized and standard (online) psychological treatments in terms of (cost-) effectiveness.

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References

- [1] Matcham F, Scott IC, Rayner L, et al. The impact of rheumatoid arthritis on quality-of-life assessed using the SF-36: a systematic review and meta-analysis. *Semin Arthritis Rheum* 2014;44:123–30.
- *[2] Sturgeon JA, Finan PH, Zautra AJ. Affective disturbance in rheumatoid arthritis: psychological and disease-related pathways. *Nat Rev Rheumatol* 2016;12:532–42.
- *[3] Evers AWM, Zautra A, Thieme K. Stress and resilience in rheumatic diseases: a review and glimpse into the future. *Nat Rev Rheumatol* 2011;7:409–15.
- [4] Strohal R, Kirby B, Puig L, et al. Psoriasis beyond the skin: an expert group consensus on the management of psoriatic arthritis and common co-morbidities in patients with moderate-to-severe psoriasis. *J Eur Acad Dermatol Venereol* 2014; 28:1661–9.
- [5] Sojevic Timotijevic Z, Jankovic S, Trajkovic G, et al. Identification of psoriatic patients at risk of high quality of life impairment. *J Dermatol* 2013;40:797–804.
- [6] Shen CC, Hu LY, Yang AC, et al. Risk of psychiatric disorders following ankylosing spondylitis: a nationwide population-based retrospective cohort study. *J Rheumatol* 2016;43:625–31.
- [7] Vriezekaalk J, Eijssbouts A, Evers A, et al. Poor psychological health status among patients with inflammatory rheumatic diseases and osteoarthritis in multidisciplinary rehabilitation: need for a routine psychological assessment. *Disabil Rehabil* 2010;32:836–44.
- *[8] Geenen R, Newman S, Bossema ER, et al. Psychological interventions for patients with rheumatic diseases and anxiety or depression. *Best Pract Res Clin Rheumatology* 2012;26:305–19.
- [9] Hyphantis T, Kotsis K, Tsifetaki N, et al. The relationship between depressive symptoms, illness perceptions and quality of life in ankylosing spondylitis in comparison to rheumatoid arthritis. *Clin Rheumatol* 2013;32:635–44.
- [10] Kotsis K, Voulgari PV, Tsifetaki N, et al. Anxiety and depressive symptoms and illness perceptions in psoriatic arthritis and associations with physical health-related quality of life. *Arthritis Care Res* 2012;64:1593–601.
- [11] Nikolaus S, Bode C, Taal E, et al. Fatigue and factors related to fatigue in rheumatoid arthritis: a systematic review. *Arthritis Care Res* 2013;65:1128–46.
- [12] Overman CL, Kool MB, Da Silva JAP, et al. The prevalence of severe fatigue in rheumatic diseases: an international study. *Clin Rheumatol* 2016;35:409–15.
- [13] Poh LW, He HG, Lee CSC, et al. An integrative review of experiences of patients with rheumatoid arthritis. *Int Nurs Rev* 2015;62:231–47.
- [14] Overman CL, Bossema ER, Van Middendorp H, et al. The prospective association between psychological distress and disease activity in rheumatoid arthritis: a multilevel regression analysis. *Ann Rheum Dis* 2012;71:192–7.
- [15] Rathbun AM, Reed GW, Harrold LR. The temporal relationship between depression and rheumatoid arthritis disease activity, treatment persistence and response: a systematic review. *Rheumatology* 2013;52:1785–94.
- [16] Lorton D, Lubahn CL, Zautra AJ, et al. Proinflammatory cytokines and sickness behavior in rheumatic diseases. *Curr Pharm Des* 2008;14:1242–60.
- [17] Overman CL, Jurgens NS, Bossema ER, et al. Change of psychological distress and physical disability in patients with rheumatoid arthritis over the last two decades. *Arthritis Care Res* 2014;66:671–8.
- [18] Hawley DJ, Wolfe F. Depression is not more common in rheumatoid arthritis - a 10-year longitudinal-study of 6,153 patients with rheumatic disease. *J Rheumatol* 1993;20:2025–31.
- [19] Matcham F, Rayner L, Steer S, et al. The prevalence of depression in rheumatoid arthritis: a systematic review and meta-analysis. *Rheumatology* 2013;52:2136–48.
- [20] Matcham F, Ali S, Irving K, et al. Are depression and anxiety associated with disease activity in rheumatoid arthritis? A prospective study. *BMC Musculoskelet Disord* 2016;17:155.
- [21] Matcham F, Norton S, Scott DL, et al. Symptoms of depression and anxiety predict treatment response and long-term physical health outcomes in rheumatoid arthritis: secondary analysis of a randomized controlled trial. *Rheumatology* 2016;55:268–78.
- *[22] Edwards RR, Calahan C, Mensing G, et al. Pain, catastrophizing, and depression in the rheumatic diseases. *Nat Rev Rheumatol* 2011;7:216–24.
- *[23] Walker JG, Littlejohn GO, McMurray NE, et al. Stress system response and rheumatoid arthritis: a multilevel approach. *Rheumatology* 1999;38:1050–7.
- [24] Taylor SE, Aspinwall LG. Psychosocial aspects of chronic illness. In: Costa PT, Vandenbos GR, editors. *Psychological aspects of serious illness: chronic conditions, fatal diseases, and clinical care*. Washington: American Psychological Association; 1996. p. 3–60.
- [25] Walker JG, Jackson HJ, Littlejohn GO. Models of adjustment to chronic illness: using the example of rheumatoid arthritis. *Clin Psychol Rev* 2004;24:461–88.
- *[26] De Brouwer SJM, Kraaimaat FW, Sweep F, et al. Experimental stress in inflammatory rheumatic diseases: a review of psychophysiological stress responses. *Arthritis Res Ther* 2010;12:R89.
- *[27] Geenen R, Van Middendorp H, Bijlsma JWJ. The impact of stressors on health status and hypothalamic-pituitary-adrenal axis and autonomic nervous system responsiveness in rheumatoid arthritis. *Ann N. Y Acad Sci* 2006;1069:77–97.

- [28] Smith BW, Zautra AJ. Vulnerability and resilience in women with arthritis: test of a two-factor model. *J Consult Clin Psychol* 2008;76:799–810.
- [29] Zautra AJ, Hall JS, Murray KE. Resilience: a new definition of health for people and communities. In: Reich JW, Zautra AJ, Hall JS, editors. *Handbook of adult resilience*. New York: Guilford Press; 2010. p. 3–29.
- [30] Goodin BR, Bulls HW. Optimism and the experience of pain: benefits of seeing the glass as half full. *Curr Pain Headache Rep* 2013;17:329.
- [31] Pulvers K, Hood A. The role of positive traits and pain catastrophizing in pain perception. *Curr Pain Headache Rep* 2013;17:11.
- [32] Smith BW, Zautra AJ. The role of personality in exposure and reactivity to interpersonal stress in relation to arthritis disease activity and negative affect in women. *Health Psychol* 2002;21:81–8.
- [33] Affleck G, Tennen H, Urrows S, et al. Neuroticism and the pain-mood relation in rheumatoid arthritis: insights from a prospective study. *J Consult Clin Psychol* 1992;60:119–26.
- [34] Matcham F, Ali S, Hotopf M, et al. Psychological correlates of fatigue in rheumatoid arthritis: a systematic review. *Clin Psychol Rev* 2015;39:16–29.
- [35] Huyser B, Parker JC. Stress and rheumatoid arthritis: an integrative review. *Arthritis Care Res* 1998;11:135–45.
- [36] Leventhal H, Leventhal AE, Cameron L. Representations, procedures, and affect in illness self-regulation: a perceptual-cognitive model. In: Baum AS, Revenson TA, Singer JE, editors. *Handbook of health psychology*. New York: Erlbaum; 2001. p. 19–48.
- [37] Evers AWM, Kraaimaat FW, Van Lankveld W, et al. Beyond unfavorable thinking: the Illness Cognition Questionnaire for chronic diseases. *J Consult Clin Psychol* 2001;69:1026–36.
- [38] Bandura A. Self-efficacy - toward a unifying theory of behavioral change. *Psychol Rev* 1977;84:191–215.
- [39] Sullivan MJL, Bishop SR, Pivik J. The pain catastrophizing scale: development and validation. *Psychol Assess* 1995;7:524–32.
- [40] Crombez G, Eccleston C, Baeyens F, et al. Attention to chronic pain is dependent upon pain-related fear. *J Psychosom Res* 1999;47:403–10.
- [41] Lumley MA, Cohen JL, Borszcz GS, et al. Pain and emotion: a biopsychosocial review of recent research. *J Clin Psychol* 2011;67:942–68.
- [42] Lazarus RS, Folkman S. *Stress, appraisal and coping*. New York: Springer; 1984.
- [43] Evers AW, Kraaimaat FW, Geenen R, et al. Long term predictors of anxiety and depressed mood in early rheumatoid arthritis: a 3 and 5 year followup. *J Rheumatol* 2002;29:2327–36.
- [44] Evers AW, Kraaimaat FW, Geenen R, et al. Stress-vulnerability factors as long-term predictors of disease activity in early rheumatoid arthritis. *J Psychosom Res* 2003;55:293–302.
- [45] Evers AW, Kraaimaat FW, Geenen R, et al. Pain coping and social support as predictors of long-term functional disability and pain in early rheumatoid arthritis. *Behav Res Ther* 2003;41:1295–310.
- [46] Evers AWM, Verhoeven EWM, Van Middendorp H, et al. Does stress affect the joints? Daily stressors, stress vulnerability, immune and HPA axis activity, and short-term disease and symptom fluctuations in rheumatoid arthritis. *Ann Rheum Dis* 2014;73:1683–8.
- [47] Vriezolkolk JE, Van Lankveld WGJM, Geenen R, et al. Longitudinal association between coping and psychological distress in rheumatoid arthritis: a systematic review. *Ann Rheum Dis* 2011;70:1243–50.
- [48] Camacho EM, Verstappen SMM, Chipping J, et al. Learned helplessness predicts functional disability, pain and fatigue in patients with recent-onset inflammatory polyarthritis. *Rheumatology* 2013;52:1233–8.
- [49] Jia XJ, Jackson T. Pain beliefs and problems in functioning among people with arthritis: a meta-analytic review. *J Behav Med* 2016;39:735–56.
- [50] De Ridder DTD, Geenen R, Kuijer R, et al. Psychological adjustment to chronic disease. *Lancet* 2008;372:246–55.
- [51] Hamilton NA, Zautra AJ, Reich JW. Affect and pain in rheumatoid arthritis: do individual differences in affective regulation and affective intensity predict emotional recovery from pain? *Ann Behav Med* 2005;29:216–24.
- [52] Van Middendorp H, Geenen R, Sorbi MJ, et al. Emotion regulation predicts change of perceived health in patients with rheumatoid arthritis. *Ann Rheum Dis* 2005;64:1071–4.
- [53] Cormier S, Lavigne GL, Choiniere M, et al. Expectations predict chronic pain treatment outcomes. *Pain* 2016;157:329–38.
- [54] Hanssen MM, Peters ML, Vlaeyen JWS, et al. Optimism lowers pain: evidence of the causal status and underlying mechanisms. *Pain* 2013;154:53–8.
- [55] Boselie JJLM, Vancleef LMG, Smeets T, et al. Increasing optimism abolishes pain-induced impairments in executive task performance. *Pain* 2014;155:334–40.
- [56] De Brouwer SJM, Van Middendorp H, Stormink C, et al. Immune responses to stress in rheumatoid arthritis and psoriasis. *Rheumatology* 2014;53:1844–8.
- [57] Rose JP, Geers AL, Rasinski HM, et al. Choice and placebo expectation effects in the context of pain analgesia. *J Behav Med* 2012;35:462–70.
- *[58] Evers AWM, Bartels DJP, Van Laarhoven AIM. Placebo and nocebo effects in itch and pain. *Handb Exp Pharmacol* 2014;225:205–14.
- [59] Van Laarhoven AIM, Vogelaar ML, Wilder-Smith OH, et al. Induction of nocebo and placebo effects on itch and pain by verbal suggestions. *Pain* 2011;152:1486–94.
- [60] Peerdeman KJ, Van Laarhoven AIM, Keij SM, et al. Relieving patients' pain with expectation interventions: a meta-analysis. *Pain* 2016;157:1179–91.
- [61] Petersen GL, Finnerup NB, Groesen K, et al. Expectations and positive emotional feelings accompany reductions in ongoing and evoked neuropathic pain following placebo interventions. *Pain* 2014;155:2687–98.
- [62] Kjøgg H, Kasch H, Zachariae R, et al. Experimental manipulations of pain catastrophizing influence pain levels in patients with chronic pain and healthy volunteers. *Pain* 2016;157:1287–96.
- [63] Terry EL, Thompson KA, Rhudy JL. Experimental reduction of pain catastrophizing modulates pain report but not spinal nociception as verified by mediation analyses. *Pain* 2015;156:1477–88.

- [64] Van den Hout JHC, Vlaeyen JWS, Peters ML, et al. Does failure hurt? The effects of failure feedback on pain report, pain tolerance and pain avoidance. *Eur J Pain* 2000;4:335–46.
- [65] Dixon KE, Keefe FJ, Scipio CD, et al. Psychological interventions for arthritis pain management in adults: a meta-analysis. *Health Psychol* 2007;26:241–50.
- *[66] Eccleston C, Fisher E, Craig L, et al. Psychological therapies (Internet-delivered) for the management of chronic pain in adults. *Cochrane Database Syst Rev* 2014:61.
- [67] Dissanayake RK, Bertouch JV. Psychosocial interventions as adjunct therapy for patients with rheumatoid arthritis: a systematic review. *Int J Rheum Dis* 2010;13:324–34.
- [68] Evers AW, Kraaimaat FW, Van Riel PL, et al. Tailored cognitive-behavioral therapy in early rheumatoid arthritis for patients at risk: a randomized controlled trial. *Pain* 2002;100:141–53.
- [69] McCracken LM, Turk DC. Behavioral and cognitive-behavioral treatment for chronic pain: outcome, predictors of outcome, and treatment process. *Spine* 2002;27:2564–73.
- [70] Turner JA, Holtzman S, Mancl L. Mediators, moderators, and predictors of therapeutic change in cognitive-behavioral therapy for chronic pain. *Pain* 2007;127:276–86.
- [71] Lumley MA, Keefe FJ, Mosley-Williams A, et al. The effects of written emotional disclosure and coping skills training in rheumatoid arthritis: a randomized clinical trial. *J Consult Clin Psychol* 2014;82:644–58.
- [72] De Brouwer SJM, Van Middendorp H, Kraaimaat FW, et al. Immune responses to stress after stress management training in patients with rheumatoid arthritis. *Arthritis Res Ther* 2013;15:R200.
- [73] Lumley MA, Leisen JCC, Partridge RT, et al. Does emotional disclosure about stress improve health in rheumatoid arthritis? Randomized, controlled trials of written and spoken disclosure. *Pain* 2011;152:866–77.
- [74] Mattukat K, Rennert D, Brandes I, et al. Short- and long-term effects of intensive training and motivational programme for continued physical activity in patients with inflammatory rheumatic diseases. *Eur J Phys Rehabil Med* 2014;50:395–409.
- [75] Hamilton-West KE, Quine L. Effects of written emotional disclosure on health outcomes in patients with ankylosing spondylitis. *Psychol Health* 2007;22:637–57.
- [76] Van Middendorp H, Geenen R, Sorbi MJ, et al. Health and physiological effects of an emotional disclosure intervention adapted for application at home: a randomized clinical trial in rheumatoid arthritis. *Psychother Psychosom* 2009;78:145–51.
- [77] De Brouwer SJM, Kraaimaat FW, Sweep FCGJ, et al. Psychophysiological responses to stress after stress management training in patients with rheumatoid arthritis. *PLoS One* 2011;6:10.
- [78] Veehof MM, Trompetter HR, Bohlmeijer ET, et al. Acceptance- and mindfulness-based interventions for the treatment of chronic pain: a meta-analytic review. *Cogn Behav Ther* 2016;45:5–31.
- [79] Zangi HA, Mowinckel P, Finset A, et al. A mindfulness-based group intervention to reduce psychological distress and fatigue in patients with inflammatory rheumatic joint diseases: a randomised controlled trial. *Ann Rheum Dis* 2012;71:911–7.
- [80] Bawa FLM, Mercer SW, Atherton RJ, et al. Does mindfulness improve outcomes in patients with chronic pain? Systematic review and meta-analysis. *Br J Gen Pract* 2015;65:e387–400.
- [81] Davis MC, Zautra AJ, Wolf LD, et al. Mindfulness and cognitive-behavioral interventions for chronic pain: differential effects on daily pain reactivity and stress reactivity. *J Consult Clin Psychol* 2015;83:24–35.
- [82] Fogarty FA, Booth RJ, Gamble GD, et al. The effect of mindfulness-based stress reduction on disease activity in people with rheumatoid arthritis: a randomised controlled trial. *Ann Rheum Dis* 2015;74:472–U8987.
- [83] Trompetter HR, Bohlmeijer ET, Veehof MM, et al. Internet-based guided self-help intervention for chronic pain based on Acceptance and Commitment Therapy: a randomized controlled trial. *J Behav Med* 2015;38:66–80.
- [84] Black DS, Slavich GM. Mindfulness meditation and the immune system: a systematic review of randomized controlled trials. In: Sequeira S, editor. Special issue: advances in meditation research. *Annals of the New York Academy of Sciences*, vol. 1373. Oxford: Blackwell Science Publ; 2016. p. 13–24.
- *[85] Evers AWM, Gieler U, Hasenbring MI, et al. Incorporating biopsychosocial characteristics into personalized healthcare: a clinical approach. *Psychother Psychosom* 2014;83:148–57.
- [86] Slok AHM, Bemelmans TCH, Kotz D, et al. The Assessment of Burden of COPD (ABC) scale: a reliable and valid questionnaire. *COPD J Chronic Obstr Pulm Dis* 2016;13:431–8.
- [87] Vercoulen JH. A simple method to enable patient-tailored treatment and to motivate the patient to change behaviour. *Chronic Respir Dis* 2012;9:259–68.
- [88] Zangi HA, Ndosi M, Adams J, et al. EULAR recommendations for patient education for people with inflammatory arthritis. *Ann Rheum Dis* 2015;74:954–62.
- [89] Van Beugen S, Ferwerda M, Spillekom-van Kouilil S, et al. Tailored therapist-guided internet-based cognitive behavioral treatment for psoriasis: a randomized controlled trial. *Psychother Psychosom* 2016;85:297–307.
- [90] Van Kouilil S, Van Lankveld W, Kraaimaat FW, et al. Tailored cognitive-behavioral therapy and exercise training for high-risk patients with fibromyalgia. *Arthritis Care Res* 2010;62:1377–85.
- [91] Johansson R, Sjobgen M, Sjobgen M, et al. Tailored vs. standardized internet-based cognitive behavior therapy for depression and comorbid symptoms: a randomized controlled trial. *PLoS One* 2012;7:e36905.
- [92] Nordgren LB, Hedman E, Etienne J, et al. Effectiveness and cost-effectiveness of individually tailored Internet-delivered cognitive behavior therapy for anxiety disorders in a primary care population: a randomized controlled trial. *Behav Res Ther* 2014;59:1–11.
- [93] Ferwerda M, Van Beugen S, Van Middendorp H et al. A tailored guided internet-based cognitive-behavioral intervention for patients with rheumatoid arthritis: a randomized controlled trial [Abstract]. In EABCT 2016 Program book Stockholm; www.eabct2016.org/print.
- [94] Van Beugen S, Ferwerda M, Hoeve D, et al. Internet-based cognitive behavioral therapy for patients with chronic somatic conditions: a meta-analytic review. *J Med Internet Res* 2014;16:251–65.
- [95] McCombie A, Geary R, Andrews J, et al. Computerised cognitive behavioural therapy for psychological distress in patients with physical illnesses: a systematic review. *J Clin Psychol Med Settings* 2015;22:20–44.

- [96] Andersson G, Cuijpers P, Carlbring P, et al. Guided Internet-based vs. face-to-face cognitive behavior therapy for psychiatric and somatic disorders: a systematic review and meta-analysis. *World Psychiatry* 2014;13:288–95.
- [97] Ferwerda M, Van Beugen S, Van Burik A, et al. What patients think about E-health: patients' perspective on internet-based cognitive behavioral treatment for patients with rheumatoid arthritis and psoriasis. *Clin Rheumatol* 2013;32: 869–73.
- [98] Hedman E, Ljotsson B, Lindefors N. Cognitive behavior therapy via the Internet: a systematic review of applications, clinical efficacy and cost-effectiveness. *Expert Rev Pharmacoecon Outcomes Res* 2012;12:745–64.