

# The relationship between mental health and rheumatism

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*A study on which rheumatic specific factors  
predict  
mental health*

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# Abstract

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**Objective:** Firstly to get an impression of mental health among individuals with rheumatic diseases and to investigate factors associated with its three facets: emotional, social and psychological well-being. Secondly to explore how much variance these factors can explain in mental health. We are interested in establishing whether mental or physical factors play the bigger role.

**Methods:** This study was accomplished in the rheumatology department of the clinic “Medisch Spectrum Twente” in collaboration with the University Twente in Enschede. We compared the mental health of our sample with that of the general Dutch population (Westerhof and Keyes, 2008). 66 patients filled in Short form version2 (SF-36), Health assessment questionnaire – disability Index (HAQ-DI) and the Mental Health Continuum–Short Form (MHC–SF). They measure respectively Health (mental and physical), Disability and mental health (consists of three facets: emotional, social and psychological well-being).

**Results:** Compared to the general Dutch population more people of our sample are languishing (difference: 5.7%) as well as flourishing (difference: 22.7%) and less moderately healthy (difference: 28.4%). Following constructs correlated significantly with emotional well-being ( $p < 0.05$ ): Role limitations due to physical and emotional problems, General health perception, Vitality, Social functioning, emotions (mental health) and disability. Social well-being correlates significantly ( $p < 0.05$ ) with vitality, role limitation due to emotional problems and emotions (mental health). Psychological well-being correlates significantly ( $p < 0.05$ ) with general health perception, vitality, social functioning, role limitation due to emotional problems and emotions (mental health).

With multivariate regression analyses we found that the health factors explain 55% of emotional, 27 % of social and 21 % of the variance in psychological well-being.

**Discussion:** Role restriction due to emotional problems and vitality are the strongest predictors for mental health. It should be tried to find ways to influence them in order to increase mental health among the rheumatism population. Emotional well-being is strongly influenced by health factors whereas social and psychological well-being is less affected. In contradiction with our expectation, pain shows no significant correlation with any of the three mental health facets. All other factors show at least a relation with one of the mental health facets. More mental factors correlate with mental health and their correlation is generally higher than that of physical factors. It seems thus that mental health is more affected by the psychological consequences of rheumatism rather than from rheumatism itself. Further research should investigate whether physical factors influence mental health indirectly via mental factors. Attention should be paid to the high prevalence of flourishing people in our study. Maybe flourishing people were more inclined to take part in our study than languishing ones.



# Samenvatting

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**Doel:** Ten eerste om een indruk te verkrijgen van de geestelijke gezondheid onder individu's met reumazikten en om te onderzoeken welke factoren met de drie facetten van mentale gezondheid samenhangen: emotionele, sociale en psychologische welzijn. Ten tweede om te onderzoeken hoeveel variantie deze factoren in mentale gezondheid kunnen verklaren. Wij zijn geïnteresseerd of mentale of fysieke factoren een grotere rol spelen.

**Methoden:** Dit onderzoek is uitgevoerd op de reumaafdeling van de kliniek "Medisch Spectrum Twente" in samenwerking met de universiteit Twente in Enschede. We hebben de mentale gezondheid van onze steekproef vergeleken met de algemene geestelijke gezondheid van de Nederlandse bevolking (Westerhof en Keyes, 2008). 66 patiënten hebben de Short form versie 2 (SF-36), Health assessment questionnaire – disability Index (HAQ-DI) en de Mental Health Continuum–Short Form (MHC–SF) ingevuld. Deze vraaglijsten meten telkens gezondheid (mental en fysiek), handicap en mentale gezondheid (bestaat uit drie facetten: emotioneel, sociaal en psychologisch welbevinden).

**Resultaten:** Vergeleken met de algemene Nederlandse bevolking zijn in onze steekproef meer mensen florerend (verschil: 5.7%) als ook verkommerend (5.7%) en minder mensen hebben een gematigde geestelijke gezondheid. De volgende constructen correleren significant met emotioneel welbevinden ( $p < 0.05$ ): Rol beperking door fysieke en emotionele problemen, algemene gezondheidsperceptie, vitaliteit, sociaal functioneren, emoties (mentale gezondheid) en handicap. Sociaal welbevinden correleert significant ( $p < 0.05$ ) met vitaliteit, rol beperking door emotioneel problemen en emoties (mentale gezondheid). Psychologisch welbevinden correleert significant ( $p < 0.05$ ) met algemene gezondheidsperceptie, vitaliteit en sociaal functioneren, rol beperking door emotionele problemen en emoties (mentale gezondheid). Met multivariate regressie analyses hebben wij gevonden dat gezondheidsfactoren 55% van de variantie in emotioneel, 27% in sociaal en 21% in psychologisch welbevinden verklaren.

**Discussie:** Rol beperking door emotionele problemen en vitaliteit zijn de sterkste voorspellers van mentale gezondheid. Voor deze twee factoren zou een manier moeten worden gevonden om ze te beïnvloeden om de mentale gezondheid onder mensen met reuma te verbeteren. Emotioneel welbevinden wordt sterk beïnvloed door de gezondheidsfactoren terwijl ze op sociaal en psychologisch welbevinden echter minder effect hebben. Anders dan verwacht correleert pijn niet significant met een van de drie mentale gezondheidsfacetten. Meer mentale dan fysieke factoren correleren met mentale gezondheid en hun correlatie is algemeen hoger. Het lijkt erop dat geestelijke gezondheid meer beïnvloedt wordt door de psychologische consequenties van reuma dan van de ziekte zelf. Aanvullend onderzoek zou moeten nagaan of fysieke factoren mentale gezondheid indirect beïnvloeden via mentale factoren. Aandacht zou moeten worden besteed aan de hoge prevalentie van florerende mensen in onze steekproef. Misschien waren florerende mensen eerder geneigd om deel te nemen in onze studie dan verkommerende mensen.



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# 1. Introduction

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Healthcare systems are inclined to spend all their resources on reduction and preventing of mental disorders. But it becomes more and more clear how important mental health is. It cannot be explained by the absence of mental disease alone. The aim of the present study is to bring to light how rheumatism is related to mental health. We want to figure out the factors in rheumatism which could be related to mental health. We want to investigate which mental and physical factors are related to mental health. In addition to that we want to get to know how well these factors explain mental health. The results could be useful for healthcare systems in order to give better aid which is in line with the patient's needs. We first start with defining mental health (1.1). Secondly we give information on rheumatism (1.2). Subsequently an overview of well-being among patients with rheumatic diseases is given (1.3). Finally we will define our research question and present our hypotheses (1.4).

## 1.1. *Mental Health*

The present study aims to investigate the relationship between rheumatism and mental health. Before we relate specific rheumatism characteristics to mental health we will first explain the two-factor model of complete mental health (1.1.1). Then we will concentrate on what mental health is and how it can be measured (1.1.2). Subsequently we make the relationship between mental illness and health clear (1.1.3). Finally we explain how mental health influences life (1.1.4).

### 1.1.1. *The two-factor model of complete mental health*

In the past, mental health was not studied through a combined assessment of mental health and mental illness. It was just as the absence of mental disease. Research meanwhile brought to light that both the presence of a positive mind and the absence of mental illness together constitute mental health. In order to be “completely” mentally healthy one must have a positive mind and be free of a mental illness. In our study we will focus on the positive side of mental health only. Nevertheless we must bear in mind, that the absence/presence of mental illness also plays a role in assessing one's mental state. In order to give our study a place in a broader framework we will explain why the positive side of mental health became important and how a complete mental health status can be assessed (Keyes (2007)).

Mental health was just studied as the absence of mental disease. Keyes (2007) argued that in the past the western world was influenced by the “pathogenic approach”. This traditional approach views health as the absence of disability, disease and premature death. This was justified in the past, because acute and infectious diseases caused premature death. But now more and more countries undergo the epidemiological transition. Most acute diseases and infections can be treated so well that they are no longer the leading cause for mortality.

Nowadays chronic and modifiable lifestyle factors evoke illness and death. People are getting older and the years they spend living with a chronic physical disease (like rheumatism) increases. Lifestyle factors now influence the physical and mental health status of people. That there is a shift towards attention to a healthy life in addition to longevity is reflected in the “complete- state model”. That is explained by the WHO (1948) as a complete state, consisting of the presence of a positive state of human capacities and functioning as well as the absence of disease or infirmity (Keyes (2007)).

To sum it up, a single factor model, based just on the absence or presence of mental illness as latent factor is not enough to explain mental health. It has to be replaced by a two-factor model, seeing mental health and illness as two different constructs which make up complete mental health.

### *1.1.2. What is mental health?*

The World Health Organization refers to mental health as “a state of well-being in which the individual realizes his or her own abilities, copes with the normal stresses of life, works productively and fruitfully and is able to make a contribution to his or her community” (World Health Organization, 2004, p. 12). In short, this definition compasses three central concepts: Positive emotions, positive psychological functioning and positive social functioning. These concepts in turn agree with three concepts from the field of psychology which are: subjective / emotional, psychological and social well-being (Westerhof & Keyes, 2008).

Emotional well-being<sup>1</sup> can be understood as being satisfied with one’s life and having positive feelings, e.g. pleasure, interest and happiness. In the WHO definition this is reflected as a “state of well-being in which the individual (...) copes with normal stresses of life”. Emotional well-being can be seen as hedonic well-being, because it concentrates on the individual experience of oneself. We now will describe psychological and social well-being

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<sup>1</sup> In some articles it is referred to emotional well-being as subjective well-being, for example in Westerhof and Keyes (2008). In the whole study we used just the term emotional well-being in order to avoid confusion.

which together form eudaimonic well-being. Psychological well-being describes the ambition to realize one's potential. It is expressed in the WHO definition as self-actualization "in which the individual realizes his or her own abilities (...)". Social well-being comprises to have a positive vision of one's community, participate in it and have a feeling of membership. This reflects the subjective view of function effectively in the community. This is in accordance with the WHO which defines social well-being as state in which the individual "works productively and fruitfully and is able to make a contribution to his or her community" (Westerhof & Keyes, 2008).

Although the three syndromes, subjective, psychological and social well-being are highly correlated, they reflect different aspects of mental health. They are the latent factors for different symptoms of well-being (Keyes, 2002). As shown in table 1, research revealed that 13 specific dimensions of well-being are indicators of subjective, emotional and social well-being. They reflect mental health as "flourishing" (Keyes, 2007).

When exactly is somebody defined as mentally healthy? The continuum of mental health goes from flourishing to languishing. Someone who scores high on positive emotion, positive psychological functioning and positive social functioning is labeled as flourishing (Westerhof & Keyes, 2008). That means one has a lot of positive emotions and functions psychologically and socially well. Being indicated as "languishing" means the reverse, namely low scores on all three factors. This state can be understood as a state of "emptiness and stagnation", which fits to people who describe their life as "hollow". If one scores between these two extremes, one speaks of "moderate mental health" (Westerhof & Keyes, 2008).

**Table 1: Definitions of the 13 dimensions that underlie the 3 mental health factors.**

Dimension	Definition
<b>Emotional well-being</b>	
Positive affect	Regularly cheerful, interested in life, in good spirits, happy, calm and peaceful, full of life.
Avowed quality of life	Mostly or highly satisfied with life overall or in domains of life.
<b>Psychological well-being</b>	
Self-acceptance	Holds positive attitudes towards self, acknowledges, likes most parts of self, personality.
Personal growth	Seeks challenge, has insight into own potential, feels a sense of continued development.
Purpose in life	Finds own life has a direction and meaning.
Environmental mastery	Exercises ability to select, manage, and mold personal environs to suit needs.
Autonomy	Is guided by own, socially accepted, internal standards and values.
Positive relations with Other	Has, or can form, warm, trusting personal relationships
<b>Social well-being</b>	
Social acceptance	Holds positive attitudes toward, acknowledges, and is accepting on human differences
Social actualization	Believes people, groups, and society have potential and can evolve or grow positively
Social contribution	Sees own daily activities as useful to and valued by society and others.
Social coherence	Interested in society and social life and finds them meaningful and somewhat intelligible.
Social integration	A sense of belonging to, and comfort and support from, a community.

*Note.* From "Promoting and protecting mental health as flourishing. A complementary strategy for improving national mental health" by C. L. M. Keyes, 2007, *American Psychologist* 62, 98. Copyright 2007 by the American Psychological Association. Vol. 62, No. 2, 95–108

### 1.1.3. The relationship between mental illness and mental health

In table 2 we give an overview of the prevalence of a major depressive episode and mental health in the general population of the USA. We can see that some people are free of major depression but are languishing (14%). The other way round we see that some people are flourishing but have a major depression (6%). This supports the view that mental illness and health belong to different dimensions and are not two extremes of one dimension (Keyes, 2007).

**Table 2:**  
**The prevalence of Mental Health and Major Depression among Adults between the Ages of 25 and 74 in the 1995 Midlife in the United States Study**

	Mental Health status			Total
	Languishing	Moderately Mentally Health	Flourishing	
<b>Major Depressive Episode</b>				
No N (%)	368 (14)	1715 (67)	520 (20)	2603 (100)
Yes N (%)	143 (33)	259 (60)	27 (6)	429 (100)
Total N (%)	511 (17)	1974 (65)	547 (18)	3032 (100)

*Note:* Adopted from “The Mental Health Continuum: From languishing to Flourishing in Life” by C. L. M. Keyes, 2002, *Journal of health and social research* 43, 213.

Because the total number of people with or without a depressive episode were not equally, we transformed the original table and computed the row percentages.

#### *1.1.4. The consequences of mental health*

The idea of complete mental health as the absence of mental illness and the presence of mental health has implications. Since mental health and mental illness are no longer viewed as the same, attention must be paid to the improvement of mental health besides the treatment of mental illness (Keyes, 2007). Prevention and treatment of mental illness alone will not necessarily lead to an increase in mentally healthy individuals (Keyes, 2002).

Mental illness is already known as an economic burden for nations. Worldwide it is among the top 5 causes of disability –adjusted life years (Keyes, 2007). But what can we say about mental health? What is the additional benefit of including mental health next to mental illness in the assessment? Complete mental health is defined as being “flourishing” and free of a mental illness. Research found evidence that anything less than complete mental health is related to increased impairment and disability in many life situations. For example it is related to more work days missed, more limitations in daily activities and more chronic physical diseases with age- just to name a few disadvantages. This fact demonstrates that there is a relationship mental health and increased impairment and disability.

“Languishing” people without a mental disorder reported the same health limitations of daily living and worse levels of psychosocial functioning than adults with a mental illness and a moderate or flourishing mental health (Keyes, 2007). People who are completely mentally ill, that is being “languishing” and having a mental illness have the worst outcome in all life areas named above. We can conclude from Keyes results that it is worthy to promote mental health besides mental illness, because a combination of mental illness with a “languishing” state is more dysfunctional than having a mental illness in combination with a moderate or flourishing health (Keyes, 2007).

#### *1.2. Rheumatism*

The prevalence of rheumatism is around 22% in the adult population and it rises to 50% in the population of people older than 65 years in the USA (Fuller-Thomson & Shaked, 2009). The population is getting older on average and so the number of people with rheumatic diseases is growing. Therefore Arthritis and other rheumatic conditions continue to be a large and growing public health problem. In the USA the number of people affected by rheumatism is expected to increase by 40% in the next 25 years (Helmick et al., 2008).

In the Netherlands rheumatism is also a problem. Around 2.3 million people are affected by rheumatic diseases. Women are more affected by rheumatism. 800.000 men and 1.500.000 women are affected in the Netherlands (Reumafonds, 2010).

Rheumatism is an umbrella term for all diseases which are associated with pain and movement restrictions in the musculoskeletal system (Härter, Weißer, Reuter & Bengel (2003). The cause of rheumatic diseases is still unknown. They share the symptoms of being chronic, disabling and progressive (Sangha, 2000). More than 100 disorders affect the musculoskeletal system. Due to the great clinical and pathological overlap between many rheumatic conditions a clear classification is difficult. Bearing in mind that there is a great overlap, we will give a very general classification of rheumatism.

Rheumatism can be broadly categorized into two groups: Immune inflammatory rheumatism and rheumatic diseases due to degeneration of the skeletal system (Nouri, Panay & Goodman, 1984).

We first will consider immune inflammatory rheumatism. Such diseases are also called autoimmune diseases, because the body's immune system attacks its own tissues. The immune system isn't able to distinguish between the own tissue and foreign antigens. In case of rheumatism, the tissues being systematically destroyed are those of the skeletal system. A well-known disease of this category is rheumatoid arthritis (RA). It mostly becomes manifest between the ages of 20 and 50 and affects three times as many women as men. The course of RA varies greatly and is marked by flare-ups and remissions. The chronic inflammatory disease affects the joints which leads to joint tenderness and stiffness. The initial trigger for the inflammation is still not known, but we do know that it begins with the inflammation of the synovial membrane of the affected joint. This again leads to accumulation of synovial fluid in the joint. The membrane begins to thicken and clings to the articular cartilages. This in turn leads to erosion of the underlying bone cartilages and the bone itself. Through this process bone ends often connect and fuse together. Later on the destroyed tissue ossifies and the two bone ends remain connected. This makes joint movement impossible and leads to pain. In this end state rheumatoid arthritis is called "ankylosis" (Marieb & Hoehn, 2007). In case of RA the joints are affected, but inflammatory rheumatism is multisystemic. This means that inflammation can migrate to nonarticular organs, too (Sangha, 2000).

We now will turn to the other category of rheumatic diseases which are due to degeneration of the skeletal system. A wellknown form of it is osteoarthritis (OA), most common among the elderly and related to the normal aging process. Nevertheless, there are a few young people who suffer from OA. In those cases a genetic basis for the disease onset is assumed. Through

normal joint use articular cartilage breaks down. In contrast to healthy people, the cartilage is not replaced in people with OA. The result is softened, roughened, pitted and eroded articular cartilage. In later stages of OA the affected bone tissue thickens and forms bony spurs. These lead to enlargement of bone ends and restricted joint movement. Through the destroyed cartilage the bones have direct contact and rub together which causes pain. Joints that are most often affected are the spine, fingers, knuckles, knees and hips. The course of OA is slow and irreversible (Marieb & Hoehn, 2007). Characteristic for OA is pain in the joints, stiffness at the start of movement and general limitation in movement (Taal, Seydal, Rasker & Wiegman, 1993).

So far we have explained the difference between inflammatory rheumatism and rheumatism due to degeneration. We used diseases as examples where the joints, bones and cartilage are affected. Rheumatic disorders (inflammatory as well as degenerative) where other parts are affected are called “soft-tissue” rheumatism. As the name already said it includes all rheumatic diseases where the soft tissues are affected. This can be ligaments, tendons, tendon sheets, bursa or muscles. Often back and neck disorders belong to this category. Known forms of “soft-tissue” rheumatism are fibromyalgia, tendinitis and bursitis (Natvig & Picavet, 2002). The symptoms of fibromyalgia are often very nonspecific (Marieb & Hoehn, 2007). Often occurring symptoms are for example, widespread pain, tenderness, fatigue, sleep disturbance and psychological distress (Wolfe, Ross, Anderson, Russel & Hebert, 1995). The pain which often goes through many areas of the body is yet unexplained (Hudson, Goldenberg, Pope, Keck & Schlesinger, 1992). Fibromyalgia affects the muscle’s connective tissue, tendons and capsules of nearby joints (Marieb & Hoehn, 2007).

Bursitis is an inflammation of the bursa and is in most cases caused by a blow or friction. Tendonitis is an inflammation of the tendon sheaths and typically caused by overuse. Both tendonitis and bursitis are restorable (Marieb, Hoehn, 2007).

### *1.3. Well-being among rheumatic population*

Rheumatism has a great impact on the individual as well as on society. The economic costs are very high due to lost productivity and increased costs of healthcare systems worldwide (Sangha, 2000). Besides this burden for society, rheumatism has a negative influence on the quality of life.

The World Health Organization identified physical, psychological and social impacts on the individual (Jacobs, van der Heide, Rasker & Bijlsma, 1993). Physical consequences of RA for example are pain, stiffness, fatigue and deformation of the joints. Also functional limitations,



for example problems with mobility, household activities and daily activities like dressing and washing play a role (Riemsma, Taal, Wiegman & Rasker, 2000).

The loss of independence has social consequences. Through the disability, the relationships between the patient and his/her family and friends changes (Taal et al., 1993). Partners for example must take over many of the responsibilities of the patient and support and care for him/her (Walsh, Blanchard, Kremer & Blanchard, 1999). In general people are no longer able to do all social activities they did before the disease (Härter et al. 2003).

Typical psychological consequences for rheumatism are uncertainty about the future (Riemsma et al. 2000). People feel that it is impossible to control their disease (Taal et al. 1993). Their self-esteem is reduced and they have feelings of helplessness (Härter et al. 2003).

Physical, psychological and social factors cannot be seen independently. Difficulty in walking for instance may interact with the patient's mood or may reduce his/her social contacts. On the other hand, depression and loneliness may worsen the pain and handicap a patient experiences (Jacobs et al., 1993). In recent years there is an increasing emphasis on the psychosocial burden of the disease (Sangha, 2000).

The present study will focus on the relationship between mental health and rheumatism. A lot of research has already been done on the relationship between mental diseases and rheumatism. It has been shown that rheumatism often shows comorbidity with psychological disorders. The life-time prevalence of getting mentally ill is between 50% and 98% for people with rheumatism (Härter et al. 2003). People with chronic diseases generally show a higher prevalence of mental disorders compared to the normal population without somatic illness. In most cases it concerns anxiety and depressive disorders (Härter, Woll, Wunsch & Bengel, 2006). This prevalence is also reflected in rheumatism. Härter, Reuter, Weisser and Schretzmann, (2002) found a higher prevalence of psychiatric syndroms in patients of musculoskeletal diseases than in the general population, particularly for anxiety and affective disorders.

The prevalence of major depression is 2-3 times higher than in the general population (Fuller-Thomson & Shaked, 2009). Härter et al. (2003) compared different studies with each other and found chronic pain and reduced physical functioning as predictors for depression. They themselves also have done research and found that "social functioning" and "role limitation due to emotional problems" are related with depression (measured with the SF-36). In the current study we want to find out what is related to positive mental health among patients with rheumatism.

#### 1.4. *Research question and hypotheses*

People with rheumatic disorders show a lower quality of life compared to the general population. This is due to the physical, psychological and social burden caused by the illness. One consequence of the psychological burden is the higher prevalence of depression and anxiety among people affected with rheumatism.

A lot of research is already done to clarify the relationship between rheumatism and mental illnesses. But there is almost nothing known about the positive side of mental health. Therefore we will pay attention to mental health and rheumatism in this study. Our first research question is:

*“Which factors in rheumatism are related to mental health?”*

Before we consider the related factors we are interested in the prevalence of the mental health states among the rheumatic population. We assume a higher percentage of people to be “languishing” and lower percentage of people to be “flourishing”, compared to the general Dutch population.

It is proven that mental illness correlates negatively with mental health (Keyes, 2002). And because we already know that the prevalence of mental illness is high among the rheumatism population it can be expected that the mental health is low. Keyes (2005) even found a direct relationship between rheumatism and being languishing. The more chronic physical conditions were present the worse the mental health status of people with rheumatism was. Actually his aim was to prove that “complete mental health” works as a protective factor against chronic physical conditions with age. He indeed detected that people who are flourishing had fewer chronic illnesses with age than people who were not flourishing. However a causal relationship cannot be proven, because his data are gathered cross – sectional. Moreover we even think that the relationship is the other way around, that chronic physical conditions determine mental health. Therefore our first hypothesis is:

- 1) *“Compared to the general population, less people are “flourishing” and more people are “languishing” among the rheumatism population.*

We now turn to the factors we expect to be related to mental health among patients with rheumatism. Here we make a distinction between mental and physical factors. In this way we get insight to what extent the mental health in rheumatism is determined by the disease itself

or its psychological consequences. As mental factors we handle: mental health (measurement of emotions), subjective health perception, role restriction due to emotional problems and social functioning (hypothesis 2-5). As physical factors we handle: Vitality, role restriction due to physical problems, physical disability and pain (hypothesis 6-9).

We have to note here that an absolute strict classification is difficult for some factors. Vitality for example is composed of physical and mental components. We decided to handle it as a physical factor in our sample, because we think that among the rheumatism population vitality is more the result of fatigue which is caused by body and health condition. For the general population we rather would classify it as a mental factor, because there we think emotions are more important and the body function remains more in the background. Subjective health perception is also a construct which could be classified as physical factor, because the perception of health is probably related to the objective health of an individual. Nevertheless we classified it here as a mental factor, because the emphasis here is on the perception of health and not the true health condition.

We assume that mental factors are directly related to mental health. And physical factors we think are indirect related to mental health via mental factors. According to this we assume mental factors to have a moderate to high correlation and physical factors a low to moderate correlation with mental health. We handle the following allocation of correlations:

$r = < 0.30$  : low correlation  
 $r = > 0.30$  and  $< 0.60$  : moderate correlation  
 $r = > 0.60$  : high correlation

The construct “mental health” of the SF-36 asks for emotions. Emotions play an important role in the well-being of people with rheumatic diseases. Rheumatism often is accompanied by feelings of uncertainty about the future (Riemsma et Al., 2000) and of losing the control of the course of disease (Taal et al. 1993). According to this rheumatism often coincides with psychological disorders (Härter et al., 2006). Emotions in that construct are indicated by being fun-loving, nervous, being down in dumps, dissatisfied, depressed/downhearted, calm and satisfied and full of energy. High scores stand for having positive emotions. It is comparable with the facet “emotional well-being” of mental health which again is measured by the MHC-SF. We thus expect that it correlates highly positive with emotional well-being. The theory on which mental health is based says that all three facets of well-being are highly correlated. We thus think that emotions, measured by the SF-36 also correlate highly positive with

psychological and social well-being. The following hypothesis can rather be seen as confirmation of an already existing theory about mental health. Our second hypothesis is:

- 2) *“Feeling peaceful, happy, and calm all of the time correlates highly positive with mental health.”*

Research has shown that there is often discrepancy between self-reported health by the patients and the underlying pathology of the diseases. Consequently physical, mental and social problems that patients with chronic diseases present vary even among patients with the same severity of disease. Psychosocial factors like subjective health perception seem to explain a lot of the variation in health outcomes in patients with chronic diseases. The own thoughts and beliefs about the disease thus play a role, too (Boot, van der Gulden & Rijken, 2008). Subjective health perception has shown to be highly correlated with subjective perception of well-being such as life-satisfaction, anxiety and depression (Schneider, Driesch, Kruse, Wachter, Nehen & Heuft, 2004). Related to people with arthritis, believing that illness will be lengthy, severe and uncontrollable is associated with poorer functioning and increased pain (Hampson, Glasgow & Zeiss (1994). High scores on the construct “General health perception” of the SF-36 stand for a positive subjective health perception. Our third hypothesis is:

- 3) *“Evaluating personal health as excellent has a moderate to high positive correlation with mental health”.*

Among the general population, role restriction correlates negatively with mental health. Role restriction can be defined in terms of being limited in daily-life, for example in social activities and at work or school (Westerhof & Keyes, 2008). Due to the symptoms of the illness, people affected by rheumatism are strongly affected by role restriction (Riemsma, Taal & Rasker, 2000). Role restriction can be caused by emotional problems. High scores on the construct “Role restriction due to emotional problems” of the SF-36 stand for low levels of restrictions. Our fourth hypothesis is:

- 4) *“Having no problems with work or other daily activities due to emotional problems have a moderate to high positive correlation with mental health.”*

Social activity has shown to be one of the most consistent predictors of people's subjective reports of well-being. Mainly satisfaction with one's own social activities has revealed to be a strong predictor (Cooper, Okamura & Gurka, 1991). We know that people affected by rheumatism often suffer from emotional problems and bad physical health. We assume that this could limit their social activities and make them dissatisfied with their social activities. This in turn would lead to a bad mental health. High scores on the construct "social functioning" of the SF-36 can be interpreted as functioning well socially. Our fifth hypothesis is:

5) *"Performing normal social activities without interference of emotional or physical problems has a moderate to high positive correlation with mental health."*

Furthermore we wanted to figure out how vitality is linked to mental health. Subjective vitality is defined as a "positive feeling of aliveness and energy" (Ryan & Frederick, 1997). It reflects organismic well-being and thus co-varies with both, psychological and somatic factors that have impact on the energy available to oneself. Vitality co-varies positively to self-motivation and negatively correlated with physical symptoms and low perceived body function. It is also shown that vitality is lower in people with chronic pain, mainly for those who perceived their pain as disabling and frightening. High scores on the construct "Vitality" of the SF-36 can be interpreted as being full of pep and energy all of the time. Our third hypothesis is:

6) *"Vitality has a moderate to high positive correlation with mental health."*

Role restriction can be due to emotional problems (see hypothesis 4) as well as physical factors. In both cases we think that an increase in role limitations probably leads to a decrease in mental health. High scores on the construct "Role restriction due to physical problems" of the SF-36 stand for low levels of restrictions. Our seventh hypothesis is:

7) *"Having no problems with work or other daily activities due to physical problems has a low to moderate positive correlation with mental health."*

People who function badly physically often experience functional limitation. That is if someone is not able to do everyday tasks and activities due to physical disability. This could

be for example not being able to eat, walk and bicycle and so forth. We think that physical limitations influence mental health via role restriction. Through the disability people are often limited in fulfilling their roles which are central to their lives. That means that functional limitations detract the patients from opportunities for positive affect and life-satisfaction (Ryan & Deci, 2001). We assume that such limitations affect mental health negatively. Our sixth hypothesis thus is:

8) *“Physical disability is low to moderate negatively correlated with mental health.”*

Besides role restriction and physical disability, pain plays a big role for people with rheumatism. It is already shown that pain is a predictor for psychopathology for people with a rheumatic disease (Härter et al. 2003). Pain directly increases negative affect (Ryan & Deci, 2001) and when asking people themselves, they said pain is one of the most important problems they have (Taal et al. 1993). This leads to our seventh hypothesis:

9) *“Pain correlates low to moderate negatively with mental health.”*

Hypotheses 2-9 were important to investigate the factors which are related to mental health among patients with rheumatism. On basis of these identified factors we can answer our second research question. We want to know which of the constructs has the greatest impact on mental health. In this way we get an idea of what should be improved in the first place to achieve better mental health among patients with rheumatic diseases. The help could be more tailored to factors which have the greatest impact on mental health. We try to answer this question on two dimensions, a physical and a mental one. In this way we get to know if mental health is rather explained by mental or by physical factors. Once knowing the explaining factors, health care systems can account for them when trying to improve the mental health of people with a rheumatic disease. The predictor variables for each mental health component (emotional, social and psychological well-being) are the significant correlating physical and mental constructs of the SF-36, HAQ-DI and the pain scale. Our second research question is:

*“Which factors have the greatest impact on mental health among patients with rheumatic diseases?”*

## 2. Method

### 2.1. Procedure

The data was gathered from 15<sup>th</sup> March until 14<sup>th</sup> April 2010 from 103 people who are affected by rheumatism. The whole procedure took place in the waiting room of the policlinic for rheumatology of the “Medisch Spectrum Twente” in Enschede. There we asked the patients to participate in our study and to fill in our questionnaires.

The three questionnaires and the pain scale were completed via the ROMA system (rheumatology online monitor application) on a computer. The participants had to type in their patient number to register in the system. With help of a touchscreen people could mark their answers. First we asked some questions about their demographic background. These were followed by the HAQ, SF 36 and the visual pain scale which starts with a little introduction. After the patients filled these in, they could choose to fill in the MHC-SF or to stop participating. All questionnaires were given in cooperation with the hospital. In table 3 we give a short overview of what types of rheumatic diseases occur in our sample. In table 4 we present background characteristics about our sample. The average age of our sample was approximately 53 years. On average the people had been suffering rheumatism for 11 years.

Diseases	Descriptive statistic	
	Frequency	%
Rheumatoid arthritis	17	25.8
Osteoarthritis	11	16.7
Articular gout	7	10.6
Fibromyalgia	9	13.6
Low backpain	6	9.1
Bechterew's disease	5	7.6
Arthritis psoriatica	3	4.5
S-L-E	3	4.5
Osteoarthritis	0	0.0
Scleroderma	0	0.0
Reiter's syndrom	0	0.0
Tendinitis, bursitis	0	0.0
Another disease	5	7.6
Don't know their disease	16	24.2
Total	66	100.0

**Table 4: Demographical variables of our sample**

		Frequency	%
Demographical variables			
Children	Having children	52	78.8
	Childless	14	21.2
Marital Status	Having a partner (married & not married)	54	81.8
	No partner (Single, divorced, widower)	12	18.2
Contemporary situation	Work (Full-time, part-time, housekeeping)	35	53.0
	No work (unemployed, unable to work, pensioned, school, study)	31	47.0
Sex	Male	30	45.5
	Female	36	54.5
Education*	High education	23	34.8
	Low education	43	65.2

*Note:* n=66. These data is from all patients who took part in the MHC-SF. It is not about the part who just took part in the other questionnaires.

\*= Low education includes no education, “basis onderwijs”, “lager beroepsonderwijs”, MAVO, (M)ULO, “3-jarige HBS”, VMBO, “Middelbaare beroepsonderwijs”. High education includes “5-jarige HBS”, HAVO, MMS, atheneum, gymnasium, “Hoger beroepsonderwijs” and university.

## 2.2. Respondents (demographical data)

We asked 364 patients in the waiting room to participate in our study. From the 103 who agreed to take part, just 66 filled in the MHC-SF. A comparison between patients who filled in the MHC-SF with those who did not is discussed in the results (see 3.2) Reasons why people did not want to take part in our study from the beginning were that they had no time or interest, already took part in too many studies, were too tired, spoke no Dutch, could not see enough or refused to work with the PC or took part in a cohort study already.

## 2.3. Instruments

We used a set of demographical questions to get background information about of our sample (2.3.1). The HAQ is used to assess the physical disability (2.3.2), whereas the SF-36 measures the health related quality of life (2.3.3). The visual pain scale measures pain (2.3.4). With MHC-SF we assessed the mental health status (2.3.5). In the following sections, we describe each questionnaire and explain how its scores have to be interpreted.



### *2.3.1. Demographic background questions*

In the basis questionnaire the patients were asked about their personal situation, especially their living and work conditions. The information we asked for was civil status, education, contemporary situation (e.g. unemployed, household, full time job), children, types of rheumatic diseases, duration of rheumatism.

### *2.3.2. Health assessment questionnaire – disability Index (HAQ-DI)*

Whereas the SF-36 provides a broader picture of health-related life quality, the HAQ is more tailored to rheumatism (Husted, Gladman, Farewell & Cook, 2001).

The HAQ assesses the health related quality of life. Its validity and reliability is very high. Consequently it is one of the most widely used patient-oriented outcome assessment instruments in rheumatology. Although it is intended to detect the influence of multiple chronic diseases on physical functioning, it originally was used for rheumatism patients. Thereupon the HAQ has been used for a variety of rheumatic diseases such as osteoarthritis, rheumatoid arthritis, fibromyalgia and more (Bruce & Fries, 2003).

In the current study we just use a part of the HAQ, the HAQ-DI. The HAQ-DI measures fine movements of the upper extremity, locomotor activities of the lower extremity, and activities which involve both upper and lower extremities. Limited function in these movements is assessed with 20 questions. The questions in turn are subdivided in 8 categories- dressing, rising, eating, walking, hygiene, reach, grip, and usual activities. The 8 categories enable us to see in which areas people in our sample are physically restricted. In addition to these 20 questions, there are two distinctive questions which ask if the patient needs devices/aids and/or help from others to complete the activities. The patient can choose between many devices and can mark for which of the 8 categories he needs help from other persons. The completion of the HAQ-DI costs the patients approximately 5 minutes (Bruce & Fries, 2003).

We give a short overview of how the scoring of the HAQ works and how its outcome has to be interpreted. Each question is about a specific activity. Patients state the amount of difficulty they have in performing this activity on a 4 point Likert –Scale. The four response options range from 0, “No difficulty” to 3 “Unable to do”. There are three steps in order to convert the raw scores into interpretable scores. Firstly, the score of the 8 categories is computed. The category score is the highest subcategory score from each category. When for example in “Arising” the three questions belonging to this category are answered with 1, 2, and 0, two becomes the category score for “Arising”. The next step is to take the aids/devices into account. Each aid or help from another person is related to one of the 8 categories. If

somebody marks to use a cane, this aid is related to the category “walking”. In table 5 we give an overview of all categories and the aids/devices belonging to them (HAQ-questionnaire, 2009).

**Table 5:**  
**Companion Aids/Devices for HAQ-DI Categories**

HAQ-DI category	Companion aid/device
Dressing & Grooming	Devices used for dressing (button hook, zipper pull, long handled horn etc.
Arising	Built up or special chair
Eating	Built up or special utensils
Walking	Cane walker, crutches
Hygiene	Raised toilet seat, bathtub seat, bathtub bar, long handled appliances in bathroom
Reach	Long handled appliances for reach
Grip	Jar opener (for jars previously opened

*Note:* Table of HAQ-manual from: ARAMIS (the Arthritis, Rheumatism, and Aging Medical Information System) (2009). *The Health Assessment Questionnaire (HAQ) and the Improved HAQ*. Retrieved July 7, 2010, from <http://aramis.stanford.edu/>

If a patient indicates to use one or more aids and/or help from others for one of the categories, his/her category score is adjusted. When the patient’s score was a 0 or 1, it rises to a 2. If the score was a 2 or a 3, it remains a 2 or a 3. The third and final step is to sum the adjusted category scores and divide them by the number of categories, which are 8. The score we now get is the total disability index of a person (HAQ-questionnaire, 2009).

The disability index scores range from 0 to 3. A score between 0 and 1 represents a mild to moderate difficulty, 1 to 2 moderate to severe disability, and 2 to 3 severe to very severe disability. It reveals that the score of the general population for the total disability index is 0.49. For osteoarthritis and rheumatoid arthritis patients the score was 0.8 and 1.2 (Bruce & Fries, 2003).

### 2.3.3. Short-Form 36 v2 (SF 36 version2)

One of the most widely used generic health status measures is the SF-36 Health Survey. It is designed to assess the general health related quality of life and is not directly related to specific illnesses. It lasts 5-10 minutes to administer the SF-36v2. In its health evaluation it takes the time period of the last 4 weeks into account. It is especially appropriate to assess the health of specific groups of the population and to compare groups with each other. The SF-36 consists of 36 questions which have shown to be a reliable and valid measure of functional health and well-being from the patient's point of view. It comprises scores for eight health domains. From these scores a psychometrically-based physical component summary and mental component summary score can be computed (see table 6) (SF-36.org, n.d.).

**Table 6:**  
**The eight health domain scales of the SF-36v2 and the psychometrically-based physical and mental component scores.**

Component summary measures	scales	Number of items
Physical health	Physical functioning	10
	Role physical	4
	Bodily pain	2
	General health	5
Mental health	Vitality	4
	Social functioning	2
	Role emotional	3
	Mental health	5
<b>Total</b>	<b>8</b>	<b>35*</b>

*Note:* \*= The 36<sup>th</sup> item asks for health change and underlies no scale. We disregard this item in our study. All health scales contribute to the scoring of both the physical and mental component summary measures. In this table the scales are grouped to the component measures with which they correlate most.

**Table 7:**  
**Summary of Information about SF-36 Scales and Physical and Mental Component**  
**Summary Measures**

	Interpretation	
	Lowest possible score	Highest possible score
<b>Scales</b>		
Physical Functioning	Very limited in performing all physical activities, including bathing or dressing	Performs all types of physical activities including the most vigorous without limitations due to health
Role-Physical (RP)	Problems with work or other daily activities as a result of physical health	No problems with work or other daily activities
Bodily Pain	Very severe and extremely limiting pain	No pain or limitations due to pain
General Health (GH)	Evaluates personal health as poor and believes it is likely to get worse	Evaluates personal health as excellent
Vitality	Feels tired and worn out all of the time	Feels full of pep and energy all of the time
Social Functioning	Extreme and frequent interference with normal social activities due to physical and emotional problems	Performs normal social activities without interference due to physical or emotional problems
Role-Emotional (RE)	Problems with work or other daily activities as a result of emotional problems	No problems with work or other daily activities
Mental Health (MH)	Feelings of nervousness and depression all of the time	Feels peaceful, happy, and calm all of the time
Physical Component Summary	Limitations in self-care, physical, social, and role activities, severe bodily pain, frequent tiredness, health rated "poor"	No physical limitations, disabilities, or decrements in well-being, high energy level, health rated "excellent"
Mental Component Summary	Frequent psychological distress, social and role disability due to emotional problems, health rated "poor"	Frequent positive affect, absence of psychological distress and limitations in usual social/role activities due to emotional problems, health rated "excellent"

*Note:* SF-36.org (A community measuring health outcomes using SF-tools) (n.d.). *General health surveys*. Retrieved June 24 from <http://www.sf-36.org/>

Table 7 summarizes the content of the eight SF-36 scales and the two summary measures. The computation of the scores exists of four steps. First, the raw scores in each scale are summed up. Then they are transformed to a 0-100 scale. After the transformation to 0-100 scale, the z-scores are computed, using as basis the data of the general population of the USA in 1998. Finally, a linear transformation is performed to transform the z-scores to a mean of 50 and standard deviations of 10, in the general US population. With such norm-based scoring, each scale has the same average of 50 and the same standard deviation of 10. Scores above 50 indicate a better health and scores below 50 a worse health than the average US population (SF-36.org, n.d.).

#### 2.3.4. *The visual analog Pain scale (VAPS)*

The visual analog pain scale measures pain which is also measured by the SF36. It differs in the way pain is assessed. In contrast to the SF-36, another response format is used. A visual analog scale is used with a continuous line representing opposite ends of the continuum pain. The line goes from 0 to 10. The main advantage of this kind of response format is its sensitivity (De Vellis, 2003). Because pain has proven to play a big role in rheumatism we think it is worth to measure pain twice, in the SF-36 and with a visual analog scale.

#### 2.3.5. *Mental Health Continuum–Short Form (MHC–SF)*

The mental health continuum short form is designed to measure mental health. It consists of 14 items which represent the three dimensions, emotional well-being, psychological well-being and social well-being. They are divided into 13 subcategories (see table 2). These again are defined by each item. The prototypical items for each dimension are chosen for MHC-SF (see table 8).

**Table 8: Items chosen for the MHC-SF**

Dimension	item
Emotional well-being	Happy/ interested in life/ satisfied
Psychological well-being	likes most parts of self/ ability to manage personal environs to suit needs/ trusting personal relationships/ Seeks challenge of continued development/ guided by own, socially accepted, internal standards and values/ own life has a direction and meaning
Social well-being	own daily activities useful to and valued by society and others/ sense of belonging to community/ Believes society has potential to grow positively/ Holds positive attitudes toward humans, finds society intelligible

*Note:* Keyes, C.L.M. (2009). Atlanta: Brief description of the mental health continuum short form (MHC-SF). Available: <http://www.sociology.emory.edu/ckeyes/>. [Online, retrieved 08.05.2010].

The items are formed into questions. The patient is asked to give a judgment on a 6-point Likert scale which measures frequency. The answer options refer to how often respondents experienced the given symptoms of mental health in the last month. One can choose between: Never, once or twice, about once a week, twice or three times a week, almost every day or every day. In the introduction of the MHC-SF the patient is explained to take the last month

into account when giving the answers. People can be categorized to be “languishing”, “flourishing” or “moderately mentally healthy”.

To which category one belongs is calculated on the basis of the frequency with which one marked the answer options. People are diagnosed as “flourishing” when they fulfill the following two criteria: If they experience “every day” or “almost every day” at least on one of the three items of emotional well-being. And in addition to that they have to experience at least six of the eleven items of psychological and social well-being “every day” or “almost every day”. People are diagnosed as ‘languishing’ when they fulfill the following tow criteria: If they experience “never” or “once or twice” at least one item of emotional well-being and six items of social and psychological well-being. If neither “languishing” nor “flourishing” can be diagnosed, the individual is categorized as having a “moderate mental health”. The MHC-SF has a high validity and reliability (Keyes, 2009). For the general Dutch population Westerhof and Keyes (2008) found an alpha of 0.83 for subjective and psychological well-being and an alpha of 0.74 for social well-being. For the total-score they found an alpha of 0.89. In order to compute correlations of the MHC-SF with other questionnaires we gave the answer categories scores:

Never (last month) =	1
once or twice (last month) =	2
about once a week=	3
2 or 3 times a week =	4
almost every day =	5
every day =	6

With these scores we can compute the average score of each person in the three mental health categories and the total mental health scores. High scores present good mental health and low scores the reverse.

## 2.4. Analysis plan

### *Demographical background*

We analyzed our data by using the Statistical Package for the Social Sciences (version 16.0.). In order to get to know the demographical background, especially about the living and work conditions of our sample we computed a frequency analysis of the number of children, marital status, contemporary situation, sex, education, age and duration of rheumatism. In addition to that we made a frequency analysis of the types of rheumatic diseases in our sample.

### *Distribution of our data*

Whether a data set has a normal or non-normal distribution is important for the choice of statistical analyses. It affects for example the choice of statistics, comparisons between groups and correlation analyses. We used the Kolmogorov-Smirnov test to examine if the scores of the HAQ- DI, SF-36, MHC-SF and VAPS have a normal distribution.

### *Comparing the patients who filled in the MHC-SF with those who did not*

Not all people were willing to fill in all questionnaires. After answering the demographical questions, the SF-36, HAQ and the VAPS they had the choice to go on and fill in the MHC-SF. It might be that the people who refused to go on differ systematically in health from those who filled in the MHC-SF. This in turn could consequently lead to a misleading picture of mental health among rheumatism patients. To test if they differed in physical disability, health and age we used the Mann- Whitney test (non- parametric variant of the t-test for independent samples). Our grouping variable was the non-/ participation of the MHC-SF. The test variables were all scales of the SF-36 the HAQ-DI and the visual analog pain scale. We used the Chi-square test to control for possible differences in demographical variables that were number of children, marital status, contemporary situation, sex and education.

### *Performance of our sample on the tests*

We used a descriptive analysis to get to know how our sample performed on the four tests. In this way we can compare their scores with norm-based scores.

We conducted a reliability analysis for each construct of the questionnaires. This is important in order to get to know how trustworthy the questionnaires measure their constructs and how meaningful a comparison to the general population is.



*Research question 1: “Which factors in rheumatism are related to mental health?”*

The first hypothesis states “Compared to the general population, less people are “flourishing” and more people are “languishing” among people with rheumatic diseases.” We made a descriptive analysis of the three different mental health categories. These are languishing, moderately mental health, and flourishing. We compared our findings with those of Westerhof & Keyes (2008) who calculated the mental health states among the general Dutch population. With help of a Barchart the different patterns can be compared. We cannot prove possible differences, because we do not have the raw data from Westerhof and Keyes (2008). If and how different factors correlate with mental health is tested by hypothesis 2-9 with a Spearman correlation (non parametric correlation). We will compare correlations of the MHC-SF score with those of the SF-36v2 (health), HAQ-DI (disability) and the VASP (pain).

*Research question 2:*

*“Which factors have the greatest impact on mental health among patients with rheumatic diseases?”*

We conducted multivariate regression analyses with emotional, psychological, social well-being respectively as dependent variables. Predictors for each multivariate analysis are those constructs which correlated significantly with the corresponding mental health scale. We put physical as well as mental factors in a regression analysis. In this manner we could also see if mental or physical factors explain more variance in mental health.

With help of a multicollinearity analysis we first checked whether the predictor variables were related with each other. This analysis computes two values, the tolerance and the variance inflation factor (VIF). The first one is the proportion of variance in each dependent variable which is not explained by the other predictor variables. The VIF is the reciprocal of the tolerance. If the VIF values are higher than 10, there is multicollinearity between the independent variables. Such an analysis is important, because the higher the multicollinearity the greater the standard error. When multicollinearity is present, intervals for the coefficients are very wide and the chance to detect statistical significant coefficients is reduced (Huizingh, 2006).

There are different methods to conduct a regression analysis. We decided to use the method “Backward” which allows us to see which factors explain mental health best. The analysis begins with all predictors. Then the predictor variables are withdrawn one by one from the

regression analysis if their removal leads to no significant decrease in  $R^2$ . SPSS starts with the predictor variable which has the lowest partial correlation with the dependent variable. If the variable fulfilled the removal criteria, it is removed and the regression analysis is done again. In that case the removal of predictor variables would not lead to a significant decrease in  $R^2$ . This principle goes on until no variable fulfills the removal criteria any longer or all variables are removed. After each removal one sees the change in  $R^2$  and the regression coefficients. SPSS stops with the removal of predictor variables if their removal will lead to a significant decrease in  $R^2$ . This can be detected with the F-test. If the F-value was below 2.71, a predictor was removed (Huizingh, 2006).

**Table 9: Comparison of the factors on which patients who took part in the MHC and those who did not scored different**

Scales	Participation on the MHC-SF			
	Yes		No	
	Median	Percentile range	Median	Percentile range
Social functioning	43.21	16.36	51.40	13.63
Role Physical	37.26	17.76	44.61	15.92
Vitality	45.85	16.39	52.09	14.05
Physical component summary	38.55	9.25	44.20	11.40
HAQ-disability Index	1.75	1.00	1.25	0.88

*Note:* The median and percentile range is used, because of the non-normal distribution of the data. The percentile range is the difference between the 25<sup>th</sup> and 75<sup>th</sup> percentile.

## 3. Results

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### 3.1. Testing for normal distribution

We detected for every variable if its scores had a normal distribution with the Kolmogorov-Smirnov test. All significance levels which are below 0.05 are handled as having a non-normal distribution. The HAQ-DI is not normally distributed. Some scales of the SF-36 had a normal distribution. The scales “Physical functioning”, “Vitality”, “Social function”, “Role limitation due to emotional problems” and “mental health” showed a non-normal distribution. The component mental summary was also non-normal distributed. The visual analog scale for pain had a normal distribution. But the significance level was just a little bit above 0.05. From the MHC-SF the scale “emotional well-being” was not normally distributed. In the further analysis we therefore use analysis for non-normal distributed data.

### 3.2. Testing for differences between people who take/did not take part in the MHC-SF

We used the Mann-Whitney U test to compare the health of those who filled in the MHC-SF ( $n=66$ ) and those who did not ( $n=37$ ). We tested if the two groups scored differently on the eight scales of the SF-36v2. It revealed that the groups differed significantly from each other with regard to role limitations due to physical problems ( $Z=-2.279$ ;  $p=0.023$ ), Vitality ( $Z=-2.09$ ;  $p=0.037$ ), Social functioning ( $Z=-2.71$ ;  $p=0.007$ ) and their scoring on the physical component score ( $Z=-2.44$ ;  $p=0.015$ ). On these scales the group who filled in the MHC-SF scored worse (see table 9).

Also for the HAQ-DI we found a significant difference with the Mann-Whitney U test ( $Z=-2.459$ ;  $p=0.014$ ). People who filled in the MHC-SF were more disabled than people who did not (see table 9).

Finally we checked whether the two groups had a different demographical background. With the chi-square test we compared for the following variables: number of children, marital status, contemporary situation, sex and education. The  $\chi^2$  values led in all variables to a  $p > 0.05$ . Patients in both groups thus share the same demographical background. For age we could not find a significant difference.

**Table 10:**  
**Performance of our sample on the SF-36, HAQ-DI, MHC-SF and VAPS**

Questionnaire	Scale	Descriptive statistics			
		Alpha	<i>Mdn</i>	P-range	<i>M</i>
SF-36v2	Physical Functioning	0.29	41.25	19.47	-
	Role-Physical (RP)	0.96	37.26	17.76	-
	Bodily Pain	0.88	41.41	13.10	-
	General Health Perception (GH)	0.67	41.02	14.30	-
	Vitality	0.85	45.85	16.39	-
	Social Functioning	0.81	43.21	16.36	-
	Role-Emotional (RE)	0.97	44.22	23.32	-
	Mental Health (MH)	0.89	52.82	17.60	-
HAQ-DI		0.95	1.75	1.00	-
VAPS*	-	-	5.00	4.00	-
MHC-SF	Total score	0.95	4.36	1.50	4.31
	Emotional well-being	0.93	0.93	5.00	1.75
	Social well-being	0.82	0.82	4.10	1.80
	Psychological well-being	0.93	0.93	5.00	1.67

*Note:* Because our data does not have a normal distribution we computed the median and percentile range instead of mean and standard deviation. For the MHC-SF we make an exception and also give the mean. In this way our data is comparable with that of Westerhof and Keyes (2008). \* VAPS = Visual analogue pain scale.

### 3.3. Performance of our sample on the tests

With descriptive statistics we get to know how our sample scored on the SF-36v2, HAQ-DI, Visual pain scale and the MHC-SF. Because of the small sample size and the non-normality of our data we stated the Median and Percentile range instead of the mean and standard deviation. The percentile range presents the difference between the 75<sup>th</sup> and the 25<sup>th</sup> percentile. The median can be found by arranging all observations from the lowest value to the highest value. The middlemost observation is the median (Huizingh, 2006). Both, the percentile range and the median are less influenced by sample size and fluctuations.

Table 10 represents the median and percentile range of each questionnaire outcome. When we take a look at the score for the HAQ-DI we see that our sample has a moderate to severe disability (score between 1 and 2). Compared to the outcome of a general population-based study which had a score of 0.49 this is very high. This is not unexpected, because our sample exists of people who are affected by rheumatism. But what is striking is that our sample even scored worse than an osteoarthritis and rheumatoid arthritis population which scored respectively 0.8 and 1.2 (Bruce & Fries, 2003).

When we take a look at the scores of the SF-36v2 we can conclude that our sample has a worse health than the general US population in 1998. They scored remarkably low on role restrictions due to physical problems. Our sample scored on all SF-36 scales below 50 with the exception of “mental health”. Here the score is around 50 which agrees with the score for the general population. It is striking that compared to the general population, our sample scored higher on psychological and emotional well-being and lower on emotional well-being. The mean score for emotional well-being is 4.55, for social well-being 3.88 and for psychological well-being 4.55. Westerhof & Keyes (2008) found for these scales respectively a mean score of 4.67, 3.33 and 4.18 in the general Dutch population. We also computed the scores on the visual pain scale. We cannot compare them to normative scores but we will need them for further analyses.

In order to get to know how trustworthy we measured all our data we conducted a reliability analysis for each scale (see table 10). All scales had an alpha higher than 0.80 which accounts for a very good reliability (except General Health perception with an alpha of 0.67). In a few cases as for example the scale “Vitality” the reliability could be heightened if we had deleted item sf09 (Full of life). We decided against it, because our questionnaires were based on norm based scales.

### 3.4. Research question 1

#### 3.4.1. Hypothesis 1

Our first hypothesis states that compared to the general population less people in our sample would be flourishing and more people would be languishing.

On basis of the MHC-SF scores we assign the people to the three mental health categories, languishing, moderately mental health or flourishing. In figure 1 we present the distribution of the health states among our sample and that of the normal Dutch population. In accordance with our hypothesis more people in our sample are languishing. But contradictory to our hypothesis a lot more people are flourishing compared to the general population. In the general population we recognized rather a normal distribution with most people having a moderate mental health. In our sample there seems to be an ascending slope from languishing to flourishing.

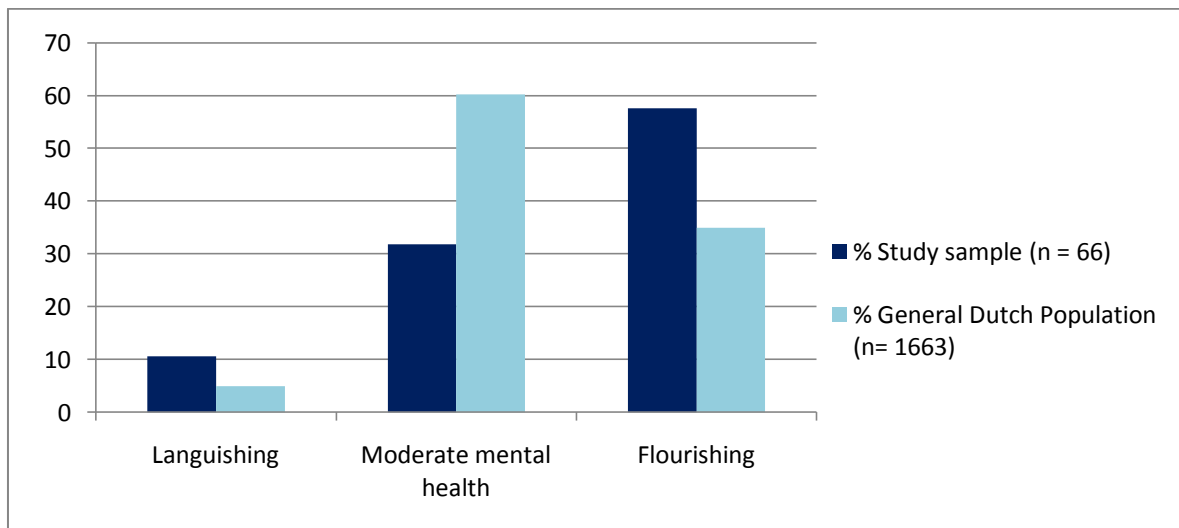


Figure 1: Percentages of people belonging to the MHC-SF health categories (our sample and normal Dutch population). The data of the general Dutch population is taken from “Geestelijke gezondheid is meer dan de afwezigheid van geestelijke ziekte” (Westerhof & Keyes, 2008).

We have to be cautiously in tracking conclusions. The two groups differ in size and in our sample the average age is probably older than that in the general Dutch population.

#### 3.4.2. Hypothesis 2-9

We conducted correlation analyses to test our hypotheses 2-9 (see table 11 and 12). As stated in theory, the three mental health scales, emotional, psychological and emotional well-being are highly positive correlated. We first will turn to the mental factors. We can confirm our second hypothesis which says “Feeling peaceful, happy, and calm all of the time correlates

*highly positive with mental health.*” The construct “mental health” of the SF-36v2 correlates highly with all three scales of the MHC-SF ( $\alpha < 0.01$ ).

**Table 11:**  
**Spearman correlations between the SF-36 scales and the MHC-SF**

Scale	Mental health	General health perception	Role emotional	Social functioning	Vitality	Role physical	Physical functioning	Bodily pain	Physical component summary	Mental component summary
Total score (MHC-SF)	<b>.66**</b>	<b>.29*</b>	<b>.47**</b>	<b>.30*</b>	<b>.44**</b>	.21	.13	.06	-.06	<b>.67**</b>
Emotional well-being	<b>.74**</b>	<b>.36**</b>	<b>.57**</b>	<b>.35**</b>	<b>.59**</b>	<b>.29*</b>	.24	.19	.03	<b>.77**</b>
Social well-being	<b>.54**</b>	.24	<b>.45**</b>	.23	<b>.33**</b>	.16	.08	.01	-.09	<b>.58**</b>
Psychological well-being	<b>.64**</b>	<b>.27*</b>	<b>.42**</b>	<b>.29*</b>	<b>.41**</b>	.18	.13	.09	-.04	<b>.63**</b>

Note: \* = correlation is significant at the 0.05 level (two-tailed). \*\* = correlation is significant at the 0.01 level. N=66

We confirm hypothesis 3, “*Evaluating personal health as excellent has a moderate to high positive correlation with mental health*” for the most part. The construct “General health perception” is measured by the SF-36 and shows a moderate significant correlation with emotional well-being ( $\alpha < 0.01$ ) and weak significant correlation with psychological well-being ( $\alpha < 0.05$ ). There is no significant correlation with social well-being.

Hypothesis 4 can be confirmed, “*Having no problems with work or other daily activities due to emotional problems have a moderate to high positive correlation with mental health.*” We found that the experience of role restrictions due to emotional problems correlates significantly moderate with all scales of the MHC-SF ( $\alpha < 0.01$ ).

Hypothesis 5 can be partly confirmed, “*Performing normal social activities without interference of emotional or physical problems has a moderate to high positive correlation with mental health.*” The construct “social functioning” correlated moderate significantly with emotional well-being ( $\alpha < 0.01$ ) and a low significant correlation with psychological functioning ( $\alpha < 0.05$ ). There was no significant correlation with social well-being.

We will now turn to the physical factors. Hypothesis 6 states, “*Vitality has a moderate to high positive correlation with mental health.*” We can confirm this hypothesis fully. The construct “vitality” shows moderate significant correlations with all three scales of the MHC-SF ( $\alpha < 0.01$ ). The correlation with emotional well-being is almost highly significant ( $r=0.59^{**}$ ).

We can confirm partly hypothesis 7, “*Having no problems with work or other daily activities due to physical problems has a low to moderate positive correlation with mental health.*” The construct “role limitations due to physical problems” correlates significantly low with emotional well-being. But there is no significant correlation with social or psychological well-being ( $\alpha < 0.05$ ).

Hypothesis 8, “*Physical disability is low to moderate negatively correlated with mental health*” can be supported partly. Physical disability is measured by the HAQ-DI and one subscale of the SF-36. They are both valid measures of physical functioning. We only found a moderate negatively correlation of the HAQ-DI with emotional well-being ( $\alpha < 0.05$ ). There was no significant correlation with social or psychological well-being. We have to reject hypothesis 9, “*Pain correlates negatively with mental health.*” We found neither significant correlations of the SF-36 subscale nor significant correlations of the visual analog pain scale with any scale of mental health (see table 11 and 12).

**Table 12:**  
**Spearman correlations between mental health scales with each other and with pain and disability**

Scale	HAQ Standard Disability Index Total	Visual pain scale	Total score MHC-SF	Emotional well-being MHC-SF	Social well- being MHC-SF	Psychological well-being MHC-SF
Total score MHC-SF	<b>-.25*</b>	-.11				
Emotional well-being MHC-SF	<b>-.31*</b>	-.13	<b>.86**</b>	-		
Social well- being MHC-SF	-.22	-.11	<b>.92**</b>	<b>.69**</b>	-	
Psychological well-being MHC-SF	-.20	-.11	<b>.95**</b>	<b>.79**</b>	<b>.80**</b>	-

Note: \*= correlation is significant at the 0.05 level (two-tailed). \*\*=correlation is significant at the 0.01 level. N=66



Hypothesis 9 is the only hypothesis we fully have to reject. All other hypothesis can be at least partly confirmed. If we take a closer look to the hypotheses we indeed found higher correlations between mental factors and mental health than between physical factors and mental health. An exception is “Vitality” with its high correlation.

### 3.5. Research question 2

With the multivariate regression analyses we want to answer our second research question “Which factors have the greatest impact on mental health among patients with rheumatic diseases?”

In all regression analyses we can exclude collinearity among the predictor variables. All VIF values are below 10 (see table 13-16).

Although the construct “mental health” of the SF-36 correlates very significantly with emotional, social and psychological well-being we do not use it as predictor variable in a regression analysis. The reason is that the SF-36 measures with this construct emotions. That is in fact comparable with the facet emotional well-being of the MHC-SF. It makes no sense to want to explain mental health with one of its own facets, namely emotional well-being. In addition to that, the inclusion of that construct would probably lead to a regression analysis in which mental health alone remains significant and all other predictors not.

#### 3.5.1. Regression analyses on emotional well-being

We used the following predictors in the multivariate regression analysis on emotional well-being: Role limitations due to emotional and physical problems, General health perception, disability, Vitality and Social function. When omitting Physical disability, General health perception and social functioning  $R^2$  does not decrease significantly (see table 13). Role limitation due to physical and emotional problems and vitality remain and explain 61% of emotional well-being. But it is striking that the regression coefficient of “Role physical” is negative, because the correlation between Role limitations due to physical problems and emotional well-being was positive (see table 11). The negative beta makes no sense. It would mean that experiencing no role restriction due to physical problems influences emotional well-being negatively. The other way around is actually much more logical. We made several investigations to explain this phenomenon and to find a proper interpretation.

Jan van Bavel (2006) examined collinearity in multivariate regression analysis and explains such phenomenon as we found. We could not prove collinearity among the predictor variables ( $VIF < 10$ ) but even so we assume collinearity, because of the high correlation between the

three remaining predictor variables. The correlation between “Role physical” with “Role emotional” and “Vitality” is respectively 0.62 and 0.68 ( $\alpha < 0.01$ ).

If the sign of beta becomes negative and it previously correlated positively with the dependent variable one speaks of a pseudo effect (Jan van Bavel, 2006). We investigate if that could be the case in our study. It would mean that “Role physical” actually correlated negatively with emotional well-being when controlling for “Vitality” and “Role emotional”. The partial correlation between “Role physical” and “emotional well-being” when controlling for “Vitality” and “Role emotional” is indeed negative ( $r = -0.35$ ).

We used “role physical” alone as predictor and get a significant positive standardized beta of 0.35. Subsequently we conducted two further regression analysis with “Role physical” and either “Vitality” or “Role emotional”. In both cases the beta of “Role physical” becomes negative. Although these analyses support the idea of a possible pseudo effect we do not believe in it. We rather think the problem lays in the data we gathered.

Jan van Bavel (2006) stated that a pseudo effect just is reliable when the sample is big enough. And we think our sample ( $n=66$ ) is not big enough to believe in a pseudo effect. Such a negative beta and partial correlation could be the result of chance, which more often occurs in small samples.

In order to go on we conducted the multivariate regression analysis again without the construct “Role physical” (see table 14). “Vitality” and “Role emotional” together explain 55% of the variability of emotional well-being. Their standardized beta’s are comparable which means that their predicting power is similar.

**Table 13:**

**Summary of backward regression analysis for variables predicting emotional well-being.**

Model	Variable	Coefficients					Collinearity Statistics	
		<i>B</i>	<i>SE B</i>	$\beta$	<i>t</i>	Sig.	Tolerance	VIF
$R^2$								
0.61								
	Role physical	-0.04	0.01	-0.33	-2.94	0.01	0.50	1.97
	Vitality	0.06	0.01	0.53	4.76	0.00	0.52	1.93
	Role emotional	0.05	0.01	0.55	5.06	0.00	0.53	1.88

*Note:* Role emotional, General health perception, HAQ Standard Disability Index Total (disability), Vitality, Social function, Role physical were used as predictors. The exclusion of Physical disability, General health perception and social functioning lead to no significant decrease in  $R^2$  when the regression analysis already contains Role physical, Vitality and role emotional as predictors.

**Table 14:****Summary of backward regression analysis for variables predicting emotional well-being.**

Model	Variable	Coefficients					Collinearity Statistics	
		<i>B</i>	<i>SE B</i>	$\beta$	<i>t</i>	Sig.	Tolerance	VIF
$R^2$								
0.55								
	Vitality	0.05	0.01	0.39	3.68	0.00	0.62	1.61
	Role emotional	0.04	0.01	0.43	4.03	0.00	0.62	1.61

*Note:* This is the same backward regression analysis for emotional well-being as in table 14 but without the construct “Role physical”.

### 3.5.2. Regression analysis on social well-being

We now take a look at social well-being. 27% of the variability in social well-being is explained by Role limitation due to emotional problems and Vitality. The exclusion of Vitality leads to no further decrease in  $R^2$ . The standardized beta is 0.52 (see table 15).

**Table 15:****Summary of backward regression analysis for variables predicting social well-being.**

Model	Variable	Coefficients					Collinearity Statistics	
		<i>B</i>	<i>SE B</i>	$\beta$	<i>t</i>	Sig.	Tolerance	VIF
$R^2$								
0.27								
	Role emotional	0.05	0.01	0.52	4.84	0.00	1.00	1.00

*Note:* Role emotional and vitality were used as predictors. The exclusion of vitality lead to no significant decrease in  $R^2$  when the regression analysis already contains role emotional as predictor.

### 3.5.3. Regression analysis on psychological well-being

Role limitation due to emotional problems, vitality, general health perception and social function explains around 21% in the variability of psychological well-being.  $R^2$  did not decrease when excluding vitality, general health perception and social function. The standardized beta is 0.45 (see table 16).

**Table 16:**  
**Summary of backward regression analysis for variables predicting psychological well-being.**

Model	Variable	Coefficients					Collinearity Statistics	
		<i>B</i>	<i>SE B</i>	$\beta$	<i>t</i>	Sig.	Tolerance	VIF
0.21								
	Role emotional	0.04	0.01	0.45	4.07	0.00	1.00	1.00

*Note:* General health perception, Role emotional, vitality and social functioning were used as predictors. The exclusion of General health, Vitality and social functioning lead to no significant decrease in  $R^2$  when the regression analysis already contain role emotional as predictor.

## 4. Discussion

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The aim of this study was to get an impression of mental health among individuals with rheumatic diseases. We wanted to investigate which factors were associated with the three facets of mental health: emotional, social and psychological well-being (research question 1). Secondly we wanted to explore which factors have the greatest impact on mental health (research question 2). When answering these questions we also paid attention to whether mental or physical factors play a bigger role.

Before we start to answer our research questions we want to discuss the prevalence of mental health in our study (hypothesis 1). In our sample people were both, more flourishing (difference = 22.7%) and languishing (difference = 5.7%) compared to the general Dutch population. The first finding is strange and unexpected. The difference is based mainly on psychological and social well-being. Here our sample scored better than the general Dutch population. On emotional well-being they scored slightly lower. Emotional well-being seemed to play a crucial role. This is also reflected in our further analysis. Emotional well-being correlated with more factors than did psychological and social well-being and its correlations were higher. In the regression analysis this phenomenon is reflected, too. Most variance can be explained in emotional well-being.

We have no idea why people with rheumatic diseases should be more flourishing than people in the general population. Perhaps our findings are not reliable, because other factors distort them. One cause could be different characteristics between the general population and our sample. In our sample the average age was 53.11 years. We did not know the average age of the study from Westerhof and Keyes (2008) whose data we treated as normative data. But even if the two samples differ in age, this should not have such a big impact. Some studies found that age does not have much influence on mental health (Westerhof & Keyes, 2009). It could also be that patients did not fill in the MHC-SF truthfully, because they were afraid that the data is not handled anonymously. We rather assume another reason for the high percentage of flourishing people. We think that in general more flourishing people took part in our study. Flourishing people are more positive and hopeful than languishing people. They could be more inclined to take part, because they see the sense of our research. So in fact it is possible that fewer patients would be flourishing if the remaining 37 patients who did not fill in the MHC-SF would have taken part. To sum it up, we think that the high percentage of flourishing people in our study is not valid, because our sample is not representative.

Another finding supports the assumption that our sample is not representative. We found that the people who filled in the MHC-SF scored worse on General health perception, Vitality, Social function, disability and role restrictions due to physical problems than the people who did not. We rather expected it the other way around. Namely that people who are healthier and were less disabled were more inclined to fill in the MHC-SF. The reverse came out. A possibility could be that people who were more strongly affected by rheumatism saw the participation as a chance to improve and broaden the knowledge about rheumatism. This again would have a positive impact on them through better health care.

We will now turn to the actual question we are interested in: *“Which factors in rheumatism are related to mental health?”* These factors seemed to be physical disability, Role limitation due to physical as well as emotional problems, general health perception, Vitality and social functioning. We have to note some striking results here. Vitality and role restriction due to emotional problems were the only factors which correlated with all mental facets (hypothesis 4 and 6). Pain, in contrary shows no correlation with any facet of mental health (hypothesis 9). All remaining factors correlated with emotional well-being but not always with psychological and social well-being (hypothesis 3, 5, 7 and 8).

If mental health and illness are the same, they would have the same predictors. But Pain shows no correlation with mental health in our sample. But it is a predictor for psychopathology among people with rheumatism (Härter et al., 2003). This difference contributes to the assumption that mental health and illness are two different dimensions. As said before, we find a correlation between physical functioning, social function and role limitation due to emotional problems and mental health. These factors are also predictors of depression among people with rheumatism (Härter et al., 2003). In the general Dutch population role restriction is negatively correlated with mental health (Westerhof and Keyes, 2008). We can broaden this finding to the population of patients with rheumatic diseases. In our sample, a low level of role restriction due to physical and particularly emotional problems was positively correlated with mental health. Not having the ability to act in one's role seems to be related to mental health, independent of being affected by rheumatism. Another interesting finding is revealed when looking at the three mental health facets. Emotional well-being correlated with most factors and in addition to that, its correlations are also higher.

That emotional well-being plays an important role also becomes clear when we turn to research question 2: *“Which factors have the greatest impact on mental health among patients with rheumatic diseases?”* Health factors seem to explain 55% in emotional- and just 21% in psychological and 27% in social well-being. So when trying to manipulate the related health

factors one should be aware that this influences emotional well-being the most. So health appears to have most impact on emotional well-being and is less relevant for social and psychological well-being.

With help of the method “backward” we could reduce the number of predictors of mental health and retain the best. We will first have a look at emotional well-being. When all predictors are taken into account, just vitality and the experience of role restriction due to emotional and physical problems remain as predictors. But the beta of role restriction due to physical problems was negative. That would mean that role restriction due to physical problems leads to a decrease in emotional well-being which makes no sense. We think the measurement of this factor was not valid due to our small sample size. We therefore removed it and conducted a new regression analysis with just Vitality and role restriction due to emotional problems as predictors. These two factors respectively had a beta of 0.53 and 0.55 which is similar and means that they both have the same predicting power on emotional well-being.

In social as well as psychological well-being just the factor role restriction due to emotional problems remains as predictor. In both cases the beta is around 0.55. The answer to our second research question is: Vitality and role restriction due to emotional problems have the greatest impact on mental health among patients with rheumatism. It would be most effective to find a way to influence these factors first. Of course, one can try to influence all factors which were used in the regression analyses. But when already influencing vitality and the experience of role restriction due to emotional problems, they add nothing to the explained variance in mental health.

We were also interested whether physical or mental factors play a bigger role for mental health among people with rheumatism. To answer this question we will take a look to the correlation analysis and the regression analysis. It was remarkable that more mental factors correlated with mental health than physical factors. Besides that, their correlation was stronger than that of physical factors. An exception was the as physical labeled factor Vitality with its high correlation. We have to bear in mind that vitality consists of mental as well as physical components. We assume that the physical components have a greater relevance in patients with rheumatism. Therefore we labeled it as physical factor. Nevertheless, also in these people the factor vitality is partly composed of mental components. It is therefore not a remarkable finding that vitality as the only “physical” factor shows such a high correlation.

In the regression analysis the greater impact of mental factors can also be seen. When all factors are taken into account, role restriction due to emotional problems remains as predictor

for each facet of mental health whereas vitality just predicted emotional well-being (to the same degree as role restriction does). The mental factor role restriction thus has more predicting power than the physical factor vitality.

Based on the correlation and regression analysis we assume that mental factors have a greater impact on mental health than physical factors. It seems that mental health is not directly influenced by the disease itself but by the psychological consequences from it. We have to be critical about the superiority of mental factors above physical factors in predicting mental health. The finding that mental factors explained mental health better than physical factors does not mean per se that physical factors are less important. It is possible that the physical factors influence mental health indirectly via mental factors.

In some aspects we have to be cautious with our findings. Our study has some limitations. Firstly, we gathered the data cross-sectional and cannot prove causality for sure. It may thus for example be that mental health influences one's subjective health perception and not vice versa as we assumed. Secondly, our sample size has been with 66 participants very small. Although our reliability of the tests was high, a bigger sample would have been better.

The prevalence of flourishing people was exceptionally high in our study, because languishing people were probably less inclined to take part. Further research therefore should be done to investigate mental health among patients with rheumatism. In our study the factor role restriction due to physical problems got a negative beta in one multivariate regression analysis. Further research should use a bigger sample to see whether the negative beta still remains. If that is the case, this phenomenon probably is not caused by chance and the reason should be investigated.

The factors which predicted mental health best were Role limitations due to emotional problems and Vitality. Further research should focus on these factors and try to find methods to influence them. It might be that they are difficult to measure or change. The construct Vitality for example is a very complex and perhaps difficult to influence. In this case one should focus on the previously removed predictors of the regression analysis. These were Social function, disability and role limitations due to physical problems. These factors achieve predicting value when in fact the best predicting factors are not influenced. But one has to keep in mind that they explain mental health to a lesser degree than role limitation through emotional problems and vitality. That is to say, they predict mental health to a lesser degree. As we already stated, there is the possibility that the physical factors influence mental health indirectly via mental factors. We suggest further research to investigate this possibility with a linear structure model. In this model, physical factors should be used as independent



variables, mental factors as mediating factors and the three mental health facets finally as dependent variables.



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