A MULTITRAIT-MULTIMETHOD INVESTIGATION OF DEPRESSION AND DISABILITY IN RHEUMATOID ARTHRITIS

by

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ABSTRACT

A multitrait-multimethod (MtMm) procedure was used to investigate the magnitude of association between disability and depression as well as the convergent and discriminant validity of the Health Assessment Questionnaire (HAQ) Disability Index and two measures of depression, the Beck Depression Inventory (BDI) and the Hamilton Interview Rating Scale for Depression (HRS-D).

Three measures of disability on the HAQ (patient self-report, physical therapist assessment and spouse report) were compared with the two measures of depression in 107 subjects with rheumatoid arthritis (RA). Pearson correlations among the three disability measures provide strong evidence in support of the convergent validity of the HAQ Disability Index (r's = .89 to .85, p's $<$ .000). Similarly, the correlation between the BDI and the HRS-D (r = .69, $p < .001$) provides evidence of convergent validity between the two measures of depression. However, the degree of discrimination between the construct of depression and the construct of disability was greater when disease-related somatic difficulties were not included in the measure of depression.

The high correlations among the disability measures suggest that subjects report their physical disability on a health status questionnaire with a high level of accuracy. In addition, the small discrepancies that were observed between self-reported and physical therapist assessed disability

were clearly not associated with depression. This observation was true even though items that may have been endorsed due to disease-related difficulty rather than affective disturbance were included in the BDI score. However, a measure of helplessness and perceived loss of control, the Rheumatology Attitude Index (RAI), was associated with discrepancy between self-reported and physical therapist assessed disability ($\underline{r}$ = .20, $\underline{p}$ <.05), indicating a sense of helplessness and perceived loss of control may have contributed to subject over-report of disability.

Finally, although disability and depression were positively correlated in the MtMm matrix, the level of this association was related to the methodological issue of whether or not items reflecting somatic difficulties were included in assessing depression. Due to high somatic and disease-related content on many of the BDI items and the fact that the HRS-D was not scored positively on similar items when the complaints reflected disease-related difficulty, the correlations between the HRS-D and the measures of disability ($\underline{r's}$ = .17 to .25, $\underline{p's}$ <.01) likely reflect a more realistic level of association between disability and depression in RA than do the correlations between the BDI and the measures of disability ($\underline{r's}$ = .31 to .50, $\underline{p's}$ < .001).

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INTRODUCTION

The Disease of Rheumatoid Arthritis

Rheumatoid arthritis (RA) is the most common of the inflammatory polyarthritis diseases and has a worldwide distribution involving all racial and ethnic groups. Depending on the criteria used to define RA (i.e., American Rheumatism Association (ARA) Criteria or the more stringent New York Criteria), the reported incidence of RA in the United States population varies in a range from 3 to 1%. Women are affected two to three times more often than men; however, the preponderance of females relative to males is much less when only subjects with positive serological tests for rheumatoid factor and erosive changes on x-ray are considered (Rodnan, Schumacher & Zvaifler, 1983, p. 38). The onset is most frequent in the third to fourth decade of life but may occur at any age. Early diagnosis rests mainly on the exclusion of other possible causes of active synovitis; however, as the disease progresses the tissue damage of RA results in a recognizable and distinct pattern of clinical, laboratory and radiographic findings. Convergence of these variables is used to establish the level of certainty of the diagnosis of RA disease. The ARA's development of specific criteria for four diagnostic categories that reflect the certainty of the diagnosis of RA disease (i.e., classical, definite, probable and possible rheumatoid arthritis) has led to the greater consistency of diagnosis reported in more recent studies (Rodnan et al., 1983).

RA is a chronic and systemic disease of unknown etiology that is characterized by periods of exacerbation and remission. Inflammation of the synovial lining of joints (synovitis) is combined with varying degrees of extra-articular disease manifestations. The concept of "rheumatoid disease" is justified by the high frequency of the extra-articular manifestations such as rheumatoid nodules, arteritis, neuropathy, scleritis, pericarditis, lymphadenopathy and splenomegaly as well as by the hallmark RA symptom of excessive fatigue. In the majority of patients, the primary clinical manifestations are the chronic inflammation of the synovial membranes surrounding joints and the chronic systemic fatigue. The chronic inflammation of synovial membranes causes the formation of chronic granulation tissue (pannus) that proliferates in joints and causes erosion of the joint cartilage. This, in turn, results in destruction of the cartilage and bone that comprise joints. In addition, the soft tissue structures such as the ligaments and tendons that support joints become overstretched and frequently rupture due to the presence of chronic inflammation and active synovitis. In this way, the continued pathological state of chronic inflammation leads to the progressive disability of RA.

Disability, or the level of difficulty an RA patient experiences in performing an activity, is generally attributable to a combination of the severity of joint damage and deformities (i.e., the degree of joint and muscle contractures as well as the degree of loss of integrity of the supporting soft tissue structures) and the amount of pain. Pain in RA is caused by the active inflammation of joints (synovitis) as well as by joint damage (erosive changes in the articular cartilage). In patients with very active RA for any substantial length of time, the pain is generally due to a combination of both of the above conditions. In fact, a major methodological problem inherent in assessing disability in arthritis is the difficulty in determining the relative contribution of joint damage and deformity (fixed disability) versus the contribution of pain to limited function for a specific subject. Assessing disability is further confounded by fluctuations in the degree of fatigue as well as by the fact that increases in active joint inflammation and systemic disease activity frequently occur shortly following overexertion. In subjects with very active disease, for example, a minimal amount of increased physical activity may cause marked increases in RA disease activity, including the symptoms of excessive fatigue, joint swelling and pain with a resultant inability to perform even basic self-care or functional activities.

History of Disability Assessment in RA

Steinbrocker (1949) developed the classification system that has since been adopted by the ARA as the ARA Functional Classification system. The ARA Functional Classification, the current method of quantifying levels of disability, includes four functional classes (I through IV), which are defined as follows. Class I reflects complete functional capacity with ability to carry out all usual duties without handicaps. Class II reflects functional capacity adequate to conduct normal activities despite handicap of discomfort or limited mobility of 1 or more joints. Class III reflects functional capacity adequate to perform only a few or more of the duties of usual occupation or self-care. Class IV reflects a functional capacity in which the patient is largely or wholly incapacitated, often bedridden or confined to wheelchair and able to perform little or no self-care (Rodnan et al., 1983). This traditional ARA method of assessing functional capacity is often considered inadequate and has been criticized as unreliable, in part due to the valueladen terminology within the definitions of each of the four functional classifications (e.g., Meenan, 1985).

The recent development of psychometric measures of health status represents an important advancement in the assessment and quantification of physical disability as well as in the assessment of psychological and psychosocial status in subjects with a variety of chronic diseases, including RA. The current interest in the use of psychometric measures to assess health status was an outgrowth of a large multiple phase health insurance study conducted by the Rand Corporation in the middle to late 1970s. Shortly after the publication of the Rand Health Insurance study's questionnaires (see Brook et al., 1979 for overview; and e.g., Rand Corporation publications: Ware, Johnston, Davies-Avery & Brook, 1979, 1980; Ware et al., 1980), health status measures such as the Arthritis Impact Measurement Scales (AIMS: Meenan, Gertman & Mason, 1980), the Health Assessment Questionnaire (HAQ: Fries, Spitz, Kraines & Holman, 1980) and the Sickness Impact Profile (SIP: Berger, Bobbitt, Carter & Gilson, 1981) were developed. The construct of health status that was operationalized in the Rand Corporation health insurance study was based on the World Health Organization's conceptualization of health as comprised of an individual's physical, psychological and social well-being.

At this time, health status measures have become highly valued as outcome measures for both psychological and health-related research. The two health status measures that were specifically developed for use in rheumatology research include the AIMS and the HAQ. In a statement comparing serologic disease measures that have traditionally been used as outcome measures in rheumatology clinical trials research with the new health status measures, Fries (1983, p. 698) stated,

> On every one of the central characteristics that defines 'hard' data (precision, quantification, reproducibility, and inter-observer variation), most arthritis laboratory variables are inferior to the new questionnaire instruments developed by social science research techniques. New measures of disability assessment, for example, are more reliable as outcome measurements than are sedimentation rate, antibody level or grip strength.

Fries also argued that the above is particularly evident if one considers the variability in laboratory values obtained for serologic measures both within as well as between laboratories. In addition, Fries (1983) cited results of a 1982 survey of rheumatologists who were primarily involved in clinical trials research in RA. The five most valued clinical end-point measures according to this group of experts were: physician global assessment of arthritis activity, the joint count, self-report of pain, self-report of morning stiffness and grip strength, in that order (Bombardier et al., in Fries, 1983, p. 698). Fries (1983) also suggested that, overall, the traditional "hard' measures of disease activity (i.e., serologic measures) have become less valued in rheumatology clinical trials research as they are not very sensitive to detecting differences between treatments.

It is now widely accepted that in comparison with the traditional ARA functional classification, the new self-report health status measures provide a substantially improved and valuable means of assessing disability (Meenan, 1985; Fries, 1983). In addition, it has been suggested that self-report health status measures have excellent potential for providing a highly sensitive method of measuring the more subtle changes in functional abilities associated with disease exacerbations and remission in patients with rheumatic diseases (Meenan, 1985). Self-report health status measures also provide a potential means of quantifying changes in health status in populations of subjects with chronic disease other than RA. Thus, these measures have important potential implications for research in both health psychology and clinical trials in subjects with a variety of chronic illnesses.

The present study was designed to address several limitations in the existing health status literature. First, although a variety of research has been reported in support of the convergent validity of the various health status measures currently in use, no prior study has investigated the discriminant validity of a health status questionnaire. Also, only one study has investigated the validity of patient self-reported disability by comparison with the criterion of professional assessment (Fries et al., 1980) and a replication of this study has not been previously reported. Further, prior research has suggested that psychological and cognitive factors may represent an important variable in determining patient disability in other populations of subjects with chronic painful disorders (Turk & Rudy, 1986). To date, however, no study has specifically investigated whether or not psychological factors contribute to subject reports of more severe physical disability on a health status questionnaire. The present study specifically investigates whether the psychological variables of depression and helplessness are associated with discrepancy between patient self-reported and professionally assessed disability. Finally, although deteriorated physical health status and psychological distress appear to be related in RA (e.g., Hawley & Wolfe, 1988; Meenan, Gertman, Mason & Dunaif, 1982; Spiegel et al., 1986) as well as in subjects with other chronic illnesses (Cassileth et al., 1986), prior research has not specifically investigated the independence of these constructs or the magnitude of association between depression and physical disability using full-scale and well-validated measures of each of these constructs in RA subjects. It is also noteworthy that the above prior studies in RA (i.e., Hawley & Wolfe, 1988; Meenan et al., 1982; Spiegel et al., 1986) used only brief self-report measures of anxiety and depression from the AIMS (Meenan et al., 1980).

Given the current extensive use of health status measures in both psychological and health-related research, it is anticipated that the present study will provide useful evidence of the validity of both self-reported disability and each of two depression measures, the Beck Depression Inventory (Beck, 1960) and the Hamilton Interview Rating Scale for Depression (Hamilton, 1960) as well as a measure of helplessness/perceived loss of control, the Rheumatology Attitude Index (Nicassio, Wallston, Callahan, Herbert & Pincus, 1985) in an RA population.

BACKGROUND AND LITERATURE REVIEW

The Arthritis Impact Measurement Scales (AIMS)

The AIMS was the first health status measure specifically developed to assess functional status in subjects with RA. The AIMS was developed at the Boston University Multipurpose Arthritis Center to assess the physical, psychological and social aspects of an individual's health (Meenan et al., 1980). The AIMS scales were constructed by building on two previously developed health status measures, Bush's Index of Well-Being (Kaplan, Bush & Berry, 1976) and the Rand Health Insurance Study batteries (Brook et al., 1979). The AIMS consists of nine scales: mobility, physical activity, dexterity, household activity, activities of daily living, social activity, pain, depression and anxiety. In addition, there are questions regarding the subjects' perceptions of their general health status and recent arthritis activity which have been used in the validation studies of the AIMS.

Several studies reported by Meenan and his colleagues support the construct validity of the AIMS as a measure of health status in arthritis. Data reported in the original AIMS article (Meenan et al., 1980) included high Gutman correlations of reproducibility and scalibility for items within each group and high correlations between component scales and selected measures of health status. Criterion validation of the AIMS as a measure of health status was provided by comparing AIMS results with three measures: age; subject perception of overall health and recent arthritis activity; and physician report of disease activity, functional status and joint count. Agreement between scale scores and physician's report was significant and overall results reported in this study provide evidence of convergent validity of the AIMS as a measure of health status in arthritis subjects. However, comparison of the subjects' self-report of functional status with observer ratings of patients' performance of the activities was not done as part of this or as part of any subsequent validation study of the AIMS.

A subsequent study of the AIMS provided further convergent evidence of AIMS construct validity as a measure of health status which was highly related to other measures disease activity and function in four types of arthritis (rheumatoid arthritis, osteoarthritis, systemic lupus erythematosis and seronegative variants), in a range of sociodemographic groups and across time (Meenan et al., 1982). Data were collected from subjects in 15 different clinical settings in 10 different states and stability of the AIMS over a 6 month period was reported. Three estimates of reliability were reported for each of the nine component scales of the AIMS. On each of the scales criterion levels of 0.7 for standardized alpha, 0.9 for coefficients of reproducibility and 0.8 for 2-week test-retest correlations were exceeded. Guttman scale coefficients values were significant for all scales but the social activity scale. Validity assessments reported included significant correlations of the scales of the AIMS scales with the clinical measures of disease activity, factor analysis of each group of items (to demonstrate single factor loading within each scale) and a series of multiple regressions using patients' and physicians' estimates of overall health status as dependent variables. Physicians' measures of overall health status included estimates of the patients' ARA functional class and recent arthritis activity, grip strength, walk time, joint count and range of motion of a signal joint. Data analysis in this study strongly supported the reliability and validity of the AIMS instrument. Results of this study indicated the AIMS performed well in at least four major types of arthritis, in a range of sociodemographic groups and across time.

A recent 5-year AIMS follow-up study in RA raises the question of whether the AIMS lacks adequate sensitivity to detect the progression of disability expected to occur over 5 years in an RA population versus whether progression of disability in RA occurs more slowly than previously assumed. Kazis et al. reported results of a 5-year readministration of the AIMS to 261 (66%) of an original sample of 396 RA subjects (Kazis, Meenan, Anderson & Swift, 1985). Thirty-two subjects had died and those lost to follow-up (103, 26%) had health status scores at baseline that were comparable to those in the study group. Mean age at follow-up was 57 years and mean disease duration was 14 years. The authors reported relatively little deterioration over a 5-year period in the health status of subjects with RA. This observation may, however, be due to a lack of sensitivity of the AIMS in detecting changes over a 5-year period rather than to the stability health status in the RA study sample. Given that the HAQ Disability Index has demonstrated sensitivity to progression of disability in the magnitude of about .08 increased HAQ disability scores per year in a 3-year follow-up study (Fries, Spitz & Young, 1982), further studies of the sensitivity of the AIMS to detecting clinically significant differences in the health status of RA subjects over time are indicated. These studies point to a very important implication for the use of health status instruments in rheumatology -- that of quantification of the progression of disability in RA.

Overall, results of the early validation studies of the AIMS support the construct validity of the AIMS as a global measure of health status, which includes the three dimensions of physical disability, psychological and social well-being in arthritis populations. However, the recent Kazis et al. (1986) study raises the question of whether or not the AIMS has adequate sensitivity to detect progression of disability in RA. Also, with regards to the sensitivity of the AIMS to detecting clinically significant differences in arthritis, it is interesting to note that a Cooperative Clinics investigation of the sensitivity of the AIMS to detecting changes due to drug treatments with gold and oral gold versus placebo (Meenan et al., 1984) did not report which of the AIMS scales (i.e., the physical disability scales, the psychological scales, or the pain scale) actually contributed to AIMS score improvements with drug treatment. Thus, it is not known from the published results of this study what portion of the variance in the AIMS score (an aggregate 1 through 10 global health status rating) was due to changes in the physical dimension, the pain dimension or the psychological dimension of patients' health status. Given the above described questionable sensitivity of the AIMS to detecting progression of disability in RA over 5 years in the Kazis et al. (1986) study and the lack of description of which dimensions of patient health status contributed to sensitivity of the AIMS in detecting improvements with treatment in the gold, oral gold and placebo study (Meenan et al., 1984), it is reasonable to speculate that the AIMS physical dimension scales could perhaps be less sensitive than the psychological scales in detecting changes due to treatments. The nature of the relationships among improvements in the health status dimensions of the AIMS that may occur with treatment has not been well-delineated.

The Stanford Health Assessment Questionnaire (HAQ)

Although the Disability Index of the HAQ (Fries et al., 1980) was initially published in the same year as the AIMS (Meenan et al., 1980), work on the AIMS had begun much earlier, in the mid-1970s. The Disability Index of the HAQ assessed the dimension of physical disability on the HAQ and was based on a previously developed disability scale, the Polyarticular Disability Index (Convery, Minteer, Amiel & Connett, 1977). The full-scale HAQ evaluates patient outcome in five dimensions: death, discomfort, disability, dollar cost and drug toxicity and side effects. In the Disability Index section of the HAQ, patients' self-report of functional status is assessed in eight categories: dressing and grooming, arising, eating, walking, hygiene, reach, grip and activities. Two or three questions are in each category for a total of 20 questions in the disability section. Subjects are asked to record the amount of difficulty they have experienced in performing the activities over the last week. Responses are listed in four categories: "without any difficulty," "with some difficulty," "with much difficulty" and "unable to do." The scoring of responses is from 0 to 3; with 0 meaning "without any difficulty" and 3 meaning "unable to do." The highest score on any question within a category is the score for that category. The Disability Index is calculated by adding the scores and dividing by the total number of categories answered. In addition, the scoring is influenced in each of the eight categories by checks made for assistive devices used and assistance required from another person in order to perform any of the activities within the category. The Disability Index score is then calculated within a score range from 0 to 3. Additionally, there is a 100 millimeter visual analog pain scale that comprises the discomfort or pain dimension of the HAQ.

The original article on the development of the HAQ Disability Index (Fries et al., 1980) reported the results of a two phase validation study of the index. In the first phase results of a nurse-assessor's interviews of 20 subjects regarding function on items of the HAQ were compared with subjects' questionnaire responses on the same items. The intermethod correlations for questionnaire versus interview assessments ranged from .56 to .85 in the eight functional categories (with an average of .68) and was .85 for the overall Disability Index score. In the second phase results of a nurse-assessor's in-home evaluation of subjects' performance was compared with subjects' questionnaire responses. Intermethod correlations were reported for six of the functional categories (correlations for the dressing and the activity sections were not reported). The intermethod correlations for the second (performance) phase ranged from .47 to .88 (with an average of .70) and was .88 for the Disability Index score. Overall results revealed the nurse-evaluator and questionnaire responses agreed 59% of the time and although they were within 1 point (on the 0 to 3 scale) 93% of the time, there was a substantial discrepancy of 41%. The weighted Kappa statistic, using rank disagreement weights (to adjust for the degree of agreement which would be expected to occur by chance), was only moderate at .52.

Construct validity of the HAQ Disability Index was further supported by a study that investigated the progression of disability on the HAQ over time and the differential sensitivity of the HAQ in rheumatoid arthritis and osteoarthritis (Fries, Spitz & Young, 1982). This study reported results of HAQ administrations in 322 subjects with rheumatoid arthritis over seven successive administrations at 6 month intervals (Fries et al., 1982). A 6-month test-retest correlation coefficient of .98 was reported. Little change was noted over the first year; thereafter a steady increase in disability was reported. In the same study, administration of the HAQ to 147 subjects with osteoarthritis (OA) over a 20-month period showed less of a tendency in this population (as compared to the RA population) to exhibit an increased Disability Index with time (Fries et al., 1982, p.791). This finding indicates the HAQ has adequate sensitivity to detect the usually observed differential rate of progression of disability in OA versus RA. Rheumatoid arthritis subjects show a mean score of 1.2 on the scale of 0 to 3 with an increase per year of disease of about 0.08. According to Fries (1983), disability in RA increases most rapidly in the first 10 to 12 years of the disease, then disability progression occurs more slowly over the remainder of the disease course. Data reported in the Fries et al. (1982) study also included comparison of four variables at outset and completion. These four variables included the number of joints involved, morning stiffness, latex fixation and disability index scores. Results indicated the number of joints involved, presence of morning stiffness and to a lesser extent latex fixation identified subjects with greater or lesser disability at the end of the study period but did not substantially predict the rate of development of disability scores. Initial disability scores did, however, strongly predict final disability scores (Fries et al., 1982, p. 792). In 1982, the Stanford group reported that over 21,000 HAQ administrations in more than 7,000 subjects were recorded in their computer scored data base (Fries et al., 1982, p. 790). A 2-week test-retest reliability coefficient of .85 was reported in a sample of 32 subjects for the HAQ visual analog pain scale (meeting handout, Spitz, 1985).

Factor Analysis of the HAQ and the AIMS

In a joint study conducted between the between the Boston University group and the Stanford University group, strong evidence of convergent validity of the physical disability dimension assessed by the HAQ and the AIMS was reported (Brown et al., 1984). The AIMS and the HAQ were administered to 48 subjects with rheumatoid arthritis using a random cross-over design. A high correlation of .91 was reported between the AIMS and the HAQ disability dimensions. Factor analysis of the AIMS and the HAQ further demonstrated that overall, health status measured by these instruments is composed of three dimensions: physical disability, psychological disability and pain. Intercorrelations within each of these three dimensions were high, usually ranging from 0.6 to 0.8 and intercorrelations between dimensions were weak, usually less than 0.3. Additionally, patient self-assigned "global" arthritis scores were strongly related to disability and were less related to pain. As noted above, the primary significance of this study is the evidence of high convergent validity demonstrated in RA patients between the physical disability dimension of the AIMS and physical disability assessed by the HAQ Disability Index.

Sensitivity of Health Status Measures to Detecting Clinically Significant Differences

The sensitivity of health status measures to detecting clinically significant differences among subjects with chronic disease is an important issue that has recently begun to be investigated in rheumatology. Five studies have specifically addressed the issue of the sensitivity of health status outcome measures to detecting clinically significant differences in subjects with arthritis. These have included two studies using the AIMS

(Mason, Weener, Gertman & Meenan, 1983; Meenan et al., 1984), one study using five health status measures (Liang, Larson, Cullen & Schwartz, 1985) and two studies using the HAQ (Fries et al., 1986; Sherrer, Bloch, Mitchell, Young & Fries, 1986).

In order to determine if the AIMS was sensitive to detecting differences between groups of subjects with different chronic disease conditions, an investigation was conducted in Boston in which results of AIMS scores of 220 subjects with RA were compared with AIMS scores of 152 subjects with five other chronic diseases (Mason et al., 1983). Subjects with RA and pulmonary disease (COPD) overall exhibited poorer health status on the AIMS than the other four chronic disease groups (hypertension, cardiac disease, cancer and diabetes). However, the lower overall health status of the RA and pulmonary subjects relative to the other four chronic disease groups was primarily due to their more compromised health status on the AIMS physical disability scales. When controlled for sociodemographic variables, no significant differences on the psychological scales measuring depression and anxiety were observed among the six chronic disease populations. This finding suggests the effects of chronic disease on an individual's psychological health are similar across a range of chronic illnesses. However, a limitation of this study with regard to the differences in physical disability noted among the different chronic disease populations is that it is possible a bias in the relative severity of disease in the subjects within each of the six categories may have existed in the initial selection of the sample populations.

The second study using the AIMS was a large comprehensive study involving the cooperative efforts of 10 university rheumatology clinics under the NIH sponsored Cooperative Systematic Studies of Rheumatic Disease

Project (Meenan et al., 1984). This study investigated the sensitivity of the AIMS as an outcome measure in a clinical drug trial of intramuscular injectable gold, oral gold and placebo. Injectable gold is a well-established treatment for rheumatoid arthritis and is considered to be very effective as a disease modifying agent in RA. Disease modifying agents are slow-acting, remission-inducing drugs that produce a gradual suppression of symptoms and signs, including inflammation in rheumatoid arthritis. Oral gold is a relatively new drug that was undergoing premarketing evaluation at the time of the study. Although oral gold is effective as a long-acting, disease-modifying agent in the treatment of RA, overall it is generally less effective than gold injections. It was thus hypothesized in this study that the subjects on injectable gold treatments would show greater improvement on the AIMS than the subjects receiving oral gold. Also, subjects treated with either injectable or oral gold were expected to show more improvement on the AIMS than subjects given a placebo. Data analysis comparing the clinical (physician assessment and laboratory data) and the AIMS showed highly similar results: injectable gold and oral gold were more effective than placebo for treatment in RA and injections were slightly more effective than oral gold. The authors concluded the health status measure was quite sensitive to clinically meaningful drug-induced changes and that their findings support the further application of health status measures to clinical trials of chronic disease (Meenan et al., 1984).

A recent study investigated the comparative efficiency and sensitivity of five health status instruments in 50 subjects undergoing lower extremity total joint arthroplasty (Liang et al., 1985). Five health status instruments described by the authors as fulfilling the minimum requirement of measurement reliability and validity were studied: the Functional Status

Index (FSI). the HAQ. the AIMS. the Index of Well-Being (IWB) and the SIP. The five health status measures were administered to the subjects before and after either total knee or total hip joint replacement surgery. Subjects who had undergone prior joint replacement surgery were excluded as well as subjects with a diagnosis other than RA or OA. The final sample included 50 subjects, 40 (80%) of whom had OA and 10 (20%) percent had RA. The mean age was 66.3 years and 31 were female while 19 were male. The mean number of tender and swollen joints was 6.2 for the RA subjects and 1.8 for the OA subjects. Global interinstrument correlations between the HAQ Disability Index and the global scores of the other health status instruments at preoperative assessment were reported as follows: HAQ and AIMS (.84), HAQ and SIP (.78), HAQ and FSI (.84), HAQ and IWB (.62).

Liang et al., 1985, p. 543) stated,

> Since the number of subscales and their substance differed for each instrument, the first task was to create new measures with comparable content across instruments. Three dimensions of function or 'health status' were chosen: Mobility, including ambulatory and physical activity such as bed and chair transfers; Social, including social activities, social role and home management functions; and Pain.

Factor analysis was not used in determining these three dimensions of function across instruments. Preoperative and postoperative functional change interinstrument correlations were reported for the three dimensions. Preoperative interinstrument correlations between the Mobility dimension of HAQ scores (the Disability Index of the HAQ) and Mobility on the other instruments were: HAQ and AIMS (.61), HAQ and SIP (.49), HAQ and FSI (.58) and HAQ and IWB (.51). Preoperative interinstrument correlations between the Pain dimensions of the HAQ (visual analog pain scale), the AIMS (four verbal questions with six possible responses for each question) and the

FSI (visual analog pain ratings for each functional item assessed) were also reported: HAQ and AIMS (.52), HAQ and FSI (.65) and AIMS and FSI (.65) Although interinstrument correlations between a HAQ Social dimension and the Social dimension of other instruments were reported, these correlations are of questionable value. The HAQ Disability Index was developed to assess physical disability and not social role and activity. The authors of this study defined the HAQ category of reach (i.e., the two items: reaching to get down a 5 pound object from just above the head, and bending down to pick up items from the floor) and as the HAQ Social dimension. Perhaps a more reasonable category to have included as a surrogate social dimension from the HAQ Disability Index might have been the activities category which includes items regarding running errands and shopping, getting in and out of a car and doing chores such as vacuuming and yardwork.

Postoperative interinstrument correlations of functional change in Global scores of each of the instruments and the HAQ included: HAQ and AIMS (.50), HAQ and SIP (.31), HAQ and FSI (.44) and HAQ and IWB (.31). Functional change correlations between the Mobility dimension of the HAQ and Mobility on the other instruments were: HAQ and AIMS (.34), HAQ and SIP (.28), HAQ and FSI (.18) and HAQ and IWB (.04). Correlations between post changes in the Pain dimensions of the HAQ, AIMS and FSI included: HAQ and AIMS (.43), HAQ and FSI (.03) and AIMS and FSI (.31). Liang et al. (1985) also compared each instrument with the FSI in terms of Relative Efficiency (RE) to detect changes in Mobility, Pain, Social Function and in Global Status. The Relative Efficiency (RE) score compared postop scores of each of the other health status instruments to the postop scores of the FSI. For purposes of the study, the FSI postop change score was considered 100% efficient (i.e., the FSI RE score was 100%) and the RE postop change scores for the HAQ. SIP. AIMS and IWB were computed by squaring the subsequent ratio of appropriate _t_-statistics (e.g., RE of the AIMS versus FSI = (_t_ of AIMS/_t_ of FSI) quantity squared). Thus, an RE score greater than 1 meant that an instrument was a more efficient tool for measuring postop change than the FSI and an RE score less than 1 meant that an instrument was less efficient than the FSI for measuring postop change. The authors stated selection of the FSI as the choice of a standard against which efficiency of the four other health status measures were compared was arbitrary. Results indicated that the AIMS and the SIP were nearly equally efficient compared with the FSI and both superior to the HAQ in the measurement of change in subjects mobility (e.g., ambulation and transfer activities). Additionally, the SIP and the HAQ were also reported to be about equally efficient when compared with the FSI postop change scores and both were superior to the AIMS in assessing changes in social activity. However, as noted above, the author's interpretation of comparison of changes in social function assessed by the HAQ is of questionable value. Finally, Liang et al.(1985) reported the AIMS was more efficient than the HAQ in comparison of the postop RE scores in the pain dimension.

Overall, results showed relatively high interinstrument correlations; however, important differences in dimensions assessed were reported. Interinstrument differentials were larger for social and global outcomes reported than for pain and mobility. Also, according to the authors, no single instrument consistently outperformed the others. Liang et al. (1985) suggested, when selecting an instrument for use in medical research, one should examine the instrument closely both for its appropriateness for the target population and its measurement efficacy in detecting differences within dimensions. Results of this Liang et al. (1985) study are relevant to the present investigation of convergent/discriminant validity of the HAQ Disability Index in RA in that this study provided further evidence of the convergence of the disability dimension assessed on the HAQ with the disability dimension assessed by four other health status measures.

However, several limitations of this Liang et al. (1985) study warrant comment. This is the first study in which the FSI was used as a self-report measure rather than as an interviewer assessment measure. Thus, validity of the FSI as a self-report measure had not been established. Since the RE change score was computed comparing each of the other four health status measures (HAQ, AIMS, SIP and IWB) with a previously unvalidated format (self-report method) of the FSI, the validity of the Relative Efficiency (RE) scores may be questionable. In addition, it is reasonable to assume respondent burden was fairly high in this study as the subjects were asked to fill out five complete health status instruments in their preoperative and postoperative assessments. Subjects who are required to fill out a large number of items at the same time may be less attentive to their responses on the many questionnaire items. Poorly considered response choices could lead to instrument scores that reflect an inaccurate assessment. Also, although statistical measures were employed to correct for missing data in questionnaire responses, in some instances the missing questionnaire responses were as high as 30%. In addition to the above limitations, caution should be used in extrapolating results of the comparison of the instruments in this study to what might be expected in a comparison of the same instruments in a population of subjects with only RA. This is due to the fact that RA subjects frequently have more upper extremity limitations as well as a greater number of tender and swollen joints (i.e., higher joint count) than do subjects with OA. For example, in this Liang et al. study, the majority of the subjects in the sample had OA (N=40, 80% of the sample population), with a mean joint count of tender and swollen joints of only 1.8 in comparison with the mean joint count of 6.2 in the RA subjects (N=10, 20% of the sample population). Also, the health status instruments used in the Liang et al. study vary greatly with respect to their emphasis on upper extremity versus lower extremity functional activities. Finally, the fact that all subjects in the study were undergoing lower extremity total joint arthroplasty would indicate the postop Relative Efficiency change score would be primarily be due to changes in lower extremity function. Thus, results of this study may not be generalized to imply that the health status measures included in this study would be similarly efficient in assessing other interventions such as drug treatments, psychosocial interventions or even upper extremity surgical procedures.

A recent study investigated the validity of the HAQ as a self-report measure of physical disability with adequate sensitivity in determining disability to be significantly predicted by prior measures of disease status in subjects with RA (Sherrer, Mitchell, Young & Fries, 1986). In a large sample from the northern section of the Canadian Province of Saskatchewan, the development of disability in RA was followed over an average of 11.9 years in 681 consecutive subjects with definite or classical RA . Subjects were first seen between 1966 and 1974. The sample population in this study was remarkable in that, due to the structure of the Canadian health care system and the fact that the Department of Medicine at the University of Saskatchewan is the sole referral center in the region, the sample population included approximately 75% of all subjects with definite or classical RA in northern Saskatchewan. Data were stored in the American Rheumatism Association Medical Information System (ARAMIS). A systematic follow-up of subjects was begun in 1978 and completed in 1982. Follow-up included assessment of function on the HAQ and physician global assessment as well as routine clinical, laboratory and radiographic data. The initial sample included 1,043 RA subjects. However, by 1982, 281 subjects had died and 81 were lost to follow-up with a remaining sample of 681 for whom complete data were available for the study analysis.

The Disability Index of the HAQ was the outcome measure in the analysis of this study. Thirty-nine potentially predictive variables (e.g., physician assigned ARA functional class, disease duration, age, erosions, x-ray grade, joint count, serologic measures such as sedimentation rate and latex titer, grip strength, morning stiffness and the presence of rheumatoid nodules) were obtained at study onset. The study analysis was conducted using stepwise regression methods in which the 39 study outset variables were evaluated for their predictive power in determining the final outcome measure (dependent variable) of self-reported disability on the HAQ. Results indicated that age was the single most powerful of the 39 study outset variables in predicting subsequent disability on the HAQ. The second most powerful study outset variable in predicting subsequent HAQ disability scores was radiographic grade, which was followed by sex and then by physician assigned ARA functional classification. Both disability and radiographic progression of disease were reported to develop most rapidly in the first few years following disease onset. The worst prognosis for disability was reported in older women who developed functional impairment and radiographic progression early in their disease course. Although the first few years after disease onset were often characterized by a rapid and variable course in the progression of both disability and radiographic worsening, after 10 years both disability and radiographic progression exhibited a slow, nearly linear rate of increase. It was also noted that approximately 10% of subjects did not develop significant disability. The authors stated their study suggested that early in the disease course of RA (i.e., soon after disease onset) it may be possible to identify subjects who are likely to develop more severe disability. An implication of their observation is that if this is true, disease modifying therapy might well be initiated and used more aggressively in these patients throughout their RA disease course.

The Sherrer et al. (1986) study suggests that health status measures may be useful as research outcome measures in studies investigating determinants and progression of disability. Construct validity of the HAQ is also supported in this study by the fact that the HAQ demonstrated adequate sensitivity as a measure of disability to be able to be predicted by disease measures that were obtained at a much earlier point (i.e., study outset, an average of 11.9 years prior to the HAQ administration). Results of this study are also suggestive that the progression of disability is an important outcome measure for assessing the efficacy of more long-term treatment interventions and combinations of interventions in RA.

In another recent study, Fries et al. (1986) demonstrated the HAQ was sensitive enough as a measure of disability to be able to detect the differential changes in disability expected to occur with the more commonly used drug treatments in RA. Fries and his colleagues assessed the impact of specific drug therapy on the progression of disability in RA using the HAQ Disability Index. Fries et al. reported results of a prospective, parallel and descriptive study of 737 consecutive subjects with new drug uses for 11 drugs prescribed in subjects with definite or classical RA. Outcome assessment included the sections of the HAQ which assess disability, pain, patient global assessment, medication costs, laboratory costs and number of physician visits. Subjects were evaluated by strict prospective protocol at 6-month intervals for 3 years. Control data included parallel results with other drugs as well as initial and follow-up values for each subject. Results indicated that beneficial effects were observed with the 'disease modifying' drugs including intramuscular gold as well as penicillamine and methotrexate. As might be anticipated, gold had the most apparent effect. A mean of 9 months of gold therapy resulted in significant reductions in disability ($p < .005$) and pain ($p < .001$). However, subjects receiving gold and methotrexate reported almost twice as many visits to physicians. Drug costs increased substantially with gold and laboratory costs tripled. Differences among the various nonsteroidal anti-inflammatory agents were difficult to interpret, however. This study extended the outcome assessment variables of HAQ disability, pain and dollar cost to a study of the comparative efficacy of drug treatments in RA. This study provided further support for the HAQ Disability Index as a measure of the construct of disability with adequate sensitivity to detect the expected differential efficacy of the most frequently used drug treatments in RA.

The above review reveals the specific types of validity and reliability studies conducted to date on the AIMS and the HAQ as measures of health status in arthritis. Since the SIP was not specifically designed to assess physical disability and/or health status in RA subjects and since Deyo et al. (1982) compared results of the psychosocial dimension of the SIP with results of the physical and independent dimensions in RA, SIP results in RA subjects are reviewed below under the section of psychological measures and disability in RA.

Disability on the Modified Health Assessment Questionnaire (MHAQ) and Patient Satisfaction

Patients' satisfaction with their functional abilities has been shown to be highly related to recent changes in the patient's functional status. A study conducted at the Vanderbilt University Multipurpose Arthritis Center investigated patients' level of satisfaction with their functional status using a modified form of the HAQ, the MHAQ (Pincus, Summery, Soraco, Wallston & Hummon, 1983). One question was selected from each of the eight disability sections of the HAQ and patients' level of satisfaction with their functional status was assessed. Four response categories, "very satisfied," "somewhat satisfied," "somewhat dissatisfied" and " very dissatisfied" were used. The authors concluded significant difficulty with performance of activities may not be accompanied by dissatisfaction with daily function; however, a major determinant of patient satisfaction was perceived change in difficulty. Of interest to note with regards to this study is that assessment of depression or other measures of mental health was not included. Perhaps the presence of depression, or a sense of helplessness might have been associated with patients' report of dissatisfaction with and/or recent changes in their functional status.

The Development and Validation of the Rheumatology Attitude Index (RAI)

The Rheumatology Attitude Index (RAI) is an instrument that was recently developed at the Vanderbilt Multipurpose Arthritis Center in order to assess subject's perceptions of loss of control and a sense of helplessness in association with arthritis. Seligman's learned-helplessness model of depression (Abramson, Seligman & Teasdale, 1978; Seligman, 1975) served as the theoretical basis for the development of this index, which was originally named the Arthritis Helplessness Index (Nicassio, Wallston, Callahan, Herbert & Pincus, 1985). However, the instrument has subsequently been renamed the Rheumatology Attitude Index (RAI) as the authors felt the use of the term helplessness in the title had a negative impact on patients (meeting discussion, Callahan & Pincus, 1985).

Learned-helplessness has become a popular theoretical framework in psychology for research on depression. Depression and learned-helplessness have been well-characterized in the literature as exhibiting similar behavioral, affective, cognitive and motivational deficits. A major axiom of the learned-helplessness model is that it is the uncontrollable nature of the aversive event that eventually leads to the behavioral manifestations of the learned-helplessness phenomenon. Thus, inherent in the learned-helplessness model of depression is the cognitive component of the expectancy or belief that outcomes are not controllable or influenced by responses (Garber & Seligman, 1980; Seligman, 1975). It is this cognitive component of perceived loss of control in the learned-helplessness model of depression that the RAI was developed to assess in subjects with arthritis. The authors of the RAI hypothesized that in many subjects, the unpredictable nature of the exacerbations and remissions in rheumatoid arthritis may contribute to considerable subjective uncertainty, feelings of personal helplessness, passive resignation and other forms of dysfunctional coping behavior. Thus, as a measure of helplessness, the RAI should correlate positively with theoretically relevant variables reflecting a lack of personal control or self-efficacy and depression (Nicassio et al., 1985, p. 462).

The RAI consists of 15 items measuring subjects' perceptions of their abilities (9 items) or their inabilities (6 items) to control their life in association with arthritis (e.g., "I can do a lot of things myself to control my life" and "My condition is controlling my life"). Subjects are asked to rate the 15 items using a 4-point Likert format with one of the response options, "strongly disagree", "disagree", "agree", or "strongly agree" for each of the questions. Scoring for the 9 items assessing perceived control is reversed. Total scores for the scale range from 15 to 60 with higher scores indicating greater helplessness.

In their initial validation of the RAI, Nicassio et al. (1985) administered the RAI along with a battery of other psychological measures to 219 subjects with rheumatoid arthritis. Psychometric indices used as validation measures included: the Multidimensional Health Locus of Control Scale (MHLC), a 10-item self-esteem measure, the anxiety and depression scales of the General Well-Being Schedule (GWBS) and the Modified HAQ (MHAQ). Reliability measures reported included Cronbach's alpha of .69 (N=173) and a one year test-retest reliability of .53 (N=60). Nicassio and his colleagues (1985, p. 646) stated,

> ...while this Cronbach's alpha reflects a significant level of internal consistency for a brief scale, it does suggest the possibility that the RAI may be a multidimensional measure. In this regard, items 4 and 11, which deal with the predictability of arthritis pain and flares, were unrelated to the RAI total scores suggesting perhaps that predictability may comprise a distinct component of this scale.

Nicassio et al. (1985) also indicated the RAI may possess more than the one factor loading of helplessness and that the .53 test-retest reliability over one year may be indicative that the RAI may allow for sensitivity to changes over time.

Helplessness on the RAI correlated positively with depression (.38) and anxiety (.31) and was negatively correlated with self-esteem (-.41). Higher RAI scores also correlated positively with increased age and lower education. When controlled for age and education the positive correlations with depression (.37) and anxiety (.33) as well as the negative correlation with self-esteem (-.35) remained in close range to the original results. The authors suggested the positive correlations of the RAI with increased age and lower education may indicate that older and less well-educated individuals may require more clinical assistance in learning to acquire control over their RA. In addition, higher levels of reported helplessness correlated positively with higher levels of difficulty (.32), dissatisfaction (.43) and pain (.38) in carrying out activities of daily living assessed on the MHAQ, as well as with subject retrospective report of change in difficulty over the previous 6 months (.25) and general perceptions of worsening clinical status (.36). Correlations between changes on the RAI and changes on the psychological and functional measures over a one year period were reported for 60 subjects who had participated in a pilot study of the RAI. Convergent validity of the RAI was supported by significant positive correlations between changes on the RAI and changes in MHAQ assessed disability (.52) and dissatisfaction (.50) as well as changes in the psychological variables assessed by the Internal Health Locus of Control (IHLC) scale (.62) and the self-esteem measure (-.33).

Also of interest in the reported results of change in scores of the 60 subjects from the pilot study over one year is that changes in MHAQ difficulty scores correlated highly with changes in MHAQ subject satisfaction scores (.65). The authors concluded the data analysis demonstrated a pattern of relationships between the RAI and measures of health beliefs, self-esteem, emotional states and functional capacity which support the construct validity of the instrument as a useful index for assessing helplessness/perceived loss of control in arthritis subjects. Although further reliability and validity studies are needed, the construct validation of the RAI in this initial study supports interpretation of the RAI as a measure of helplessness/perceived loss of control in arthritis.

In a subsequent study, Callahan and Pincus (abstract & presentation, 1985) reported results of RAI administration to 225 subjects with RA. RAI scores were compared with results of the MHAQ and clinical assessments, which included joint count, length of morning stiffness, sedimentation rate and three standardly used performance tests of functional activity (grip strength, button time and walk time). Results reported in this study included the following. RAI scores were not significantly correlated with age, duration of disease, or sedimentation rate. However, higher scores (indicating lower control/higher helplessness) were associated with lower educational levels (.24). The observed lack of correlation of the RAI with age in this study is inconsistent with the initial findings reported by these investigators. However, the positive correlation with lower educational levels is consistent with the initial findings. RAI scores were significantly correlated with MHAQ scores of dissatisfaction (.52), pain (.47) and difficulty ($\underline{p}<.001$) (the correlation coefficient for difficulty that was included in the slides at the talk was not reported in the written copy of the presentation or the published abstract). Significant correlations were also reported between RAI results and joint count (.36), as well as grip strength, button time and walk time (the correlation coefficients for grip strength, walk time and button time which were included in the slides at the meeting presentation were not included in the written copy of the talk or the published abstract). The authors concluded correlations between the RAI and the disease and functional measures remained significant when controlled for age, duration of disease and educational level (1985, abstract).

Subjects with chronic disease experience a loss of control over their health status. Prior to the development of the RAI, no measure of helplessness in chronic disease was available. Instead, investigators have relied on measures of locus of control to assess the cognitive component of learned-helplessness. Thus, the development of the RAI as an instrument designed that operationalizes the cognitive component of the learned-helplessness model of depression in a population of subjects with a chronic disease is important. Several limitations of existing RAI validation studies warrant comment. Thus far, the psychological status measures that have been compared with RAI scores in RA have been exclusively self-report questionnaires. Since correlations between self-reports may include shared variance due to the exclusive use of self-report, the reported magnitude of association between helplessness on the RAI and the other measures of psychological status may reflect shared self-report method variance. Moreover, the psychological status measures used in the RAI validation were very brief and this may limit their reliability and validity as indices of psychological distress. Further, RA is not, in fact, a disease over which subjects have full control--and to some extent at least--subjects with RA would not be expected to report a sense of complete control over their arthritis. Finally, mean scores on the RAI in a nondepressed population of RA subjects has not been reported thus far in the RAI validation studies. Therefore, it is not known what base rates might be expected to occur on the RAI in a nondepressed population of RA subjects. Although the reliability and validity in the initial studies are only moderate, the evidence of convergent construct validity of the RAI in these studies does tend to support interpretation of the RAI as a measure of helplessness in RA. Comparison of the results of the RAI with the results of the BDI and the HRS-D as well as with disability on the HAQ, visual analog pain scores, age and educational levels in the present study is useful as a further investigation of the construct validity of the RAI.

Psychological Measures and Disability in RA

The presence of depression in subjects with rheumatoid arthritis has been documented in a number of studies (e.g., Frank et al., 1984; Moos & Solomon, 1964; Polley & Swenson, 1970; for reviews see Anderson, Bradley, Young & McDaniel, 1985; Bradley, 1985; Volhart & Ackerman, 1981;). However, the incidence of depression reported varies from 10% to 47% depending on the assessment method used (Wegener, 1986). Many of the earlier studies reported the incidence of depression in RA using the MMPI. However, it has been suggested that self-reports of depression may represent a reaction to any chronic disabling illness (Spergel, Ehrlich & Glass, 1978). Several recent studies have failed to find a difference between arthritis subjects' self-reports of depression and those of subjects with other chronic illnesses (Cassileth et al., 1984; Mason, 1985).

A recent study reported results of a survey of 18 rheumatologists in which 117 items on the MMPI hypochondrias, depression and hysteria scales (scales 1,2,3, neurotic triad) were rated as to how this group of experts predicted an RA subject would respond because of the presence of RA, without regard to psychological status (Pincus, Callahan, Vaughn, Bradley & Wolfe, 1986). MMPI scores of 34 female RA subjects were compared with the MMPI scores of two control populations, 130 normal females whose scores had been published in a 1983 MMPI normative study and 23 female nursing students and faculty. Eleven items that were predicted by two-thirds of the rheumatologists as likely be rated "true" by RA subjects because of the presence of RA disease were identified. RA subject responses on these 11 items were compared with control group responses in a conservative analysis which used a Bonferonni adjustment for the multiple comparisons (i.e., a p value of .05 was chosen for statistical significance and .05 was then divided by 117, thus defining a p value = .0004 as statistically significant). Given this strict criterion, the differences between RA subjects and the normal controls were statistically significant for five items: "I am about as able to work as I ever was," "I am in just as good physical health as most of my friends," "During the past few years I have been well most of the time," "I do not tire quickly" and "I have few or no pains." RA and normal subjects responses differed at an unadjusted $p < .05$ level in two additional items: "I wake up fresh and rested most mornings," and "I have never felt better in my life than I do now." In addition, positive responses to these items correlated positively with the two measures of disease severity included in the study, grip strength and self-report of disability on the HAQ. RA subjects and normal subjects did not differ significantly in their responses to most of the 106 MMPI statements that were not predicted by rheumatologists to be RA disease relates items. The Pincus et al. (1986) study indicates that MMPI results are likely elevated in RA subjects due to the fact that many items on scales 1, 2 and 3 are responded to positively by subjects with RA due simply to the presence of RA disease. In addition, higher elevation on MMPI scales 1, 2 and 3 in subjects with RA may indicate the presence of more severe disease rather than psychological abnormalities.

When the measures used to assess depression in RA contain a high number of somatic items, a higher incidence of depression is reported. For example, using a structured interview developed by the authors and derived from the Diagnostic Interview Schedule as the criterion in diagnosing depression, Frank et al. (1986) reported an overall 47% incidence of depression in RA outpatients. This interview schedule contained numerous items assessing symptoms such as fatigue, work interests and involvement and weight loss as well as other symptoms that could be related to the presence of physical illness. Frank and his colleagues (1986) also used this interview schedule to diagnose current major depressive disorder (MDE) and dysthymic disorder (DD) in RA patients. In addition, the study reported interrelationships between depression and RA disease related parameters, including joint count and erythrocyte sedimentation rate (ESR) in RA. In addition, ARA physician assigned functional class was assessed. The study included patients in functional classes I thorough III (functional class I N=10, functional class II N=84 and functional class III N=16; total sample N = 110). The facts that the majority of subjects in the sample were in functional class II and there were no functional class IV subjects are not necessarily unusual in an outpatient population of RA patients. Frank et al. (1986) reported an overall 47% incidence of depression in RA outpatients using this interview assessment instrument as the criterion for diagnosing depression. In this study, 33 patients (30%) met criteria for MDE, 38 (35%) met criteria for DD and 19 (17%) met criteria for both. Depressed and nondepressed subjects (as identified the instrument used in this study) did not differ significantly on measures of age, disease duration, joint score, number of involved joints, ARA functional class, education or social class. However, erythrocyte sedimentation rate (ESR) values were higher in subjects identified as depressed ($p<.04$) and patients with more severe joint swelling reported more suicidal ideation ($p<.03$). Depressed subjects reported higher levels of pain by both visual analog scale ($p<.02$) and number of words chosen on the

McGill Pain Questionnaire ($p<.01$). However, since many of items in this structured interview were related to physical complaints that may well be due to the presence of RA disease, the results do not likely reflect the true incidence of psychological disturbance in RA subjects.

Results of the Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mock, & Erlbaugh, 1961) have not been reported in outpatients with RA and results of the Hamilton Interviewer Rating Scale for Depression (HRS-D; Hamilton, 1960) have not been previously reported in RA patients. No previous investigation of the relationship between disability as quantitatively assessed by a disability index and depression as assessed by a standardized and full-scale measure of depression has been previously reported.

As a criterion measure of depression, the BDI has been used extensively in studies with psychiatric and medical patients. The BDI has exhibited high construct validity, internal consistency and concurrent validity with other measures of depression (Gallagher, Nies & Thompson, 1982; Weckowitz, Muir & Cropley, 1967). Two studies have reported results of the BDI in inpatients with RA in which items on the BDI felt to be disease-related were either not scored (Zaphiropoulous & Burry, 1974) or were omitted (Lorish & Maisaik, 1986).

Zaphiropoulous and Burry (1974) compared responses on the BDI in 50 British hospital inpatients with RA with 32 other inpatients who had chronic painful and noninflammatory skeletal diseases. A significant excess of mood disturbances and depressive reactions among RA patients compared to the control group was reported. The mean BDI scored for RA patients was 15.0 and that for the control group was 10.9. The authors reported there was evidence of mood disturbance in 23 of the 50 RA patients (46%), compared with 6 of the 30 controls (18.7%). No significant correlations in the patients with RA were observed between BDI scores and age, sex, duration of disease, level of disability, disease severity or steroid therapy. The authors stated there was also an excellent correlation between BDI and the clinical presentation of the subjects included in the study. Additionally, the authors stated they did not include scoring of items on the BDI that could have been the result of systemic manifestations of the patients' disease such as "weight loss, loss of libido and work inhibition" (p. 132). However, the authors did not specifically state whether or not these three items were the only items on which scoring was omitted. Significant improvements were observed in results of the BDI scores at hospital discharge compared to admission indicating the BDI was sensitive to detecting expected improvements in patients with RA.

In a recent study, another modified version of the Beck was also sensitive to detecting a decrease in psychological distress expected to occur with input hospitals (Lorish & Maisaik, 1986). This study investigated the validity of a pictorial facial expression scale as a method for assessing patient mood. Seven of the BDI items were judged by the authors to reflect disease-related complaints and were thus omitted on the questionnaire. The authors did not report which seven of the 21 BDI items were omitted. In addition to the Face Scale and the modified version of the BDI, three other measures, the SIP, the Bradburn Affect Scales and a visual analog pain scale, were administered to 174 RA patients at hospital admission to an inpatient rehabilitation facility and again at discharge. The correlation between the Face Scale and the modified version of the BDI was .49. However, correlations between the modified BDI and the other scales assessing subject affect (i.e., the Bradburn positive and negative affect scales and the emotional behavior scale of the SIP) were not specifically reported. The overall BDI mean score decreased from 5.1 at hospital admission to 2.2 by hospital discharge on, indicating lower levels of depression were associated with inpatient treatment on an arthritis rehabilitation unit.

A positive association between measures of disability and brief self-report measures of psychological distress was also found in the above described second validation study of the AIMS at the Boston University Multipurpose Arthritis Center (Meenan et al., 1982). This study investigated use of the AIMS in 625 subjects with various forms of arthritis and reported correlations between the AIMS anxiety and depression scales as well as disability (measured by ARA functional class) and physician global assessment of disease activity. Of the total sample of 625 subjects, 336 had RA and the remaining subjects had other forms of arthritis including: osteoarthritis (108), systemic lupus erythematosis (57), seronegative variant diseases (34) and other forms of arthritis including soft-tissue rheumatism and crystal associated arthropathy. It should be noted that the percentage of subjects with RA (as compared with other forms of arthritis) was not specifically reported in the correlations between the AIMS anxiety and depression scales and the physical disability and disease activity measures. In a subsample of 444 subjects with various forms of arthritis, significant correlations were reported between: depression and ARA functional class (.34); depression and physician global assessment of arthritis activity (.28); anxiety and ARA functional class (.24); and anxiety and physician global assessment of disease activity (.19). In a second analysis correlations between the AIMS anxiety and depression scale and functional disease measures were reported for 114 of this 444 subsample.

Overall, the correlations between the AIMS depression scale and functional disease measures in these 114 subjects with various forms of arthritis were low, including: joint count (.08), grip strength (.12), walk time (.21) and range of motion of a signal joint (.14). Similar low correlations were reported between the AIMS anxiety scale and the same measures, specifically: joint count (.04), grip strength (.10), walk time (.17) and range of motion of a signal joint (.11).

An additional analysis in this study reported correlations in a subsample of subjects who had only RA (subjects with other forms of arthritis, which are frequently much less severe than RA, were excluded). Higher correlation coefficients were reported between ARA functional class and depression (.44) and ARA functional class and anxiety (.30) in the RA sample than between ARA functional class and depression (.34) and ARA functional class and anxiety (.24) in the sample of subjects with various forms of arthritis. In both samples, the correlations between the psychological scales and ARA functional class were higher than between the AIMS psychological scales and physician assessed disease measures (Meenan et al., 1982). These results indicate there is a consistent positive association between measures of disability, disease activity and psychological distress in arthritis. It should be noted, however, that the magnitude of the association between disability and psychological distress appears to be greater in a subsample of subjects with only RA than in a subsample of subjects with various forms of arthritis that includes RA.

The SIP has been administered to subjects with RA in two studies (Berger, Bobbitt, Carter & Gilson, 1981; Deyo, Inui, Leininger & Overman, 1982). As part of the final revision of the SIP, Berger et al.(1981) administered the SIP to subjects with hyperthyroidism ($\underline{N}$=14), rheumatoid arthritis (N=15) and hip replacements (N=15). In subjects with RA, it was hypothesized that Dimension I scores (physical) would be more highly correlated with grip strength, walk time, number of painful and swollen joints than Dimension II (psychosocial) scores. Second, it was hypothesized that SIP scores would be minimally correlated with erythrocyte sedimentation rate (ESR) and hematocrit (HCT). This hypothesis was generated based on the widely accepted medical view that ESR and HCT do not accurately reflect the functional impact of disease on the patient. Third, it was hypothesized that dimension II scores (psychosocial) would be more highly correlated with patients' assessment of pain, ease of movement and how they felt than dimension I (physical) scores. The authors concluded that, in general, their hypothesis were supported. The physical dimension score correlations with grip strength, walk time and the number of painful and swollen joints were higher than for the psychosocial dimension. Also, correlations with these disease activity measures and the physical dimension were slightly higher than for the overall SIP scores. The authors stated this suggested the independent category and the physical dimension are more sensitive to the functional and disease criteria measures of grip strength, walk time and number of painful and swollen joints than is the psychosocial dimension. Overall SIP scores and erythrocyte sedimentation rate were not correlated and overall SIP scores and hematocrit exhibited a negative correlation (-0.25) (Berger et al., 1981, p. 799). It should be noted, the sample of patients with RA in this study was small (N=15) and the correlation between the physical dimension and the psychosocial dimension scores was not reported in the subsample of patients with RA. The following study of the SIP in RA included a more specific investigation of the relationship between the SIP physical and psychosocial dimensions in patients with RA.

Deyo et al.(1982) reported results of SIP administrations in 79 subjects with a diagnosis of definite or classical RA. Means and standard deviations of the SIP administration in the RA subjects were compared with the original, Berger et al. (1981) sample of SIP scores in a general population for: the overall SIP scores, the Physical, Psychosocial and Independent dimensions and each category within these dimensions. Overall results indicated dysfunction relating to work, recreational activities and household management was especially marked in subjects with RA; however, major impacts of the disease were observed in the results of nearly every category except eating.

Means and standard deviations of overall SIP scores and the physical and psychosocial dimension were also reported by ARA functional class. Physical dimension scores increased steadily with the disability level determined by ARA class (i.e., ARA class 1 mean physical score = 6.4 and ARA class 4 mean physical score = 25.8). However, only minimal changes were observed in the Psychosocial dimension scores with increased level of disability by ARA functional class (i.e., ARA functional class I mean psychosocial score = 8.2 and ARA functional class 4 mean psychosocial score = 11.8). Overall, mean SIP scores increased steadily with ARA class (ARA functional class I mean SIP = 6.4 and ARA functional class 4 mean SIP = 37.3). However, since little change was observed across ARA functional classification in the Psychosocial dimension, the increase in overall SIP scores across ARA functional class was primarily due to increased scores in the Physical and Independent categories.

Deyo et al. (1981) concluded psychosocial adjustment is positively correlated with disease status in RA at any given time. However, they added that with increasing duration of the disease, psychosocial impacts become less severe after controlling for physical function. It should be noted the vast majority of the subjects in the study sample were in the ARA functional Class II (N=64 out of total study N=79). This, however, is not necessarily unusual in a sample of RA outpatients. Deyo et al. also pointed out that caution should used in generalizing the findings of this study with regards to psychosocial function to other populations of subjects with RA as their sample was from a Veterans Administration Hospital and the men in the sample (N=56) outnumbered the women (N=23). The fact that mean SIP Psychosocial dimension scores showed relatively little overall increase across ARA Functional Class in comparison with the increases observed in mean SIP Physical dimension scores across ARA Functional Class is suggestive that subjects with RA may be able to find ways to maintain a substantial amount of psychosocial function in the process of adapting and coping with the progression of disability in RA.

The above detailed review of studies comparing measures of disability with depression and anxiety on the AIMS, helplessness on the RAI and psychosocial function on the SIP reveals a positive association between disability and brief self-report measures of mental health. However, an investigation of the magnitude of association between disability assessed by a full-scale health status measure and depression assessed by a full-scale, well-validated and criterion measure of depression has not been previously reported. In addition, an extensive review of the literature failed to reveal a prior study which specifically addressed the issue of the possible influence of psychological factors on patients' self-report of functional status. That is, no prior study has specifically investigated the question of whether discrepancies between self-reported and professionally-assessed disability may be due to psychological factors.

However, in the initial paper describing results of a study conducted at the University of California at Los Angeles, Spiegel et al.(unpublished manuscript, 1985) suggested that "self-reported functional status reflects aspects of mental health" (p. 2). In their initial manuscript, Spiegel et al. (1985) reported a series of regression analysis of five functional status scales (including physical activity, mobility, activities of daily living, household activity and manual dexterity) in which statistically significant correlations were observed between functional status and brief measures of mental health (including psychological well-being, depression and anxiety). The positive association between psychological distress on brief self-report measures of mental health and self-reported functional status was not surprising in that, as described above, Meenan et al.(1982) had reported a similar positive association. However, the primary investigator in the UCLA study, Dr. Spiegel, was one of two physicians who performed the physician measures of disease activity and functional status included as part of the initial evaluation and subsequent 3-month follow-up assessments on each subject that were conducted over a 1-year time period. Dr. Spiegel stated that although causal inferences cannot be made from the correlational data reported in the study, it was her opinion that aspects of mental health may be influential in determining patient's responses on self-report measures of disability (personal communication, September 1, 1985). In addition, in the results of the UCLA study, the variables assessing disability that were included explained only about 50% of the variance in self-reported functional status, indicating that other factors that were not measured influenced subject responses on the self-report functional measures (Spiegel et al., unpublished manuscript, 1985, p. 19).

In support of the hypothesis that self-reported functional status may reflect aspects of mental health, Spiegel et al.(1985) described several hypothetical situations. An example cited was a situation in which no improvement in objective disease activity measures, such as joint tenderness, was found in a drug study. However, self-report functional status improved. It was hypothesized that the improvement in self-report functional status could be due to improvement in the patient's psychological status secondary to attention from the study team. In contrast, Spiegel et al. hypothesized that self-report of functional improvement that actually occurs may not be detected due to depression or other unforeseen psychological factors (unpublished manuscript, 1985, p. 18). Spiegel and her colleagues recently published this study in revised version in Arthritis and Rheumatism (Spiegel et al., 1988). In the published version, the authors reported that a brief self-report scale assessing psychological well-being predicted functional status even when clinical measures of disease severity had been accounted for; however, the similar brief self-report scales assessing anxiety and depression did not significantly predict self-report functional status.

The impressions of the investigators in the original Spiegel et al. (1985) study and the hypothesis that psychological factors may be influential in determining patient's responses on functional status measures was intriguing and worthy of further investigation. Thus, the present study was designed to provide a comprehensive investigation of whether or not self-reports of disability are influenced by psychological status.

RATIONALE FOR THE PRESENT STUDY

Limitations of Existing Research

As described above, a substantial amount of research has been generated that supports the convergent validity of both the HAQ and of the AIMS as self-report measures of health status. In summary of the above studies using the HAQ, convergent validity of the HAQ Disability Index has been demonstrated through: correlations with a nurse-assessor's evaluations of patients' functional status (Fries et al., 1980); correlations with commonly used clinical end-point measures such as the number of painful and swollen joints, length of morning stiffness and sedimentation rate (Fries et al., 1982); sensitivity to disability changes over time in rheumatoid arthritis and osteoarthritis patients (Fries et al., 1982); a high correlation of .91 with the disability dimension of the Arthritis Impact Measurement Scale (AIMS)(Brown et al., 1984); and high correlations with the physical dimension of four other health status measures (Liang et al., 1985); high correlations with other measures of disability in a study using the HAQ as the primary outcome variable in assessing the development of disability in RA over 11.9 years in the Canadian province of Saskatchewan (Sherrer et al., 1986); and sensitivity to changes over time with drug treatments (Fries et al., 1986). No study has previously investigated discriminant validity of the HAQ. That is, no study has specifically investigated whether or not the construct of disability as assessed on a self-report health status measure is in fact independent of other related but conceptually distinct constructs.

Also, the Fries et al.(1980) study is the only investigation in the area of self-reported disability that included professional assessment of patient's functional abilities as a criterion validation measure and overall results reported a weighted Kappa statistic of only .52 between self-reported disability and nurse-evaluator's assessments. A nurse-assessor's interviews of 20 patients and performance evaluations of 25 patients showed a relatively low agreement between self-reported functional status and the criterion of professional (nurse) assessment. Overall results revealed the nurse-assessor and questionnaire responses were in agreement 59% of the time, and although they were within 1 point (on the 0 to 3 scale) 93% of the time, there was a substantial discrepancy of 41%. This discrepancy could be due to several potential methodological limitations. One possible methodological problem could have been the separation of the nurse's assessments into the two categories of interview and performance assessments in the separate samples. Thus, the present study was specifically designed to provide a more detailed criterion assessment of the validity of the HAQ Disability Index. Convergent validity of the HAQ is evaluated in the present study through correlations with a carefully selected group of criterion measures including the criterion of a physical therapist assessor and spouse report of the patients' functional status on the HAQ. The assessments conducted as part of the present study included a physical therapy assessment of gross joint range of motion and muscle strength followed by a traditional physical therapy assessment in which both a performance and an interview assessment were conducted in all patients.

Spouse assessment of patients' functional status on a disability questionnaire has not previously been investigated.

A second major objective of the present study is to investigate the discriminant validity of the HAQ. To date, there are no prior studies of the discriminant validity of any of the existing health status measures. That is, no study has investigated whether or not the construct of disability and functional status as assessed on a self-report questionnaire is in fact independent of other constructs. Disability and depression are different constructs or characteristics which, theoretically, should be independently assessed by instruments that purport to measure each of these respective constructs. Since a variety of studies have suggested depression is positively associated with disability in RA patients (e.g., Brown et al., 1984; Meenan et al., 1982; Spiegel et al., 1985), depression represents a logical choice of a construct to use in investigating the discriminant validity of self-reported functional status. Evidence of discriminant validity of a construct is provided by divergence of related but conceptually distinct traits (Cook & Campbell, 1979; Cronbach & Meehl, 1955). In addition, however, Campbell and Fiske (1959) suggested a construct should be differentiated not only from other theoretically related constructs, but also from methodological irrelevancies. Moreover, in order to differentiate method variance, two methods of assessing each of the constructs, specifically a self-report and an interviewer or observer method were employed to assess each of the constructs. If the construct of disability assessed by the HAQ is independent of the construct of depression assessed by each of two measures of depression (i.e., self-report and interview), then discriminant validity of the HAQ could be demonstrated using the Multitrait-Multimethod validation procedure. Similarly, if the measures of the construct of depression included in the present study were independent of the measures of disability assessed by different methods (i.e., self-report and observer), discriminant validity of the depression measures could be demonstrated in the RA sample.

A third issue the present study investigates is whether or not the psychological factors of depression and helplessness account for discrepancy between self-reported and professionally assessed disability. Since disability is self-reported on the HAQ according to how much difficulty the patient experiences in performing an activity (i.e., "with some difficulty" or "with much difficulty"), the patient who feels depressed and/or helpless may report experiencing more difficulty than the physical therapist observed during an in-home assessment. As noted above, many RA patients experience depression and part of the discrepancy between self-reported disability and professional assessment may be due to depression or related psychological processes. No previous study has addressed whether or not the psychological factors of depression or helplessness account for discrepancies between self-reported and professionally assessed disability.

A fourth issue the present study investigates is the magnitude of association between disability and depression in RA. As described above, brief self-report scales assessing depression and have correlated positively with self-report measures of disability in patients with rheumatoid arthritis (Brown et al., 1984; Meenan et al., 1982; Spiegel et al., 1985, 1988). However, no previous study has investigated the relationship between disability and depression in an RA population using full-scale and well-validated (i.e., criterion) measures of depression.

Finally, the present study was designed to provide further validation of the RAI as a measure of helplessness/perceived loss of control in association with arthritis. It was hypothesized that since depression is the major affective disturbance associated with learned-helplessness, a significant positive association between helplessness on the RAI and depression measured by each of two criterion measures of depression (the BDI and the HRS-D) would be observed. It was also hypothesized that the present study would replicate the findings reported by the Vanderbilt Multipurpose Arthritis Center research team in which helplessness on the RAI was positively associated with higher levels of disability and pain as well as with increased age and lower education.

Purposes of the Present Study

In summary, the present study was designed to examine:

I. Convergent validity of the HAQ through through associations with measures of disability generated by a physical therapist assessor and spouse report;

II. Discriminant validity of the HAQ through comparison of its correlations with other measures of disability in contrast to its correlations with measures of depression and helplessness;

III. Whether or not the psychological factors of depression and helplessness account for discrepancies between self-reported disability and professional in-home assessment;

IV. Whether or not higher levels of disability are associated with higher levels of psychological distress on the measures of depression and helplessness; and

V. Convergent validity of the Rheumatology Attitude Inxex through comparison of the RAI with the two measures of depression and investigation of whether RAI helplessness scores are associated with higher levels of disability and pain, as well as increased age and lower educational levels.

Multitrait-Multimethod Validation Procedure

The Multitrait-Multimethod (MtMm) validation process originally proposed by Campbell and Fiske (1959) is a widely accepted procedure in which at least two processes or traits are measured by at least two different methods in order to examine both convergent and discriminant validity of an instrument.

According to the MtMm model, convergent validity of a test is exhibited when a higher correlation is obtained between at least two measures of the same trait assessed by different methods than between measures of a different trait assessed by the methods. Discriminant validity is evaluated through a relative comparison of the correlation coefficients obtained and involves two phases. The first phase compares the relative convergence among the traits and the second compares the method variance. First, a higher correlation coefficient should be obtained between same-construct or within-trait measures, than between cross-construct (intertrait) measures for both of the constructs or traits assessed. Second, a higher correlation coefficient should be obtained between measures of the same trait generated by different methods than between measures of a different trait generated by the same methods. In addition, by comparing and contrasting the different methods across the different traits in the MtMm matrix one may, theoretically, be able to obtain some empirical estimate of the portion of variance which may be attributable to the methods used (i.e., method variance).

In order to provide evidence of convergent/discriminant validity of the HAQ as well as of the two measures of depression, the BDI and the HRS-D, the following parameters have been investigated using a multitrait-multimethod validation procedure. Convergent validity of the HAQ was investigated through comparison of patient self-reported disability with physical therapist's assessment and spouse report on the HAQ, and discriminant validity of the HAQ was evaluated through comparison of HAQ correlations with the other measures of disability (within-construct correlations) in contrast to its correlations with two measures of depression (cross-construct correlations). Convergent validity of the the depression measures was evaluated by determining the correlation obtained between the BDI and the HRS-D, and discriminant validity of these depression instruments was evaluated through comparison of the correlation between the two depression measures in contrast to the correlations between the measures of depression and disability (cross-construct correlations).

Finally, the present study investigated whether depression as assessed by two independent measures (i.e., a self-report measure, the BDI and an interviewer rated measure, the HRS-D) and helplessness/perceived loss of control in association with arthritis (a self-report measure, the RAI) was associated with a discrepancy between self-reported and physical therapist assessed disability. Although this analysis is not part of the MtMm validation procedure, it was intended to provide a further investigation of construct validity of the HAQ Disability Index.

Reliability

Interrater reliability on the HAQ has not been previously investigated. Thus, an interrater reliability coefficient for independent assessments of two physical therapists is reported for a subsample of the study population.

SUBJECTS AND METHODS

Subjects

One hundred seven subjects with definite or classical RA by ARA criteria were consecutively recruited from the Outpatient Rheumatology Clinics at the University of Utah Medical Center and the Salt Lake Veterans Administration Hospital. Since each of these clinics follows subjects from five Intermountain states, only those subjects within 1 hour driving time from the clinic were recruited for the study. One hundred forty-nine consecutive subjects were asked to participate; the majority (107/149 or 72%) participated. Of the 42 subjects who declined participation, 23 were male and 19 were female. Although complete demographic information is not available on subjects who declined participation, the subjects who declined did not appear to be different in terms of demographic variables, disease activity or disability from those subjects who participated.

The minimum sample size of 100 was selected for the present study since at the 5% significance level, a sample of 100 provides 92% power to detect the difference between a correlation of .3 and a correlation of 0 (Cohen, 1977, p. 87).

Demographics

The characteristics of the sample population are reported in Table 1. Of the 107 subjects who participated, 67 (63%) were females and 40 (37%) were males. The study sample included 82 subjects from the University of Utah (65 females and 17 males) and 25 subjects from the Veterans Hospital (23 males and 2 females). All subjects in the sample were Caucasian; four of these were Hispanic. A high prevalence of Caucasians in the sample is typical in Salt Lake City. Age range was from 23 to 81 years with a mean of 59.3 years and a median of 62.0 years. Disease duration ranged from one to 53 years with a mean of 17.6 years and a median of 15 years. Seventy-four of the subjects were married and 33 were either divorced (_N_ = 15), widowed (_N_ = 11) or single (_N_ = 7). Sixty-one of the spouses filled out a spouse report and six of the spouse reports were filled out by a significant other adult (i.e., a daughter or son) who was either living with or next door to the subject. This provided a total of 67 spouse reports. Educational level ranged from less than eighth grade to a master's degree with a mean of a high school degree plus some trade or professional school training and a median a high school degree. The majority of subjects (_N_ = 71) had been unemployed for a number of years. In addition, 6 subjects had never been employed and 6 were recently unemployed. Thus, 83 subjects (78% of the sample) were not employed at the time of the study. Of the 24 subjects (22% of the sample) who were employed, 17 were working full-time and 7 part-time. The demographic questionnaire did not specifically delineate whether subjects were work disabled, never employed because of having been a housewife or retired due to age.

Table I

Description of Sample Characteristics

Variable	Mean	Median	SD	Range
Age	59.3	62.0	13.0	23-81
Disease Duration (years)	17.6	15.0	10.9	1-53
Disease Activity Measures				
AIMS Disease Activity	2.0	2.0	.87	1-4
Arthritis Impact VAS	44.4	50	21.1	5-100
HAQ Disability Measures				
Physical Therapist HAQ	1.30	1.25	.77	0-2.88
Patient HAQ	1.42	1.50	.77	0-2.88
Spouse HAQ	1.29	1.25	.84	0-2.88
Depression				
BDI	11.8	10.0	7.7	0-44
HRS-D	5.1	4.0	4.5	0-18
Helplessness				
RAI	34.2	34.0	4.8	20-46
Pain				
VAS Pain	15.4	16	7.6	0-99

Note: AIMS Disease Activity = Arthritis Impact Measurement Scales Disease Activity Question; AIMS Arthritis Impact VAS = Arthritis Impact Measurement Scales Arthritis Impact Visual Analog Scale; HAQ = Health Assessment Questionnaire (HAQ) Disability Index; BDI = Beck Depression Inventory; HRS-D = Hamilton Rating Scale for Depression; RAI = Rheumatology Attitude Index; VAS Pain = Visual Analog Scale Pain.

Instruments

1. The Disability Index of the Stanford Health Assessment Questionnaire (HAQ). The HAQ Disability Index is a 20-item self-report questionnaire that assesses subjects' level of "Difficulty" with activities of daily living. There are 8 categories, including: dressing and grooming, arising, eating, walking, hygiene, reach, grip and activities. A Visual Analog Pain Scale is also included.

2. Beck Depression Inventory (BDI). The BDI is a 21-item self-report measure of general dysphoria and depression. Items include: sadness, pessimism, sense of failure, satisfaction, guilt, disappointment, self-criticism, suicidal ideation, tendency to cry, irritability, interest in other people, indecisiveness, beliefs concerning physical attractiveness, effort required for work, sleep, fatigue, appetite, weight loss, worry about physical problems, and sexual interest.

3. Hamilton Rating Scale for Depression (HRS-D). The HRS-D is a 21-item interview rating scale that assesses symptoms of mood dysphoria and depression. Items include: depressed mood, guilt, suicidal ideation, insomnia (initial, middle, and delayed), work and interests, retardation, agitation, anxiety (psychic and somatic), somatic symptoms, loss of libido, hypochondriasis, weight loss, and loss of insight. In addition there are four less frequently observed symptoms of psychological disturbance that are noted but not included in the scoring. These include diurnal variation, depersonalization and derealization, paranoid symptoms, and obsessional symptoms. In scoring the HRS-D, the interviewer scored positively only those symptoms that were judged by the interviewer to reflect affective disturbance, as well as sleep disorders. Difficulties present which, in the interviewer's judgement were likely due to disability (e.g., decreased work activity or aches and pains) or to arthritis disease activity in the specific subject (e.g., concerns about physical health or aches and pains, fatigue, or decreased work activity), were scored positively as symptoms of affective disturbance. Also, decreased sexual interest in elderly individuals living alone that were not accompanied by feelings of loss of libido were not scored positively as a symptom of affective disturbance. Complaints of sleep disturbance were scored positively within the categories of initial, middle and early morning insomnia.

4. Rheumatology Attitude Index (RAI). The RAI is a 15-item self-report measure of helplessness/perceived loss of control recently developed to assess the cognitive component of the learned-helplessness model of depression (i.e., perceived loss of control) in subjects with rheumatoid arthritis. The RAI includes questions assessing subjects' perceptions of their abilities (nine items) or their inabilities (six items) to control their life in association with arthritis.

Data Collection Procedure

Subjects were either seen in clinic with their primary physician or their medical history was obtained from the chart and by interview. Subjects were provided with a folder containing the consent forms, each of the self-report questionnaires, a stamped return-addressed envelope and a business card with the name and telephone number of the investigator. Subjects were given verbal instructions regarding how to appropriately fill out each of the questionnaires. Subjects were encouraged to contact the investigator by phone if they had any questions with regard to filling out the questionnaires. Following return of the questionnaires by mail, subjects were contacted to schedule an in-home evaluation which ranged from 1 1/2 to 2 1/2 hours. All in-home assessments were conducted by the same evaluator with exception of the interrater reliability assessments. The mean number of days elapsed between the postmark date on the return envelope and the home visit was 14 days and the range was from 1 to 30 days.

Questionnaires

Information Form. The information form included the following: age, disease duration, sex, marital status, education and employment status.

HAQ Disability Index self-report. The HAQ Disability Index included the 100 mm Visual Analog Pain Scale (VAS Pain).

HAQ Disability Index Spouse Report. The HAQ spouse report also included the 100 mm Visual Analog Pain Scale. Note: Subjects were given specific instructions regarding the importance of the independence of this measure of disability from that of the subject's self-report HAQ score.

Beck Depression Inventory (BDI).

Rheumatology Attitude Index (RAI).

Arthritis Impact Visual Analog Scale (VAS). The Arthritis Impact VAS is 100 scale assessing overall Arthritis Impact from the AIMS and the long (i.e., complete five-section) form of the HAQ. The question asks, "Considering all the ways your arthritis affects you, mark (X) on the scale for how well you are doing." Scoring is from 0 = Very Well to 100 = Very Poor.

AIMS Arthritis Disease Activity Question (AIMS Disease Activity). The AIMS disease activity question is a four point self-report disease activity questionthat states, "During the past month how active has your arthritis been? 1= very active, 2 = moderately active, 3 = mildly active, and 4 = not active at all." (Note: A lower score indicates higher levels of active arthritis. Thus, the AIMS Disease Activity

Question is scored inversely relative to the Arthritis Impact VAS with regard to disease severity.)

In-Home Assessments

All in-home assessments with the exception of the interrater reliability assessments on the HAQ were conducted by the same evaluator who was blinded to subject responses on the questionnaires at the time of the in-home visits. The in-home assessments included the following:

HAQ Disability Index Physical Therapy Assessment. The physical therapist's assessment included a detailed performance and interview assessment of the subject's functional abilities on each of the items on the HAQ Disability Index. Performance was rated according to specific criteria on each of the items.

Hamilton Interviewer Rating Scale for Depression (HRS-D). Administration of the HRS-D averaged approximately 45 minutes.

Interrater reliability assessment. Seventeen of the last 26 subjects in the sample participated in an independent in-home assessment on the HAQ Disability Index by a second physical therapist.

RESULTS

Convergent Validity Among the Disability Measures and Interrater Reliability

In order to examine convergent validity among the measures of disability, Pearson correlation coefficients were calculated between the each of the three measures of disability (patient self-report on the HAQ, physical therapist assessment on the HAQ, and spouse report of the patient's functional status on the HAQ. See Figure 1). High correlations were found between each of the measures of disability. Patient self-report on the HAQ correlated with the physical therapist's assessment at .89 ($p < .001$). Patient self-report on the HAQ correlated with the spouse report of patient function at .87 ($p < .001$). The physical therapist's assessment and spouse report correlated at .85 ($p < .001$). Interrater reliability assessed by a Pearson correlation coefficient between the independent in-home HAQ assessments of two physical therapists on 17 of the last 26 patients in the sample was .94 ($p < .001$).

Convergent Validity Between the Depression Measures (BDI and HRS-D)

Convergent validity between the measures of depression was also evaluated using a Pearson correlation coefficient. The BDI and the HRS-D correlated .69 ($p < .001$). This is considered to be a reasonably high degree of convergence between the two instruments, particularly given the fact that

	DISABILITY			DEPRESSION	
	PT HAQ	SELF HAQ	SPOUSE HAQ	BDI	HRS-D
DISABILITY					
P.T. HAQ					
SELF HAQ	.89++				
SPOUSE HAQ	.85++	.87++			
DEPRESSION					
BDI	.31++	.37++	.50++		
HRS-D	.17+	.24+	.25+	.69++	

++p<0.001 +p<0.01

Figure 1 Multitrait-Multimethod Correlation Matrix: Disability and Depression

NOTES: TRAITS = Disability and Depression; METHODS = Observer and Self-report. DISABILITY MEASURES: P.T. HAQ = Physical Therapist Health Assessment Questionnaire Disability Index (Method = observer/performance rating); SELF HAQ = Patient Health Assessment Questionnaire Disability Index (Method = self-report); SPOUSE HAQ = Spouse Report of the subject's disability on the Health Assessment Questionnaire Disability Index (Method = observer rating). DEPRESSION MEASURES: BDI = Beck Depression Inventory (Method = self-report); HRS-D = Hamilton Rating Scale for Depression (Method = observer/interviewer rating).

the measures involved different methods of assessment (i.e., self-report and interviewer methods) as well as the fact that there are some differences in the complaints assessed by these two measures. Pearson correlations between each of the depression measures (the BDI and the HRS-D) and age, education and disease duration were each statistically nonsignificant.

Comparison of Convergent/Discriminant Validity of the HAQ

In order to evaluate the convergent/discriminant validity of the HAQ as a self-report measure of disability, a Multitrait-Multimethod correlation matrix was generated between the measures of disability and the measures of depression (Figure 1). As reported above, high correlations were found among the measures of disability (large triangle, Figure 1) as well as between the two measures of depression (small triangle, Figure 1). Discriminant validity was evaluated by comparison of the within-construct correlations (i.e., the correlations among the measures of disability as well as the correlations between the two measures of depression) in contrast to the lower cross-construct correlations. The cross-construct correlations (i.e., the correlations between the measures of disability and the measures of depression) included: physical therapist HAQ and BDI ($\underline{r} = .31$, $\underline{p} < .001$), physical therapist HAQ and HRS-D ($\underline{r} = .17$, $\underline{p} < .01$), patient HAQ and BDI ($\underline{r} = .37$, $\underline{p} < .001$), patient HAQ and HRS-D ($\underline{r} = .24$, $\underline{p} < 0.01$), spouse HAQ and BDI ($\underline{r} = .50$, $\underline{p} < .001$), and spouse HAQ and HRS-D ($\underline{r} = .25$, $\underline{p} < .01$) (rectangle, Figure 1).

T-tests of the significance of differences among the dependent correlations obtained in the study indicated the within-construct correlations (triangles, Figure 1) were all significantly greater than the cross-construct correlations (rectangle, Figure 1). That is, T-tests of significance indicated each of the three convergent correlations among the disability measures (seen in the large triangle) and the convergent correlation between the measures of depression (seen in the small triangle) were significantly greater than each of the six cross-construct correlations (seen in the rectangle) (*p's* $<.02$ to *p's* $< .001$).

Investigation of Whether or Not Depression and Helplessness are Associated with Discrepancy between Self-Reported and Physical Therapist Assessed Disability

In order to determine whether discrepancy between the patient HAQ and the physical therapist's assessment were associated with the psychological processes assessed, Z-values were determined for the patient HAQ scores and the physical therapist HAQ scores. Calculation of a Z-value discrepancy score (consisting of physical therapist's HAQ minus patient HAQ) was then carried out. Pearson correlation coefficients between this Z-discrepancy score (D) and each of the psychological measures (RAI, BDI, and HRS-D) were then determined. The RAI helplessness scale and the Z-discrepancy score correlation was significant at .20 ($p<.05$), indicating that patient over-report of disability (as determined by the physical therapist's assessment) was associated with a higher helplessness score. Pearson correlations of the Z-discrepancy score with the depression measures were nonsignificant statistically with D and BDI $r=.13$ ($p=.18$) and D and HRS-D $r=.14$ ($p=.07$).

Among the Pearson correlations between the Z-discrepancy score and patient age, educational level, disease duration, the AIMS disease activity question, and the arthritis impact visual analog score, only the correlation between the arthritis impact visual analog score was statistically significant ($r = .16$, $p = .05$), indicating that patient over-report of disability was also associated with patient self-report of less severe overall impact of arthritis.

Relationship Between Disability and Depression

In order to determine the magnitude of association between disability and depression, Pearson correlations were calculated between each of the three measures of disability and each of the two measures of depression (cross-construct correlations; rectangle, Figure 1). Significant positive correlations were found between increased disability on all three HAQ disability measures and higher levels of depression on both the BDI and the HRS-D. However, higher correlations occurred between each of the measures of disability and the BDI than between each of the measures of disability and the HRS-D (Figure 1). Disability and depression are clearly associated in the RA population. However, the fact that the correlations between the BDI and each of the depression measures is higher than the correlations between the HRS-D and each of the disability measures suggests the magnitude of the association between disability and depression is higher when somatic and disease-related complaints are included in the depression measure.

It should also be noted that not including complaints on the HRS-D score that reflected disease-related difficulty may have contributed to an underestimation of the magnitude of association between disability and depression. To some degree, many of the disease-related complaints score may have been associated with both affective disturbance and disease-related difficulty.

Although not a focus of the study, it is worth mentioning that a concern was present as to whether or not to rate sleep disturbance as a symptom of affective disturbance for purposes of the HRS-D score. Sleep disturbance is included as one of many symptoms of depression on most of the traditional and well-validated measures of depression, including the BDI and the HRS-D. On the HRS-D, difficulty sleeping is differentially scored in three categories: initial, middle and early insomnia. Based on the patients' responses during the HRS-D interview, it was the interviewer's impression that the RA patients' verbal reports of sleep disturbance primarily reflected affective disturbance. However, a number of patients commented they sometimes experience sleep disturbance in association with the pain of active RA disease; complaints of sleep disturbance in association with the pain of end-stage joint damage were not common. Since there was some concern as to whether sleep disturbances may have reflected a disease-related complaint, the strength of association between sleep disturbance and depression was compared with the strength of association between sleep disturbance and each of the measures of disease severity and pain.

First, all complaints of sleep disturbance were recorded during the HRS-D interview. Second, a total for the interviewer's ratings on HRS-D sleep items (items 4, 5 and 6; initial, middle and early morning insomnia, respectively) was calculated. Fifty-eight patients out of the 107 sample (54% of the sample) complained of sleep disturbance in one or more category during the HRS-D interview. Finally, the total score for interview-rated sleep disturbance was compared with each of the depression and disease severity measures. The interview-rated sleep disturbance was closely related to depression in the study, but was not significantly associated with pain, disability, age, self-report disease activity, disease duration, steroid dosage or age. The Pearson correlations between the sum of interview-rated sleep disturbance and the depression measures excluding their respective sleep items were both highly significant. Interview-rated sleep disturbance correlated with the BDI excluding the sleep difficulty item (i.e., item 16) at .49 (p <.001). Similarly, interview-rated sleep disturbance correlated with the HRS-D excluding the sleep disturbance items at .47 (p <.001). In contrast, the Pearson correlation coefficients between the the sum of the interview-rated sleep disturbance and VAS pain (r = .13, p = .085), patient and physical therapist disability (r = .12, p = .103 with patient HAQ and r = .08, p = .08 with physical therapist HAQ, respectively), self-report disease activity (r = -.014, p = .44 with the AIMS self-report disease activity question), disease duration (r = .04, p = .34), age (r = -.03, p = .38) and steroid dosage (r = .07, p = .22) were each statistically nonsignificant. The Pearson correlation coefficient between the sum of the HRS-D sleep disturbance items and the arthritis impact visual analog scale was minimally significant at the .05 level (r = .25, p =.018). These findings support inclusion of sleep disturbance in assessing depression in RA patients and suggest RA patients' verbal reports of sleep disturbance primarily reflect affective disturbance rather than a disease-related difficulty. Since sleep disturbance is included as a symptom of depression on both depression measures in the study, sleep disturbance contributes, at least to some degree, to the size of the correlations between disability and depression in study. However, sleep disturbance represents only one of the 21 symptoms of depression on the BDI and three of the less highly weighted complaints of the total differentially weighted 21 symptoms on the HRS-D. Thus, it is likely that the overall contribution of sleep disturbance to the level of association between disability and depression is relatively small in the study.

Validation of the Rheumatology Attitude Index (RAI)

As predicted, the RAI correlated positively with both measures of depression. The RAI correlated more highly with the BDI ($r = .40$, $p < .001$) than with the HRS-D ($r = .21$, $p < .01$). In order to replicate the findings reported by Nicassio et al. (1985) in their initial validation of the RAI, Pearson correlation coefficients between RAI scores and each of the measures of disability, pain, age and education were also calculated. RAI scores correlated positively with all three measures of disability. The RAI correlated most highly with self-reported disability on the HAQ ($r = .33$, $p < .001$). Similarly, the RAI correlated significantly with disability on the Spouse HAQ ($r = .26$, $p < .01$) and with disability on the Physical Therapist's HAQ ($r = .24$, $p < .01$). These correlations indicate that across all measures, helplessness is positively associated with disability in RA patients. Further, RAI scores correlated positively with patient visual analog pain scores ($r = .33$, $p < .001$), indicating that increased helplessness was also associated with higher self-report of pain. Finally, RAI scores correlated positively with increased age ($r = .16$, $p < .05$) and negatively with education ($r = -.17$, $p < .05$), indicating higher helplessness scores were also associated with increased age and lower educational levels.

DISCUSSION

The Multitrait-Multimethod Matrix provides a strong pattern of evidence in support of the convergent and discriminant validity of the HAQ Disability Index as well as the two criterion measures of depression included in the present study. Comparison of the high convergent correlations obtained among the measures of disability on the HAQ and the convergent correlations between the measures of depression in contrast to the significantly lower cross-construct correlations indicates that what is assessed by the HAQ is, in fact, the health status dimension of physical disability. Similarly, comparison of the high convergent correlation between the measures of depression and the convergent correlations among the measures of disability, in contrast to the lower cross-construct correlations indicates that what is assessed by each of the depression indices is, in fact, the health status dimension of depression or psychological distress. In addition, although a significant positive association between the health status dimensions of physical disability and psychological health exists, results of the present study support the conclusion that depression does not contribute to the self-reported health status dimension of physical disability on the HAQ.

Convergent and Discriminant Validity of the HAQ Disability Index

In order to demonstrate both convergent and discriminant validity of an instrument using the Multitrait-Multimethod validation process, different traits are compared across different methods. Convergent validity of an instrument is evident when the instrument correlates highly with other measures of the same construct assessed by different methods (e.g., a self-report and an interviewer method). In the present study, convergent validity of the HAQ as measure of disability is strongly supported by the high correlations between patient HAQ scores (self-report method) and the other two measures of disability, the physical therapist's HAQ score and the spouse report HAQ score (observer methods). Similarly, convergent validity is evident between the two measures of depression since the different methods of assessing depression, the Beck Depression Inventory (self-report method) and the Hamilton Interviewer Rating Scale (interview method) also correlated highly.

In addition to providing evidence in support of the convergent validity of the HAQ as well as each of the two depression measures, the Multitrait-Multimethod Matrix provides a pattern of evidence in support of the discriminant validity of each of these measures. As described above, the high within construct correlations obtained among the measures of disability (see large triangle, Figure 1) and the within construct correlation obtained between the measures of depression (see small triangle, Figure 1) support the convergent validity of each of these measures. The high within construct correlations are also important in evaluating the discriminant validity of the instruments under investigation. Discriminant validity is evident when a significantly higher correlation coefficient is obtained between the measures of the same trait (i.e., within-construct correlation) assessed by different methods than between different traits assessed by the same methods. Specifically, in the present study, discriminant validity of the HAQ is evident by the high within construct correlations obtained among the measures of disability in the large triangle (Figure 1), which are significantly greater than the cross-construct correlations (i.e., correlations between the measures of disability and the measures of depression, rectangle, Figure 1). Similarly, the high correlation obtained between the measures of depression in the small triangle is significantly greater than the cross-construct correlations in the rectangle (Figure 1). This methodology provides clear evidence of the convergent and discriminant validity of the HAQ as a measure of disability. There is also clear evidence in support of the convergent and discriminant validity of the depression measures. However, the degree of discrimination between disability and depression was greater between the HAQ scores and the HRS-D than between the HAQ scores and the BDI. This, in turn, indicates the degree of discrimination between the construct of depression and the construct of disability was greater when RA disease-related complaints were not included in the scoring of the depression measure.

An underlying theoretical assumption of the MtMm model is that a part of what is assessed by a measure of a trait may be due to method variance. That is, a portion of the variance explained by the scores obtained in assessing different traits may be due to the use of the same method of assessment employed across traits. For example, a self-report measure of disability may correlate more highly with a self-report measure of depression than with an interview measure of depression due to method variance attributable to the use of the self-report method. Specifically, among the six correlations between disability and depression seen in the cross-construct rectangle (Figure 1), a higher correlation is observed between the self-report disability measure and the self-report depression measure (Patient HAQ and BDI, r = .37) than between the physical therapist/observer assessed disability measure and the self-report depression measure (physical therapist HAQ and BDI, r = .31), suggesting self-report method variance may account for the higher association of self-reported disability and depression. However, since the Spouse HAQ (observer-assessed measure) also correlated more highly with the BDI (r = .50) relative to the correlation between the BDI and the physical therapist HAQ (observer-assessed measure) (r =.31), it is not reasonable to assume that method variance accounts for the higher correlation between the Patient HAQ and the BDI relative to the correlation between the Physical Therapist HAQ and the BDI. The fact that the highest correlation between the disability and depression measures occurred between the spouse report of disability and patient-reported depression is suggestive that the spouses of more depressed subjects may attribute problems the patient is experiencing to the patient's physical disability rather than the patient's psychological status. The differences among the magnitudes of the correlations between traits (i.e., the cross-construct correlations seen in the rectangle) indicate that the levels of association between disability and depression were highly related to methodological factors, including the problem of inclusion of somatic complaints in assessing depression in subjects with chronic disease and the methods (i.e., self-report versus interview/observer) used in assessing the constructs.

Investigation of Whether or Not Depression and Helplessness Account for Discrepancies Between Self-Reported and Physical Therapist Assessed Disability

It was anticipated that the HAQ "difficulty" score would reflect the two dimensions of levels of assistance due to joint deformity and levels of pain due to active disease. The question of how much assistance a subject required in performing an activity was perhaps more easily assessed by a physical therapist than was the question of how much pain the subject was experiencing. It is the opinion of the physical therapist assessor in this study that the HAQ "difficulty" score remains, to some degree at least, a subjective rating on the part of both the subject and the therapist-observer. These limitations considered, a major question posed by the present study was whether or not the HAQ "difficulty" score involved a third major dimension, that of psychological distress.

Construct validity of the HAQ is further supported by the lack of a significant association between depression and discrepancy between self-reported and assessed disability. As described in the results section, a discrepancy score of Physical Therapist HAQ minus Patient HAQ (Discrepancy = P.T. HAQ - Patient HAQ) was calculated. A Z-value discrepancy score was then correlated with the full-scale Beck Depression Inventory and the Hamilton Interviewer Rating Scale. Pearson correlations between this discrepancy score and each of the measures of depression were nonsignificant statistically, indicating the small discrepancy that was observed between self-reported and professionally assessed disability was not associated with depression. This observation was true even when items that may reflect symptoms of disease activity or may reflect the presence of more severe disability were included in the BDI score. Although a small but statistically significant association was observed between the RAI and subject over-report of disability (i.e., higher helplessness scores were minimally associated with subject over-report of disability ($\underline{r} = .20$, $\underline{p} = .05$), this finding should be interpreted cautiously since further investigation of the reliability and validity of the RAI is indicated. However, the positive association between helplessness as assessed by the RAI and subject over-report of disability is intriguing and supports the relevance of the construct of helplessness in subjects with RA. Results of the present study do, however, strongly support the conclusion that the HAQ "difficulty" score does not include the dimension of psychological distress as assessed by the two criterion measures of depression included in the study.

The Relationship Between Disability and Depression in RA

A significant positive association between levels of disability and depression was observed across both the self-report (BDI) and interviewer assessed (HRS-D) measures of depression. The correlations between the BDI and each of the measures of disability were overall higher than the correlations between the HRS-D and each of the measures of disability. This is likely due to the fact that all items endorsed by the subject were included in the BDI scoring--that is, no correction was made on the BDI score for positive endorsement of somatic items when responses on such items may have reflected disease-related difficulty. For example, the BDI includes items that assess such RA disease-related parameters as fatigue, taking an extra effort to get started at doing something, concern about looking old or unattractive or belief that there are permanent changes in one's appearance that make one look old and ugly, and worries about health and physical problems such as aches or upset stomach. Endorsement of these complaints is included in the BDI depression score in the present study.

However, in scoring the interview rated measure of depression--the HRS-D--only those items judged by the interviewer to be related to mood disturbance and/or depression at the time of the interview were scored positively as symptoms of depression. Complaints that were present which in the interviewer's judgement were likely related to arthritis disease activity or disability for the specific subject (e.g., systemic fatigue associated with active RA disease, concerns about aches and pains in subjects with active and/or disabling disease, diurnal variation in mood associated only with morning stiffness and decreased work activity in a subject with active and disabling disease) as well as decreased sexual interest in a very elderly individual were thus scored negatively on the HRS-D. The negative scoring of such somatic items--when judged by the interviewer as reflecting the presence of more severe RA disease with the specific subject--likely explains the relatively lower correlations between the HRS-D depression and the HAQ disability scores compared with the correlations between the BDI and the HAQ scores.

Comparison of levels of disability on all three measures (Patient HAQ, Physical Therapist HAQ and Spouse HAQ) with levels of depression on both the interviewer (HRS-D) and self-report (BDI) measures consistently supports the existence of a significant positive association between disability and depression in subjects with RA. However, the level of this association is related to the amount of somatic content included in the instrument used to assess depression as well as to the method employed to assess depression and disability (i.e., self-report method versus professional observation/interview method). Due to the high somatic and disease-related content on some of the BDI items--and zero scoring of similar items on the HRS-D when judged by the interviewer to be related to disease processes with a given subject--the correlations between the measures of disability and the HRS-D likely reflect a more realistic level of association between disability and depression in RA than do the correlations between the disability scores and the BDI. It is noteworthy that the positive association between disability and depression remained significant even when somatic symptoms that were judged as likely to be associated with disease processes, but that could in some instances have also been due to depression, were scored zero on the interviewer rated measure--the HRS-D.

Further Validation of the RAI as a Measure of Helplessness/Perceived Loss of Control in Association with Arthritis

Finally, results of the present study provide additional support for interpretation of the recently developed RAI as a measure of the construct of helplessness/perceived loss of control in RA subjects. As in the initial investigation of the RAI, helplessness correlated positively with the theoretically related processes of depression, disability and pain as well as with increased age and lower education. Thus, as predicted, more depressed individuals with RA as well as more disabled individuals are likely to experience higher levels of helplessness in association with their disease. The positive associations between helplessness/perceived loss of control with depression, disability and pain as well as with increased age and lower education suggest that individuals experiencing more depression and disability in association with their RA as well as elderly and less well-educated RA subjects may require more assistance in learning to cope with the impact of their disease.

CONCLUSION

In summary, results of the present study strongly support the conclusion that subjects are able to report their current functional status on a self-report health status measure with a high level of accuracy. This suggests it may well be possible to develop self-report measures of health status that are more sensitive to the subtle changes in function and disease activity known to occur with the exacerbations and remissions of RA disease. More sensitive measures of health status would be extremely useful as outcome measures for research in a variety of chronic disease populations. The recent proliferation of research using health status measures in health psychology and in other health-related fields, such as rheumatology, reflects the widespread acknowledgment of the value of health status measures as a means of quantifying the impacts of disease. Continued research efforts targeting the development of improved sensitivity of self-report health status measures in detecting the subtle but clinically important differences in health status are likely to be of substantial value.

Comparison of a health status measure of disability with two full-scale measures of depression in this study suggests a positive association between disability and depression exists in RA subjects. Future research should include longitudinal investigation of the nature of the relationships between disability and depression. Longitudinal studies may serve to identify factors associated with changes in the physical and psychological dimensions of health status over time. Such research would be valuable in developing an improved understanding of the nature of the relationships between disability and depression. Finally, results of the present study strongly suggest that when assessing depression in subjects with RA it is important to consider the level and nature of somatic content that is included in the psychological test employed. Somatic complaints on traditional depression measures may well be endorsed due to disease-related difficulty in other patients with chronic disease; however, further investigation of this issue is needed. The problem of inclusion of somatic complaints in assessing depression in subjects with chronic disease likely represents a methodological concern in assessing depression in a variety of chronic disease populations. Future research might address which complaints on traditional and well-validated measures of depression may be endorsed by subjects with RA as well as subjects with other chronic illnesses due to difficulties that reflect symptoms of specific diseases rather than affective disturbance. Further investigation of the methodological problem of inclusion of somatic and disease-related complaints in assessing depression in subjects with chronic illness is urgently needed and would be valuable in developing an improved understanding of the relationships between physical limitations and psychological distress.

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