THE ASSOCIATION BETWEEN SOCIAL SUPPORT AND MEDICATION ADHERENCE IN ADULTS WITH RHEUMATOID ARTHRITIS

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The association between social support and medication adherence has been studied in several chronic diseases. However, this association has not been extensively explored in patients with rheumatoid arthritis (RA), especially with valid and objective measures. The purpose of this study was to examine the association between social support and medication adherence in adults with RA using a valid and reliable social support questionnaire, the Interpersonal Support Evaluation List (ISEL), and the Medication Event Monitoring System (MEMS) to objectively measure medication adherence of RA drugs. A cross-sectional, descriptive, correlational design was used for this secondary analysis of data from a randomized controlled trial of a behavioral intervention to improve medication adherence in patients with RA. The parent study used convenience sampling, and a total of 567 subjects were included in this secondary analysis. At baseline, the subjects completed a sociodemographic questionnaire and the ISEL. Then the subjects were instructed to use the MEMS cap for 30 days. Multivariate logistic regression analyses were used to examine which of the four ISEL subscale scores (tangible, appraisal, self-esteem, and belonging) best predicted each of the adherence measures (dose adherence, days adherence, and on-time adherence). No social support subscale significantly predicted days adherence. Tangible social support was a significant predictor of dose adherence (OR=1.082, 95% CI=1.008 - 1.162). For on-time adherence, self-esteem social support was a significant predictor (OR=0.942, 95% CI=0.893 - 0.994). These results may be due to controlling for the

effect of other social support subscale measures that may be related to alternate variables affecting the associations between the adherence and social support. A further study examining these variables is recommended for a greater understanding of the role of social support on medication adherence in persons with RA.

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1.0 INTRODUCTION

Rheumatoid arthritis (RA) is an autoimmune disease in which joint damage occurs when the immune system mistakenly recognizes the joint structures as foreign (Ruderman & Tambar, 2013). This process creates inflammation that causes thickening of the tissue lining the joints, and results in pain, stiffness, swelling and limited mobility and function of these joints (Ruderman & Tambar, 2013). The most commonly affected joints are the small joints in the hands and feet (Ruderman & Tambar, 2013).

About 1.5 million people in the United States are affected by RA, with about 75% of these being women (Dugowson et al., 1991). Currently, 1-3% of women have a chance of being diagnosed with RA throughout their lifetime. Although this disease commonly begins between 30 and 60 years of age, it can start at any age and cause chronic disability of the joints (Ruderman & Tambar, 2013). Over time, permanent joint deformity can occur; therefore, early diagnosis, a treat-to-target strategy, and adherence to the medication regimen to control RA are recommended.

RA is associated with other medical co-morbidities as well. The primary co-morbidity for people with RA is cardiovascular disease (CVD), particularly ischemic heart disease (Wolfe et al., 1994). It is unclear whether the risk of CVD is due to RA, the risk factors associated with RA, such as hypertension and higher likelihood of being a smoker, or the effects of the drugs used to treat RA (Wolfe et al., 1994). The second most common co-morbidity is infection, most

frequently tuberculosis, which is one of the primary causes of death among people with RA and may be responsible for one-quarter of deaths among this population. Other co-morbidities associated with RA are mental health problems and lymphoproliferative malignancies, such as leukemia and multiple myeloma. A high prevalence of anxiety and depression has been documented as well (Dickens, McGowan, Clark-Carter, & Creed, 2002).

Not only is the physical disability from RA debilitating, but the financial toll is significant. As with any illness, there are direct and indirect costs associated with RA. A study of direct costs, such as medical costs, among people with RA found an average cost of $2,085 per person annually (Kawatkar et al., 2012). In addition, patients with RA are six times more likely than people without arthritis to incur other medical expenses independent of RA. The age-adjusted indirect costs, such as non-medical expenditures, for a person with RA are on average $1,212 annually (Simons, Rosenblatt, & Trivedi, 2012). Regarding employment, people with RA are more likely to have difficulty finding a job, change occupations, lose their jobs, reduce work hours, and retire early (Gabriel, Crowson, Campion, & O'Fallon, 1997). These factors would put additional financial strain on patients with RA.

2.0 BACKGROUND

The World Health Organization (WHO) has a model that predicts adherence to medical regimen of long-term therapies in various illnesses. This model has five sets of factors that interplay to affect adherence and include the following: socioeconomic-related, healthcare team/health system-related, condition-related, therapy-related, and patient-related (Sabate, 2003). The socioeconomic-related factor in this model of adherence includes social support. The association of social support with adherence has been studied in several chronic disorders. However, the association of social support with medication adherence has not been explored extensively in patients with RA (Van den Bemt, Van den Ende, & Zwikker, 2012). Therefore in the proposed study, the association between social support and medication adherence posited by this model was examined in patients with RA.

Medication adherence is defined as the extent to which a patient's behavior, with respect to taking medication, corresponds with agreed recommendations from a healthcare provider (Sabate, 2003). Therapy for RA has greatly improved in the past 30 years. The current management of RA is not curative, but can significantly reduce the progression of joint damage and provide good relief of symptoms, especially with early aggressive treatment. Pharmacotherapy often consists of disease-modifying anti-rheumatic drugs (DMARDs), corticosteroids, and some biologic response modifier agents (Van den Bemt, et al., 2012). Medication nonadherence has negative consequences, such as increased disease flares and

disability. Adherence rates to prescribed medication regimens in people with RA are low, varying from 30-80%, depending on how adherence is measured and various patient characteristics (van den Bemt et al., 2012). Achieving greater adherence to the therapy could improve efficacy of the medication treatments, decrease disability, and reduce health care costs associated with the disease.

Social support is a patient characteristic that may affect patients' management of their health problems. According to Sabate (2003), social support is described as informal or formal support received by patients from other members of their community. Social support can be differentiated into functional and structural social support. There are three types of functional social support, which are practical, emotional, and family cohesiveness. Structural social support is described by marital status and living arrangement of adults (DiMatteo, 2004). Social support networks are known to buffer disease-related distress and improve quality of life in patients with RA by enhancing their ability to cope (Elliot, 2008). Although social support has been found to improve psychological well-being in patients with RA (Treharne, Lyons, & Kitas, 2004), less is known about the association between social support and medication adherence in patients with RA.

A few studies have examined the association between social support and medication adherence in patients with RA. A study completed in Taiwan by Chen and Wang (2007) used a cross-sectional design with 115 participants. Social support was measured using a 15-item social support scale designed by Wang (2000) to determine the degree of social support perceived by the participants. The social support subscales had Cronbach's alpha coefficients of .78 for emotional support, .74 for cognitive support, .60 for informational support, and .52 for tangible support. The Cronbach's alpha coefficient of the overall social support scale in the study was .86.

Medication adherence was measured by using the Self-Care Behavior Scale of RA patients (SCBS), which was adapted from a scale used in a study by Peng (1997). The results showed that patients with RA who have a higher level of social support have better self-care behavior, including medication adherence ($r=0.19$, $p=.0469$).

Wong and Mulherin (2007) conducted a prospective cohort study examining medication beliefs and psychosocial factors shortly after starting DMARD therapy and one year later. The sample of 68 patients with RA was recruited from a rheumatology department in a hospital in England. Social support was measured by using a Significant Others Scale Questionnaire, and medication adherence was assessed via patient self-report. The data were collected in a semi-structured interview, and a stepwise logistic regression model was applied to find the predictive value of medication beliefs and psychosocial factors, such as social support, on early discontinuation of DMARD therapy. The results indicated that social support was not significant in predicting medication adherence (regression coefficient not reported, $p \geq .05$).

Another study conducted in England by Treharne et al. (2004) investigated the associations of several psychosocial factors including social support on medication adherence in 85 patients with RA. In this cross-sectional study, social support was evaluated using the Social Support Questionnaire, and medication adherence was assessed using the Compliance Questionnaire. These results demonstrated that social support satisfaction ($r=-0.15$, $p \geq .05$) and number in the social support network ($r=0.03$, $p \geq .05$) were not statistically significantly related to medication adherence.

Finally, a study led by Brus, van de Laar, Taal, Rasker, and Wiegman (1999) in the Netherlands investigated the relationship of social support on medication adherence in patients with RA. This study used a descriptive correlational design with secondary analysis of data from

a randomized, controlled, assessor-blinded clinical trial of patient education in a sample of 65 patients. Medication adherence was measured from 3 to 6 months via a pill counting procedure on sulphasalazine by the assessor. High adherence was defined as greater than or equal to 80%, and low adherence was defined as less than 80%. Adherence was comparable between the two groups in this trial so the data were combined. Perceived social support was measured by a single item on a 5-point scale at 3 months. The correlation between medication adherence with sulphasalazine treatment and perceived social support was not significant ($r=0.20$, $p\geq.05$). In the logistic regression analysis for medication adherence with sulphasalazine treatment, perceived social support was not a significant predictor ($p=0.15$, OR and 95% CI were not reported).

To summarize, although the study by Chen and Wang (2007) found a significantly positive relationship between social support and medication adherence, the other three studies did not, which suggests that current evidence is inconclusive. In addition, all of these studies were conducted outside of the United States and had several limitations, including small sample sizes, a variety of social support measures, and self-report questionnaires or pill counts to measure medication adherence, which may not provide the most accurate information.

In this study, we addressed these gaps by using a large sample, measuring social support with the valid and reliable Interpersonal Support Evaluation List (ISEL) (Cohen, 1985), and assessing medication adherence objectively with the Medication Event Monitoring System (MEMS). MEMS data were used to compute percentage of prescribed administrations/doses taken (dose adherence), percentage of days with the prescribed number of administrations/doses (days adherence), and percentage of days with the prescribed number of administrations/doses and optimal inter-dose intervals (on-time adherence).

2.1 PURPOSE

The purpose of this secondary analysis was to examine the association between social support and medication adherence in adults with RA.

The research questions were:

1) Is tangible support related to (a) dose adherence, (b) days adherence, and (c) on-time adherence?

2) Is appraisal support related to (a) dose adherence, (b) days adherence, and (c) on-time adherence?

3) Is self-esteem support related to (a) dose adherence, (b) days adherence, and (c) on-time adherence?

4) Is belonging support related to (a) dose adherence, (b) days adherence, and (c) on-time adherence?

5) Is total support related to (a) dose adherence, (b) days adherence, and (c) on-time adherence?

3.0 METHODS

3.1 DESIGN

This secondary analysis used a cross-sectional, descriptive, correlational design with data from a randomized controlled trial of a behavioral intervention to improve medication adherence in patients with RA. Permission for the secondary analysis was granted by the Principal Investigator, Dr. Jacqueline Dunbar-Jacob (NIH, R01 NR04554). University of Pittsburgh Human Research Protection Office approved this study.

3.2 SAMPLE AND SETTING

Convenience sampling was used in the parent study to obtain the study sample. The data in the parent study were collected from a community-based sample from 11/01/1999 to10/31/2003. The parent study screened 663 adults with RA. This study used data on 567 adults with RA who were enrolled in the parent study and had complete data on the social support and medication adherence variables. The nominal scaled categorical variables, such as sex, race, marital status, and employment status, and the continuous type variables, such as age and number of years of formal education, of subjects with complete data (n=567) and missing data (n=96) were compared and no significant differences were found. Therefore, for this study the subjects with

only complete data were included in the statistical analyses and were deemed representative of the full sample of the parent study.

3.3 MEASURES

The Interpersonal Support Evaluation List (ISEL) by Cohen (1985) was used to measure social support for this study. The ISEL consists of 40 statements regarding the perceived availability of social support. The items are half positive and half negative statements about social relationships in order to counterbalance for desirability (Cohen, 1985). The items were developed based on the domains of supportive social resources that could potentially facilitate coping with stressful events. Participants rate the statements as "definitely false," "probably false," "probably true," or "definitely true" about themselves. Each item is scored from 0 to 3.

The items on the ISEL are categorized into four 10-item subscales that comprise the separate components of social support. The "tangible" subscale captures the perceived availability of material aid. The "appraisal" subscale is the perceived availability of a person to speak to about one's problems. The "self-esteem" subscale is the perceived availability of a positive comparison when one compares himself or herself to others. Lastly, the "belonging" subscale is the perceived availability of people with whom one can do things (Cohen, 1985). The possible range for each subscale score is 0 to 30 with higher scores indicating greater social support. The possible range for the total score is 0 to 120. The ISEL is a widely used, valid and reliable instrument with internal consistency reliability of α=0.88 to 0.90 for the total score. Subscale alpha coefficients were 0.73 to 0.81 for tangible, 0.70 to 0.82 for appraisal, 0.62 to 0.73 for self-esteem, and 0.73 to 0.78 for belonging (Cohen, 1985). In the parent study, the

Cronbach's alpha coefficient was 0.94 for the total score, and the subscale Cronbach's alpha coefficients were 0.83 for tangible, 0.88 for appraisal, 0.79 for self-esteem, and 0.85 for belonging. Test-retest reliability based on Pearson correlation coefficients for two days, six weeks, and six months ranged from 0.70 to 0.87 for the total score, 0.49 to 0.78 for tangible, 0.60 to 0.84 for appraisal, 0.54 to 0.74 for self-esteem, and 0.65 to 0.68 for belonging (Cohen, 1985).

Medication adherence of RA drugs, such as prednisone, anti-tumor necrosis factor (TNF) drugs, and non-steroidal anti-inflammatory drugs (NSAIDs), was measured by using data collected from the Electronic Event Monitoring System (MEMS). MEMS allows the recording of percentage of prescribed administrations taken (dose adherence), percentage of days with the prescribed number of administrations (days adherence), and percentage of days with the prescribed number of administrations and optimal inter-dose intervals (on-time adherence). These recordings are made possible by the significant advances that have been made in the MEMS over the last few decades with current devices being small, microprocessor-based monitors (Dunbar-Jacob, Sereika, Rohay, & Burke, 1998). Each MEMS cap contains a battery-powered microprocessor chip that records the date (month, day, year) and time (hour, minute, second) of when the monitor is activated (Dunbar-Jacob et al., 1998). The monitor is activated by opening and closing of a pill vial cap that contains the chip. The date and time of opening and closing the cap is recorded to the nearest second. Multiple opening and closing of the cap within just a few seconds, for example due to loose fitting caps or repeated manual opening and closing, create rapid firings that are automatically filtered and not included in the adherence data. The monitors are able to store data for several months or even over a year. Data can be downloaded directly onto a computer for review and analysis (Dunbar-Jacob et al., 1998).

MEMS does not record medication ingestion, although the activation of the monitor serves as an indicator of ingestion (Dunbar-Jacob et al., 1998). This limitation could potentially put the adherence measures at risk for inaccurate data, if the pill bottle was opened but the medication was not taken. However, the monitors record each access to the medication vial so the patients would need to exert considerable effort in order to actually trick the system. They would have to activate the medication monitor at each correct administration time. Since most of the patients' poor adherence is due to forgetting, schedule disruptions, and other environmental interferences, the likelihood of the patients manipulating the MEMS in such a way is low (Dunbar-Jacob et al., 1998).

Obtaining medication adherence measured objectively with MEMS reveals information that may otherwise not be possible with alternative means of adherence measures, such as self-report questionnaires and diaries. Multiple studies have noted that adherence levels tend to be higher when assessed with self-report compared to objective measures such as MEMS. In one study examining the adherence to pilocarpine, nearly 90% of the sample reported 100% adherence with self-report. However, the eye drop monitor revealed just over 20% of the sample at 100% adherence (Dunbar-Jacob et al., 1998). Therefore, objective measures like MEMS are important in collecting accurate data for medication adherence.

3.4 PROCEDURES

In the parent study, subjects received the MEMS cap and were instructed to place the MEMS cap on their pill bottle containing the selected RA medication. They were informed to open the MEMS caps only to take the RA medication and to record in a diary any other openings or

missed doses. Subjects were instructed to use the MEMS cap for one month and then return it to the project office by mail. In addition, subjects received baseline questionnaires to complete and return by mail, which included a demographics questionnaire and the ISEL.

3.5 STATISTICAL ANALYSES

The MEMS data consist of the date and time of all activations of the MEMS cap. In the parent study, these values were then analyzed to derive the three measures of medication adherence. In the parent study, 30 days of MEMS data were collected. In order to calculate the baseline adherence, the first 7 days were dropped to allow the subjects to adapt to the use of the MEMS cap. Then the last day was dropped as well in order to prevent false readings due to an extra opening of the cap to turn it in or to avoid variations in data by turning it in before being due for a dose. Therefore, a total of 22 days of MEMS data were used in order to calculate the baseline adherence for this study.

Data were analyzed using IBM® SPSS® Statistics version 23 (IBM Corp., Armonk, NY). The level of significance for two-sided hypothesis testing was set at .05 and 95% was used for confidence interval estimation. Data were first carefully screened for any anomalies (e.g., outliers, nonnormality, and missing data) and remedial measures applied as necessary (e.g., data transformations, imputation). Appropriate descriptive statistics based on the variable's level of measurement and observed data distribution were used to summarize the sociodemographic characteristics of the sample, the ISEL total score and four subscale scores (tangible, appraisal, self-esteem, and belonging), and the three derived adherence measures (dose adherence, days adherence, and on-time adherence).

Subjects with complete data in this sample were compared to those with missing data in the parent sample on all variables using parametric two-sample t-tests for continuous type (ratio or interval scaled) variables and Chi-square tests of independence for nominal scaled categorical variables. Nonparametric Mann-Whitney U-tests were used for group comparisons of nonnormally distributed continuous type variables and ordinal scaled categorical variables.

Correlational analyses were used to examine the bivariate associations between the social support and adherence measures. Since the data were not normally distributed and normality could not be induced through data transformations, Spearman rank-order correlation coefficients were employed. Since some dose adherence values were greater than 100%, these values were folded so that the maximum dose adherence was 100%. For example, 110% was folded and became 90%.

Initially, univariate linear regression was performed to study the bivariate associations between the adherence measures (dose adherence, days adherence, and on-time adherence) and the social support measures (ISEL total score and subscale scores). However, the bivariate scatterplots indicated nonnormality for all of the associations between social support and medication adherence measures. Thus, log based 10 transformations of the adherence measures were done to see if the transformed variables helped to correct the nonnormality of model residuals. However, the log transformation did not help to solve the nonnormality of model residuals. Thus, univariate binary logistic regression was employed to model the probability of being adherent using dichotomized medication adherence data. In addition, multivariate logistic regression models were employed to examine which of the four ISEL subscale scores best predicted each of the dichotomized medication adherence measures. In addition to point

estimates to summarize associations such as correlation and regression coefficients, the corresponding 95% confidence intervals were obtained.

For the univariate and multivariate logistic regression models, the medication adherence variables were dichotomized into adherent and non-adherent categories due to the non-linearity of the data. For days adherence and on-time adherence, 80% was chosen as the adherence cut-off value with ≥80% classified as adherent and <80% classified as non-adherent. Since the value for dose adherence had the possibility of being over 100%, ≥80% and ≤120% were considered to be adherent and <80% or >120% was considered to be non-adherent.

4.0 RESULTS

4.1 SUBJECTS

The 567 subjects were on average 59.2 (SD=11.9) years old with 13.4 (SD=2.5) years of education. The subjects were primarily women (80.2%), white (92.8%), married (65.6%), and employed (30.9%).

4.2 DESCRIPTION OF SOCIAL SUPPORT AND MEDICATION ADHERENCE

Table 1 describes the subjects' social support and medication adherence. On average, the subjects had moderate to high social support in each of the four subscales, although the ranges were wide. Mean dose adherence was highest at 88.36% (SD=22.98) ranging from non-adherence at 0% to over-adherence at 163.64%. Mean days adherence was intermediate at 79.90% (SD=27.57, range 0 to 100), while mean on-time adherence was lowest at 58.80% (SD=34.42, range 0 to 95.45).

Table 1: Descriptive Statistics for Social Support and Medication Adherence (N=567)

Characteristic	Mean (*SD*)	Range
ISEL Scores		
Tangible*	24.69 (4.55)	9.00 - 30.00
Appraisal*	23.13 (5.44)	3.00 - 30.00
Self-esteem*	20.07 (4.43)	4.00 - 30.00
Belonging*	23.16 (4.78)	4.00 - 30.00
Total**	91.05 (16.67)	34.00 - 120.00
Medication Adherence		
Dose Adherence	88.36 (22.98)	0.00 - 163.64
Days Adherence	79.90 (27.57)	0.00 - 100.00
On-time Adherence	58.80 (34.42)	0.00 - 95.45

Note. ISEL=Interpersonal Support Evaluation List.
*Possible range 0-30.
**Possible range 0-120.

4.3 BIVARIATE CORRELATIONAL ANALYSES

Spearman rank-order correlations were used to examine the bivariate associations between the adherence measures and the ISEL total score. As shown in Table 2, no statistically significant correlations were found between social support and medication adherence.

Table 2. Spearman Rank-Order Correlations between Social Support and Medication Adherence (N=567)

ISEL Scores	Medication Adherence r_s (p)			
	Dose Adherence	Dose Adherence Folded	Days Adherence	On-time Adherence
Tangible	.050 (.232)	.067 (.110)	.064 (.128)	.043 (.302)
Appraisal	.023 (.587)	.041 (.335)	.057 (.175)	.009 (.827)
Self-Esteem	-.050 (.234)	-.029 (.493)	-.016 (.713)	-.030 (.472)
Belonging	-.006 (.884)	-.007 (.875)	.013 (.762)	.016 (.709)
Total	.008 (.850)	.019 (.651)	.034 (.420)	.008 (.848)

Note. ISEL=Interpersonal Support Evaluation List.

4.4 REGRESSION ANALYSES

Using univariate logistic regression analyses, none of the dichotomized adherence measures were significantly associated with the social support measures (Tables 3, 4, and 5). Although no significant associations were found with univariate logistic regression analyses, multivariate logistic regression analyses were used to examine which of the four ISEL subscale scores best predicted each of the dichotomized adherence measures (Table 6, 7, and 8). No significant predictor was found for days adherence; however, there were significant predictors for the other two adherence measures. For dose adherence, tangible social support was a significant predictor (OR=1.082, 95% CI=1.008 - 1.162). For on-time adherence, self-esteem social support was a significant predictor (OR=0.942, 95% CI=0.893 - 0.994).

Table 3. Univariate Logistic Regression of Social Support Predicting of Being Adherent based on Dose Adherence (N=567)

ISEL Scores	Dose Adherence		Univariate Logistic Regression Results		
	<80% or >120% Mean (*SD*) *n*=105	≥80% and ≤120% Mean (*SD*) *n*=462	Odds Ratio	95% CI	Wald Test Statistic X^2 (*p*)
Tangible	24.27 (4.73)	24.78 (4.50)	1.024	0.979 - 1.072	1.054 (.305)
Appraisal	23.30 (5.68)	23.09 (5.39)	0.993	0.955 - 1.033	0.120 (.729)
Self-esteem	20.61 (4.98)	19.95 (4.30)	0.966	0.920 - 1.015	1.894 (.169)
Belonging	23.28 (5.59)	23.13 (4.59)	0.994	0.950 - 1.039	0.078 (.780)
Total	91.46 (18.95)	90.95 (16.13)	0.998	0.985 - 1.011	0.081 (.776)

Note. CI=Confidence Interval; ISEL=Interpersonal Support Evaluation List.

Table 4. Univariate Logistic Regression of Social Support Predicting of Being Adherent based on Days Adherence (N=567)

ISEL Scores	Days Adherence		Univariate Logistic Regression Results		
	<80% Mean (*SD*) *n*=170	≥80% Mean (*SD*) *n*=397	Odds Ratio	95% CI	Wald Test Statistic X^2 (*p*)
Tangible	24.47 (4.63)	24.78 (4.51)	1.015	0.976 - 1.055	0.549 (.459)
Appraisal	22.90 (5.56)	23.23 (5.39)	1.011	0.979 - 1.045	0.449 (.503)
Self-esteem	20.26 (4.83)	19.99 (4.26)	0.986	0.947 - 1.028	0.428 (.513)
Belonging	23.01 (5.25)	23.22 (4.58)	1.009	0.972 - 1.048	0.228 (.633)
Total	90.63 (17.96)	91.22 (16.11)	1.002	0.991 - 1.013	0.150 (.698)

Note. CI=Confidence Interval; ISEL=Interpersonal Support Evaluation List.

Table 5. Univariate Logistic Regression of Social Support Predicting of Being Adherent based on On-time Adherence (N=567)

ISEL Scores	On-time Adherence		Univariate Logistic Regression Results		
	<80% Mean (*SD*) *n*=340	≥80% Mean (*SD*) *n*=227	Odds Ratio	95% CI	Wald Test Statistic X^2 (*p*)
Tangible	24.54 (4.66)	24.90 (4.38)	1.017	0.980 - 1.056	0.829 (.363)
Appraisal	23.07 (5.40)	23.22 (5.52)	1.005	0.975 - 1.037	0.114 (.736)
Self-esteem	20.23 (4.47)	19.84 (4.39)	0.981	0.944 - 1.019	1.024 (.312)
Belonging	23.03 (4.80)	23.35 (4.77)	1.014	0.979 - 1.051	0.618 (.432)
Total	90.86 (16.79)	91.32 (16.52)	1.002	0.992 - 1.012	0.105 (.746)

Note. CI=Confidence Interval; ISEL=Interpersonal Support Evaluation List.

Table 6. Multivariate Logistic Regression of Social Support Predicting of Being Adherent based on Dose Adherence (N=567)

ISEL Scores	Multivariate Logistic Regression Results		
	Adjusted Odds Ratio	95% CI	Wald Test Statistic X^2 (*p*)
Tangible	1.082	1.008 - 1.162	4.723 (.030)
Appraisal	0.987	0.926 - 1.051	0.175 (.675)
Self-esteem	0.936	0.874 - 1.003	3.561 (.059)
Belonging	0.990	0.909 - 1.078	0.054 (.817)

Note. CI=Confidence Interval; ISEL=Interpersonal Support Evaluation List.

Table 7. Multivariate Logistic Regression of Social Support Predicting of Being Adherent based on Days Adherence (N=567)

ISEL Scores	Multivariate Logistic Regression Results		
	Adjusted Odds Ratio	95% CI	Wald Test Statistic X^2 (*p*)
Tangible	1.021	0.961 - 1.085	0.470 (.493)
Appraisal	1.014	0.963 - 1.068	0.278 (.598)
Self-esteem	0.957	0.904 - 1.014	2.236 (.135)
Belonging	1.010	0.940 - 1.084	0.069 (.793)

Note. CI=Confidence Interval; ISEL=Interpersonal Support Evaluation List.

Table 8. Multivariate Logistic Regression of Social Support Predicting of Being Adherent based on On-time Adherence (N=567)

ISEL Scores	Multivariate Logistic Regression Results		
	Adjusted Odds Ratio	95% CI	Wald Test Statistic X2 (p)
Tangible	1.026	0.968 - 1.087	0.746 (.388)
Appraisal	0.993	0.945 - 1.044	0.072 (.788)
Self-esteem	0.942	0.893 - 0.994	4.714 (.030)
Belonging	1.041	0.972 - 1.114	1.332 (.248)

Note. CI=Confidence Interval; ISEL=Interpersonal Support Evaluation List.

5.0 DISCUSSION

The present study was conducted to determine the association between social support and medication adherence in adults treated for RA. This study showed no significant bivariate association between the adherence measures and the ISEL social support measures using correlational analyses or univariate logistic regression analyses. However, when all four ISEL subscales were examined with each of the adherence measures, significance was found in two subscales. For every one point increase in tangible support (based on the ISEL tangible subscale), the odds of being adherent to RA medications based on dose adherence at baseline are estimated to increase 1.082 times, controlling for the other ISEL subscale measures. Tangible support is determined by statements such as, “If I needed help fixing an appliance or repairing my car, there is someone who would help me.” In addition, the odds of being adherent to RA medications based on on-time adherence at baseline are estimated to be 0.942 less with a one unit increase in self-esteem support (based on the ISEL self-esteem subscale), controlling for the other ISEL subscale measures. Self-esteem was measured with statements such as, “I am as good at doing things as most other people are.” These results may be due to controlling for the effect of other social support subscale measures that may be related to alternate variables affecting the associations between the medication adherence and social support.

Although most of the previous studies that examined associations between social support and medication adherence did not have significant findings, the study by Chen and Wang (2007)

found a positive association, similar to this present study. All of the previous studies had small samples and measured adherence through self-report or pill count, which are prone to recall bias and pill dumping, respectively. For this study, a large sample was used, medication adherence to RA drugs was measured objectively through the use of MEMS, and social support was measured by using the valid and reliable ISEL. Therefore, the results obtained through this study are more meaningful than past studies.

One of the limitations of this study is that although the ISEL is a valid and reliable social support measure, it is not specific to medication adherence regimens. Perhaps a social support measure that is more relevant to medication self-management and adherence would be able to demonstrate more accurate associations between social support and adherence. Second, the correlational design of this study does not permit causal inferences to be made between social support and medication adherence.

Future studies could be designed to explore the roles of tangible and self-esteem social support on medication adherence. A better understanding of these relationships may help to inform interventions intended to mobilize social support.

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