12-5-2005

Multilevel Analysis of Couple Congruence on Pain, Interference, and Disability

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Published in final edited form as:
Pain. 2005 December 5; 118(3): 369–379. doi:10.1016/j.pain.2005.09.003.

Multilevel analysis of couple congruence on pain, interference, and disability

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Abstract

Couple congruence on ratings of pain severity and disability were examined using hierarchical linear modeling. Older community Individuals with Chronic Pain (ICPs) and their spouses completed the Multidimensional Pain Inventory (pain severity, interference, negative spouse responses to pain), Sickness Impact Profile (physical disability, psychosocial disability), and the Mood and Anxiety Symptom Questionnaire (psychological distress). Both spouses reported on ICPs' pain and disability as well as their own psychological distress. Spousal incongruence was observed on interference and physical disability such that ICPs reported greater disability than their spouses reported for them. No significant incongruence was observed in pain severity or psychosocial disability. Predictors of couples' mean ratings of pain and disability were identified. Specifically, couples in which the ICP was female reported higher couples' ratings of pain severity and interference. ICP distress was related to higher couples' ratings of all pain and disability variables whereas spouse distress was related to higher psychosocial disability ratings. ICPs' perceptions of negative spouse responses were also positively associated with couples' ratings of physical and psychosocial disability. In terms of congruence, ICP distress was associated with incongruence on interference, physical disability, and psychosocial disability whereas spouse distress predicted incongruence on pain severity, and interference. This study suggests that understanding couples' pain outcome ratings involves an awareness of factors that might influence their perceptions and behaviors.

Keywords

Pain severity; Psychosocial disability; Psychological distress; Couples; Congruence

1. Introduction

Individuals with chronic pain (ICPs) and their caregivers are often incongruent in their ratings of ICPs' pain and physical disability (Cano et al., 2004b; Clipp and George, 1992; Cremeans-Smith et al., 2003; Miaskowski et al., 1997; Riemsma et al., 2000; Yeager et al., 1995). In addition, female and depressed patient couples report more incongruence than male patient couples and nondepressed patient couples (Cano et al., 2004b). However, researchers have not examined the simultaneous role of ICP and spouse psychological distress on couple congruence nor have spouse responses to pain been examined as moderators of congruence. The study of couples' ratings of the pain experience can provide insight into the interpersonal context of pain. For instance, couple incongruence might generate more interpersonal distress or affect the degree to which spouses become involved in their partners' healthcare.

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Following cognitive–behavioral theory, depression may be one variable that affects couples' ratings of the pain experience. Depression can cause negatively biased schemas to become dominant (Beck, 1987) and may lead to more consistently negative interpretations of events (Sheppard and Teasdale, 1995; Teasdale, 1993). Therefore, distressed ICPs and spouses may perceive ICP pain and disability as more severe. Depression can also result in social withdrawal of the depressed person (Joiner and Coyne, 1999), leading to more incongruence within couples. While both partners' psychological distress have not been addressed simultaneously in the congruence research, ICPs and their caregivers report more distress when they are incongruent on pain and disability ratings (Cano et al., 2004b; Miaskowski et al., 1997; Riemsma et al., 2000).

ICP gender may also be important in couples' experiences of pain. Women report more pain and physical disability than men in experimental and clinical pain studies (Keefe et al., 2000; Wise et al., 2002). Women are also more accurate at perceiving their husbands' thoughts and feelings than husbands are at perceiving their wives' inner experiences (Bernieri et al., 1994; Hall, 1978; Ickes et al., 2000). Therefore, women may be evaluated by both partners as having more pain and disability and male ICP couples may experience more congruence than female ICP couples.

Finally, pain-specific interactions might play a role in couples' ratings. Spouses' negative reactions to ICPs' pain are related to ICPs' appraisals of pain, disability, and mood (Burns et al., 1996; Cano, 2004; Cano et al., 2000, 2004a; Flor et al., 1987; Kerns et al., 1990; Romano and Turner, 1985; Turk et al., 1992), suggesting that couples' ratings would be greater when negative spouse responses are reported. In addition, couples might be more incongruent in the presence of more negative spouse responses because such responses may be a result of spouses' underestimation of illness severity.

The goals of this study were to examine the correlates of (1) couples' mean ratings of ICP pain and disability and (2) incongruence within couples using multilevel modeling. It was expected that mean ratings and incongruence would be related to elevated psychological distress in ICP or spouse, ICP gender, and greater negative spouse responses to pain.

2. Method

2.1. Participants

Participants were 84 married couples recruited from the community through newspaper advertisements. A subset of the ICPs (not spouses) participated in Cano (2004) and Geisser et al. (in press). At least one of the partners experienced chronic musculoskeletal pain of at least 6 months duration. The minimum eligible age for ICPs was 55 years of age. The definition of ‘older adults’ appears to be fluid in the gerontology literature with some studies of aging including adults as young as 50 (Bookwala, 2005; Prigerson et al., 2000; Wurm et al., 2004). As noted by Walco and Harkins (1999), some healthcare professionals may not refer older adults to multidisciplinary pain clinics because the latter are not viewed as good candidates for pain treatment; therefore, findings based on clinic samples may not be representative of the broader population with pain. Recruitment of older samples from the community is necessary to improve our knowledge about this under-treated segment of ICPs and to identify characteristics of couples that could be addressed in treatment.

The majority of ICPs were female (n=54, 64.3%) and mean pain duration was 11.89 years (SD=13.38). The mean age of ICPs and their spouses was 66.18 years (SD=7.12) and 65.29 years (SD=9.32), respectively. The sample was predominantly Caucasian (ICP: n=63, 75%; spouse: n=64, 76.2%). Approximately, 18% of ICPs (n=15) and 18% of spouses (n=15) were African–American and approximately 7% identified other racial/ethnicity categories. On

average, ICPs and their spouses reported some college education (ICP: M=14.51 years, SD=2.93; spouse: M=14.82, SD=3.25). Mean family income was $59,865 (SD=$40,888). The majority of the ICPs and spouses were retired (ICP: n=41, 48.8%; spouse: n=46, 54.8%), but many were employed full-time (ICP: n=46, 54.8%; spouse: n=16, 19%).

The most common pain diagnoses in ICPs were Osteoarthritis (42%, n=35), spine and disc problems such as degenerative disc disease and spinal stenosis (13%, n=11), pinched nerves (8%, n=7), and Fibromyalgia (4%, n=3). Twenty-two spouses (26%) of the identified ICPs also reported a pain diagnosis, although the pain was not always musculoskeletal in nature. The most common diagnoses in spouses were Osteoarthritis (13%, n=11) and nerve problems (10%, n=8). The most common pain sites were low back (ICPs: 41%, n=34; Spouses: 8%, n=7), knees (ICPs: 14%, n=12; Spouses: 10%, n=8), and hips (ICPs: 13%, n=11; Spouses: 2%, n=2).

2.2. Measures

Multidimensional Pain Inventory-Patient Version (Kerns et al., 1985) and Multidimensional Pain Inventory -Spouse Version (Kerns and Rosenberg, 1995). The 52-item MPI-Patient Version and MPI-Spouse Version assess a variety of psychosocial components of the chronic pain experience. The MPI subscales have good construct and discriminant validity, internal consistency, and test–retest reliability (Kerns and Jacob, 1992; Kerns et al., 1985). The 3-item pain severity subscale was used to assess ICPs' and spouses' perceptions of ICPs' current pain severity and intensity. Pain severity was rated using 7-point Likert-type scales (e.g. 0=not at all severe, 6=extremely severe). Two of the items referred specifically to the past week or the time of study participation. In the current study, inter-item reliabilities for both ICP and spouse scales were excellent (pain severity-ICP: α=.81; pain severity-spouse: α=.90).

The 9-item *interference* subscale was used to assess the degree to which ICPs and spouses perceived the pain to interfere with or change ICPs' satisfaction with and ability to engage in everyday, work, social, and interpersonal activities. Participants were not directed to a specific time frame on which to report but they most likely reported about current interference as these items were imbedded in Section 1 of the MPI, which contained other items referring to the past week. Responses ranged from 0 (No change) to 6 (Extreme change). Again, inter-item reliabilities were excellent (interference-ICP: α=.93; interference-spouse: α=.92).

The *negative spouse responses to pain* subscales assessed perceptions of negative or punishing spouse responses (four items). Participants used a 7-point Likert-type scale to indicate the frequency (i.e. 0=Never, 6=Very Often) with which spouses responded to the ICPs with anger, frustration, or irritation when the ICP was in pain. Participants were not given a particular timeframe (e.g. in the last week) on which to report; however, it is likely participants reported on spouse behaviors that occurred at the time of interview or in the very recent past. The inter-item reliabilities were adequate for ICPs' reports of how their spouses responded to them (α=.86) and for spouses' reports of how they responded to the ICPs' pain (α=.76). Since spouse responses are relational in nature, the perceptions of both the spouse and the ICP should be accounted for in relating to couple congruence on pain and disability.

Sickness Impact Profile-Patient Version (Bergner et al., 1981) and Sickness Impact Profile-Spouse Version (Romano et al., 1989). The SIP is a measure of disability and functional impairment that has good convergent and discriminant validity and excellent inter-item and test–retest reliabilities (Bergner et al., 1981; Kerns and Jacob, 1992). The spouse version is also psychometrically sound (Romano et al., 1989). Participants were instructed to identify the presence of behaviors that characterized the ICP on the day of assessment. Following Bergner et al. (1981), each item was weighted indicating the degree to which the behavior affects daily life and then items within each subscale were summed. The following SIP subscales were used

in the current study: *physical disability* (45 items; i.e. disability in ambulation, body care and movement, mobility) and *psychosocial disability* (48 items; i.e. social interaction, communication, alertness, emotion). The inter-item reliabilities of the physical disability subscales for ICPs and spouses were excellent (alphas=.88 and .89, respectively). Similarly, inter-item reliabilities for ICPs and spouses on psychosocial disability were excellent (alphas=.88 and .87, respectively).

The correlations between MPI interference and SIP physical disability (ICPs: r=.57, spouses: r=.48) and between MPI interference and SIP psychosocial disability (ICPs: r=.59, spouses: r=.48) were moderate, indicating that that they measure different aspects of disability and activity limitations. While the SIP disability scales measure behavioral limitations of ICPs, the MPI interference scale appears to assess a more subjective perspective of the changes in satisfaction with activities. Differences in findings for the SIP scales and for the MPI interference scale may provide some evidence that congruence is affected by the degree of subjective appraisal of disability. The physical and psychosocial subscales of the SIP were also moderately correlated for both ICPs and spouses (r=.56 and .61, respectively). The use of the two SIP scales may indicate that couples' perceptions of physical versus psychosocial limitations are more vulnerable to contextual factors such as distress, gender, and spouse responses.

Mood and Anxiety Symptom Questionnaire (MASQ, Watson and Clark, 1991). The General Distress scale (18 items) was used to assess psychological distress. This scale consists of items representing depressive and anxiety symptoms that are commonly considered psychological distress. Participants used a 5-point Likert-type scale (e.g. 1=not at all; 5=extremely) to identify the extent to which they experienced each symptom in the past week. The MASQ has good convergent and discriminant validity, reliability, and a stable factor structure in different populations including chronic pain samples (Geisser et al., in press; Watson et al., 1995a,b). In the current sample, the general distress subscale had good inter-item reliability for ICPs (α=.83) and spouses (α=.89).

2.3. Procedure

Participants were recruited through newspaper advertisements in a large metropolitan area in the Midwest. Potential participants were screened over the telephone to determine their eligibility. Eligible couples denied current psychotic symptoms, denied terminal illness, and demonstrated adequate cognitive functioning with verbal items of the Mini-Mental Status Exam (Folstein et al., 1975). Adequate cognitive function was estimated with a minimum score of 18 out of the 20 points that could be earned for verbal responses. If both partners reported chronic musculoskeletal pain, each partner was then asked about the severity of the pain condition. The partner experiencing the more severe or debilitating pain as reported by both partners was then identified as the ICP. For clarification purposes, the term ‘spouses’ is used to refer to the spouses of ICPs whereas ‘partners’ is used to refer to both members of the couple throughout the rest of the paper. Eligible and interested participants completed consent forms prior to participation. Some participants mailed in their surveys and others completed the surveys at the first author's laboratory. Participants were provided with referrals and were financially compensated upon completion of the surveys.

2.4. Data analysis plan

The measures were normally distributed with the exception of physical and psychosocial disability, which were significantly and positively skewed. A log transformation improved the distributional qualities of these two variables. The results based on transformed physical and psychosocial disability are presented but dissimilarities with the untransformed results are noted. Effect size d is included in the tables to provide additional information about the strength

of associations, with .20, .50, and .80 suggesting small, medium, and large effects, respectively (Cohen, 1988). Continuous explanatory (i.e. independent) variables were then grand mean centered (i.e. the mean on the scale=0) to aid in the interpretation of the results. This approach allows the unstandardized regression coefficients (i.e. Bs) for the couple mean and congruence to represent the overall sample mean and congruence scores on the particular scale used for that analysis. In addition, ICP gender was dummy coded so that a 0 indicated a female ICP whereas a 1 indicated a male ICP.

Hierarchical linear modeling (HLM) was used to test the hypotheses. Maguire (1999) has demonstrated that HLM is the analysis of choice for examining congruence and the direction of dyad member difference. Difference scores were not used because the two scores used to create the difference score are often more reliable than the difference score. In addition, classifying couples into groups based on difference scores (e.g. no or small discrepancy vs. large discrepancy; no discrepancy vs. patient>spouse vs. spouse>patient) as performed by several research groups (Cremeans-Smith et al., 2003; Miaskowski et al., 1997; Riemsma et al., 2000) may result in lost statistical power because the full range of scores are not used. Ordinary least squares (OLS) procedures such as correlations, paired samples *t*-tests, analysis of variance (ANOVA), and repeated measures ANOVA analyses have also been used to examine congruence (Cano et al., 2004b; Clipp and George, 1992; Riemsma et al., 2000; Yeager et al., 1995). However, standard errors can be underestimated in these procedures, especially if there is a great deal of variance within couples, leading to biased estimates of coefficients and a greater risk of Type I errors. Moreover, heterogeneity of regression is assumed to be absent in OLS, meaning that there should be a consistent relationship between ICP and spouse variables across couples, which is unlikely to be the case. Multilevel modeling has several advantages over these methods including the enhanced estimation of models and standard errors and the more accurate estimation of between- and within-couple variance. Multilevel modeling accounts for the nonindependence of partners within a couple and can be used to estimate simultaneously couples' mean ratings and congruence, thus reducing Type I error. Previous congruence research using ANOVA and similar statistical techniques focused only on within-couple congruences. However, multilevel analysis of between-couple means can demonstrate whether there is significant variation in the way couples rate pain and disability. In addition, variables that might affect couples' means can be investigated. Therefore, the results of this study are expected to provide a more accurate picture of couple congruence.

To conduct HLM with cross-sectional dyadic data, two data points per measure for each spouse are needed in order to fit a regression line for each spouse within the couple. Therefore, two parallel scales were constructed for each of the SIP disability measures as demonstrated in existing multilevel studies of cross-sectional dyads (Barnett et al., 1993; Lyons et al., 2002; Sayer and Klute, 2005) and longitudinal dyads (Raudenbush et al., 1995). Parallel scales were created by splitting the items for each scale into two groups. First, pairs of items were matched on their standard deviations. Second, one item from each pair was randomly assigned to a separate scale. This procedure resulted in two scales each for physical disability and psychosocial disability for ICPs and spouses. The random assignment meant that each parallel scale consisted of items having similar variance and reliability. Indeed, the physical disability alphas ranged from .78 to .80 and the psychosocial disability alphas ranged from .76 to .80. Thus, the parallel scales demonstrated adequate inter-item reliability.

In the cases of pain severity (three items) and interference (nine items), there were not enough items to construct parallel scales. There is an alternative method used to estimate measurement error variance that bypasses the necessity of having enough items in the scale to create two data points per person (i.e. parallel scales). Rather than having the program estimate the error variance, the user supplies an estimate of the measurement error variance under the ‘known

variance' option available in the HLM program. The error variance for the outcome scale is calculated as ([1–reliability]×observed variance). The program then creates a precision weight, which is the reciprocal of the error variance, and carries out a weighted analysis. This strategy has been used successfully in other multilevel modeling studies with dyads (Goldberg and Sayer, in press; Lyons and Sayer, 2005).

HLM 6 (Raudenbush et al., 2004) was used to analyze the data. The Level 1 model was examined first to determine whether there was significant variation across couples in mean ratings of pain, interference, and disability and whether there was variation in the ICP-spouse ratings (i.e. congruence) across couples. The Level 1 model is also called the baseline model because it is the starting point from which to examine means and congruences. If there is no significant variation across couples in mean ratings or congruences, OLS analytic strategies such as ANOVA could be used instead (Raudenbush and Bryk, 2002). If there is significant variation at Level 1 across couples in means, congruences, or both, Level 2 equations can be conducted to determine whether couples' variables account for that variation.

The baseline Level 1 equation is as follows:

$$Y_{ij}=\beta_{0j}+\beta_1\,(\text{Spouse ID})+r_{ij}$$

In the case of physical disability, Y_{ij} is the rating of the ICP's physical disability made by spouse i in couple j. β_{0j} is the mean on physical disability for couple j when β_1=0 (i.e. held constant). The 'Spouse ID' term was coded as .5 for the ICP and −.5 for the Spouse; therefore, the couple average is provided when Spouse ID=0 (i.e. held constant). β_1 is the slope indicating the difference between ICP and spouse in couple j, and r_{ij} is the residual or unpredicted variance in Y_{ij}. For pain severity and interference, r_{ij} was not estimated because the analysis included a weighting for error variance as described earlier.

Auxiliary statistics were also calculated at Level 1 to describe the association between couple mean and congruence (r). For instance, it may be the case that higher couple mean ratings are correlated with greater incongruence. The reliabilities of the mean and congruence coefficients (ρ) were also computed. These reliabilities are different from alpha coefficients for single measures in that they represent the proportion of observed variance to true variance in each parameter (i.e. β_{0j}, β_{1j}). Reliabilities of .45 and greater have been used as indicators of acceptable reliability of coefficients in previous research (Karney and Bradbury, 2000). Last, the Level 1 residual terms, u_0 and u_1, are particularly important auxiliary statistics because they represent the unexplained between-couple variance in mean ratings and congruence, respectively. Significant residual terms indicate significant variation across couples and suggest that sources of this variation should be examined (Raudenbush and Bryk, 2002).

Because significant variation across couples was found in the current study, each couple's estimates in the Level 1 equation (i.e. β_{0j} [couple mean], β_1 [couple incongruence]) were then predicted by the grand means for the entire sample plus residuals with the Level 2 equations. Explanatory variables may be added at Level 2 to explain the significant variation across couples in mean ratings and in mean congruences between ICPs and spouses. In the current study, we examined three sets of explanatory variables including gender of the ICP, psychological distress of ICP and spouse, and negative spouse responses of ICP and spouse. In other words, the Level 2 equations consist of the following:

$$\beta_{0j} = \gamma_{00} + \gamma_{01}\,(\text{ICP Gender}) + \gamma_{02}\,(\text{Psychological Distress} - \text{ICP}) + \gamma_{03}\,(\text{Psychological Distress} - \text{Spouse}) + \gamma_{04}\,(\text{Negative Spouse Responses} - \text{ICP}) + \gamma_{05}\,(\text{Negative Spouse Responses} - \text{Spouse}) + u_{0j}$$

$$\beta_{ij} = \gamma_{10} + \gamma_{11}\,(\text{ICP Gender}) + \gamma_{12}\,(\text{Psychological Distress} - \text{ICP}) + \gamma_{13}\,(\text{Psychological Distress} - \text{Spouse}) + \gamma_{14}\,(\text{Negative Spouse Responses} - \text{ICP}) + \gamma_{15}\,(\text{Negative Spouse Responses} - \text{Spouse}) + u_{ij}$$

In these cases, γ_{01} through γ_{05} indicate the influence of ICP gender, couples' psychological distress, and perceptions of negative spouse responses on couples' mean ratings of pain, interference, or disability while γ_{11} through γ_{15} indicate the influence of these variables on the congruence between partners' ratings. The coefficient for each explanatory variable, γ, is interpreted just as an unstandardized *B* coefficient is interpreted in multiple regression. That is, for every one-unit increase in the explanatory variable, there is a particular unit change in couples' average ratings and in congruences within couples. This approach to analyzing the data is similar to a simultaneous multiple regression approach, the aim of which is to determine unique variance in a dependent variable accounted for by several variables, controlling for the effect of other explanatory variables. The effect of each variable is estimated given that the other variables are held at 0. Because of the dummy coding for gender and the mean centering of variables, the effect of each variable is estimated when the ICP is a female and when the other independent variables are held at their means. As in the Level 1 equations, significant residual terms (i.e. u_0, u_1) at Level 2 suggest that variables not included in the equations might explain additional variance in mean ratings and congruence. The significance level was set at $P<.05$ for the four (4) HLM analyses.

3. Results

3.1. Multilevel modeling of pain severity

Auxiliary statistics derived from the baseline model were examined first. The correlation estimate between couples' mean pain severity and congruence was −.17, indicating that higher couples' ratings of ICP pain were slightly related to spouses rating the pain as more severe than ICPs. The reliabilities of the estimates of couples' mean (β_{0j}) and congruence scores (β_{1j}) were .90 and .71, respectively.

The baseline models for pain severity and the other variables are shown in the first set of columns of Table 1. The mean rating across couples on pain severity was 3.40, which is at the midpoint on the pain severity scale (scale ranged from 0 to 6). On average, ICPs and spouses did not report significantly different ICP pain severity scores. However, significant random effects for couples' means and congruences indicated that there was significant variation across couples that could be explored.

Simultaneous regression results were then conducted to determine whether Level 2 variables explained between-couples variance in means and congruences. Couples in which the ICPs were female reported significantly more ICP pain (see Table 1, Level 2 Model column). In addition, higher ICP psychological distress was associated with higher couple means on pain severity. These were medium effects as indicated by effect size *d*. When examining the congruence between ICPs and spouses, only spouse psychological distress was significant.

That is, higher spouse distress was associated with spouses rating the pain as more severe than the ICP. This was a large effect. The model with Level 2 explanatory variables was a significantly better fit compared to the baseline model, χ^2 (df=10)=37.54, *P*<.0001. Approximately 28% of the variance in couple means and 22% of the variance in couples' congruence was accounted for by the set of Level 2 variables. However, the random effects (i.e. residuals) remained significant, indicating that other variables not assessed in this study may also affect the variance across couples on mean pain severity ratings and congruence within couples.

3.2. Multilevel modeling of interference

The correlation estimate between couple mean interference scores and congruence was −.01, indicating that these two estimates were not related to one another. The reliability estimates of couples' mean and congruence were .95 and .84.

The baseline interference model indicated that the mean couple rating of interference was 2.84, just below the scale midpoint (the scale ranged from 0 to 6; see Table 2). Unlike pain severity, there was a significant difference between ICPs and their spouses with ICPs reporting that the pain interfered with their daily life significantly more than reported by spouses. Analysis of the random effects indicated that a significant amount of variance in mean ratings and congruence remained unexplained.

The Level 2 model showed that couples in which the ICP was a female rated her interference higher than couples in which the ICP was a male (see Table 2). Similarly, psychological distress in the ICP was associated with elevated couples' ratings on interference. These effects were medium to large. Congruence results showed that ICP and spouse psychological distress were associated with incongruence (both medium effects) albeit in different directions. ICPs' distress was associated with the ICPs rating their interference higher than their spouses. Spouses' distress was associated with spouses rating the interference higher than the ICPs. The addition of the Level 2 explanatory variables improved the fit of the model significantly, χ^2 (df=10) =52.07, *P*<.0001. The group of Level 2 variables accounted for 37% and 21% of the variance in means and congruences, respectively. Despite inclusion of these variables in the regression, there was still significant variance that was unaccounted for.

3.3. Multilevel modeling of physical disability

The correlation between couples' mean physical disability and congruence was −.05, indicating that couple mean was not associated with couple congruence. Couples' means were reliably estimated (.92). The degree to which the congruences for each couple were estimated was lower but still acceptable for further analysis (.49). Seventy-three percent of the variance in couples' mean physical disability ratings was accounted for by between-couples variance. This means that there was more variance between couples in physical disability ratings than within couples.

The baseline model showed that ICPs and their spouses reported significantly different ratings of physical disability, with ICPs reporting themselves as more disabled than their spouses reported them to be (see Table 3). Significant random effects indicated that other variables might account for the incongruence across couples.

The addition of Level 2 variables revealed that greater ICP distress, a medium effect, and perceptions of negative spouse responses, a large effect, were related to elevated couples' mean ratings of ICP physical disability (see Table 3). In addition, elevated ICP distress was associated with ICPs rating their physical disability as more severe than their spouses, a medium effect. The group of Level 2 variables accounted for 31% and 27% of the variance in means and congruences, respectively. As compared to the baseline model, the model with Level 2

explanatory variables was a better fit, χ^2 (df=10)=41.67, *P*<.0001. Significant unexplained variance remained, suggesting that other variables might account for the variation across couples on mean ratings and incongruence.

Incidentally, when the results with untransformed physical disability were examined, two effects disappeared. First, the congruence between ICPs and their spouses did not achieve significance in the baseline model (Coefficient=.39, SE=.21, *t*=1.86, *P*<.07). Second, ICP distress was no longer significant in relating to couples' mean (Coefficient=.05, SE=.03, *t*=1.71, *P*<.09). The skew in physical disability was likely masking the congruence and distress effects, providing evidence that the transformation allowed for a more accurate representation of the data.

3.4. Multilevel modeling of psychosocial disability

The correlation between couple mean psychosocial disability and congruence was .02, indicating that couple mean was not associated with couple congruence. The reliability estimates of couples' mean and congruence were .88 and .55, respectively. As with physical disability, between-couples variance (65%) accounted for most of the variation in psychosocial disability scores. Unlike interference and physical disability, ICPs and spouses were congruent on psychosocial disability (see Table 4). However, significant random effects indicated that there was significant variation across couples in both means and congruence and suggested further testing to determine the nature of this variation.

As shown in the second set of columns in Table 4, elevated psychological distress in both partners and ICP's perceptions of negative spouse responses were positively related to couples' ratings of psychosocial disability. The effect for ICPs' psychological distress was large, whereas the other two effects were medium. In addition, ICP distress was related to ICPs rating their psychosocial disability as more severe than their spouses rated it, a medium to large effect. This simultaneous regression model was a significantly better fit than the baseline model, χ^2 (df=10)=61.88, *P*<.0001, with the group of Level 2 variables accounting for 59% and 20% of the variance in means and congruences, respectively. However, significant unexplained variance remained, suggesting that other variables might also account for the variation in mean ratings and incongruence.

When the results with untransformed physical disability were examined, three effects correlating with couples' mean were different. Spouse distress was no longer significant in relating to couples' mean (Coefficient=.03, SE=.03, *t*=1.17, *P*<.25). On the other hand, ICP and spouse reports of negative spouse responses were significant correlates of couples' mean (ICP Coefficient=.10, SE=.04, *t*=2.67, *P*<.01 and spouse Coefficient=.09, SE=.05, *t*=2.07, *P*<.05). The skew in psychosocial disability was likely masking the effect of spouse distress but spuriously inflating the effects of ICP and spouse perceptions of negative spouse responses.

Because a sizeable number of spouses also had pain, we reran these HLM analyses to test whether the presence of a pain problem in the spouses affected the mean couple ratings or incongruence findings. Whether the spouse had pain or not was not significantly related to couple mean or incongruence. This finding was repeatedly found for all four outcomes (pain severity, interference, physical disability, and psychosocial disability). Similar findings were found when examining employment status.

4. Discussion

Researchers have become interested in factors that might affect couples' experiences of chronic pain including how both partners perceive the pain and disability. In this study, hierarchical linear modeling (HLM) was used to simultaneously examine older couples' mean ratings and

couple congruence on ICPs' pain severity, interference, and disability. Few published studies of couples and pain have used this technique despite the fact that HLM is uniquely suited to examine these issues. As expected, baseline models showed that ICPs reported more interference and physical disability than the spouses reported. This finding replicates physical disability results in a younger pain clinic patient sample (Cano et al., 2004b). Contrary to previous studies which did not use multilevel modeling techniques (Cano et al., 2004b; Clipp and George, 1992; Cremeans-Smith et al., 2003; Miaskowski et al., 1997; Yeager et al., 1995), couples were not significantly incongruent on pain severity. Similarly, couples were not significantly incongruent on psychosocial disability. While the pain severity finding became significant when other variables were entered, the psychosocial disability finding remained whether or not additional variables were included. The psychosocial disability of one spouse may affect the social activities of the other; therefore, both partners may be more likely to agree on the extent of this type of disability.

The use of HLM also allowed an investigation of variables that might relate to couples' ratings and congruence. We expected that both partners' psychological distress would be related to couples' mean ratings and couples' incongruence on pain and disability. Indeed, ICPs' psychological distress was positively related to higher couples' ratings of all pain and disability variables. Psychological distress in the patient might translate into greater disability and pain that is noticed by both partners (Patrick et al., 2004). Furthermore, ICP distress was significantly related to incongruence such that distressed ICPs rated their interference, physical disability, and psychosocial disability as more severe than their spouses. This is an especially robust effect when it is recalled that the analysis controlled for ICP gender, spouse distress, and perceptions of negative spouse responses. These findings replicate existing research (Cano et al., 2004b; Cremeans-Smith et al., 2003; Riemsma et al., 2000) and support cognitive theories of depression (Beck, 1987; Sheppard and Teasdale, 1995; Teasdale, 1993), suggesting that distress might adversely affect ICPs' appraisals of their disability, whether these appraisals involve satisfaction with different activities or simply the presence of behaviors. Continued research is needed to determine the perceptual and interpersonal processes fueling the incongruence (e.g. communication). In contrast to the findings related by Cremeans-Smith et al. (2003) but consistent with those by Cano et al. (2004b), ICP distress did not moderate the incongruence of pain severity. Perhaps, both partners' perceptions of the ICPs' pain are affected similarly by ICP distress in musculoskeletal pain samples.

A different pattern of findings emerged for spouse psychological distress. Spouse distress was related to higher couples' mean ratings of psychosocial disability but not to the means of the other pain and disability variables. ICP psychosocial disability, which includes social interaction, may affect spouses' appraisals about the relationship, thereby affecting spouse distress. As expected, spouse distress was related to spousal incongruence in pain severity and interference ratings. When spouses were distressed, they rated ICP pain and interference higher than the ICPs. Following cognitive theorists (Beck, 1987; Sheppard and Teasdale, 1995; Teasdale, 1993), distress in the perceiver might lead to more negative appraisals of negative events, even those occurring to a close other. The spouse distress effect was not observed in physical or psychosocial disability ratings. While distress in the observer may not impair one's ability to perceive disability behaviors, it may impair one's ability to accurately judge thoughts and feelings about the pain and disability.

With respect to gender effects, couples' mean ratings of ICP pain severity and interference were significantly higher when the ICP was female than when the ICP was male. These findings extend the previous work demonstrating gender differences in pain perception among individuals (Keefe et al., 2000; Wise et al., 2002) to couples. However, no significant effects for ICP gender were found in correlating with disability mean ratings or any of the congruences. This is surprising because previous research suggested that female gender was related to

incongruence on reports of pain and physical disability (Beaupre et al., 1997; Cano et al., 2004b). In addition, research suggested that men are more likely to engage in defensive distancing (Whitehead and Smith, 2002) and are not as accurate as women in perceiving others' internal states (Bernieri et al., 1994; Hall, 1978; Ickes et al., 2000). Perhaps, gender differences are not as striking in community samples of ICPs because their pain and disability is not as severe as in pain clinic samples. Alternatively, OLS methods in previous studies could not account for simultaneous effects of patient and spouse variables that might account for gender effects.

ICPs' perceptions of negative spouse responses were related to higher couples' mean ratings of physical and psychosocial disability but not to pain severity and interference. These findings are similar to those demonstrating that support dissatisfaction was related to disability in older adults (Jang et al., 2003). Negative spouse responses as reported by both partners were not significantly related to mean ratings of pain and interference or incongruence in any of the measures. Whereas significant correlations between negative spouse responses and pain and disability have been reported in other studies (Burns et al., 1996; Cano, 2004; Cano et al., 2000; Flor et al., 1987), the effect of spouses' perceptions of the responses may have been accounted for by patients' perceptions or other variables in the multilevel modeling analyses in the current study. Continued research may provide additional information about the direct and indirect effects of relational variables on ratings of pain and disability.

Several limitations of the study deserve consideration. The fact that this study of older participants (i.e. at least 55 years old) in the community yielded ICP distress results similar to a study of younger sample of patients from a multidisciplinary pain clinic (Cano et al., 2004b) suggests that the findings are generalizable to ICPs in different settings. However, it should be noted that the current sample was self-selected. It remains to be seen if findings are generalizable to participants who may not have volunteered because of serious depression or disability, concerns about travel, or unwillingness of the spouse to participate. It will be important to determine if the findings can also be found across pain types, settings, and in samples with different demographic characteristics. The cross-sectional nature of the study prevents an analysis to determine whether variables are predicting incongruence, incongruence predicts distress and negative spouse responses, or both. Longitudinal and experimental research may be able to address temporal associations. It should be noted that the results for physical and psychosocial disability were obtained with transformed versions of the disability variables to account for substantial skewness. According to Tabachnick and Fidell (1989), analyses with variables having non-normal distributions can lead to a misrepresentation of results. On the other hand, results derived from transformed, normalized variables can be difficult to interpret, which is why effective sizes were also presented in the tables. The fact that the results were largely similar whether or not variables were transformed lends confidence to the findings; however, it remains to be seen if similar relationships can be found in other samples in which disability is not substantially skewed.

In sum, this and other research shows that there is great variation across couples in how severely they rate ICP pain and disability and in the degree of incongruence within couples. This study is one of the first to show that couples' pain and disability ratings and the degree to which ICPs and their spouses are incongruent appear to depend on several characteristics of *both* partners. The HLM results also demonstrated the importance of conducting multilevel analysis when interest is focused on how both partners contribute simultaneously to couples' mean scores and incongruence. Multilevel studies such as this one may provide researchers with insights about individual and couple characteristics that play a role in the interpersonal aspects of the pain experience. Clinically, this research suggests that healthcare professionals should obtain assessments of ICPs' pain from both partners. The assessment of only one person's perceptions may conceal important characteristics of the couple that might require attention or treatment

(i.e. psychological distress, negative interactions). Pain management programs that incorporate the spouse such as Spouse-Assisted Coping Skills Training (Keefe et al., 1996, 1999, 2004; Martire et al., 2003) may be effective, in part, because spouses are educated to recognize and help patients cope actively with pain. These types of programs might motivate spouses to engage in treatment and develop empathy rather than withdraw from the patient and the pain problem. Future research will reveal whether increased congruence on pain and disability is an indicator of treatment success.

Acknowledgements

The author was supported by grant K01 MH066975 while working on this paper. The authors thank the members of the Relationships and Health Laboratory for their help in conducting the study and to Aline Sayer for her feedback on an earlier version of this manuscript.

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Table 1

Baseline and Level 2 hierarchical linear models: pain severity

Fixed effects	**Baseline Model**				**Level 2 Model**			
	B	**SE**	***t***	***d***	***B***	**SE**	***t***	***d***
Couple mean (β_0)								
Intercept (γ_{00})	3.40	0.12	27.97***	6.14	3.61	0.13	26.78***	6.06
ICP gender (γ_{01})					−0.58	0.23	−2.48*	−0.56
Psych. distress-ICP (γ_{02})					0.03	0.01	2.30*	0.52
Psych. distress-Spouse (γ_{03})					0.02	0.01	1.26	0.29
Neg. spouse responses-ICP (γ_{04})					0.06	0.07	0.79	0.18
Neg. spouse responses-Spouse (γ_{05})					0.15	0.09	1.67	0.38
Couple congruence (β_1)								
Intercept (γ_{10})	−0.26	0.14	−1.80	−0.40	−0.36	0.17	−2.15*	−0.49
ICP gender (γ_{11})					0.29	0.29	0.99	0.22
Psych. distress-ICP (γ_{12})					0.01	0.02	0.27	0.06
Psych. distress-Spouse (γ_{13})					−0.06	0.02	−3.56**	−0.81
Neg. spouse responses-ICP (γ_{14})					−0.11	0.09	−1.22	−0.28
Neg. spouse responses-Spouse (γ_{15})					0.14	0.11	1.23	0.28
Random effects	Variance component		χ^2		Variance component		χ^2	
u_0	1.17		841.48***		0.81		632.24***	
u_1	1.21		288.76***		0.94		234.74***	

df=83 for Baseline Model, df=78 for Level 2 model.

*$P<0.05$

**$P<0.001$

***$P<0.0001$

Table 2

Baseline and Level 2 hierarchical linear models: interference

Fixed effects	**Baseline Model**				**Level 2 Model**			
	B	**SE**	***t***	***d***	***B***	**SE**	***t***	***d***
Couple mean (β_0)								
Intercept (γ_{00})	2.84	0.13	21.64***	4.75	3.03	0.14	22.43***	5.08
ICP gender (γ_{01})					−0.54	0.24	−2.30*	−0.52
Psych. distress-ICP (γ_{02})					0.04	0.01	3.08**	0.69
Psych. distress-Spouse (γ_{03})					0.02	0.01	1.67	0.38
Neg. spouse responses-ICP (γ_{04})					0.14	0.07	1.83	0.41
Neg. spouse responses-Spouse (γ_{05})					0.15	0.09	1.70	0.38
Couple congruence (β_1)								
Intercept (γ_{10})	0.39	0.15	2.65**	0.58	0.46	0.17	2.69**	0.61
ICP gender (γ_{11})					−0.19	0.30	−0.66	−0.15
Psych. distress-ICP (γ_{12})					0.05	0.02	2.67**	0.60
Psych. distress-Spouse (γ_{13})					−0.04	0.02	−2.32*	−0.53
Neg. spouse responses-ICP (γ_{14})					−0.7	0.09	−0.76	−0.17
Neg. spouse responses-Spouse (γ_{15})					−0.11	0.11	−0.99	−0.22
Randon effects	Variance component		χ^2		Variance component		χ^2	
u_0	1.37		1692.36***		0.87		1099.98***	
u_1	1.50		524.46***		1.20		434.75***	

df=83 for Baseline Model, df=78 for Level 2 Model.

*P<0.05

**P<0.001

***P<0.0001

Table 3

Baseline and Level 2 hierarchical linear models: physical disability

Fixed effects	**Baseline Model**				**Level 2 Model**			
	B	**SE**	***t***	***d***	***B***	**SE**	***t***	***d***
Couple mean (β_0)								
Intercept (γ_{00})	0.43	0.03	13.76***	3.02	0.44	0.03	13.19***	2.99
ICP gender (γ_{01})					−0.04	0.06	−0.74	−0.17
Psych. distress-ICP (γ_{02})					0.01	0.01	2.35*	0.53
Psych. distress-Spouse (γ_{03})					0.01	0.01	1.31	0.30
Neg. spouse responses-ICP (γ_{04})					0.06	0.02	3.47**	0.79
Neg. spouse responses-Spouse (γ_{05})					−0.01	0.02	−0.57	−0.13
Couple congruence (β_1)								
Intercept (γ_{10})	0.06	0.03	2.20*	0.48	0.07	0.03	2.42**	0.55
ICP gender (γ_{11})					−0.05	0.05	−0.91	−0.21
Psych. distress-ICP (γ_{12})					0.01	0.01	2.63*	0.60
Psych. distress-Spouse (γ_{13})					−0.01	0.01	−1.79	−0.41
Neg. spouse responses-ICP (γ_{14})					−0.01	0.02	−0.49	−0.11
Neg. spouse responses-Spouse (γ_{15})					−0.01	0.02	−0.55	−0.12
Random effects	Variance component		χ^2		Variance component		χ^2	
u_0	0.07		996.70***		0.05		712.52***	
u_1	0.03		165.58***		0.02		142.46***	
Level 1 Error, r_{ij}	0.03							

df=83 for Baseline Model, df=78 for Level 2 Model.

*$P<0.05$

**$P<0.001$

***$P<0.0001$

Table 4

Baseline and Level 2 hierarchical linear models: psychosocial disability

Fixed effects	**Baseline Model**				**Level 2 Model**			
	B	**SE**	***t***	***d***	***B***	**SE**	***t***	***d***
Couple mean (β_0)								
Intercept (γ_{00})	0.46	0.03	16.66***	3.66	0.45	0.03	17.08***	3.87
ICP gender (γ_{01})					0.03	0.05	0.73	0.17
Psych. distress-ICP (γ_{02})					0.01	0.01	4.97***	1.13
Psych. distress-Spouse (γ_{03})					0.01	0.01	2.02*	0.46
Neg. spouse responses-ICP (γ_{04})					0.03	0.01	2.02*	0.46
Neg. spouse responses-Spouse (γ_{05})					0.03	0.02	1.89	0.43
Couple congruence (β_1)								
Intercept (γ_{10})	0.01	0.03	0.49	0.11	0.02	0.03	0.70	0.16
ICP gender (γ_{11})					−0.02	0.06	−0.48	−0.11
Psych. distress-ICP (γ_{12})					0.01	0.01	2.82**	0.64
Psych. distress-Spouse (γ_{13})					−0.01	0.01	−0.74	−0.17
Neg. spouse responses-ICP (γ_{14})					−0.00	0.02	−0.05	−0.01
Neg. spouse responses-Spouse (γ_{15})					−0.01	0.02	−0.37	−0.08
Random effects	Variance component		χ^2		Variance component		χ^2	
u_0	0.06		712.91***		0.03		393.79***	
u_1	0.04		185.39***		0.03		165.15***	
Level 1 error, r_{ij}	0.03							

df=83 for Baseline Model, df=78 for Level 2 Model.

*$P<0.05$

**$P<0.001$

***$P<0.0001$