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The relationship between pain and negative affect in older adults: anxiety as a predictor of pain

Sharon L. Feeney*

Nova Southeastern University, Ft. Lauderdale, Florida, USA

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Abstract

Although the relationship between pain and negative affect (e.g., depression, anxiety, and anger) has been repeatedly demonstrated in younger populations, the findings have varied widely among studies. Additionally, there has been minimal research on the relationship between negative affect and acute pain in older adults. This is especially disturbing when one considers that the population is at a higher risk for painful conditions than any other age group. The current study investigated the relative contributions of state anxiety, trait anxiety, depression, state anger, and trait anger to acute pain in an elderly, postsurgical population. The participants ($n = 100$) were all over the age of 65 and were receiving treatment on an inpatient rehabilitation unit following orthopedic surgery (e.g., knee or hip replacement surgery). Data were analyzed by means of multiple regression, regressing the five predictor variables on the single criterion variable. Results indicated that the only significant predictor of pain in this population was state anxiety, and that this variable alone accounted for 27% of the variance in pain. Treatment implications and suggestions for further research were discussed.

Keywords: Anxiety; Pain; Negative affect; Older adults

* Present address: Summit Psychological Services, 51 Summit Ave, Summit, NJ 07901.

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1. Introduction

While pain and its management have been frequently studied, a limitation of the current behavioral literature on this topic is that it has relied primarily on younger or middle-aged subjects. It remains an understudied problem in older adults (Ferrell, Ferrell, & Osterweil, 1990; Keefe & Williams, 1990), who are at great risk for functional decline resulting from painful illness. The psychological aspects of pain have also been understudied in older adults. The ramifications of this include the possibility of treatment errors made because pain is seen solely as a symptom of unhealed damage to the body. The suffering and affect involved are not taken into account in older adults (Fordyce, 1988).

Though it is clear that there is an increase in the prevalence of pain in older adults (Valkenburg, 1988), the relationship between pain and affect remains unclear. In an attempt to clarify the relative contributions of negative affect (e.g., depression, anger, anxiety) to the subjective experience of chronic pain, Gaskin, Greene, Robinson, and Geisser (1992) found that these emotions predict self-reports of pain among chronic pain patients. However, this study did not utilize a geriatric sample, and did not apply to acute pain.

While age is no longer an overt exclusion criterion for multidisciplinary treatment centers, as it has been in the past, many multidisciplinary programs are effectively made unavailable to most older patients through indirectly age-related criteria (e.g., vocational goal requirements) (Kee, Middaugh, Redpath, McCabe, & Brena, 1995). Part of the problem inherent in this exclusion is that older adults are not receiving the psychological components of multidisciplinary treatment provided by pain clinics. The emphasis in treatment of pain in older adults has been primarily pharmacological (Kee, Middaugh, & Pawlick, 1996), although this research has been conducted primarily on younger patients. Salzman, Schneider, and Lebowitz (1993) reviewed literature for all pharmacological studies of antidepressant therapy in elderly patients and found that only 33 of 400 studies dealt exclusively with patients over the age of 65, and none as controlled and double blind. They concluded that recommendations made for the elderly were based on data derived from studies of younger patients. Medication management is complicated in older adults by factors, such as interactions with medical medications, changes in sensitivities of bodily systems, and side effects, such as changes in cognitive functioning (i.e., reversible dementia). The psychological management of pain in older adults is an effective and safe alternative.

While it appears clear that there is a relationship between depression and pain, some argument remains as to the nature and degree of the relationship Romano and Turner (1985) reviewed the literature on the relationship between pain and depression and concluded that research support can be found for virtually all hypotheses about the nature of the relationship between the two constructs: depression leads to pain by increasing pain sensitivity and decreasing pain threshold; pain becomes a virtual equivalent of depression among patients with certain dispositions; pain serves as a stressor that leads to subsequent depression;

and that pain and depression occur simultaneously, but are related only due to coincidentally similar psychological and/or biological mechanisms. It is clear that continued research is necessary.

Symptomatic depression has the highest prevalence in the age group over 65 (Blumenthal, 1975; Chaturvedi, 1987; Neshkes & Jarvik, 1986). Estimates of depression in this group range from 5 to 44% (Blazer & Williams, 1980). Even higher prevalence has been found in geriatric medically ill patients (Kitchell, Barnes, Veith, Okimoto, & Raskind, 1982). In this study, an attempt is made to determine if the severity of pain can be predicted by reports of depression. This may help elucidate appropriate targets for intervention by psychologists.

Anger is another affective state that may be related to pain and styles of inhibiting anger have been found to be the strongest predictor of pain intensity (Kerns, Rosenberg, & Jacob, 1994). Suppression of anger has also been linked to the development of depression in general, as well as specifically among pain patients (Beutler, Engle, Oro'-Beutler, Daldrup, and Meredith, 1986). While there is a clear link between anger and pain (Parkes, 1973; Wade, Price, Hamer, Schwartz, & Hart, 1990), there is a need for more research on the relationship between the two (Gaskin et al., 1992; Kerns et al., 1994). This is especially true when one compares the amount of research available on pain and anger to that on pain and depression and anxiety.

Just as pain in older adults has been understudied, there has been insufficient research on pain and anxiety, despite the fact that anxious mood and other symptoms of anxiety have frequently been noted in pain patients (Krishnan et al., 1985). The effect of anxiety may be independent, or may be related to comorbid depression.

Pilowsky (1988) has proposed a model to explain the interrelationship of anxiety and depression to both acute and chronic pain. He suggested that anxiety may be more characteristic of acute pain and depression more characteristic of chronic pain. VonKnorring (1988) shares this opinion, contending that the symptoms associated with acute pain are similar to anxiety, while chronic pain symptoms more closely resemble depression.

There is an increasing amount of evidence suggesting that anxiety plays a role in the subjective experience of pain in younger patients (Gaskin et al., 1992; Varni et al., 1996; Von Knoff, Dworkin, Le Resche, & Kruger, 1988). Chen, Dworkin, Haug, and Gehrig (1989) found that pain measures of pain-sensitive patients correlated with anxiety. In that study, 36% of pain in these patients could be predicted by psychological trait factors, such as self-regulation, absorbance, fear, and anxiety. It has also been found that the more anxious one is, the more intense one perceives a pain stimulus (Chaves & Barber, 1976; Merskey, 1978), and that anxiety promotes overestimation of pain intensity (Hill, Kornetsky, Flanary, and Wikler, 1982).

Again, lack of research on anxiety in older adults affects treatment. ''One has to settle for inference based on studies in younger groups and hope that these methods [of treating anxiety] will be similarly effective in geriatric patients''

(Sheikh, 1994, p. 291). This is particularly disturbing in light of the apparent increase in anxiety with age (Bromley, 1975; Kalish, 1977).

The present study investigated the relationship between negative affect and acute pain in an elderly population. Rather than propose specific hypotheses, this study intended to determine the amount of variance in total pain experience that can be accounted for by the five predictor variables. Specifically, the relative contributions of depression, state anxiety, trait anxiety, state anger, and trait anger to the overall experience of pain were examined.

2. Methods

2.1. Participants

One hundred participants were tested. All were patients on a multidisciplinary unit specializing in the rehabilitation of a variety of medical problems, including surgery, cerebrovascular accident, amputation, multi infarct, and multiple sclerosis. Participants included in this study were limited to postsurgical orthopedic patients (i.e., hip and knee replacements). The following were criteria for inclusion: (a) minimum age of 65; (b) oriented to time, place and person; (c) no evidence of gross cognitive deficits (e.g., history of stroke, diagnosis of Alzheimer's); (d) no evidence of present or past psychosis; (e) lack of suicidal ideation. All participants were tested within 5 days of their admission to the IRU, and at least 3 hours post last administration of analgesic medication.

Participants ranged in age from 65 to 92 years, with a mean age of 78.55. Ninety-three percent were Caucasian, 4% African American, and 2% were Hispanic. With regard to gender, 33% were male and 47% were married.

2.2. Materials

2.2.1. McGill Pain Questionnaire

Pain was assessed by means of the McGill Pain Questionnaire (MPQ; Melzack, 1975). The reliability and validity of this well-known and widely used measure have been amply demonstrated (e.g., Chen et al., 1989; Love, Loebeouf, & Crisp, 1989; Pearce & Morley, 1989; Wilke, Savedra, Holzemer, Tesler, & Paul, 1990). The MPQ index utilized to measure overall pain experience was the Total Pain Rating Index (TPRI). This score is the sum of the rank values of the words endorsed by the patient. The range on possible scores is 0–78. Scores obtained by participants in this study ranged from 1 to 70, with a mean score of 29.56, and a standard deviation of 15.52.

2.2.2. Geriatric Depression Scale

The Geriatric Depression Scale (GDS; Yesavage et al., 1983) is the only self-report measure of depression that has been devised, standardized, and proven

valid with geriatric patients. Therefore, it allows for the unique presentation of depression in older adults. No somatic items are included on the GDS. The authors suggest that these items may fail to identify depression in this population because they are also fairly common in the non-depressed elderly, and therefore, failed to discriminate between the two groups (Brink et al., 1982). Yesavage et al. (1983) found the GDS to be internally consistent, with the median correlation between each item and the total score at .56 (range .32–.83). They reported a split half reliability coefficient (Spearman–Brown) of .94; the test–retest correlation 1 week apart was .85. It has also been found to be highly correlated with the Zung Self-Report Depression Scale (SDS), and the Hamilton Rating Scale for Depression (HRSD). Scores obtained by participants in this study ranged from 0 to 29, with a mean score of 10.49 and a standard deviation of 6.73.

2.2.3. State-Trait Anxiety Inventory

The State-Trait Anxiety Inventory (STAI) was developed by Spielberger, Gorsuch, and Lushene (1970) and Spielberger, Gorusch, Lushene, Vagg, and Jacobs (1983), and is the most widely used instrument for measuring anxiety (Buros, 1978; Sheikh, 1994). The instrument differentiates between and measures anxiety as a psychological state and as a personality trait. The reliability and validity of the STAI have been demonstrated as adequate by many researchers, including Spielberger et al. (1970) and Patterson, O'Sullivan, and Spielberger (1980). On the STAI, Scores of 40 or above are generally considered clinically significant. A-State scores obtained by participants in this study ranged from 20 to 80, with a mean score of 43.47 and a standard deviation of 17.12. A-Trait scores ranged from 20 to 63, with a mean score of 30.88 and a standard deviation of 10.17.

2.2.4. State-Trait Anger Expression Inventory

The State-Trait Anger Expression Inventory (STAXI; Spielberger, 1988) consists of 44 items, divided into six scales and two subscales. Only the State Anger (S-Anger) and Trait Anger (T-Anger) Scales were used in the present study. Respectable reliability and validity have been reported (Gaskin et al., 1992; Jacobs, Latham, & Brown, 1988; Spielberger, 1988; Stoner, 1988).

Scores obtained on S-Anger in this study ranged from 10 to 30, with a mean of 12.40 and a standard deviation of 3.71. T-Anger scores ranged from 10 to 33, with a mean of 15.55 and a standard deviation of 4.94.

2.3. Procedure

Written informed consent was obtained prior to commencement of testing. Each subject was tested postsurgery, within 5 days of admission to the IRU. Each subject was administered the MPQ by the examiner. Subsequently, the STAI, GDS, and STAXI were filled out by the patient in random order. During the time the patient was completing these forms, the examiner was present for any

procedural or content problems. Each questionnaire was scanned by the examiner upon completion, and any incomplete or incorrectly completed questionnaires were immediately remedied by the participant. Such infractions tended to be minor (e.g., a single omitted item) and were infrequently encountered. No data sets were thrown out. Approximately 1.5 hours were required to complete all tests.

3. Results

Data analysis consisted of both bivariate correlation and standard multiple regression. An initial question addressed statistically was whether the relationship between pain and the predictor variables was the same for all types of surgery. To test for this, data were divided into three groups: knee surgery ($n = 32$), hip surgery ($n = 53$), and other types of surgery ($n = 15$). Included in this latter group were shoulder replacements and open reduction surgical procedures. The variables were dummy coded, and a multiple partial F-test was performed on the data to determine if the regression planes were coincident, parallel, or different for type of surgery. Since this equation yielded an $F_{(12,82)} = 0.837$, $P > .05$., the null hypothesis that all planes are equal was not rejected. This indicates that the regression planes are coincident and no further tests were required.

Means, standard deviations, ranges, and Pearson correlations, appear in Table 1. With regard to correlations between predictor variables and the criterion of total pain, only two predictor variables were significantly related to pain: state anxiety ($r = .52$, $P < .001$), and depression ($r = .32$, $P < .001$). Implications of this finding will be examined in further detail in the discussion. Correlations between pain and trait anxiety, state anger, and trait anger were all non-significant with $r = .16$, .12, and .21, respectively.

Standard multiple linear regression analysis was performed on the data. Prior to conducting this analysis, regression diagnostics were performed, and it was determined that all assumptions of multiple regression were reasonably well met. TPRI scores were regressed on the linear combination of state anxiety, trait anxiety, depression, state anger, and trait anger. The equation containing these five variables accounted for 30.8% of the variance in total pain, $F_{(5,94)} = 8.38$, $P <$

Table 1
Means, standard deviations, ranges, and intercorrelations among variables

	Variable	Mean	S.D.	Range	1	2	3	4	5
1.	TPRI	29.56	15.52	1–70					
2.	SANX	43.47	17.12	20–80	.520*				
3.	TANX	30.88	10.18	20–63	.164	.578*			
4.	GDS	10.49	6.73	0–29	.325*	.725*	.500*		
5.	SANG	12.40	3.72	10–30	.119	.255	.124	.288	
6.	TANG	15.55	4.94	10–33	.210	.270	.169	.245	.411*

* $P < .001$.

Table 2
Beta weights and uniqueness indices obtained in multiple regression analyses predicting total pain

Beta weights[a]		Uniqueness indices[b] uniqueness	
Predictor	Beta	Index	F[c]
SANX	.67	.18	25.86*
TANX	.20	.02	3.714
GDS	.07	.00	0.286
SANG	.05	.00	0.286
TANG	.10	.01	1.00

[a] Beta weights are standardized multiple regression coefficients obtained when pain was regressed on all four predictors.

[b] Uniqueness indices indicate the percentage of variance in pain scores accounted for by a given predictor variable beyond the variance accounted for by the other four predictors.

[c] For F-tests that tested the significance of the uniqueness indices, $df = 1.94$.

* $P < .001$.

.0001; press $r^2 = .23$. The press r^2 statistic is particularly important to consider, as it reflects generalizability to other samples by providing a conservative estimate of cross-validation.

Beta weights (standardized multiple regression coefficients) and uniqueness indices (squared semi-partial regression coefficients) were then reviewed to assess the relative contribution of the five variables to the prediction of pain. These indices are presented in Table 2.

Table 2 shows that only state anxiety displayed a significant standardized weight, at a value of .67 ($P < .0001$). State anxiety accounted for approximately 18% of the variability in total pain, beyond the variance accounted for by the other four predictors, $F_{(1,94)} = 25.86$, $P < .0001$. No other variable contributed significantly to the prediction of pain above and beyond the contribution of the other variables.

Finally, the question of whether the remaining four predictor variables contribute significantly to the prediction of pain over and above the contribution of state anxiety was addressed. This was examined statistically, by subtracting the reduced model from the full model. This yielded a non-significant result, $F_{(4,94)} = 1.28$, $P > .05$. Only 3.8% of the variance in the prediction of pain is accounted for by the remaining four variables once state anxiety is in the equation. Therefore, the best regression equation for the prediction of pain included a single variable: state anxiety. This equation accounted for 27.01% of the variance, with a C(p) value of 3.17 and an MSE of 177.55.

4. Discussion

Results of the study clearly indicate that state anxiety is a significant contributor to the prediction of pain in older adults with acute pain. In fact, it was the

only variable of those investigated that significantly contributed to the prediction of pain in this population. Thus, we have two major findings: that state anxiety accounts for 27% of the variance in the prediction of pain, and that the combination of the other variables account for only 3.8% of the variance.

Perhaps the most surprising result of the present investigation is the small unique contribution of depression to the prediction of pain. While this is certainly not the first investigation to yield a similar result (e.g., Kerns & Haythornthwaite, 1988; Parker, Doerfles, Tatten, & Hewett, 1983), there has been an overwhelming amount of evidence attesting to the strong relationship between pain and depression (e.g., Gaskin et al., 1992; Kremer & Atkinson, 1981; Magni, Moreschi, Rigatti-Luchini, and Merskey, 1994; Wade et al., 1990). In the present study, a relationship between the two constructs was confirmed by a significant correlation, $r = .32$, $P < .001$; yet this relationship was apparently not of a predictive nature. While the two variables appear to be related, the nature of the relationship (i.e., factors that mediate the relationship, direction and degree of the relationship) remains to be further investigated.

With regard to the high correlation between depression and state anxiety, $r = .72$, the unique variances of each help clarify the relationship. While the unique contribution of depression is extremely low, contributing only .2% of the variance above and beyond that of the other four variables, state anxiety had a unique contribution of 18.1%. While the two are clearly related, depression does not seem to contribute much beyond that which overlaps with anxiety.

The relationship between pain and state and trait anger was also not significant in this population. This may be related to a number of factors, including a response bias among older adults (Harkins & Chapman, 1977; Rees & Botwinick, 1971). Furthermore, this study did not address style of anger expression or inhibition. This issue requires more research, as anger inhibition and expression have been found to be related to pain in other populations (Beutler et al., 1986; Kerns et al., 1994).

The finding that anxiety is the most significant contributor in the prediction of pain seems to support Kalish's (1977) statement that "If there is a mental 'state' peculiar to aging it may well be anxiety." (p. 329) In older adults, acute pain population, anxiety alone accounted for 27% of the variance in the prediction of pain. This finding supports both Pilowsky's (1988) and VonKnorring's (1988) conceptualization that the symptoms of acute pain are associated with anxiety.

One possible explanation for the relationship between pain and state anxiety is that the magnitude of the event is inflated in individuals who have anxious predispositions. In other words, that state anxiety is increased in individuals who have high trait anxiety. To test for this, analyses were performed on the 39 participants who obtained a minimum score of 30 on trait anxiety. These participants had a mean score of 52.64 on state anxiety, which is significantly higher than the mean for the remaining 61 participants who scored below 30 on trait anxiety ($m = 37.61$), as well as for the mean state anxiety score for all participants ($m = 43.47$). Furthermore, when the multiple regression analysis was

restricted to these participants, $r^2 = .493$, reflecting that 49.3% of the variance in total pain was accounted for by the regression equation. From this, one can infer that individuals who have an anxious disposition may feel more situational anxiety as well, and that this may in turn influence their experience of pain under stressful circumstances.

Other possible mitigating factors and the potential treatment considerations of these must be considered with regard to the role of state anxiety in the total pain experience. Specifically, pain perception may play a role. As McGrath (1994) noted, a preexisting anxious affective state may lower pain threshold, increasing the pain experienced. Chaves and Barber (1976) and Merskey (1978) found that as anxiety increases, the perceived pain of a stimulus increases. Similarly, Hill et al. (1982) found that anxiety facilitates the over estimation of pain intensity.

Psychological treatment for pain prior to surgery may enhance outcome in terms of both pain experienced and the ability to manage pain effectively. Improving self-efficacy for pain reduction prior to a painful experience appears to be associated with lower reports of pain (Litt, 1996). It is possible that this is due in part to a simultaneous reduction in anxiety. Intuitively, it makes sense that patients with more confidence in a given situation experience less anxiety in that situation. It is additionally likely that the pain control techniques taught to these individuals to reduce pain are also effective mechanisms for controlling anxiety. For example, relaxation techniques, breathing techniques, cognitive restructuring, and distraction techniques used for the treatment of pain are commonly used anxiety management techniques. The implication is that by teaching patients these skills, they are facilitating the reduction of both pain and anxiety. While many cognitive and behavioral techniques have been demonstrated to be as effective in treating chronic pain in younger and older populations (e.g., Puder, 1988; Keefe & Williams, 1990), an important area for future research may be to investigate which techniques are most useful when applied to older adults in acute pain.

Postsurgical psychological interventions are likely to be effective as well, and may be more practical to implement, especially when patients are seen in rehabilitation clinics following surgery. The relative benefits of pre- versus postsurgical intervention has not yet been evaluated, and requires further research. What is clear, however, is that the treatment of anxiety and the treatment of pain are closely related, and may interact.

The results of this investigation underscore the importance of anxiety management as a component of the treatment of pain in older adults. This treatment is cost-effective and safe relative to pharmacotherapy. Further, it has already been demonstrated that older adults can and do benefit from such treatment (Puder, 1988). There is no justifiable explanation for the exclusion of older adults from multidisciplinary programs. While they may, in fact, experience increased levels of anxiety when in pain, informed clinicians can effectively treat such anxiety and simultaneously decrease pain.

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