



# Surgeon Heuristics Regarding Effective Coping Strategies

Santiago A. Lozano Calderón,  
MD PhD<sup>1</sup>

David Ring, MD PhD<sup>2</sup>

<sup>1</sup> Department of Orthopaedic Surgery  
New York Medical College  
Westchester Medical Center

<sup>2</sup> Associate Professor of Orthopaedic Surgery  
Harvard Medical School  
Medical Director and Director of Research  
Hand and Upper Extremity Service  
Department of Orthopaedic Surgery  
Massachusetts General Hospital

A patient's coping strategies in response to nociception are a product of multiple biological, psychological and socioeconomic factors. We examined surgeon heuristics in assessing patient effectiveness of coping strategies by testing the null hypothesis that patients judged by their surgeon as having effective or ineffective coping strategies had similar psychological profiles. This was a survey study of a targeted population. Two hundred patients were categorized by their surgeon as having relatively effective (RECS) or ineffective coping strategies (RICS). They were contacted via mail to complete a set of questionnaires (Demographics, DASH score, pain scale, and three psychological instruments: The PASS [Pain and Anxiety Symptoms Scale], PCS [Pain Catastrophizing Scale] and CES-D scores [Center for Epidemiologic Studies Depression Scale]). Fifty-eight participants returned questionnaires (29%), 36 from the RECS group and 22 from the RICS group. RECS participants had higher education, and more white-collar occupations. RECS patients had lower pain levels (1.2 vs. 1.7 points), better DASH scores (9.2 vs. 26.7), lower depression (CES-D: 4.7 vs. 14.7), anxiety (PASS: 34.2 vs. 51.4) and Pain Catastrophizing scores (PCS: 15.5 vs. 23.6). Binary logistic regression demonstrated depression as the most important predictor of surgeon judged effective coping strategies. Surgeon heuristics can distinguish relatively effective from relatively ineffective coping strategies.

## Introduction

Health providers have an intuition or impression regarding a patient's adaptation, resiliency and effective coping strategies in the face of injury or illness. These are a product of heuristics (experienced based problem solving or "mental short-cuts") rather than objective testing. Affective (e.g. depression) and cognitive (e.g. pain catastrophizing and health anxiety) aspects of illness behavior can be quantitatively measured and have been shown to correlate with pain intensity and disability<sup>1-6</sup>. We wondered to what degree health provider intuition corresponds with quantitative measures of factors that hinder recovery and increase disability. This study is designed to analyze arm-specific disability and quantify psychological factors—specifically depression, anxiety and pain catastrophizing—in patients intuitively classified by a hand surgeon as having relatively effective or relatively ineffective coping strategies. Our primary null hypothesis was that arm-specific disability as measured using the Disabilities of the Arm Shoulder and Hand (DASH) questionnaire would be the same in both cohorts.

## Materials and Methods

From among a year's worth of patients (approximately 3500 individual patients), based on recollection, 200 adult patients were categorized by their treating physician—based on intuition/ experience/ "gut feeling" (heuristics) as having relatively effective or relatively ineffective coping strategies. A list of all patients seen over a six-month period

was reviewed and only those patients that the surgeon had a strong intuition about relatively effective or ineffective coping strategies were included in the study. Patients were contacted via mail to complete a series of questionnaires including a demographic form, the DASH score, an ordinal pain scale from 0 to 10 points, and three psychological instruments: The PASS (Pain and Anxiety Symptoms Scale), the PCS (Pain Catastrophizing Scale) and The CES-D score (Center for Epidemiologic Studies Depression Scale).

### *Disability of the Arm, Shoulder and Hand Questionnaire*

The DASH questionnaire is a 30-item self-reported questionnaire that is used to measure perceived arm-specific disability. It was developed by the American Academy of Orthopaedic Surgeons, the Council of the Musculoskeletal Specialty Societies, and the Institute for Work and Health. Patients rate 30 tasks and symptoms using a 5-point Likert scale. The raw score is converted to a scaled score between 0 to 100, with higher scores reflecting greater disability<sup>7</sup>.

### *Pain Anxiety Symptoms Scale*

The PASS is a forty-question inventory designed to measure anxiety about pain. The PASS contains four different subscales that measure the differences of pain and anxiety: 1) cognitive anxiety, 2) fear of pain, 3) escape and avoidance and 4) physiological anxiety. The cognitive anxiety scale measures the frequency of

---

#### Corresponding Author:

David Ring, MD, PhD  
Department of Orthopaedic Surgery  
Massachusetts General Hospital  
dring@partners.org

undesirable thoughts in relation to when the patient is in pain. The fear of pain scale measures the frequency of fear provoking thoughts and the dread of the negative consequences that can be caused by pain. The escape and avoidance scale measures the frequency of behaviors that try to minimize or avoid the strength and duration of pain. Lastly, the physiological anxiety subscale measures the patient's physical responses to pain, like sweating, increased heart rate, etc. The PASS rates responses using 6-point Likert scales. There are 4 subscales of 50 points each, with a total score between 0 and 200, which assesses generalized pain anxiety<sup>8</sup>.

### ***Pain Catastrophizing Scale***

The Pain Catastrophizing Scale (PCS) measures ineffective coping strategies characterized by exaggerated negative feelings toward their pain. The PCS measures three components of catastrophizing: rumination, magnification and helplessness. The PCS consists of 13 questions, with each question having a 1 to 4 scale, with 1 corresponding to the feeling occurring "not at all" to four that corresponds to "all the time." The total score ranges from 13 to 52, with higher scores representing greater catastrophizing<sup>9</sup>.

### ***Center for the Epidemiological Study of Depression***

The CESD instrument was designed to measure a patient's current level of depressive affect. The 20 items on the questionnaire are used to measure various aspects of depression, including feelings of worthlessness, helplessness, depressed mood, lethargy and other symptoms. Each item is based on a four point scale from zero to three, and the scale measures how often a patient felt the depressive symptom over the course of a week, with zero being "rarely or not at all" and three being "most of the time"<sup>10</sup>.

### ***Recruitment strategy***

Multiple mailings (three times) were used to increase the survey rate response. A final response rate of 29% was achieved (58 patients). There were no differences in sex, age, diagnosis, or coping strategies between responders and nonresponders. Of responders, 36 belonged to the group of patients catalogued as having effective coping strategies and 22 from the group catalogued as having ineffective coping strategies<sup>11,12</sup>.

### ***Statistical analysis***

Sample size calculations determined that to detect a 10-point difference in the primary outcome variable (DASH Score) between the effective and ineffective coping strategy cohorts, a sample of 17 patients per group was necessary to achieve a power of 80% at an alpha of 0.05 using a two-sided using Student's T-test. These calculations were obtained assuming a standard deviation of 10 points (SD) for the DASH score and an expected effect size of also 10 points (E) for a standardized side effect of 1.0 (E/S).

Bivariate and multivariable binary logistic regression analyses were used to identify predictors of coping strategy cohort. Variables included in the multivariable model included

all independent variables with  $p < 0.08$  in bivariate analysis. All analyses were performed using SPSS 10.0 (Statistical Package for the Social Sciences, Chicago, Illinois).

## **Results**

### ***Demographics***

According to the physician's intuition, 36 respondents (62%) had relatively effective coping strategies and 22 (38%) had relatively ineffective coping strategies. Both groups showed no statistically significant differences in age, gender distribution, race, marital status, diagnosis and involved extremity. There were significant differences in education and occupation. (Table 1)

### ***Pain and Level of Disability***

An 11-point ordinal scale for pain was on average significantly lower in respondents with relatively effective coping strategies, 1.2 points vs. 3.5 points ( $p < 0.01$ ). Arm specific disability (the DASH score) was also significantly lower in these participants: an average of 9.2 points in the relatively effective coping strategies group vs. 26.7 points in respondents from the relatively ineffective coping strategies group ( $p < 0.01$ ) (Table 2)

### ***Psychological Measures***

Differences were also significant for psychological instruments: Participants from the relatively effective coping strategies towards pain group had lower scores for depression (CES-D: 4.7 vs. 14.7,  $p < 0.01$ ), anxiety (PASS: 34.2 vs. 51.4,  $p < 0.01$ ) and pain catastrophizing (PCS: 15.5 vs. 23.6,  $p < 0.01$ ). (Table 2)

### ***Predictors of Effective Coping Strategies***

A binary logistic regression model including all the psychological measures education and occupation accounted for 26.5% of the variation in effective coping strategies, while a model with CES-D (depression) alone accounted for 15%. In this model, for each unit of increase in the CES-D score, the odds of a patient being categorized into the relatively effective coping strategies group are expected to be reduced by 0.85.

## **Discussion**

Pain is the product of nociception (the physiology of real or potential tissue damage) and the psychology, circumstances, culture, and experiences that determine how that nociception is interpreted. Disability (what an individual perceives themselves to be capable of) is the result of how individual patients adapt and respond to symptoms and objective impairment (e.g. loss of motion or sensation). The relationships between pain and nociception and disability and impairment are mediated by psychological distress, heightened illness concern, and ineffective coping strategies. The data presented in this paper indicate that at least with the one surgeon studied, heuristics are, on average, accurate in diagnosing these aspects of human illness behavior.

**TABLE I. Bivariate Predictors of Effective Coping Strategies**

	RECS	RICS	Total	Test	Significance
<b>Patients</b>					
Sample size	36 (62%)	22 (38%)	58 (100%)	Chi Square	
<b>Age</b>					
Mean	50 y (18-81y, SD 14.52)	56.5 y (26-85y, SD 15.71)	52.4 y (18-85y SD 15.18)	T Test	0.12 NS
<b>Gender</b>					
Female	30 (83%)	6 (27%)	12 (80%)	Chi Square	0.5 NS
Male	6 (17%)	16 (73%)	46 (80%)		
Total	36 (100%)	22 (100%)	58 (100%)		
<b>Race</b>					
White	35 (98%)	17 (77%)	52 (90%)	Chi Square	0.052 NS
Afroamerican	0 (0%)	1 (4%)	1 (2%)		
Asian	1 (2%)	0 (0%)	1 (2%)		
Latino	0 (0%)	2 (9%)	2 (3%)		
Other	0 (0%)	2 (9%)	2 (3%)		
Total	36 (100%)	20 (91%)	56 (97%)		
<b>Marital Status</b>					
Single	9 (25%)	4 (18%)	13 (22%)	Chi Square	0.2 NS
Married	17 (47%)	11 (50%)	28 (48%)		
Widowed	4 (11%)	1 (4%)	5 (9%)		
Living with partners	4 (11%)	0 (0%)	4 (7%)		
Divorced/Separated	2 (6%)	4 (18%)	6 (10%)		
Total	36 (100%)	20 (91%)	56 (97%)		
<b>Degree</b>					
None	0 (0%)	1 (4%)	1 (2%)	Chi Square	24.2 p<0.01
BA, BS, Associates, AB	17 (47%)	6 (27%)	23 (40%)		
Master, MBA	11 (31%)	1 (4%)	12 (21%)		
PhD, MD, JD	6 (17%)	1 (4%)	15 (26%)		
Unknown	2 (6%)	13 (59%)	15 (26%)		
Total	36 (100%)	22 (100%)	58 (100%)		
<b>Years of education</b>					
Years of education	16	14	15	Indep T Test	(-2.1) p<0.05
<b>Occupation</b>					
Disabled	2 (6%)	1 (4%)	3 (5%)	Chi Square	11.8 p<0.05
Retired	4 (11%)	8 (36%)	12 (21%)		
Light Duty	4 (11%)	2 (9%)	6 (10%)		
Heavy Duty	2 (6%)	5 (23%)	7 (12%)		
White Collar	24 (67%)	6 (27%)	30 (52%)		
Total	36 (100%)	22 (100%)	58 (100%)		
<b>Involved Limb</b>					
Right	14 (39%)	9 (41%)	23 (40%)	Chi Square	0.96 NS
Left	18 (50%)	11 (50%)	29 (50%)		
Bilateral	4 (11%)	2 (9%)	6 (10%)		
Total	36 (100%)	22 (100%)	58 (100%)		
<b>Diagnosis</b>					
Hand	1 (3%)	2 (9%)	3 (5%)	Chi Square	0.4 NS
Wrist	8 (22%)	6 (27%)	14 (24%)		
Forearm	10 (28%)	1 (4%)	11 (19%)		
Elbow	0 (0%)	5 (23%)	5 (9%)		
Humerus	4 (11%)	4 (18%)	8 (14%)		
Multitrauma	3 (8%)	2 (9%)	5 (9%)		
Unknown	9 (25%)	2 (9%)	11 (19%)		
Other	1 (3%)	0 (0%)	1 (2%)		
Total	36 (100%)	22 (100%)	58 (100%)		
<b>Time to return mail</b>					
Days to return mail	14.8	10.4	13.1	Indep T Test	0.25 NS
<b>No of Mailing</b>					
No of Mailing	1.53	1.73	1.6	Indep T Test	0.35 NS

RECS = Relatively Effective Coping Strategies

RICS = Relatively Ineffective Coping Strategies

TABLE II. Questionnaires

Outcome	RECS	RICS	Total	Test	Significance
Ordinal Pain Scale	1.2	3.6	2.2	Indep T Test	<b>p&lt;0.01</b>
DASH	9.2	26.7	15.8	Indep T Test	<b>p&lt;0.01</b>
CESD	4.7	14.7	8.5	Indep T Test	<b>p&lt;0.01</b>
PASS Total	34.2	51.4	40.8	Indep T Test	<b>p&lt;0.05</b>
PCS Score	15.6	23.6	18.6	Indep T Test	<b>p&lt;0.01</b>

RECS = Relatively Effective Coping Strategies

RICS = Relatively Ineffective Coping Strategies

This study has a number of limitations: most important are the low response rate and the fact that it may be difficult to draw the line between heuristics and selection bias. It is also important to emphasize that this paper draws a arbitrary dichotomy between patients with effective and ineffective coping strategies. As with all things human, these aspects of illness behavior occur on a continuum. Another shortcoming is that it may be easier for surgeons to categorize patients after a more complete course of treatment compared to the initial encounter.

This study should be seen more as pilot work building groundwork for more sophisticated and focused studies. That one surgeon could assess the effectiveness of patient coping strategies with some accuracy on average raises additional opportunities for increasing health and wellness given that there are evidence based methods for improving coping strategies (e.g. cognitive behavioral therapy; CBT). Future research should determine how surgeons learn and apply these heuristics, and identify questionnaires that provide more objective and reliable measures of the things that surgeons are picking up on intuitively. This will allow more general application of these concepts leading surgeons to more readily consider biopsychosocial treatments such as CBT.

## References

1. **Alschuler KN, Theisen-Goodvich ME, Haig AJ, Geisser ME.** A comparison of the relationship between depression, perceived disability, and physical performance in persons with chronic pain. *Eur J Pain.* Dec 19 2007.
2. **Crossman MW, Gilbert CA, Travlos A, Craig KD, Eisen A.** Nonneurologic hand pain versus carpal tunnel syndrome: do psychological measures differentiate? *Am J Phys Med Rehabil.* Feb 2001;80(2):100-107.
3. **Doornberg JN, Ring D, Fabian LM, Malhotra L, Zurakowski D, Jupiter JB.** Pain dominates measurements of elbow function and health status. *J Bone Joint Surg Am.* Aug 2005;87(8):1725-1731.
4. **Dowrick AS, Gabbe BJ, Williamson OD, Cameron PA.** Does the disabilities of the arm, shoulder and hand (DASH) scoring system only measure disability due to injuries to the upper limb? *J Bone Joint Surg Br.* Apr 2006;88(4):524-527.
5. **Goethe JW, Maljanian R, Wolf S, Hernandez P, Cabrera Y.** The impact of depressive symptoms on the functional status of inner-city patients with asthma. *Ann Allergy Asthma Immunol.* Sep 2001;87(3):205-210.
6. **Hann D, Winter K, Jacobsen P.** Measurement of depressive symptoms in cancer patients: evaluation of the Center for Epidemiological Studies Depression Scale (CES-D). *J Psychosom Res.* May 1999;46(5):437-443.
7. **Hudak PL, Amadio PC, Bombardier C.** Development of an upper extremity outcome measure: the DASH (disabilities of the arm, shoulder and hand) [corrected]. The Upper Extremity Collaborative Group (UECG). *Am J Ind Med.* Jun 1996;29(6):602-608.
8. **McCracken LM, Zayfert C, Gross RT.** The Pain Anxiety Symptoms Scale: development and validation of a scale to measure fear of pain. *Pain.* Jul 1992;50(1):67-73.
9. **Osman A, Barrios FX, Gutierrez PM, Kopper BA, Merrifield T, Grittmann L.** The Pain Catastrophizing Scale: further psychometric evaluation with adult samples. *J Behav Med.* Aug 2000;23(4):351-365.
10. **Lin N, Dean A, Ensel WM.** *Social support, life events, and depression.* New York: Academic Press; 1986.
11. **Ensel WM.** Measuring Depression: The CES-D Scale. In: Lin ND, A; Ensel, W, ed. *Social Support, life events and depression.* New York: Academic Press; 1986.
12. **Radloff LS.** The CES-D Scale: A Self-Report Depression Scale for Research in the General Population. *Applied Psychological Measurement.* June 1977;1(3):