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The Uncertainty Stress Scale: Its Development and Psychometric Properties

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Le présent article décrit l'élaboration et la mise à l'épreuve d'une nouvelle échelle : *The Uncertainty Stress Scale* (l'échelle du stress devant l'incertitude). Celle-ci mesure l'incertitude dans les situations liées à la maladie et le stress, les sentiments de menace et les émotions positives qu'entraîne un état d'incertitude. On expose la base théorique et empirique de l'échelle. Les preuves viennent de diverses recherches faites sur des malades en traitement de courte durée et des malades chroniques. Les résultats confirment la fiabilité de l'échelle et de son contenu, et concourent à sa validation. Les diverses idées quant aux révisions possibles sont décrites.

This paper describes the development and testing of a new scale—The Uncertainty Stress Scale—which measures uncertainty in illness-related situations, and the stress, threat, and positive feelings generated from the uncertain state. The theoretical and empirical basis of the scale is presented. Evidence which supports the scale's reliability and its content, concurrent, and construct validity is presented from several studies of people experiencing acute and chronic medical conditions. Descriptions and rationales for revisions are described.

Most living creatures endure some degree of uncertainty, but it can be particularly poignant for those living with medical disorders. It is a major source of stress for acutely and chronically ill individuals and their families (Strauss, et al., 1984), and is a major factor that influences expectations about illness, treatment, and prognosis (Filayson & McEwan, 1977; Mishel, et al., 1984). Uncertainty underscores the fact that the individual is vulnerable, that life is uncertain, and that they may have little control over events that may change life in major respects. One of the most important reasons why uncertainty can be stressful is that it has an immobilizing effect on coping processes. It triggers both coping strategies for anticipating an event's occurrence and those needed to anticipate the event's nonoccurrence, and the two are often incompatible (Gerber, 1974). New medical procedures for cancer raise hope of cure, but improved five-year survival rates and cure are not synonymous. In addition, preparation for alternative outcomes is difficult in uncertain situations because confusion can result from having to consider first one possible outcome and then another. When individuals cannot decide on a path of action and closure is unavailable, fear, excessive worrying and rumination, and eventually anxiety can result (Breznitz, 1971). Heightened anxiety and, or threat is likely to interfere with the cognitive functioning required for appraisal of the situation and makes it more difficult for an individual to cope. Therefore, uncertainty can lead to a long, drawn-out process of

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appraisal and reappraisal, generate conflicting thoughts, feelings, and behaviours, and culminate in feelings of helplessness and eventually confusion. Uncertainty therefore has important implications for patient and family adjustment.

Researchers have a major responsibility to generate knowledge about coping with uncertainty, and develop and test interventions based on this knowledge in order to maintain and enhance the health status of the people they serve. An understanding, and ability to measure uncertainty and its associated stresses and threats would help practitioners to assess and intervene appropriately.

The Mishel Uncertainty in Illness Scale (MUIS) was developed to measure uncertainty in illness for hospitalized individuals, and by 1983, data supported its validity and reliability in that population. The current author used the community version of MUIS to study non-hospitalized women who were coping with breast cancer and had been receiving treatment from one month to 20 years prior (Hilton, 1987, 1988). The study triangulated quantitative and qualitative methods. During the interviews, women revealed uncertainty in coping, in addition to other aspects of uncertainty, which was particularly germaine to them and was not addressed in the MUIS. They did not distinguish the uncertainty of their situation from the uncertainty of knowing how to cope with it. All aspects were uncertain for them: not being able to foretell the future, being undecided because things were not definite, being unable to rely on test results and being uncertain about what to do, how to make choices and how to interact with others.

A new scale that measures uncertainty and includes uncertainty in coping was needed; one that measures the stress (emotional strain), threat (danger), and positive feelings that might accompany uncertainty. The current article describes the development and testing of the Uncertainty Stress Scale (USS), which is designed for clinical and research purposes to measure uncertainty in illness-related situations and the stress, threat, and positive feelings generated by the uncertain state. Emphasis in the current paper will be on the uncertainty component of the scale.

Theoretical Basis of the Uncertainty Stress Scale

While ambiguity is often equated with uncertainty, uncertainty is the state of mind created by ambiguity (Norton, 1975). Lazarus and Folkman (1984), for example, define ambiguity as a lack of situational clarity and uncertainty as the person's confusion about the meaning of the environmental configuration. Other authors have not necessarily made a clear distinction between the two. According to Budner (1962), ambiguous situations are characterized by

novelty, complexity, and insolubility, and cannot be adequately structured or categorized because sufficient cues are lacking. Norton (1975) identified eight uses of the term *ambiguous* with one of these being *uncertainty*: multiple meanings (entailing at least two meanings regardless of whether the person was aware and/or clear of them); vagueness, incompleteness, fragmented (if parts of the whole were missing); probabilities; unstructured (when stimulus has no apparent or partial organization); lack of information; inconsistency, contradiction, contrariness (presence of discrepant information); lack of clarity; and uncertainty. Norton stated that the degree of ambiguity is dependent upon both the structure inherent in the physical stimulus and the interpretations of or the responses to the stimulus made by the receiver. He also noted that uncertainty, inconsistency, indistinctness or lack of clarity or structure, are not necessary conditions, but may be sufficient for labelling something as ambiguous. In addition, he emphasized that a person need not see ambiguity in a stimulus for it to be labelled as ambiguous. Duncan (1972) identified three attributes of ambiguity: a lack of information concerning the environment; a lack of knowledge regarding the consequence of a specific decision; and an inability to assign probabilities to the effects of any environmental factor. Ambiguity therefore refers to the attributes of the situation, while uncertainty refers to the person's perception of the situation which, may or may not include ambiguity.

Lazarus and Folkman (1984) emphasize the importance of uncertainty in coping, and describe a coping process in which appraisal is central. They suggest that ambiguity and the resulting uncertainty can generate stress and inhibit effective coping. Appraisal assesses the harmful, threatening or challenging nature of the situation and determines the accompanying stress and coping options available to the person. Appraisal processes are influenced by personal beliefs and values, situational properties such as novelty, predictability, event uncertainty and temporal uncertainty, the coping options and resources available, the likelihood that a given coping option will accomplish what it is supposed to, and the likelihood that one can apply a particular strategy or set of strategies effectively. Under conditions of ambiguity, cues regarding the nature of the outcome and/or extent to which it can be controlled are minimal. Consequently, beliefs have more influence in determining meaning. The greater the ambiguity in a situation, the more inference is required for making judgements about its significance. Ambiguous situations are usually evaluated as threatening because the outcome is unknown, the focus for action is unclear, and there is a limited selection of coping processes available. Uncertainty can limit the person's effective control and sense of control over the danger and thereby increase their feelings of helplessness and stress. However, in some situations uncertainty can reduce threat by allowing alternate interpretations to be considered.

Mishel is refining a middle-range nursing theory of uncertainty in illness that explains how patients cognitively process illness-related stimuli as well as how they structure meaning for those events (1988, 1990). She defines uncertainty as the inability to determine the meaning of illness-related events. It occurs in situations where the decision maker is unable to assign definite values to objects and events and/or is unable to accurately predict outcomes because sufficient cues are lacking. According to the theory of uncertainty, mastery mediates the relationship between uncertainty and appraisal, and coping mediates the relationship between appraisal and emotional distress. It is expected that when uncertainty is appraised as an opportunity, problem-focused coping strategies would be used, whereas, when it is appraised as a danger (implying that the situation is unmanageable), emotion-focused coping strategies would predominate (Mishel & Sorenson, 1991). Various studies have provided empirical support for the theory and the psychometric properties of MUIS (Christman et al., 1988; Herbst, 1986; Mishel, 1981; 1983; Mishel & Braden, 1987; Mishel et al., 1984; Yarcheski, 1988).

The author's phenomenological study of uncertainty for women coping with breast cancer (Hilton, 1987, 1988) assisted in the development of a theoretical definition of uncertainty. Sixteen women who were purposefully sampled from the larger study to reflect a range in demographic, cancer, and cancer treatment characteristics were interviewed. Uncertainty in illness was defined as a cognitive perceptual state that ranges from a feeling of just less than surety to vagueness; it changes over time and is accompanied by threatening and/or positive emotions. Uncertainty is not being able to foretell the future; a lack of clarity about the present; being in doubt; being undecided because things are not definite, clearcut or determined; not being able to rely, count, or depend on someone or something; and having a sense of vagueness about what to do, expect, know and ask. Feelings generated by uncertainty include anxiety, fear, anger, wonder, frustration, helplessness, curiosity, hope, and depression. Less anxiety and fear as well as contentment, relief, peace, confidence, and hope are associated with less uncertainty and more surety. The author's definition includes uncertainty generated by the assessment of the individual's situation and coping responses. It therefore adds the dimension of uncertainty in coping to attributes identified by others.

Scale Development and Testing

Scale Format and Item Development

The USS has undergone three revisions to date. Its goals are to measure uncertainty, the stress of that uncertainty, and the degree to which it is perceived as threatening and/or positive. The scale has three parts. Part A asks participants to rank their level of uncertainty in a number of areas related to their health condition and their coping with it. The items can be general or can be

Figure 1

Uncertainty Stress Scale (selected items for general medical condition)
Version 4

	Degree of Uncertainty	Degree of Stress
I am uncertain		
1. whether changes in my medical disorder will be detected early	0 1 2 3 4 N/A	0 1 2
2. about the ability of my medical condition	0 1 2 3 4 N/A	0 1 2
5. about the present state of my condition	0 1 2 3 4 N/A	0 1 2
7. whether changing my lifestyle will help my condition	0 1 2 3 4 N/A	0 1 2
8. how to make sense of what I am told about my condition	0 1 2 3 4 N/A	0 1 2
9. about the effectiveness of my treatments	0 1 2 3 4 N/A	0 1 2
10. whether my medical condition is under contro	0 1 2 3 4 N/A	0 1 2
12. what to say to others about my medical condition	0 1 2 3 4 N/A	0 1 2
13. about differing explanations I have been given	0 1 2 3 4 N/A	0 1 2
17. whether my medical condition will interfere with my ability to do my usual activities.	0 1 2 3 4 N/A	0 1 2
19. how to manage my symptoms	0 1 2 3 4 N/A	0 1 2
20. about choices made regarding my treatments	0 1 2 3 4 N/A	0 1 2
27. whether any change in my appearance brought about by my condition affects my relationships	0 1 2 3 4 N/A	0 1 2
29. whether what I am doing about my medical condition will help me	0 1 2 3 4 N/A	0 1 2
30. whether I can depend on test results as an indicator of my condition	0 1 2 3 4 N/A	0 1 2
34. about my ability to handle my emotions related to the medical disorder	0 1 2 3 4 N/A	0 1 2
36. whether I will have difficulty coping with my medical condition	0 1 2 3 4 N/A	0 1 2
37. about the quality of information I have	0 1 2 3 4 N/A	0 1 2
40. whether I would choose to have all the treatments recommended to me	0 1 2 3 4 N/A	0 1 2
41. what unusual symptoms mean in terms of my medical condition	0 1 2 3 4 N/A	0 1 2
46. whether I can depend on people who are important to me to be there when I need them	0 1 2 3 4 N/A	0 1 2
48. whether I can manage financiclly because of my condition	0 1 2 3 4 N/A	0 1 2
49. what symptoms I should be aware of	0 1 2 3 4 N/A	0 1 2
52. what to look for to check the state of my medical condition	0 1 2 3 4 N/A	0 1 2

The following five questions relate to levels of a particular feeling or perception. Please make a cross (X) on the line which best indicates your level right now.

1. Overall, my uncertainty level about my medical condition is:

0 _____|_____100
No uncertainty 50 Very high uncertainty

2. Overall, the stress I feel from my uncertainty is:

0 _____|_____100
No stress 50 Very high uncertainty

Some people find that uncertainty can have positive feelings (such as hope) associated with it because of the possibility that things will work out well.

4. Do you have any positive feelings because of your uncertainty?
Yes ____ No ____

5. If yes, the level of my positive feelings is:

0 _____|_____100
No positive feelings 50 Very high positive feelings

made specific to a disorder or situation by inserting the name of that condition. Part B asks participants to rank their degree of stress related to their uncertainty for those same areas. Part A can be summed to provide an overall indication of uncertainty or sums for each subscale can be calculated. Likewise, Part B can be a summed score. Part C consists of four 10-cm-long visual analogue scales that measure global uncertainty, global stress, global threat, and perception of positive aspects of the respondent's uncertain state (see Figure 1 for the scale format and selected items).

Item development was guided by the theoretical definition of uncertainty described earlier, and its attributes. It was also guided by the theoretical and empirical literature that reflected both general and specific disorders.

Content Validation

Content validity determines whether items in an instrument represent the domain of the construct. Content validity is more likely to be achieved by defining and identifying dimensions of a concept and then developing items that reflect those dimensions.

Another method used in content validation is to ask people who are considered to be experts on the concept to judge the extent to which the items reflect the concept. The USS items were reviewed for appropriateness and clarity by experts including nurses, cancer patients, doctors, psychometricians, and researchers on uncertainty. Based on their feedback, further revisions were made.

Because the phenomenological study consisted of cancer patients and the initial items developed for the USS emphasized uncertainty of coping with cancer, it was important to make sure that the scale would also be relevant for people with other disorders. To do this, additional literature was reviewed, interviews were done with people coping with other medical disorders, the USS was reworded, and a few other items were added. People with medical disorders other than cancer then reviewed the items and judged whether they were appropriate and clear.

Construct Validation Studies

Construct validity is the extent to which an instrument measures the theoretical construct or trait in question. Testing helps to confirm whether relationships that would be predicted to occur among concepts do occur. Support in the predicted direction provides evidence that the instrument measures the construct in question. The following procedures were used to evaluate the construct validity of the scale: factor analysis, multidimensional scaling, tests for convergent validity, hypothesis testing, and contrasted groups.

The initial two versions of the scale were tested with a wide variety of patients reflecting different ages, disorders, and seriousness of those disorders (Hilton, 1992). See Table 1 for a description of the samples used.

Table 1

Characteristics of the patients and their medical conditions in the sample used for testing the three versions of the USS

n	Disorder	Age Range in years (Mean)	% female	Sample characteristics
				Version 1 (N=144)
144	cancer	30-92 (63)	62	Various cancers, Currently getting treatment –14%. Extent: local–60%, in nodes–27%, elsewhere–11%, Recurrence–26%,
				Version 2 (N=428)
116	cancer	22-81(60)	51	Various cancers, Currently having treatment –14%. Extent at diagnosis: local–64%, in nodes–27%, elsewhere–6%. Recurrence–27%. Time since diagnosis: very recent to 6 years
68	cardiac	33-85 (59)	34	Number of MIs: one–54%, more than one–29%. Pacemaker–13%, bypass surgery–16%, valve replacement–12%
27	vascular	45-88 (67)	42	Vascular surgery–94% (aorto-femoral bypass–19%)
96	renal	20-72 (41)	47	One transplant–70%, two transplants–7%. Dialysis: peritoneal–20%, hemodialysis–29%, both–39%
121	heart valve	40-86 (67)	53	Time since implant of biological valve 2–13 years
				Version 3 (N=358)
221	cancer	21-84 (60)	47	Various cancers. Currently having treatment –8%. Extent at diagnosis: local–60%, in nodes–8%, elsewhere–7%. Recurrence–12%. Time since diagnosis: very recent to 30 years
31			100	Waiting biopsy of suspicious breast lumps
18	renal	36-75 (58)	22	Waiting for kidney transplant
88	renal	27-68 (44)	34	Long-term kidney transplant patients. Time since transplant 3-21 years

Factor Analysis. Factor analysis work with the first two versions of USS was used to assist in scale refinement. Common factor analysis was done to assess whether the factors that emerged reflected the major domains expected. This method was also used because both random and systematic measurement errors were assumed (Ferketich & Muller, 1990). Oblique rotation was done because the factors were not considered to be independent. Items loading .30 or larger on factors were identified with the corresponding scales. The eight factors that resulted from factor analysis of the initial version were: Inclined to disbelief (doubts about choices, treatment, and information); Clarity-comprehension and interpretation of the situation; Indefiniteness about

curability/controllability; Unsettled in opinion and belief about effects on roles; Not being able to foretell the future of the medical situation; Managing the disorder and knowing the options; Reliability/dependability of treatments, symptoms and caregivers; and Doubts about coping with the situation.

It was recommended by Hakstian (R. Hakstian, personal communication, 1988) that the eight factors be reduced to four, where each would have at least 10 items. New items were added and others reworded so that each factor reflected one of the four themes. The refined version 2 was factor analyzed using the same methods as in version 1 with a new sample patients (Table 1) . A four-factor solution was identified and the resulting factors reflected the major theoretical themes thereby lending support for construct validity. The

Table 2

Factor loadings for the two-factor solution of Uncertainty Stress Scale Version 3

Item	Loading		Item Content Intent (in whole or in part)
	Factor I	Factor II	
1	.59	–.06	whether changes detected early
2	.81	–.11	stability of condition
3	.27	.00	cause of condition
4	.59	.01	whether maintain present level of functioning
5	.76	–.08	present state of condition
6	.49	.22	what questions to ask medical specialists
7	.45	.24	what questions to ask medical non specialists
8	.22	.16	whether changing diet will help
9	.36	.42	how to make sense of what I am told re situation
10	.47	.11	re effectiveness of surgical treatments
11	.92	–.19	whether condition is under control
12	.45	.17	whether condition will cause me to have symptoms
13	.16	.34	what to say to others re medical situation
14	.30	.35	re differing explanations I have been given
15	.86	–.07	chances to be well
16	.74	–.11	whether condition will be the same in 5 years
17	.58	.20	whether symptoms can be controlled
18	.64	.03	whether condition will interfere with doing usual activities
19	.18	.35	about my medical specialist's abilities
20	.27	.42	about my medical non specialist's abilities
21	.25	.50	how to manage my symptoms
22	.27	.52	choosing the treatments I have had and am having
23	.66	.03	whether disorder will return
24	.43	.27	adequacy of the follow-up
25	.11	.43	my understanding of treatments I have received and am receiving
26	.15	.52	how to approach health care workers about my care
27	.56	.03	whether condition will be involved in my death
28	.24	.48	whether treatments other than any surgery have been effective
29	.55	–.04	whether medical treatments, other than surgery eliminated my disorder
30	.17	.35	whether any change in appearance brought about by the condition affects relationships within my family

factors were: (1) Certainty/clarity/reliability/ dependability, (2) Symptom uncertainty, (3) Doubt regarding present and future state of the condition, and (4) Doubts about coping and understanding.

Although the solution was reasonably clear, it was felt that the *strongly disagree—strongly agree* format was problematic, particularly when items were positively worded. The scales that emerged from the factor analysis contained either all certainty-directed items (e.g. I can rely, I am certain, I can depend) or uncertainty-directed items (I wonder, I am not sure, I doubt). Because of the format, interpretation of some items could have encountered difficulty. In addition, further clarification was needed to differentiate lack of knowledge from uncertainty. Based on these concerns, changes were made to version 2

Item	Loading		Item Content Intent (in whole or in part)
	Factor I	Factor II	
31	.26	.27	whether any change in appearance brought about by the condition affects relationships outside my family
32	.23	.33	whether condition will affect life goals
33	.39	.34	whether what I am doing about my condition will help me
34	.24	.40	whether I can depend on test results as an indicator of my condition
35	.18	.28	whether my condition will affect my sex life
36	.32	.37	whether delays in treatment will influence my chances of successful recovery
37	.40	.37	the seriousness of my condition
38	.41	.19	whether my surgical treatments eliminated my condition
39	.38	.34	my ability to handle my emotions related to the condition
40	.39	.26	unpredictability of symptoms
41	.09	.49	whether eliminating my bad habits will help my condition
42	.23	.46	whether I will have difficulty coping with my condition
43	.12	.57	quality of information I have
44	.39	.34	how long my symptoms will last
45	.08	.72	whether I am being told the truth about my condition
46	.00	.55	whether I would choose to have all the treatments recommended to me
47	.27	.36	what unusual symptoms mean in terms of my condition
48	.49	.17	whether they might find something wrong when I go for a check-up
49	–.23	.79	whether I will be well cared for by the nurses
50	–.11	.67	whether I will be well cared for by the health professionals other than nurses
51	.24	.27	the cause of my symptoms
52	–.21	.76	whether I can depend on people who are important to me to be there when I need them
53	–.25	.68	whether I can get health insurance
54	.02	.38	whether I can get life insurance
55	–.04	.50	whether I can get disability insurance
56	.39	.30	what symptoms I should be aware of
57	.20	.51	about choosing the treatments I will have
58	.20	.50	whether my following the treatment plan recommended to me will help
59	.30	.39	what to look for to check the state of my cancer situation
60	.44	.26	whether treatments I will be having will eliminate the cancer

and a 60-item version 3 resulted. It consisted of a ranking from no uncertainty (1) to a great deal of uncertainty (5). To ensure that respondents were indicating their uncertainty rather than their lack of knowledge or other things, the stem for all items was "I am uncertain." Subjects who assessed the above changes said that version 3 was clearer and more straight-forward and therefore easier to use.

Version 3 was factor analyzed with a sample of cancer patients, women undergoing breast biopsy, kidney transplant patients, and patients on the kidney transplant waiting list. As before, common factor analysis with principal axes factoring and oblique rotation was used (Table 2). Results revealed two factors with 28 items loading on the first factor and 32 items loading on the second factor. Only five items had loadings less than .30 on either of the factors. Two scales (factors) were identified: (1) Indefiniteness/lack of clarity about the present and future state of the disorder (not being clearly defined or precise); and (2) Being unsettled and having doubts about coping (making sense of things, depending on others/tests, knowing what to do). These two components reflected the major themes as expected from the theoretical definition. The factors reflected uncertainty arising from the disorder itself and uncertainty arising from coping with the disorder. Cronbach alpha reliability coefficients were computed for these factors and illustrated that internal consistency reliability was strong at .96 for Factor 1 and .94 for Factor II. Factor I correlated with Factor II (r=.57).

Multidimensional Scaling. Multidimensional scaling procedures (MDS), nonmetric ways of representing the ranking of relationships among data in a spatial way, were also used. A number of iterations are done to decrease the differences and thereby the error to find the best fit. The degree to which the data depart from the model is measured by stress. The closer the stress is to zero, the better the scaling process. The criteria for the number of dimensions are stress level and interpretability. The fewer the dimensions, the more compact the solution (Shepard, Romney & Newlowe, 1972; Schiffman, Reynolds & Young, 1981). One interprets the dimensions by looking at the properties of stimuli at each end of the dimension to determine if there is some attribute that changes in an obvious fashion. The MDS is based on distances between points, whereas factor analysis is based on the angles between vectors, and is presumably harder to interpret. The MDS does not assume linearity and therefore may provide a more interpretable solution of lower dimensionality.

The two-dimensional model of the USS showed two dimensions quite clearly, had a stress factor of .27, and explained 67.9% of the variance. Dimension one was the uncertainty related to clarity of the present and future state of the disorder and includes the effectiveness of treatment. Dimension

two reflected uncertainty about understanding and coping and the impact of the disorder on their functioning and on others. The items falling on each dimension were similar to those identified for the factors that emerged in the factor analysis. For example, the items with higher weightings on the first dimension were numbers 16, 27, 23, 48, 11, 15, 18, 1, 4, 5, 2, 16, 29 and those on the second dimension were items numbers 49, 50, 46, 42, 53, 54, 55, and 58. These same items had the higher factor loadings on the same factors and reflected similar themes.

Convergent Validity. Convergent validity is supported when two or more instruments that theoretically measure the same construct are administered and results reveal positive correlations between the measures. To test for convergent validity of the USS, 286 patients with cardiac, cancer, vascular or kidney disorders responded to Mishel's MUIS. A correlation of .69 (p=.00) between the USS and MUIS reflected similarity of concept, but absence of redundancy. Similarly, to test the stress component, some subjects (vascular and cardiac group of Sample 2), responded to the Spielberger State Trait Anxiety Inventory (STAI). The correlation of their state anxiety was .43 (p=.01) to the total stress and .63 (p=.00) to the stress visual analogue.

Hypothesis Testing. Hypotheses, based on theoretical expectations, can also be used to test for construct validity. Evidence of relationships in the expected direction lend support to the construct validity of the scale. Based on the Lazarus and Folkman (1984) model, it was predicted that uncertainty would be positively correlated with stress/anxiety. Using the summed scores and the visual analogue scores (refer to scale format), this prediction was proven correct (r=.50, p=.00), and was reflected in several subject groups. In addition, there was a correlation of .65 (p=.00) between total uncertainty and their state anxiety according to Spielberger's STAI. In partial agreement with the predictions, uncertainty was consistently associated with stress (r=.54, p=.00) and threat (r=.55, p=.00), but showed no relationship with positive assessment.

Multiple regression of total uncertainty with selected illness and demographic variables indicated that recurrence, poorer state of health, shorter time since treatment, and less education were predictive of greater uncertainty. Education is a personal resource variable that assists in accurate assessment and coping (Folkman & Lazarus, 1984). Variance explained totaled 43.7%. Regression on the uncertainty visual analogue indicated that recurrence predicted 20.9% of the variance. Regression on total stress showed that greater uncertainty, poorer expectation of future health, more progressive cancer, and less perception of control predicted 85% of the variance. Regression on perception of uncertainty as positive identified greater sense of control, less threat, and less education as predicting 25.1% of the variance. All results were in the direction predicted.

Because personal characteristics can have a strong influence on perception, a sense of coherence was believed to be negatively correlated with uncertainty (Lazarus & Folkman, 1984). Sense of coherence is a global orientation —a pervasive, enduring though dynamic feeling of confidence that one's internal and external environments are predictable, and that there is a high probability that things will work out as well as can reasonably be expected. In a sample of cardiac (n=68) and vascular (n=27) patients ranging from 33 to 88 years old, total uncertainty was negatively associated with sense of coherence (r=–.41, p=.01) as measured by Antonovsky's Sense of Coherence Scale (1987).

In addition, it was predicted that as demands pile up uncertainty would increase. This was confirmed in a sample of 307 patients (cancer n=116; cardiac n=68; vascular n=27; renal n=96). Responses on the Index of Predominant Concerns, which measures potential sources of distress among people with serious illness (Weisman & Worden, 1977), showed that more concerns were related to greater uncertainty (r=.27, p=.00).

Further hypotheses were tested with women being diagnosed for a suspicious breast lump (n=31). It was hypothesized that these women would have high uncertainty and anxiety prior to receiving their biopsy results and, that these feelings would subside for those where the tumor was diagnosed as benign, but remain high where it was diagnosed as cancer. To test these hypotheses, women completed the USS prior to biopsy, after results were known, after definitive surgery, and then three months later. As one might expect there was no significant difference between the two groups pre-biospy. But after results were known those with cancer had greater uncertainty (M=123, SD 37.1) than those without (M=84.6, SD 17.1, t= 4.73, p=.01). Similarly, total stress was initially high for all subjects, and dropped significantly for those not diagnosed with cancer (t=4.59, p=.02). After definitive treatment the mean uncertainty was 116.2 (SD 37.9) and three months later was still high, although not as high as at initial diagnosis (M=124, SD 47.8).

Ford (1989) described the level of uncertainty for 121 biological valve patients ranging in age from 40 to 86 years. Overall, there was a low level of uncertainty, but not being able to foretell the future generated the most uncertainty. Those who had their transplants in 1976-78 were significantly less uncertain than others who had theirs more recently. Uncertainty was significantly negatively correlated with past, present, and future life satisfaction. Internal consistency reliability of the total scale was .92. There was a significant positive relationship between uncertainty and stress, the stress visual analogue, and threat visual analogue, but not between uncertainty and positive feelings. These findings also show support in the direction expected.

Swanson (1991), studied 88 long-term kidney transplant patients to describe the relationship between uncertainty and the coping strategies used. Moderately low levels of uncertainty were generated primarily from the patients' perceptions of the indeterminateness of their situation (55% had uncertainty levels between 61-100, and 15% had levels above 141). More health problems and lower levels of education were associated with higher uncertainty. As one might expect, positive relationships were found between uncertainty and the use of emotion-focused strategies such as evasive (r=.37), fatalistic (r=.46) and emotive (r=.42) coping (significant at .05 level). The relationship between uncertainty and self-reliance was r=.20 (p=.06), and between uncertainty and palliative coping, r=-.19 (p=.08). Significant positive relationships were found between uncertainty and stress, but not between uncertainty and threat or positive feelings. Uncertainty was negatively related to age (r=-.21) and education (r=-.23). Internal consistency for the total scale was .96.

Contrasted-groups. When the contrasted-groups approach is used, two groups suspected to score extremely high or low on the construct are tested. Validation occurs when results are as expected. Several hypotheses were tested using 221 cancer subjects with various extents and types of cancer. Subjects ranged in age from 21 to 84 years old and, elapsed time since diagnosis ranged from very recent to 30 years. It was expected that severity and instability of the cancer would be related to an increase in the patient's uncertainty, and that those who had recurrent cancer would have higher uncertainty than those who did not. These hypotheses were supported. Those with more extensive cancer had higher uncertainty than those with less extensive cancer (F=3.3, p=.04); patients with cancer in the lymph nodes or beyond the nodes had higher uncertainty than those with localized cancer (M=135, M=141, and M=114, respectively), and the mean uncertainty for those with recurrence was 157 compared to 111 without (F = 24.5, p=. 00). A further hypothesis that uncertainty would be negatively related to perceptions of control was supported (r=-.20, p=.04). This was expected because ambiguity hampers coping (Lazarus & Folkman, 1984).

The studies done on factor analysis, multidimensional scaling, convergent validity, hypothesis-testing, and contrasted groups supported he construct validity of the scale.

Ongoing Work

Attempts to shorten the scale are continuing. Items are being deleted through examination of frequency of endorsement of each item, discrimination ability, similarity in content, high intercorrelation between items, and low item-total

correlations. Streiner and Norman (1991) suggest that when most people choose the same response to an item this does not improve a scale's psychometric properties, and that item can be deleted. Although some items have a high frequency of no uncertainty responses, this might be because some of these subjects have a more stable condition. For example, in response to the item uncertainty about choosing the treatments I will have, 60% of the longer-term cancer and transplant patients indicated no uncertainty, whereas only 35% of those awaiting results responded with no uncertainty, indicating that the latter group had higher uncertainty levels. The discrimination index was calculated for each item (Streiner & Norman, 1991), but consideration should be given because these were not achievement items where there was a correct answer. Responses of those who had a moderate to great deal of uncertainty on an item were compared to those who scored above and below the median total uncertainty score. According to Streiner and Norman (1991), items with discrimination ability between .2 and .8 should be used. Of the 60 items in the scale, five with indices below .2 will be considered for removal; an additional 12 have indices between .2 and .25. Analysis did not identify any items with correlations above .8, which would suggest redundancy. Item-total correlations indicated that five items had item-total correlations of less than .31.

Several changes have been made to create a refined version of the USS, but it is likely that additional items will be deleted. Items that attempted to discriminate between surgical and medical treatments have been collapsed. Uncertainty regarding financial issues was clarified as well as uncertainty about making choices. In addition, although the author was initially advised not to have a not applicable response column because of difficulty with analysis, this column has now been added. This will help distinguish between those where uncertainty is absent but the item is relevant (i.e., they feel certain) and those where the item is not relevant. Furthermore, it is conceptually clearer to have no uncertainty ranked as 0 rather than 1; the continuum therefore is now 0-4. Also, because fine discrimination was not felt necessary for the stress component, the ranking was altered from 1-4 to 0 (no stress) to 2 (a great deal of stress). Readers may obtain the latest version 4 by writing to the author.

Summary and Conclusion

The development of the USS has proceeded through a number of steps to build a strong foundation and support for its validity and reliability. Data support the content, concurrent, convergent, and construct validity of the USS, and its reliability. At this point, the scale has been tested on a reasonable range of people experiencing acute and chronic medical conditions. Although

efforts to shorten the scale continue, the investigator is hesitant to delete items too quickly. Although an item might not elicit high uncertainty for some patient groups it might be particularly relevant for others. In addition, analysis and interpretation of scores when some items are considered inapplicable will require further attention. The investigator believes that the USS is a useful scale for clinical and research purposes, and encourages others to consider using it in their work and adding their data to the pool for further analysis.

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