

THE STRESS APPRAISAL MEASURE (SAM): A MULTIDIMENSIONAL APPROACH TO COGNITIVE APPRAISAL

EDWARD J. PEACOCK, M.A.
University of Toronto, Canada

AND

PAUL T. P. WONG, PhD
Trent University and University of Toronto, Canada

SUMMARY

Cognitive-relational theory emphasizes the fundamental role of cognitive appraisal in the stress process. However, existing measures of stress appraisal suffer from conceptual and methodological problems. The present paper reports the development of a new stress appraisal scale that attempts to overcome some of these difficulties. Six dimensions of primary and secondary appraisal were identified: threat, challenge, centrality, controllable-by-self, controllable-by-others, uncontrollable-by-anyone. Items were generated for each of these dimensions, as well as for an overall perceived stressfulness scale. In three studies examining anticipatory stress experienced by undergraduates, these items were subjected to item-selection, analysis and validation procedures. The findings provide strong support for the psychometric properties of the scales. Two factor analyses showed that the six appraisal dimensions were relatively independent. In multiple regression analyses, threat and centrality consistently emerged as significant predictors of overall stressfulness. The Stress Appraisal Measure (SAM) appears to be a promising instrument for use in future stress research.

According to transactional models of stress, cognitive appraisal mediates the stressfulness of events.¹⁻⁴ In spite of the wide acceptance of these models, progress in the study of appraisal has been slow. In particular, little attention has focused on the development of suitable appraisal instruments. The present paper presents a multidimensional approach to appraisal measurement and reports the psychometric properties of the Stress Appraisal Measure (SAM).

Cognitive-relational theory views appraisal as the process of evaluating or categorizing the personal significance of events.^{2,3,5} Primary appraisal involves an assessment of the importance of a transaction for one's well-being. Encounters are appraised as irrelevant, benign-positive (beneficial), or stressful. Three stress appraisals are distinguished: harm/loss, threat, and challenge. Harm/loss appraisals are associated with events that have already occurred whereas threat and challenge appraisals are most relevant to anticipated events.

Secondary appraisal is primarily concerned with

the evaluation of what can be done about the situation. It involves a complex assessment of one's coping options. Perceptions of situational control are assumed to play an important role in secondary appraisal.^{3,6} Such appraisals reflect the individual's evaluation of the efficacy of personal coping resources in meeting situational demands.⁶

MEASUREMENT OF APPRAISAL

Much of the literature on appraisal measurement has dealt with aggregated life events or daily problems.⁷⁻¹² Lazarus notes that summarizing across encounters can provide useful information but it involves a major compromise in terms of cognitive-relational theory.¹³ The alternative is to focus on a particular person-environment transaction and to assess specific components of primary and secondary appraisal.

Several approaches to the measurement of primary appraisal have been attempted. One focuses on the emotions that are assumed to be a product

of appraisal.¹⁴ Four emotion scales, corresponding to threat, challenge, harm/loss, and benefit appraisals, have been developed.^{14,15} In another approach, the person's evaluation of what is at stake in the outcome of the encounter is assessed. This has resulted in the development of several stakes scales. These scales are either applicable to a particular situation¹⁵ or are limited to a narrow range of possible stakes.¹⁶⁻¹⁸ Primary appraisal scales, derived from factor analyses of semantic differential ratings, have also been utilized.¹⁹ Alternatively, single-item appraisal measures have been employed, including items assessing how disturbing,²⁰ difficult,^{15,21,22} stressful,^{20,23} threatening or challenging²³ the situation is perceived to be. A major problem with such single-item scales is the risk of excessively high measurement error.

Secondary appraisal frequently has been assessed using four single-item measures.^{16,17,24,25} These items involve rating the extent to which the situation can be changed, has to be accepted, requires more information, or requires holding oneself back. Because these are single-item measures, results based on these items need to be interpreted cautiously.²⁵ Another limitation of the measures is that they appear to be confounded with coping. Although the items were intended to index perceived coping options¹⁶ rather than actual coping efforts, they overlap in wording and in conception with items in frequently used coping instruments, such as the Ways of Coping Checklist.³ For example, there is little difference between acceptance as appraisal and acceptance as coping. Other measures of secondary appraisal are single-item^{15,26} or situation-specific²⁷ measures of perceived control.

In one previous study, multidimensional scales encompassing both primary and secondary appraisal were developed.²⁸ Five orthogonal appraisal dimensions were obtained from a factor analysis of items based on various appraisal dimensions reported in the literature. Two factors corresponded to threat and challenge dimensions. However, it is not clear whether the remaining factors represent dimensions of appraisal or coping because they involve the four secondary appraisal items discussed above.

On the basis of this review of appraisal measurement, several conclusions can be drawn. First, a variety of measures have been developed for specific studies but there is no single instrument which measures conceptually important dimensions of both primary and secondary appraisal. Second,

most scales are single-item measures, likely to have high measurement error. Third, some scales appear to be confounding the measurement of appraisal with coping. Fourth, there is little information available regarding the psychometric properties of these scales.

THE STRESS APPRAISAL MEASURE (SAM)

Clearly, there is a need for a psychometrically sound instrument that measures theoretically important dimensions of both primary and secondary appraisal. The Stress Appraisal Measure (SAM) was developed to achieve these objectives. Because some appraisal dimensions have been hypothesized to be most relevant to anticipatory stress whereas others are most appropriate for past or current events, somewhat different instruments are needed for these different situations. The present discussion is limited to the version of the SAM which was designed for anticipatory stress.

On the basis of cognitive relational theory and past research, three primary appraisal dimensions relevant to anticipatory stress were identified, namely threat, challenge, and centrality. Threat appraisals involve the potential for harm/loss in the future and challenge appraisals reflect the anticipation of gain or growth from the experience.³ Centrality refers to the perceived importance of an event for one's well-being. Conceptually, centrality is similar to the idea of stakes, and it is assumed to be orthogonal to both threat and challenge appraisals.

Three secondary appraisal scales focus on perceptions of control. It has been recognized that situational control appraisals are complex and multifaceted.⁶ The present view assumes that individuals assess controllability in terms of three relatively independent dimensions: the extent to which the situation is controllable-by-self, controllable by others and uncontrollable-by-anyone. We have previously found that events appraised as controllable-by-self, controllable-by-others, and uncontrollable-by-anyone are associated with distinctly different patterns of coping,²⁹ providing some initial empirical support for these three components of situational control.

In addition to the primary and secondary appraisal scales, the SAM includes a scale to index overall perceived stressfulness. Although it is assumed that primary and secondary appraisal dimensions contribute to one's overall perception of stress, little

is known about the relationship between specific appraisal dimensions and overall stress perceptions. In the present studies, the stressfulness scale is used to investigate this issue. In other studies, this scale could be used as an alternative to single-item or other existing measures of stressfulness in assessing the relationship between perceived stress and health outcomes.

STUDY 1

In the first study, an initial item pool was generated and items were selected for each of the seven scales: threat, challenge, centrality, controllable-by-self, controllable-by-others, uncontrollable-by-anyone, and stressfulness. To avoid confounding appraisal and coping, only items consistent with our conceptualization of appraisal were included in the initial pool. From this view, appraisal is regarded as the person's perception of the situation at a particular point in time, whereas coping refers to the strategies used to manage the situation. Thus, the appraisal items focused on the perception of the situation and avoided reference to specific strategies for dealing with the situation, such as acceptance, seeking information, or holding oneself back.

The primary goal of the study was item selection and item analysis. A secondary purpose was to examine the relationship between overall stressfulness and specific appraisal dimensions.

Method

A pool of 37 items was generated, with 5–7 items for each appraisal scale. The items were written to be appropriate for anticipatory stress, to avoid reference to possible coping strategies, and to correspond to one of the following scales: threat, challenge, centrality, controllable-by-self, controllable-by-others, uncontrollable-by-anyone, stressfulness. For the stressfulness scale, items were based on differing definitions or views of stress. For example, one item referred to demands that tax or exceed one's coping resources,³ another reflected the view that stress involves a call for action⁴⁵ by inquiring about the need for coping efforts, and a third referred to tension arousal.^{46,47} Another item simply asked about the stressfulness of the situation without any explanation of the term. Items in all scales were worded in question format (eg, How threatening is this situation?).

The participants in this study were 100 undergraduate students enrolled in a second-year psychology course that was required to major in

Table 1 — Internal consistencies (alphas) of SAM scales

| Scale | Study 1 (<i>N</i> = 100) | Study 2 (<i>N</i> = 151) | Study 3 (<i>N</i> = 144) |
|------------------------|------------------------------|------------------------------|------------------------------|
| Threat | 0.75 | 0.73 | 0.65 |
| Challenge | 0.74 | 0.79 | 0.66 |
| Centrality | 0.90 | 0.85 | 0.84 |
| Controllable-by-self | 0.87 | 0.86 | 0.84 |
| Controllable-by-others | 0.84 | 0.84 | 0.85 |
| Uncontrollable | 0.51 | 0.82 | 0.57 |
| Stressfulness | 0.81 | 0.75 | 0.79 |

psychology. Four weeks prior to the final examination in the course, respondents were instructed to report their perceptions of the forthcoming final examination in the course by completing the preliminary SAM. The response format consisted of a five-point Likert scale (1 = not at all, 5 = a great amount). Following item selection, scale scores were calculated by obtaining the mean rating for the items comprising each scale; thus, scale scores can potentially range from 1 to 5.

Results and discussion

For each of the seven scales, the four items yielding the highest item to scale-total correlations were retained. The reliability of each scale was then assessed using internal consistency (alpha) estimates. As shown in Table 1, for six of the scales the alphas were good, ranging from 0.74 to 0.90. However, the alpha for the uncontrollable-by-anyone scale was 0.51. Observation of the mean and standard deviation for this scale (see Table 2) suggested that internal consistency may have been attenuated because ratings of the uncontrollable-by-anyone items were consistently at the low end of the scale; this range restriction may have reduced interitem correlations. It was decided to retain the scale pending its use with other samples and in different stressful situations. The mean scores for the other scales were all approximately in the middle of the possible range.

The six appraisal dimensions were moderately correlated. Ignoring the sign of the correlations, the mean intercorrelation was 0.22. This suggests that these scales are tapping relatively independent appraisal dimensions.

Stepwise multiple regression of stressfulness ratings on the six appraisal scales revealed that threat (R^2 change = 0.53, $p < 0.001$; beta = 0.73,

centrality (R^2 change = 0.05, $p < 0.001$; $\beta = 0.23$) and controllable-by-others (R^2 change = 0.02, $p < 0.05$; $\beta = 0.13$) were significant predictors of stressfulness, yielding an overall $R^2 = 0.60$ ($p < 0.001$). Thus, the high degree of overlap between perceptions of threat and stress suggests that threat may be a major ingredient of stress appraisals. However, stress perceptions involve more than just threat because centrality and controllable-by-others appraisals accounted for significant variance beyond that predicted by threat. The two subsequent studies examined the replicability of these findings.

Overall, the results from this study are encouraging, providing initial evidence of the internal consistency and relative independence of the scales. The two subsequent studies further examine the internal consistency and independence of the scales and provide initial evidence of their validity.

STUDY 2

In addition to replicating internal consistency estimates and obtaining normative data for two different anticipatory stressors, this study examined the validity of the instrument. Construct validity was studied by investigating whether the factor structure supported the conceptually derived appraisal dimensions. Validity was also examined by determining whether the instrument could differentiate between two anticipatory stressors that, objectively, appeared to involve very different situational demands. We predicted that the prospect of unemployment would be viewed as more under one's own control than the prospect of being exposed to the acquired immuno-deficiency syndrome (AIDS) virus. At the time of the study, in early 1987, there was a high degree of public ignorance concerning the transmission of AIDS; we hypothesized that this would contribute to perceptions of low personal control over exposure to the AIDS virus. We did not make specific predictions regarding the other appraisal dimensions.

Method

The participants in this study were undergraduate students in an introductory psychology course who participated to fulfill course requirements. Two sets of instructions to the SAM were prepared. One set of instructions indicated that respondents were to rate the prospect of not being able to obtain suitable summer employment; the other set of instructions indicated that respondents

were to rate the prospect of being exposed to the virus responsible for AIDS. The subjects randomly received the SAM with one of the two sets of instructions in addition to other questionnaires not related to the present study. Ninety copies of each version of the questionnaire were distributed approximately six weeks prior to the summer academic break; these were to be completed and returned within one week. One hundred and fifty-four questionnaires were returned, 73 from the summer employment group and 81 from the AIDS virus group; three questionnaires from the AIDS group had some missing data and are not included in the results.

Results and discussion

The internal consistency estimates for the SAM scales are shown in Table 1. The alphas for all seven scales are acceptable. The value for the uncontrollable-by-anyone scale is considerably higher than obtained in Study 1. Both the mean and standard deviation (see Table 2) are also higher, supporting the suggestion that the low alpha for this scale obtained in Study 1 may have been due to the lack of variability in ratings.

Results of stepwise multiple regression predicting stressfulness from appraisal showed three appraisal variables were uniquely associated with stressfulness: threat (R^2 change = 0.50, $p < 0.001$; $\beta = 0.71$), challenge (R^2 change = 0.08, $p < 0.001$; $\beta = 0.28$), and centrality (R^2 change = 0.02, $p < 0.01$; $\beta = 0.19$). Thus, two of the three variables uniquely associated with stressfulness in Study 1 also emerged as significant predictors in this study. However, in this study challenge rather than controllable-by-others was the other significant predictor.

The factor structure of the six appraisal scales was determined using a principal factors analysis with varimax rotation of factors with eigenvalues greater than one. This procedure resulted in a five-factor solution. It can be seen from the factor loadings shown in Table 3 that these results are generally supportive of the SAM dimensions. Although items from two scales loaded on each of the first two factors, the scales can be differentiated in terms of the magnitude of the loadings. Particularly striking is the fact that the three types of control items loaded on three different factors. This provides strong support for conceptualizing situational control in terms of three independent dimensions. The

Table 2 — Means (standard deviations) of SAM scales

| | Study 1 Examination (<i>N</i> = 100) | Study 2 Unemployment (<i>N</i> = 73) | Study 2 AIDS virus (<i>N</i> = 78) | Study 3 Examination (<i>N</i> = 144) |
|------------------------|---|---|---|---|
| Threat | 2.6 (0.8) | 2.6 (0.8) | 3.2 (1.0) | 2.3 (0.8) |
| Challenge | 3.0 (0.9) | 3.5 (0.7) | 2.5 (1.0) | 3.0 (0.8) |
| Centrality | 3.6 (0.9) | 3.7 (0.7) | 3.5 (1.2) | 3.7 (0.8) |
| Controllable-by-self | 3.9 (0.7) | 3.8 (0.8) | 3.1 (1.1) | 4.0 (0.7) |
| Controllable-by-others | 3.7 (0.8) | 3.4 (0.7) | 3.3 (1.1) | 3.4 (1.0) |
| Uncontrollable | 1.6 (0.6) | 2.2 (0.9) | 2.8 (1.1) | 1.6 (0.6) |
| Stressfulness | 3.4 (0.9) | 3.0 (0.7) | 3.0 (1.0) | 3.3 (0.9) |

fifth factor appears to represent an aspect of challenge which is independent from control appraisals.

The two groups had the same mean stressfulness rating (see Table 2). However, a multivariate analysis of variance of the six appraisal scales revealed that there was a significant multivariate group effect ($F = 12.71$, $df = 6/144$, $p < 0.001$). Univariate tests indicated that the means for the two stressors did not significantly differ for the centrality and controllable-by-others dimensions, but exposure to the AIDS virus was perceived as significantly more threatening, less challenging, less controllable-by-self, and more uncontrollable by anyone than the employment stressor.

These findings were consistent with the expectation that the two stressors would be appraised differently. The prediction that the AIDS virus would be rated as less controllable-by-self was supported. Although this prediction was based on the widespread lack of knowledge about AIDS, it is not known whether amount of knowledge about AIDS actually affects the appraisal of personal control. Interestingly, the prospect of exposure to the AIDS virus was perceived as significantly more threatening but not more central than the prospect of unemployment. Perhaps, exposure to the AIDS virus was perceived as only moderately central to one's well-being because of its low incidence rate in the general population.

The different findings for threat and centrality indicate that these represent different components

of appraisal. This view is further supported by the multiple regression results, in both Study 1 and Study 2, showing that centrality predicted significant variance in perceived stressfulness beyond that accounted for by threat. Thus, even though the items from these scales loaded on the same factor in this study, there is sufficient justification for retaining threat and centrality as separate scales.

STUDY 3

Study 3 was designed to investigate the correlation between the SAM scales and measures of locus of control, mood and psychological symptomatology. In addition, this study provided a replication of the internal consistency estimates and factor structure of the SAM scales in the context of an anticipated academic examination.

Method

Respondents were 144 undergraduate students in introductory psychology who participated to fulfill course requirements. Participants completed a questionnaire which contained the SAM and measures of locus of control (scored in the direction of externality),³⁰ dysphoric mood,³¹ and psychological symptomatology.^{32,33} These measures were included in a counterbalanced order in the questionnaire booklet. Instructions to the SAM indicated that respondents were to rate their perceptions of the forthcoming Christmas examin-

Table 3 — Factor structure obtained in Study 2 ($N = 151$)

| | Factor Loadings ^a | | | | |
|-------------------------------|------------------------------|------|------|------|-------|
| | I | II | III | IV | V |
| SAM items^b | | | | | |
| <i>Controllable-by-self</i> | | | | | |
| have ability to do well | 0.85 | | | | |
| have what it takes | 0.73 | | | | |
| will overcome problem | 0.71 | | | | |
| have skills necessary | 0.76 | | | | |
| <i>Threat</i> | | | | | |
| threatening situation | | 0.56 | | | -0.50 |
| feel anxious | | 0.54 | | | |
| outcome negative | | | | | |
| negative impact | | 0.48 | | | |
| <i>Centrality</i> | | | | | |
| important consequences | | 0.81 | | | |
| will be affected | | 0.73 | | | |
| serious implications | | 0.70 | | | |
| long-term consequences | | 0.69 | | | |
| <i>Uncontrollable</i> | | | | | |
| totally hopeless | | | 0.57 | | |
| outcome uncontrollable | | | 0.72 | | |
| beyond anyone's power | | | 0.82 | | |
| problem unresolvable | | | 0.79 | | |
| <i>Controllable-by-others</i> | | | | | |
| someone I can turn to | | | | 0.69 | |
| help available | | | | 0.75 | |
| resources available | | | | 0.76 | |
| anyone who can help | | | | 0.67 | |
| <i>Challenge</i> | | | | | |
| positive impact | 0.50 | | | | 0.55 |
| eager to tackle | 0.54 | | | | |
| can become stronger | 0.43 | | | | |
| excited about outcome | | | | | 0.48 |

^a all loadings > 0.40 are shown.

^b SAM items are identified by key words in item.

ation in psychology, which was scheduled to occur in three weeks.

Results and discussion

The internal consistency estimates for the SAM scales were quite similar to those obtained in the two previous studies (see Table 1). Overall, these results show that these scales have satisfactory internal consistency. However, the alpha for the uncontrollable-by-anyone scale was similar to that obtained in Study 1, which also investigated appraisal of a forthcoming examination. As in Study 1, there was evidence that the internal consistency of this scale may have been attenuated because there

was little variation in the ratings of items on it (see Table 2).

Comparison of the scale means obtained in this study with those from Study 1 shows a high degree of consistency in the appraisal of the two examinations (see Table 2).

Stepwise multiple regression of stressfulness on the six appraisal dimensions revealed three significant predictors: threat (R^2 change = 0.41, $p < 0.001$; beta = 0.64), centrality (R^2 change = 0.01, $p < 0.001$; beta = 0.34), and uncontrollable-by-anyone (R^2 change = 0.02, $p < 0.05$; beta = 0.15). Thus, in all three studies threat and centrality were found to be unique predictors of stressfulness ratings; in each study, these appraisals together

Table 4 — Factor structure obtained in study 3 ($N = 144$)

| | Factor Loadings ^a | | | | | |
|------------------------------------|------------------------------|------|------|-------|------|------|
| | I | II | III | IV | V | VI |
| SAM items^b | | | | | | |
| <i>Controllable-by-self</i> | | | | | | |
| have ability to do well | 0.84 | | | | | |
| have what it takes | 0.84 | | | | | |
| will overcome problem | 0.47 | | | | | |
| have skills necessary | 0.73 | | | | | |
| <i>Centrality</i> | | | | | | |
| important consequences | | 0.81 | | | | |
| wil be affected | | 0.71 | | | | |
| serious implications | | 0.78 | | | | |
| long term consequences | | 0.70 | | | | |
| <i>Controllable-by-others</i> | | | | | | |
| someone I can turn to | | | 0.77 | | | |
| help available | | | 0.79 | | | |
| resources available | | | 0.53 | | | |
| anyone who can help | | | 0.87 | | | |
| <i>Threat</i> | | | | | | |
| threatening situation ^c | | | | | | |
| feel anxious | | | | 0.56 | | |
| outcome negative | | | | 0.58 | | |
| negative impact | | | | 0.51 | | |
| <i>Challenge</i> | | | | | | |
| positive impact | | | | -0.44 | | |
| eager to tackle | | | | | 0.64 | |
| can become stronger | | | | | 0.42 | |
| excited about outcome | | | | | 0.70 | |
| <i>Uncontrollable</i> | | | | | | |
| totally hopeless | -0.41 | | | | | |
| outcome uncontrollable | | | | | | |
| beyond anyone's power | | | | | | 0.49 |
| problem unresolvable | | | | | | 0.76 |

^a all loading > 0.40 are shown.

^b SAM items are identified by key words in item.

^c due to a clerical error this item was not included in this study.

accounted for over half of the variance in stressfulness ratings. However, further investigation is needed to determine whether the stressfulness scale provides any valuable information beyond that given by the threat and centrality scales.

A principal factors analysis with varimax rotation of factors with eigenvalues greater than one resulted in a six-factor solution (see Table 4). Each of the factors identified corresponds closely to one of the SAM appraisal scales. These findings, together with the factor analytic results from study 2, provide strong empirical support for conceptualizing the SAM scales as relatively independent appraisal dimensions.

Correlations of the SAM scales with locus of control, dysphoric mood and symptomatology are shown in Table 5. For locus of control, the correlations are small. Only one of the three control scales was significantly correlated with locus of control; internals were more likely to perceive the possibility of control through the help of others. Although this may seem contrary to an internal locus of control, a high score on the controllable-by-others scale reflects the perception that others can serve a useful support function. As such, this relationship fits the view that internals are confident in being able to obtain desired outcomes and is consistent with previous findings of a positive relationship

Table 5 — Correlations of SAM scales with Rotter locus of control, psychological symptoms, and dysphoric mood ($N = 144$)

| SAM scale | Locus of control ^a | Psychological symptoms ^b | Dysphoric mood ^c |
|------------------------|-------------------------------|-------------------------------------|-----------------------------|
| Threat | 0.12 | 0.36*** | 0.55*** |
| Challenge | -0.17* | 0.00 | -0.19* |
| Centrality | -0.03 | 0.33*** | 0.40*** |
| Controllable-by-self | -0.06 | -0.07 | -0.26** |
| Controllable-by-others | -0.21* | -0.20* | -0.29*** |
| Uncontrollable | 0.07 | 0.24** | 0.37*** |
| Stressfulness | 0.12 | 0.38*** | 0.58*** |

^a high score indicates external locus of control.

^b high score indicates high level of symptoms.

^c high score indicates high level of dysphoric mood.

* $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

between internal locus of control and social support.^{34,35}

On the other hand, the lack of significant correlation between the controllable-by-self dimension and locus of control is not surprising because previous studies have not consistently found a relationship between locus of control and appraisals of personal control.³⁶⁻³⁸ One situational factor that may affect the relationship between locus of control beliefs and situational control appraisals is the ambiguity of the situation. Locus of control is most likely to influence control appraisals in ambiguous situations.³ Although the exact nature and outcome of an examination are somewhat uncertain, it is a familiar situation for undergraduate students.

Dysphoric mood was significantly correlated with all the appraisal scales, positively related to threat, centrality, uncontrollable-by-anyone and stressfulness, and negatively associated with challenge, controllable-by-self and controllable-by-others. These results provide convergent validity for the SAM scales because mood has long been used as a stress index^{39,40} and recently has been demonstrated to have important influences on cognition.⁴¹⁻⁴³ Consistent with the view that measures of appraised stress are likely to show some overlap with symptomatology,^{12,13} psychological symptoms were moderately correlated with all but the challenge and controllable-by-self scales. Overall, the correlational evidence provides some initial support for the convergent validity of the appraisal scales. Of course, a wider range of correlates needs to be investigated in subsequent studies.

SUMMARY AND CONCLUSIONS

We have emphasized that a cognitive-relational view of stress demands the assessment of conceptually important appraisal dimensions. On the basis of cognitive-relational theory and our own conceptual analysis of anticipatory stress, six appraisal dimensions were identified. The Stress Appraisal Measure was developed to tap these dimensions as well as overall perceived stressfulness. The results demonstrated that this instrument has good psychometric properties and measures six relatively independent dimensions.

Centrality has been recognized by Lazarus as playing an important role in the stress process.⁴⁴ In the present approach, this view was extended by conceptualizing centrality as a dimension of primary appraisal. Centrality was assessed using multiple items that tap the person's perception of the importance of the situation. This measurement approach focuses on how much the person has at stake in an encounter rather than what specific stakes are involved, making the scale appropriate for a wide range of situations. In the factor structure obtained in Study 3, centrality emerged as a clear and independent appraisal dimension. Although centrality and threat items loaded on the same factor in Study 2, centrality accounted for significant and unique variance in overall stressfulness in all three studies. Thus, the results provide strong support for viewing centrality as a distinct appraisal dimension.

Control appraisals were conceptualized in terms

of three separate dimensions. In both Study 2 and Study 3, the factor analytic results were very supportive of this conceptualization. This evidence of three distinct control dimensions is consistent with the previous finding that situations identified as controllable-by-self, controllable-by-others, or uncontrollable-by-anyone were associated with different patterns of coping efforts.²⁹ Although the contribution of each dimension to the stress process remains to be investigated, this multidimensional view offers a potentially more sensitive approach to the measurement of control appraisals than available previously.

The overall stressfulness scale when used together with the primary and secondary appraisal scales has the potential for providing a more complete picture of the stress process. In some situations, like study 2, overall stressfulness ratings may fail to reflect important differences in primary and secondary appraisal. However, investigation of the relationship between overall stressfulness and specific appraisal dimensions may reveal important aspects of the stress process. For example, the present results highlight the importance of threat and centrality to overall stressfulness.

Establishing the psychometric properties of an instrument is a long-term process. The present studies have provided initial evidence in support of the SAM but there is the need for further psychometric data, especially those obtained in differing contexts and with a broader range of respondents. Although examination of test-retest reliability is not appropriate because appraisals are expected to change over time,¹³ further evidence of the validity of the scales is warranted. In our own research we are continuing to gather psychometric data on the instrument and we are extending the SAM, which was designed for measurement of anticipatory stress, by adapting it for use with ongoing and past events.

Cognitive-relational theory places appraisal at the center of the stress process. However, little is known about how appraisals are influenced by person variables, how they change as an encounter unfolds or how appraisals mediate coping and adaptational outcomes. To address such issues, stress appraisal needs to be examined within the context of prospective studies. The Stress Appraisal Measure appears to be an attractive instrument for use in such research. Furthermore, the SAM represents an alternative to conceptualizing and measuring stress in terms of aggregated life events.

ACKNOWLEDGEMENTS

This article is partially based on a paper presented at the Annual Meeting of the Canadian Psychological Association, Montreal, 1988. Preparation of this paper was supported by a Social Sciences and Humanities Research Council of Canada Doctoral Fellowship awarded to the first author.

Copies of the Stress Appraisal Measure are available upon request from the authors. Requests should be addressed to Paul T. P. Wong, Department of Psychology, Trent University, Canada K9J 7B8.

REFERENCES

1. Cox, T. *Stress*. Macmillan, London, 1978.
2. Lazarus, R. S. *Psychological Stress and the Coping Process*. McGraw-Hill, New York, 1966.
3. Lazarus, R. S. and Folkman, S. *Stress, Appraisal, and Coping*. Springer, New York, 1984.
4. Moos, R. H. and Billings, A. G. Conceptualizing and measuring coping resources and processes. In: *Handbook of Stress: Theoretical and Clinical Aspects*. Goldberger, L. and Breznitz, S. (Eds) Free Press, New York, 1982, pp. 212-230.
5. Lazarus, R. S. and Launier, R. Stress-related transactions between person and environment. In: *Perspectives in Interactional Psychology*. Pervin, L. A., and Lewis, M. (Eds) Plenum, New York, 1978, pp. 287-327.
6. Folkman, S. Personal control and stress and coping processes: A theoretical analysis. *J. Personal. Soc. Psychol.* 1984; **46**: 839-852.
7. Cohen, S. Contrasting the Hassles Scale and the Perceived Stress Scale: Who's really measuring appraised stress? *Am. Psychol.* 1986; **41**: 717-718.
8. Cohen, S., Kamareck, T. and Mermelstein, R. A global measure of perceived stress. *J. Hlth Soc. Behav.* 1983; **24**: 385-396.
9. DeLongis, A., Coyne, J. C., Dakof, F., Folkman, S. and Lazarus, R. S. Relationship of daily hassles, uplifts, and major life events to health status. *Hlth Psychol.* 1982; **1**: 119-136.
10. DeLongis, A., Folkman, S. and Lazarus, R. S. The impact of daily stress on health and mood: Psychological and social resources as mediators. *J. Personal. Soc. Psychol.* 1988; **54**: 486-495.
11. Dohrenwend, B. S. and Shrout, P. E. 'Hassles' in the conceptualization and measurement of life stress variables. *Am. Psychol.* 1985; **40**: 780-785.
12. Lazarus, R. S., DeLongis, A., Folkman, S. and Gruen, R. Stress and adaptational outcomes: The problem of confounded measures. *Am. Psychol.* 1985; **40**: 770-779.
13. Lazarus, R. S. Theory-based stress measurement. (in press).

14. Folkman, S. and Lazarus, R. S. Coping as a mediator of emotion. *J. Personal. Soc. Psychol.* 1988; **54**: 466–475.
15. Folkman, S. and Lazarus, R. S. If it changes it must be a process: A study of emotion and coping during three stages of a college examination. *J. Personal. Soc. Psychol.* 1985; **48**: 150–170.
16. Folkman, S., Lazarus, R. S., Dunkel-Schetter, C., DeLongis, A. and Gruen, R. J. Dynamics of a stressful encounter: Cognitive appraisal, coping, and encounter outcomes. *J. Personal. Soc. Psychol.* 1986; **50**: 992–1003.
17. Folkman, S., Lazarus, R. S., Gruen, R. J. and DeLongis, A. Appraisal, coping, health status and psychological symptoms. *J. Personal. Soc. Psychol.* 1986; **50**: 571–579.
18. Folkman, S., Lazarus, R. S., Pimley, S. and Novacek, J. Age differences in stress and coping processes. *Psychol. Aging* 1987; **2**: 171–184.
19. Fish, T. A. Semantic differential assessment of benign, threat and challenge appraisals of life events. *Can. J. Behav. Sci.* 1986; **18**: 1–13.
20. Dobson, K. S. and Neufeld, R. W. J. Sources of differential stress associated with psychometrically designated anxiety proneness. *J. Personal. Soc. Psychol.* 1981; **40**: 951–961.
21. Dobson, K. S. A regression analysis of the interactional approach to anxiety. *Can. J. Behav. Sci.* 1983; **15**: 163–173.
22. Dobson, K. S. and Neufeld, R. W. J. Stress-related appraisals: A regression analysis. *Can. J. Behav. Sci.* 1979; **11**: 274–285.
23. Wong, P. T. P. and Reker, G. T. Coping behavior of type A individuals. Paper presented at the annual meeting of the Canadian Psychological Association, Halifax, June 1985.
24. Folkman, S. and Lazarus, R. S. An analysis of coping in a middle-aged community sample. *J. Hlth Soc. Behav.* 1980; **21**: 219–239.
25. Folkman, S. and Lazarus, R. S. Stress processes and depressive symptomatology. *J. Abn. Psychol.* 1986; **95**: 107–113.
26. Forsythe, C. J. and Compas, B. E. Interaction of cognitive appraisals of stressful events and coping: Testing the goodness of fit hypothesis. *Cog. Ther. Res.* 1987; **11**: 473–485.
27. Affleck, G., Tennen, H., Pfeiffer, C. and Fifield, J. Appraisals of control and predictability in adapting to a chronic disease. *J. Personal. Soc. Psychol.* 1987; **53**: 273–279.
28. Gall, T. L. and Evans, D. R. The dimensionality of cognitive appraisal and its relationship to physical and psychological well-being. *J. Psychol.* 1987; **12**: 539–546.
29. Wong, P. T. P. and Reker, G. T. Face validity of the Coping Inventory. Paper presented at the annual meeting of the Canadian Association on Gerontology, Moncton, New Brunswick, 1983.
30. Rotter, J. B. Generalized expectancies for internal versus external control of reinforcement. *Psychol. Monogr. Gen. Appl.* 1966; **80** (whole No. 609).
31. Zuckerman, M. and Lubin, B. *The Multiple Affect Adjective Checklist (MAACL)*. Educational and Industrial Testing Service, San Diego, 1965.
32. Derogatis, L. R. *Brief Symptom Inventory*. Clinical Psychometric Research, Baltimore, 1975.
33. Derogatis, L. R. and Melisaratos, N. The Brief Symptom Inventory: An introductory report. *Psychol. Med.* 1983; **13**: 595–605.
34. Krause, N. Understanding the stress process: Linking social support with locus of control beliefs. *J. Gerontol.* 1987; **42**: 589–593.
35. Caldwell, R. A., Pearson, J. L. and Chin, R. J. Stress moderating effects: Social support in the context of gender and locus of control. *Personal. Soc. Psychol. Bull.* 1987; **13**: 5–17.
36. Archer, R. P. Relationships between locus of control, trait anxiety, and state anxiety: An interactionist perspective. *J. Personal.* 1979; **47**: 305–316.
37. Parkes, K. R. Locus of control, cognitive appraisal, and coping in stressful episodes. *J. Personal. Soc. Psychol.* 1984; **46**: 655–668.
38. Vitaliano, P. P., Russo, J. and Maiuro, R. Locus of control, type of stressor, and appraisal within a cognitive-phenomenological model of stress. *J. Res. Personal.* 1987; **21**: 224–237.
39. Lazarus, R. S., Speisman, J. C., Mordkoff, A. M. and Davison, L. A. A laboratory study of psychological stress produced by a motion picture film. *Psychol. Monogr.* 1962; **76**: (whole No. 553).
40. Norris, E. L. Verbal indices of psychological stress. In: *Theories of Cognitive Consistency: A Sourcebook*. Abelson, R. P. et al. Rand McNally, (Eds) Chicago.
41. Isen, A. M., Shalke, T. E., Clark, M. and Karp, L. Affect, accessibility of material in memory and behavior: A cognitive loop? *J. Personal. Soc. Psychol.* 1978; **36**: 1–12.
42. Bower, G. H. and Cohen, P. R. Emotional influences in memory and thinking: Data and theory. In: *Affect and Cognition*. Clark, M. S and Fiske, S. T. (Eds) Erlbaum, Hillsdale, NJ, 1982, pp. 291–331.
43. Forgas, J. P. and Bower, G. H. Mood effects on person-perception judgements. *J. Personal. Soc. Psychol.* 1987; **53**: 53–60.
44. Lazarus, R. S. Puzzles in the study of daily hassles. *J. Behav. Med.* 1984; **7**: 375–389.
45. Sarason, I. G., and Sarason, B. R. The importance of cognition and moderator variables in stress. In: *Toward a Psychology of Situations: An Interactional Perspective*. Magnusson, D. (Ed.) Erlbaum, Hillsdale, NJ, 1981; pp. 195–210.
46. Appley, M. H. and Trumbull, R. (Eds) *Psychological Stress*. Appleton, New York, 1967.
47. Mechanic, D. *Students under Stress*. Free Press, New York, 1962.