

## Modifiers and Perceived Stress Scale

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The Modifiers and Perceived Stress (MAPS) Scale measures stressful life events by number and amount of perceived stresses and provides scores for variables such as anticipation of events, responsibility for events, and amount of social support from family and friends in coping with each event that modify the way stress is perceived. Factor analysis of total and average scores for these areas identified four dimensions: Total and average anticipated and responsible scores loaded on one dimension, number of events and total perceived stress loaded on another, the two support scores loaded on a third factor, and average perceived stress loaded independently on a factor. Two-week test-retest reliabilities for scores were in the moderate to high range from  $r(43) = .69$  to  $r(43) = .88$ . Independent assessments of stress by social workers correlated significantly with the total perceived stress score and with the average perceived stress score. Average perceived stress scores correlated higher and more often with psychological and physical indicators of stress in 200 men than did total perceived stress scores. Average perceived stress may measure an individual's usual way of reacting to stressful events. Number of events, which correlated highly with total perceived stress, may represent the magnitude of stress over a specific time.

The pioneering work of Holmes and Rahe (1967) in developing the Social Readjustment Rating Scale (SRRS) opened the door to studies of effects of environmental stress. The idea that change associated with major life events could be an indicator of stress remains an attractive concept. Perhaps this is why nearly two decades of work in the field have been spent trying to perfect life event measurement. Rabkin and Struening (1976), Monroe (1982), Paykel (1983), and Dohrenwend (1979), among others, have described some of the pitfalls in life event questionnaires concerning their content, methods of data collection, time intervals covered by ratings, reliability, and scoring. However, although there are problems in measuring life events, much has been learned about stress and onset of disease through such measurements.

One content problem of life event measurements is that the specific life events must vary in order to be relevant to a population; thus comparison among studies is limited. For example, the elderly living in high-crime areas would be asked about events such as robberies or assaults, whereas medical students would be asked about death of a patient or failure on an examination. Comparability may be a justifiable trade-off for scale sensitivity and specificity. In addition, some events are consequences rather than causes of the psychological or medical outcome studied. In fact, 29 of the 43 events on the SRRS can be viewed as consequences of illness (Hudgens, 1974). This problem can be circumvented to some extent by documenting onset of illness or excluding confounding events from analyses. Also,

some events can lead to other events in a cause-effect fashion. For example, trouble with an employer may lead to loss of a job, which leads to financial problems for one individual but not for another. Finally, events can be redundant: Changes in social activities overlap with changes in recreation; arguments with a spouse may overlap with marital separation. When events are not independent, total scores can be inflated.

Reliability problems can arise from methods of data collection and time intervals covered by respondents' recall of events. Paykel (1983) suggested that stress studies move from the self-report used in the early phases of development of life event measurements to the form of structured interviews that probe for more accurate responses concerning occurrence of events. Jenkins, Hurst, and Rose, 1979 found recall covering more than 6 months unreliable.

A major problem of life event measurement as an indicator of stress is the scoring of life events. Some investigators score all events together, others score undesirable events separately from desirable events, some use weighted scores for events, and others use the individual's assessment of perceived stress for each event. Item scores can be totaled or averaged. A single event may be studied, such as death of a spouse or unemployment (Linn & Sandifer, 1985; Pearlin, Lieberman, Menaghan, & Mullan, 1981), to help clarify relations between event and outcome; however, other events occur to confound such relations. Scoring certain types of events together has sometimes been useful (Hurst, 1979). For those who advocate weighted scores, raw score totals have been shown to correlate highly with weighted scores (McFarlane, Norman, Streiner, Roy, & Scott, 1980; Rahe, 1978). Those who prefer to use an individual's own assessment, on the assumption that only the individual can judge how much stress he or she feels during an event, face the problem that perception can be colored by current mood or prior experience (Brown, 1974; Cleary, 1981). Finally, basic to any scoring system is the question of additivity of events.

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I developed the Modifiers and Perceived Stress (MAPS) Scale to measure experiences with stress in a prospective study of the effects of stress on immune responses and later onset of disease. It by no means solves all the aforementioned problems concerning life event measurement. It does, however, appear to be useful in organizing and scoring a set of stress-related variables. It documents number and types of objective events (such as divorce, death of family member, or loss of employment) as well number and types of subjective events (such as arguments with relatives or sexual difficulties). It records the way the individual perceives stress related to each event as well as whether the event is viewed as desirable or not. Other variables that modify how events are perceived are also scored, such as anticipation of events, responsibility for their occurrence, and amount of social support received from family and friends in coping with each event. Thus, the MAPS provides scores for number of events, number of positive and negative events, perceived stress, anticipated stress, responsibility for stress, and support received. In studying the relations among the variables, both totaled and averaged scores are used.

The purpose of the present study was to determine the interrelations between perceived stress and its modifiers and total or averaged scores, and obtain data on reliability and validity of the scale.

## Method

### Subjects

Data were taken from an ongoing study at the Veterans Administration (VA) Medical Center in Miami, Florida, concerning the effect of environmental stress on immune function and onset of disease. Approximately 302 men have entered the study and are being rated every 6 months for 5 years on psychological, physiological, immunological, and stress variables. Subjects average 52 years of age ( $SD = 8.6$  years), 90% are Anglo, 60% are currently married and living with their wives, and most are of lower middle to middle social class (Hollingshead, 1957). Baseline ratings were used in the analyses. Systematic sampling procedures were used to select subjects from different settings. Some were hospitalized, some were undergoing outpatient treatment, and others were not under medical care at all. All met criteria of having no current life-threatening illness, psychiatric diagnosis, current infections, or autoimmune diseases. Eighty-nine percent of the subjects who met criteria for the study signed informed consent and participated.

### Instrument

The MAPS scale contains 41 events applicable to late-adult or middle-aged men similar to those on the Holmes and Rahe SRRS (1967). Items concerning changes in habits, such as sleeping, eating, social, and recreational, were deleted because they tend to overlap with reported illness. Events including arguments with and separation from live-in partner or spouse, having an affair, unfaithfulness by spouse or lover, having visitors in the home, having children in trouble, catastrophes (fire, crime, automobile accidents, and so on), unfavorable change in appearance, legal problems, and having a member of the family hospitalized were added. Space was provided to list any other stressful events not covered by the questionnaire. Events were rated with the past 6 months as the frame of reference.

For each event that had occurred in the past 6 months, the number of months since occurrence was recorded. Likewise, for each reported event, subjects estimated on a 10 point scale (0 = none, 9 = extreme)

the degree to which the event was perceived as stressful or demanding in regard to life change, the degree to which the event was anticipated, the degree of responsibility in bringing the event about, and the amount of support received from family and friends in coping with the event.

Subjects were told that the purpose of the study was to relate their experiences with stress to changes in their health. They were encouraged to talk with the interviewer about the preceding 6 months before they provided the ratings. Instructions for rating were reviewed and individuals were asked if they had questions about the procedure. The interviewer remained with the person to answer any questions that arose. With samples less educated than the present sample, an interview method in which subjects are questioned regarding each event may be needed.

The Appendix shows the instructions provided and the general format for the MAPS items. Upon completion of the scale, the subject is asked to place a + or - before each event endorsed to indicate whether he viewed the event as desirable or undesirable. The scale was scored by totaling the number of events and the amounts of perceived stress, anticipation, responsibility, and support. It seems logical that individuals may react similarly to different stresses by being high or low responders to stress. Therefore, the average of the four areas was also calculated for each person. The average score might reflect a person's usual way of perceiving stress or the tendency to anticipate, feel responsible, or obtain social support. To determine the relations between the total and average scores as well as the relations among the variables measured by the MAPS, data were factor analyzed. The scores on desirable and undesirable events were not entered into the analyses because taken together they are redundant with the total perceived stress scores. Reliability was assessed by test-retest correlations and validity by correlations of the MAPS with clinical assessments of stress and relations to psychophysical indicators of stress.

## Results

### Description of Events

Table 1 shows the distribution of stressful events that had occurred in the past 6 months for at least 5% of the sample with corresponding raw scores for each. It can be seen that an increase in expenses, illness, and hospitalization were the most frequently reported events and reflect the sample characteristics. Rated highest in perceived stress were trouble with boss, loss of personal property, sexual difficulties, and legal problems. Ratings of anticipation of events tended to be highest for trouble with boss, gaining new family member, and spouse starting or stopping work. Ratings of degree of responsibility were highest for unfavorable changes in appearance, having an affair, losing money, and marrying or moving in with a girlfriend. Ratings of degree of support varied considerably by event, with the most social support reported for events such as a family member hospitalized, spouse starting or stopping work, and gaining a new family member. It should be noted that three events not included in Table 1 because their frequency was lower than 5% had very high perceived stress scores. Jail sentences, which occurred for four persons; being fired, which occurred for four persons; and death of spouse, which occurred for two persons, were all rated a 9.

Table 2 shows the means and standard deviations for the total and average scores on the MAPS scale. Correlations of total and average perceived stress with the other variables are also shown. Approximately five events were reported per person. Only one person reported that no events had happened in the past 6

Table 1  
*Life Changes That Occurred for More Than 5% of Respondents and Corresponding Scores on Other Stress Variables*

Events	n	%	Variable			
			Perceived stress	Degree anticipated	Degree responsible	Degree of support
Increase in expenses	78	26	6.4	5.1	3.2	3.7
Illness/injury/surgery (self)	65	22	4.9	3.2	1.7	6.3
Been hospitalized	63	21	4.9	3.0	1.6	6.3
Sexual difficulties	62	21	7.1	4.0	2.1	4.1
Illness/injury/surgery (family)	58	19	5.8	3.2	0.6	6.5
Visitors in home	54	17	4.5	4.7	4.7	5.4
Arguments with wife/girlfriend	50	17	6.7	5.2	4.0	1.8
Started new job/new responsibility	48	16	5.1	5.5	5.4	5.4
Increase in workload/hours	38	13	5.1	4.8	4.1	5.8
Death of close family member	38	13	4.6	2.1	0.3	1.8
Pressure of achievement	36	12	6.7	5.2	5.6	3.9
Children in trouble	34	11	5.8	3.1	1.2	4.8
Catastrophe (fire, crime, and so on)	34	11	6.8	0.8	1.3	2.1
Death of close friend	32	11	4.9	2.6	0.0	3.4
Gained new family member	30	10	3.7	6.1	1.8	6.9
Had legal problems	28	09	7.0	5.3	4.7	2.7
Trouble with boss/co-workers	26	09	7.5	6.3	3.2	5.4
Illness/injury/surgery (friends)	24	08	4.8	1.6	0.0	2.9
Had an affair	24	08	5.8	5.7	6.3	2.7
Family member moving out	24	08	3.6	3.0	2.2	3.4
Unfavorable change in weight/appearance	22	07	7.8	2.0	6.8	3.5
Lost money (loan, gambling)	20	07	4.5	3.0	6.3	3.3
Moved	20	07	4.2	5.5	5.5	2.8
Family member in hospital	20	07	6.0	4.5	2.7	7.8
Arguments with relatives	16	05	6.9	3.4	1.1	4.0
Lost personal property	16	05	7.2	0.0	0.0	3.6
Went into debt (large loan)	16	05	4.4	2.1	0.5	2.8
Spouse starting/stopping work	14	05	2.3	5.8	3.0	7.3
Married/moved in with girlfriend	14	05	3.5	3.7	6.0	3.0

Note. N = 302 men. Stress variables were rated on a 10-point scale.

months. Average perceived stress was 5.06 on the 10-point scale. The mean for support was 3.8, the mean for anticipation was 3.2, and the mean for degree of responsibility for events was 2.2. In regard to the correlations, the number of events was highly

correlated with the total perceived stress score. In fact, all of the total scores were moderately correlated with the total perceived stress, with more stress associated with more anticipation, more feelings of responsibility, and more social support. On the other

Table 2  
*Means and Standard Deviations for the Stress Measurements, and Correlations With Total and Average Perceived Stress*

Variable	M	SD	Correlations	
			Average perceived stress	Total perceived stress
Number of stresses	4.83	2.75	.25**	.81**
Total perceived stress	26.67	21.16	.69**	—
Total anticipation of events	16.60	17.43	.31**	.28**
Total perceived responsibility	12.66	17.06	.14*	.34**
Total perceived support	19.70	21.56	.08	.76**
Average perceived stress	5.06	2.67	—	.69**
Average anticipation of events	3.20	2.71	.32**	.23**
Average perceived responsibility	2.24	2.49	.07	.21**
Average perceived support	3.85	3.32	.01	.03

Note. N = 302 men. Stress variables were rated on a 10-point scale. Total scores are the sum of the ratings for the events that happened to the individual. Averages were computed for each individual for each of the totals. It should be noted that the averages of the means are not the same as the means of the averages.

\* p < .05. \*\* p < .01.

Table 3  
*Intraclass Correlations Between Total Scores on the MAPS*

Variable	Intraclass <i>r</i>
Number of events	.88
Perceived stress	.79
Anticipation of events	.77
Perceived responsibility for events	.76
Perceived amount of support	.69

Note. MAPS = Modifiers and Perceived Stress Scale.  $n = 45$  men.

hand, more average perceived stress per event was only moderately associated with number of events, with more anticipation (both average and total), and with total responsibility for events.

#### Test-Retest Reliability

In order to test whether the MAPS scale was reliable, 45 men not participating in the present study were selected from an ambulatory care clinic at the Miami VA Medical Center and completed the scale once and then again 2 weeks later. Intraclass correlations were computed between the total scores at the two time points (see Table 3). These ranged from  $r(43) = .69, p < .001$ , for support to  $r(43) = .88, p < .001$ , for number of stressful events.

#### Concurrent and Construct Validity

Validity of the MAPS was assessed in two ways. One was by obtaining experts' opinions of how much stress the person had experienced. The other was by determining whether the stress scores (total and average perceived) correlated with other emotional and physical parameters usually associated with stress.

Because a detailed social history compiled by a trained clinician should be able to identify stress in a person's life, three social workers were asked to interview 20 men from the stress and immunity/disease study going on at the Miami VA Medical Center about their life experiences in the past 6 months. The social workers elicited information about the individual's social adjustment in the past 6 months and probed for changes in the person's life in such areas as marriage, family, employment, interpersonal relationships, routine activities, financial adjustment, or any unusual happenings. Then they estimated how most people of the individual's background and circumstances would react to the objective events that the individual had reported in the interview. Thus, their ratings of amount of stress represented their own assessments of the situation regardless of what the person said he felt about the events. The three social workers independently rated the degree of stress they thought had been present on a 10-point scale, and their ratings were intercorrelated, Kendall  $W(18) = .79, p < .001$ . In order to control for the effect of the interview, half of the men were asked to complete the MAPS before their interview and half after. Scores from the social workers were averaged, and the average scores were correlated with the total and average perceived stress scores from the MAPS. The scores provided by the social workers correlated with the total perceived stress scores at  $r(18) =$

$.78, p < .001$ , and average perceived stress at  $r(18) = .53, p < .05$  (Pearson product-moment correlations). Thus, considerable agreement was found between the social workers' assessment of amount of stress and the perceived stress scores identified by rating on the MAPS.

The second way of validating the MAPS was to correlate the perceived stress scores (total and average) from the first 200 men (of the 300 men participating in the ongoing study at Miami Veterans Administration Medical Center) with other study data that would be expected to correlate with stress. The following data were selected as indicators of stress: anxiety and depression factors from the Hopkins Symptoms Checklist (Derogatis, Lipman, Richels, Uhlenhuth, & Covi, 1974), life satisfaction (Neugarten, Havighurst, & Tobin, 1961), self-esteem (Rosenburg, 1962), blood pressure, and response to a cold pressor test, measured by increase in mean blood pressure 1 min after immersing the hand in ice water.

As can be seen in Table 4, average perceived stress correlated somewhat higher and more often with these measures than did total perceived stress. More average perceived stress was associated with more anxiety, more depression, less life satisfaction, less self-esteem, higher systolic blood pressure, and greater increase in blood pressure during the cold pressor test (all at .01 alpha level). Total stress scores were correlated with more anxiety and depression ( $p < .01$ ) and more increase in blood pressure during the cold pressor test ( $p < .05$ ).

#### Factor Structure

Table 5 shows the results of factor analysis using the scores from the MAPS scale. The purpose was to determine the interrelations between perceived stress and modifiers of stress by total and average scores. It should be emphasized that the mean of the averages is not the same as the average of the means. Each subject's total score is averaged before entering it into the group for a mean response. Average scores were viewed as an assessment of stress different from the assessment a total score would provide.

Table 4  
*Correlations of Perceived Stress With Psychological and Physical Measurements*

Variable	Correlations with	
	Average perceived stress	Total perceived stress
Anxiety	.35**	.21**
Depression	.29**	.24**
Life satisfaction	.19**	.10
Self-esteem	.20**	.12
Systolic blood pressure	.18**	.06
Dystolic blood pressure	.04	.03
Increase mean blood pressure (cold pressor)	.19**	.13*

Note.  $n = 200$  men. Anxiety, depression, life satisfaction, and self-esteem were scored so that higher scores are less favorable responses. Increase in mean blood pressure was measured at 1 min after immersion of the person's hand in ice waer.

\*  $p < .05$ . \*\*  $p < .01$ .

Table 5  
Factor Structure of the Stress Variables  
and Loadings on Each Factor

Variable	Factor			
	1	2	3	4
Average anticipation of events	.65			
Average perceived responsibility	.89			
Total anticipation of events	.68			
Total perceived responsibility	.79			
Total number of events		.92		
Total perceived stress		.81		
Average perceived support			.96	
Total perceived support			.81	
Average perceived stress				.89
Variance	27.37	25.19	20.15	17.91

Data were analyzed for the 302 subjects first by performing two-factor analyses selecting every other subject for each analysis to cross-validate findings. Because these produced similar findings, all subjects were then entered together in a final analysis to obtain factor loadings (see Table 5). Kaiser's (1958) varimax rotation was used and factors were extracted until the eigenvalues fell to below .8. Four factors, each accounting for considerable variance, were identified.

As seen, the anticipation and responsibility scores (whether average or total) formed one factor, indicating a common dimension. Those who anticipated stressful events also felt responsible for them. The total number of events and total perceived stress score formed another dimension, suggesting that these are highly related measurements. Social support, however, (either total or average) formed a separate dimension and thus seems to measure something unique from the other modifiers of stress. Average perceived stress was also a separate entity and not a part of the factor describing number of events or total perceived stress.

### Discussion

The MAPS shows acceptable reliability as a measure of perceived stress related to recent events and to potential modifiers of stress perceptions. The perceived stress scores correlated significantly with clinical assessments of how much stress would be expected to be experienced in similar situations and also with psychological and physical parameters generally thought to be associated with stress. Although the ratings were correlated with such measures as state anxiety and depression, they were not so highly correlated as to suggest that perceived stress ratings were simply reflections of mood.

That number of events was highly associated with the total perceived stress, in that they loaded together on one factor, suggests that totaling perceptions of stress by events does not provide much new information over knowing the number of stressful events that occurred. Hurst, Jenkins, and Rose (1978) made similar observations. However, total perceived stress is a subjective indicator of magnitude, and number of events is an objective indicator of magnitude. As Rahe (1981) suggested, the

question remains whether a person's subjective estimates of recent life changes (perceived stress) are better predictors of his or her subsequent symptoms and/or illness than the more objective life changes themselves. Moreover, because total and average perceived stress loaded on separate factors, one can argue for maintaining all three scores as measures of stress. For example, in another study (Linn & Linn, 1983), total perceived stress scores measured by the MAPS were found to predict subsequent metabolic control of diabetes better than did average scores. This may be because metabolic control tends to vary over time in relation to magnitude of stress. However, in preliminary analyses of stress data and later onset of cancer, average perceived stress score was found to be a better predictor than total perceived stress (Linn & Linn, 1982). This could suggest that being highly reactive to stress over time leads to altered psychophysiological responses that predispose one to illness.

Because average perceived stress correlated to a greater degree than did total perceived stress with psychological and physiological indicators of stress, it may measure the person's general tendency or usual way of reacting to stress. Some individuals are more stress reactive and others more stress resistant. The way one usually reacts to stress may be captured in the average score.

It seems logical that anticipation of an event and a feeling of responsibility for causing the event loaded together. Our experience suggests that responsibility may be associated with feelings of guilt, particularly in relation to undesirable stressful events. Social support measured a dimension separate from perceived stress scores and their other modifiers. Total support was correlated individually,  $r(300) = .76, p < .001$ , with total perceived stress but was unrelated to average perceived stress. The high correlation of the two total scores could mean that the number of events inflates both scores; however, it could also reflect that social support was measured in relation to each specific event and not globally as is sometimes done. The average social support score may indicate how much support the subject felt he received from family and friends; however, average support was not correlated significantly with either average or total perceived stress. Social support may interact with perceived stress in modifying its impact on mental health status (Williams, Ware, & Donald, 1981) rather than being associated directly with stress perception.

The present findings must be interpreted in relation to the sample studied, in that responses can only be said to be typical of lower middle to middle class, and middle-aged Anglo men. The number of stressful events and the total perceived stress score provide a measure of objective and subjective stress within the person's environment over a given time, and such scores are often useful in evaluating the magnitude of stressful events. On the other hand, the average scores may describe the individual's general tendency toward reactivity in response to stress as well as the tendency to anticipate, feel responsible, or perceive support from family and friends that can help to explain responses to stressful life events. Although stress over a given time interval is often needed, at times it is desirable to assess degree of perceived stress at a single point in time, such as when correlations are to be determined between current stress levels and physiological parameters such as blood pressure, immune responses, or neuroendocrine function. The Global Assessment of Recent

Stress Scale (Linn, 1985) has been developed that correlated significantly with the MAPS ratings at  $r(378) = .58, p < .001$ , and was a better predictor of current physiological function than the MAPS. However, a cumulative summary of stressful events or the usual reactions to stress identified in the MAPS may be more useful in predicting ultimate disease outcomes.

It should be emphasized that when a mixture of events are totaled, some of the events may be confounded with dependent variables such as psychopathology or physical illness. Summary scores tend to obscure the differences in events. Dohrenwend (1974) suggested that one solution is to take apart what has been put together in relation to the outcomes studied. For example, events related to physical illness or injury and those related to objective losses outside the person's control might be selected as predictors of psychopathology. Therefore, various subscores derived from combinations of events on the MAPS may be useful in certain studies. In addition, stress modifier scores can be used to explain how these modifiers influence stress perceptions. For example, in the present study those who perceived more stress tended to anticipate events more and feel more responsible for their occurrence. At the same time, the modifier scores themselves may be of interest in relation to physical and mental health outcomes. For example, do those who score high on anticipation of stress have different outcomes from those who score low? Finally, modifier variables, such as social support scores, might be used as covariates in assessing impact of objective stress on mental or physical health. The MAPS provides a format for obtaining data about stressful life events that can be scored in different ways depending on the research questions asked.

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Appendix

Life Changes During Last Six Months

Directions: Consider the past six months. Did any of the following events occur? If so, indicate in the first column how long ago (0-6 months; 0 = this past month). In the second column, indicate the degree of life change that was required as a result of the event (0 = none to 9 = extreme). In the third column, use the same 0-9 scale to indicate the degree to which you anticipated the event would happen (0 = did not anticipate to 9 = very much). In the fourth column, use the same 0-9 scale to indicate how much you were involved in bringing the event about (0 = not at all to 9 = very much). In the fifth column, use the same 0-9 scale to indicate how much support you feel you received from family or friends in helping you through the event (0 = none to 9 = very much).

<u>Events</u>	Months ago it happened (0-6)	Amount of life change (stress) (0-9)	Degree event was anticipated (0-9)	Degree responsible for event (0-9)	Degree of support received (0-9)
Started new job/new responsibilities/role	_____	_____	_____	_____	_____
Trouble with boss, co-workers, employees	_____	_____	_____	_____	_____
Demoted	_____	_____	_____	_____	_____

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