

DEVELOPMENT OF THE PERCEIVED STRESS QUESTIONNAIRE: A NEW TOOL FOR PSYCHOSOMATIC RESEARCH

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Abstract—A 30-question Perceived Stress Questionnaire (PSQ) was validated, in Italian and English, among 230 subjects. Test-retest reliability was 0.82 for the General (past year or two) PSQ, while monthly Recent (past month) PSQs varied by a mean factor of 1.9 over 6 months; coefficient alpha > 0.9. General and/or Recent PSQ scores were associated with trait anxiety ($r = 0.75$), Cohen's Perceived Stress Scale ($r = 0.73$), depression ($r = 0.56$), self-rated stress ($r = 0.56$), and stressful life events ($p < 0.05$). The General PSQ was higher in in-patients than in out-patients ($p < 0.05$); both forms were correlated with a somatic complaints scale in a non-patient population ($r > 0.5$), and were higher, among 27 asymptomatic ulcerative colitis patients, in the seven who had rectal inflammation than in those with normal proctoscopy ($p = 0.03$). Factor analysis yielded seven factors, of which those reflecting interpersonal conflict and tension were significantly associated with health outcomes. The Perceived Stress Questionnaire may be a valuable addition to the armamentarium of psychosomatic researchers.

INTRODUCTION

A MAJOR theme in recent psychosomatic research has been the effect of stress on the course of disease, but there is no consensus as to how to measure it. Researchers have variously concentrated on external stressors in the form of 'life events' or 'chronic difficulties' [1, 2]; the subjective components: anxiety, depression, and psychiatric symptoms [3, 4]; the cumulative minor stressors, or 'hassles,' of everyday life [5, 6]; and on the individual's sense of control or coping [7]. Some workers have attempted to bypass patient reporting by measuring pupillary dilation, plasma neuropeptide Y, or salivary cortisol, although such measures are as yet unable to integrate states of hyperarousal over time.

Each technique of stress measurement has its own drawbacks as research tools in psychosomatic medicine. When used retrospectively to detect relations between 'stress' and disease, all of them encounter the difficulty of distinguishing cause from effect: the 'stress' may have been caused by the illness rather than vice versa. The Hassles scale, for example, may be markedly influenced by intrapsychic factors [8, 9], and therefore potentially sensitive to distortion by the effects of being sick.

Major premorbid life events would seem to be objective and free of contamination by illness. But there are a myriad of methodological pitfalls in the life events approach, especially in its original 'checklist' form [10]. Fall-off in event recall can be amazingly rapid [11], allowing recall bias to muddy the waters: sick individuals tend to remember more events than healthy ones, as part of the striving to make sense out of their illness that has been termed 'effort after meaning' [2]. Furthermore,

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while it seems self-evident that a life event occurs 'when the environment changes but the individual does not' [12], life events instruments can be quite prone to confounding by psychological difficulties [8] or by early manifestations of illness ('sexual difficulties' and 'major change in number of arguments with spouse' are examples from one much-used questionnaire [1]). Systems such as the Life Events and Difficulties Schedule, based on in-depth interviews and consensus scoring, are more valid but elaborate [2].

When organic rather than functional disease is studied, there is a risk not only of detecting spurious correlations between psychosocial circumstances and physical illness but also of failure to detect correlations that actually exist. A good illustration may be the surprising failure encountered by several groups who tried to use simple event checklists to demonstrate a relation between stressful life events and duodenal ulcers [13, 14]—a relation now amply documented by workers using better instruments to measure life events and chronic difficulties [15–18]. Psychosomatic influences on structural alterations of the body are likely to be more subtle and less mediated through the somatic symptoms of anxiety and depression than those on functional disorders, therefore necessitating extremely specific stress instruments for their detection. Thus methodological problems are not eliminated by simply substituting a prospective for a retrospective design.

The design of a new measure of stress specifically intended for clinical psychosomatic research was therefore undertaken, with as its starting point the impressions of experienced clinicians and of patients with chronic relapsing diseases regarding the life situations that actually trigger symptoms. This article describes the development and validation of the resulting Perceived Stress Questionnaire.

METHOD

Four experienced clinicians discussed among themselves, as well as with patients with ulcerative colitis, duodenal ulcer, and asthma, the psychosocial factors thought to precipitate relapses. From these discussions a preliminary list of 60 possible items was generated. Effort was made, in order to ensure sensitivity to month-by-month changes, to design each item so that each of the investigators, in the last year or so, would have personally rated it at least once at the top of the scale and at least once at the bottom. Items also had to be applicable to adults of any age, sex, occupation, or stage of life, though interpretable as specific to a variety of real-life situations. For example, 'You feel under pressure from deadlines' could refer to anything from a down payment on a new house, to a daughter's wedding, to an upcoming military conscription, to a grant proposal.

When possible, items were worded to emphasize the neutral, cognitive aspect of experience. Thus the early item, 'You get into arguments' was transformed into 'You find yourself in situations of conflict.' Several items were constructed such that a positive answer indicated lack of stress (e.g. 'You feel rested' as a measure of fatigue).

The Perceived Stress Questionnaire (PSQ) was then honed down by pilot testing of serial preliminary versions on 15 patients and health care workers; their test results and in-depth critiques were used to improve the wording, reduce associations with gender and age, and ensure sufficient response variation for each item. The scale was developed simultaneously in English and in Italian, with equivalency refined by using crossed translations of each item by native speakers from one language into the other and back, and by testing bilingual individuals on both English and Italian scales.

A 36-item version was administered to 48 subjects: 12 gastroenterology out-patients, 10 gastroenterology in-patients, 14 out-patients from a private internal medicine practice, and 12 health care workers, all native speakers of either Italian or English. At this stage, 'General' and 'Recent' forms of the questionnaire were separated, asking how often (on a scale from 1, 'almost never,' to 4, 'usually') each item applied 'in general, during the last year or two,' or 'during the last month,' respectively. Items were scored either by the circled number for negative items (e.g. 'You feel tired') or by 5—the circled number for positive items (e.g. 'You feel rested'), and a PSQ Index was derived from the raw scores,

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varying from 0 (lowest possible level of stress) to 1 (highest possible level of stress). Again, each subject was asked for comments.

Following assessment of the results, six of the items in this version were eliminated or modified, either to eliminate age or sex bias, to improve clarity, to ensure all items correlated significantly with the total score, or to minimize redundancy. The resulting, final, 30-item PSQ was then administered to an additional 182 subjects: 64 Italian ulcerative colitis out-patients, 16 Italian gastroenterology in-patients, the 93 students in four college classes (34 native English speakers, 38 native Italian speakers, 21 native speakers of other languages), and 9 health care workers. Test-retest reliability of the General PSQ at 7–10 days was examined among 101 of the in-patients, health workers, and students.

Construct validation was performed, in various subgroups, through comparison with five alternative measures of stress: (1) the State-Trait Anxiety Inventory (STAI) [19]; (2) the Center for Epidemiologic Studies Depression Scale (CES-D) [20]; (3) the Paykel Interview for Recent Life Experiences [21]; (4) subjects' own estimates of the degree of stress experienced during the last month, rated on a scale from 1 ('very little stress') to 4 ('an extreme amount of stress') either immediately after completing the PSQ (Stress I) or at the end of a life events interview (Stress II); and (5) our translation of Cohen's Perceived Stress Scale [7].

Three methods were used to assess predictive validity: (1) correlation with the somatic symptoms subscale from Kellner's Symptom Questionnaire, among college students [22]; (2) comparison of the PSQ scores of in-patients and those of out-patients; (3) examination of the relationship between PSQ scores and rectal inflammation in 27 patients with previously diagnosed ulcerative colitis who were completely asymptomatic at the time of their clinic visit. In the latter group (17 men and 10 women, aged 38.3 ± 14.5 yr, who had had ulcerative colitis for 5.2 ± 3.7 yr), proctoscopy was rated by a 'blinded' endoscopist as showing normal or inflamed mucosa.

Sensitivity of the Recent PSQ to month-by-month changes in stress levels was examined by asking 12 ulcerative colitis patients to complete monthly questionnaires until their next clinic visit.

Since only one of the retained items was altered between the 36-item and the 30-item PSQs ('I am calm', scored higher by men and therefore changed to 'I feel calm'), all 230 validation subjects (Table I) have been pooled for measures of internal consistency, analysis by demographic characteristics, and factor analysis.

TABLE I.—DESCRIPTION OF VALIDATION GROUPS FOR THE PERCEIVED STRESS QUESTIONNAIRE

	In-patients N = 26	Out-patients N = 88	Students N = 93	Health workers N = 23	Combined N = 230
Sex					
Male	57.69%	46.59%	45.16%	52.17%	52.17%
Female	42.31%	53.41%	54.84%	47.83%	47.83%
Language of questionnaire					
English	—	15.9%	58.1%	21.7%	31.7%
Italian	100%	84.1%	41.9%	78.3%	68.3%
Marital status					
Single	26.9%	29.9%	95.7%	34.8%	56.8%
Married	57.7%	63.2%	2.2%	52.2%	36.7%
Divorced/widowed	15.4%	6.9%	2.2%	13.0%	6.5%
Primary occupation					
Unskilled worker	—	14.9%	—	—	5.7%
Skilled worker	19.2%	4.6%	2.2%	—	4.8%
White-collar worker	38.5%	33.3%	3.2%	8.7%	19.2%
Professional/executive	11.5%	20.7%	—	89.0%	17.9%
Housewife	19.2%	13.8%	—	—	7.4%
Student	7.7%	8.1%	94.6%	4.4%	42.8%
Unemployed/retired	3.85%	4.6%	—	—	2.2%
Age	41.08	39.32	20.7	37.0	31.76 ± 13.85

Data analysis was performed using Statview statistical software for the Apple Macintosh computer. Either *t*-tests or ANOVAs were used to compare test or factor scores among two or more groups, and the Mann-Whitney *U* for comparing individual item scores; correlations were tested using the Spearman *r* and the Spearman Rank Correlation Coefficient respectively. Whole-scale reliability (internal consistency) was estimated using coefficient alpha [23]. Factor analysis of the General PSQ was performed

using principal components analysis with Varimax transformation, in its oblique solution. The signs were adjusted to make each factor reflect the presence rather than the absence of stress.

RESULTS

Characteristics of the validation groups by source, native language, age, sex, marital status, and occupation are summarized in Table I, and the results of PSQ scores according to demographic characteristics in Table II. Overall mean scores were 0.42 ± 0.15 for the General and 0.41 ± 0.17 for the Recent forms (mean \pm SD), with scores ranging from 0.11 to 0.86 and from 0.08 to 0.90 respectively. Scores of ≤ 0.3 fell into the lowest quartile for the validation sample as a whole, 0.31–0.40 in the second quartile, 0.41–0.51 in the third quartile, and ≥ 0.52 in the upper quartile for both forms. The correlation between General and Recent PSQs, administered at a single sitting, was $r = 0.71$. Students had lower scores than non-students, but otherwise neither occupation nor occupational status (considering white-collar and professional/executive workers high-status) was related to PSQ. Italians scored somewhat higher than non-Italians. Age was modestly correlated with higher stress ($r = 0.22$ for General PSQ and $r = 0.15$ for Recent PSQ). Individual items which varied by any demographic characteristic are listed in Table III.

TABLE II.—TOTAL PERCEIVED STRESS QUESTIONNAIRE SCORES

	General PSQ	Recent PSQ	
Sex			
male	0.40	0.38	
female	0.43	0.44*	
Language of questionnaire			
English	0.38	0.38	
Italian	0.44**	0.43	
Language of questionnaire, non-students only			
English	0.42	0.45	
Italian	0.46	0.44	
Marital status			
single	0.39	0.39	
married	0.45**	0.45	
divorced/widowed	0.47	0.41	
Occupation			
housewife	0.49	0.51	
student	0.37 †††	0.36 ††	
unskilled worker	0.42	0.37	
skilled worker	0.41	0.44	
retired/unemployed	0.35	0.34	
white-collar	0.47	0.45	
professional/executive	0.46	0.46	
Subject category			
out-patients	0.44	0.44	†
in-patients	0.53*	0.49	
health care workers	0.42 ††	0.38	
students	0.36	0.36	
Moderate-to-severe life event ($N = 49$)			
life event ($N = 19$)	0.46	0.47	
no life event ($N = 30$)	0.42	0.39*	

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TABLE II.—Continued

	General PSQ	Recent PSQ
<i>Correlations with:</i>		
Age ($N = 230$)	0.22***	0.15*
State anxiety (STAI) ($N = 24$)	0.18	0.30
Trait anxiety (STAI) ($N = 24$)	0.69***	0.75***
Depression (CES-D) ($N = 24$)	0.49**	0.56**
Self-reported 'stress' last month ($N = 102$)	0.32**	0.47**
I—asked following PSQ ($N = 52$)	0.40**	0.56***
II—asked following interview ($N = 50$)	0.27	0.33*
Cohen's Perceived Stress Scale ($N = 89$)	0.56***	0.73***
Somatic complaints (from Kellner's SQ) ($N = 73$)	0.50***	0.58***

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ by t -test or by Spearman's r .

† $p < 0.05$, †† $p < 0.01$, ††† $p < 0.001$ by ANOVA, overall.

‡‡ $p < 0.01$, ‡‡‡ $p < 0.001$ by ANOVA for students vs. white-collar workers, housewives, and professionals/executives.

TABLE III.—ITEMS VARYING AT A $p < 0.05$ LEVEL ON GENERAL PSQ

<i>Age</i>	
'You have too many things to do' ($r = 0.22$)	
'You have too many decisions to make' ($r = 0.22$)	
'You feel safe and protected' ($r = -0.28$)	
'You enjoy yourself' ($r = -0.40$)	
'You are lighthearted' ($r = -0.24$)	
'You feel loaded down with responsibility' ($r = 0.31$)	
'You have enough time for yourself' ($r = -0.20$)	
<i>Sex</i>	
'You feel that too many demands are being made on you' (female > male)	
'You feel lonely or isolated' (female > male)	
'You feel you're doing things you really like' (male > female)	
'You feel tired' (female > male)	
'You feel calm' (male > female)	
'You feel frustrated' (female > male)	
'You feel discouraged' (female > male)	
<i>Occupational status (excluding students)</i>	
'You feel frustrated' (high > low)	
'You are under pressure from other people' (high > low)	
'You have trouble relaxing' (high > low)	
'You feel loaded down with responsibility' (high > low)	
'You have enough time for yourself' (low > high)	
<i>Language</i>	
<i>Among white-collar and professional workers</i>	
'You feel that too many demands are being made on you' (English > Italian)	
'You feel frustrated' (English > Italian)	
'You are lighthearted' (English > Italian)	
<i>Among other workers</i>	
'You feel you're doing things you really like' (English > Italian)	
'You feel frustrated' (English > Italian)	
'Your problems seem to be piling up' (Italian > English)	
<i>Among students</i>	
'You feel frustrated' (English > Italian)	
'You feel under pressure from deadlines' (Italian > English)	

The General PSQ did not vary significantly by gender (0.43 for women vs. 0.40 for men, $p = 0.14$), nor did trait anxiety (0.41 vs. 0.36, $p = 0.30$), self-reported stress,

or reported stressful life events. All other questionnaire scores were significantly higher in women than in men: Recent PSQ (0.44 vs. 0.38, $p = 0.02$), Cohen's Perceived Stress Scale (27.5 vs. 22.5, $p = 0.001$), somatic symptoms from Kellners' questionnaire (8.2 vs. 4.8 symptoms, $p = 0.001$), state anxiety (0.51 vs. 0.42, $p = 0.04$), and depression (0.38 vs. 0.28, $p = 0.03$).

All individual items in both the General and the Recent PSQ correlated in the predicted direction and at a $r \geq 0.35$ level with their corresponding PSQ index. The highest correlation of any item with any other single item was $r = 0.53$. The mean for each item was between 1.7 and 2.7 in all cases, and the standard deviation always exceeded 0.78. Internal consistency, as measured by coefficient alpha, was 0.90 for the General and 0.92 for the Recent PSQ. Test-retest reliability of the General PSQ, after an interval of 8.03 ± 1.64 days (mean \pm SD), was 0.82; when the 21 non-native speakers were excluded, reliability rose to $r = 0.86$.

Of the 12 patients asked to fill in monthly Recent PSQs, 10 complied and brought all four-six forms to their next clinic visit. The coefficient of variation among all subjects was 0.37, while for individual subjects it averaged 0.22. The mean ratio between each patient's highest and lowest monthly PSQ scores was 1.94 (SD 0.53, range, 1.12-300). There was no systematic tendency for scores to fall, rise, or peak over the 6 months.

When the Recent and the General PSQ Indices were compared with alternative measures to stress (Table II), both proved to correlate highly with trait anxiety and with scores on Cohen's Perceived Stress Scale, moderately with depression, and poorly with state anxiety; the Recent but not the General Index was significantly higher in subjects who reported a moderately or severely stressful life event within 6 months. The correlation between the PSQ and self-reported stress during the last month was different according to when the subject was asked to assess stress: both the Recent and the General PSQ Indices correlated considerably better with Stress I than with Stress II. In order to shed light on this finding, the correlation between Stress II and the other psychometric tests was examined: 0.35 with State Anxiety, 0.22 with Trait Anxiety, and 0.52 with depression.

Among patients, the General Index was found to be significantly higher ($p = 0.01$) in those who were hospitalized than in those who were out-patients (Table II). Among students, both the General and the Recent PSQ correlated well ($r = 0.50$ and $r = 0.58$, respectively) with minor somatic symptoms reported on Kellner's Symptom Questionnaire Cohen's PSS, which like the Recent PSQ covers the month before testing, had a correlation of $r = 0.49$ with the Symptom Questionnaire.

Of the 27 asymptomatic ulcerative colitis patients on whom proctoscopy was performed, seven had visible mucosal inflammation. None of the four patients who reported moderate or severe life events had rectal inflammation; patients with inflammation likewise had no increase in depression or self-reported stress, and only a trend toward higher Trait and State Anxiety. Both the General and the Recent PSQ, however, were significantly higher in the group with inflammation (Table IV). Rectal inflammation was found in 57.1% of patients with a General PSQ score in the upper quartile (score > 0.49) and in 16.7% of patients with scores in the lowest quartile (score > 0.31); four out of the seven patients with inflammation scored in the upper quartile.

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TABLE IV.—PSYCHOLOGICAL VARIABLES VERSUS PROCTOSCOPY IN ASYMPTOMATIC PATIENTS WITH ULCERATIVE COLITIS

	Rectum normal (N = 20)	Rectum inflamed (N = 7)	p
Recent Perceived Stress Questionnaire	0.36	0.51	0.03
General Perceived Stress Questionnaire	0.38	0.58	0.005
State anxiety	0.44	0.53	0.12
Trait anxiety	0.37	0.44	0.37
Depression	0.31	0.36	0.42
Self-reported stress (Stress II)	2.4	2.3	0.75
Major life event within 6 months	4	0	0.21

The relation of each individual item on the appropriate PSQ form to Trait Anxiety, Cohen's PSS, somatic symptoms, Stress I, and rectal inflammation are shown in Table V.

TABLE V.—RELATIONS OF INDIVIDUAL PERCEIVED STRESS QUESTIONNAIRE ITEMS TO:

	Trait anxiety (Gen'l. PSQ) <i>r</i>	Self-reported Stress "I" (Rec. PSQ) <i>r</i>	Proctoscopy (Gen'l. PSQ) <i>t</i> statistic	Somatic symptoms (Rec. PSQ) <i>r</i>	Perceived stress (Cohen) (Rec. PSQ) <i>r</i>
You feel rested	-0.49***	-0.43***	0.15	0.38***	0.42***
You feel that too many demands are being made on you	0.45**	0.41**	-0.67	0.25*	0.41***
You are irritable or grouchy	0.40*	0.24	-1.76	0.41***	0.48***
You have too many things to do	0.01	0.26	-0.46	0.32**	0.23*
You feel lonely or isolated	0.47**	0.34*	-5.01***	0.29**	0.34***
You find yourself in situations of conflict	0.48**	0.30*	-4.30***	0.41***	0.48***
You feel you're doing things you really like	-0.41*	-0.29*	0.10	0.25*	0.46***
You feel tired	0.61***	0.52***	-2.89**	0.52***	0.41***
You fear you may not manage to attain your goals	0.40*	0.29*	-3.24**	0.25*	0.53***
You feel calm	-0.47**	-0.32*	1.19	0.43***	0.49***
You have too many decisions to make	0.23	0.44***	-1.49	0.32**	0.28**
You feel frustrated	0.57***	0.13	-4.29***	0.42***	0.52***
You are full of energy	-0.52**	-0.52***	2.54*	0.16	0.30**
You feel tense	0.65***	0.59***	-2.02	0.57***	0.49***
Your problems seem to be piling up	0.38*	0.44***	-0.83	0.40***	0.60***
You feel you're in a hurry	0.49**	0.45**	-0.86	0.36***	0.40***
You feel safe and protected	-0.31	-0.30*	-0.05	0.33**	0.22*
You have many worries	0.31	0.61***	-1.82	0.35***	0.48***
You are under pressure from other people	0.11	0.40**	-4.13***	0.29**	0.22*
You feel discouraged	0.58***	0.45***	-2.07*	0.31**	0.62***
You enjoy yourself	-0.25	-0.35**	2.48*	0.26*	0.40***
You are afraid for the future	0.43*	0.23	-0.41	0.32**	0.53***
You feel you're doing things because you have to, not because you want to	0.61***	0.28	-0.96	0.19	0.39***

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TABLE V.—Continued

	Trait anxiety (Gen'l. PSQ)	Self-reported Stress 'I'	Proctoscopy (Gen'l. PSQ)	Somatic symptoms (Rec. PSQ)	Perceived stress (Cohen) (Rec. PSQ)
	<i>r</i>	<i>r</i>	<i>t</i> statistic	<i>r</i>	<i>r</i>
You feel criticized or judged	0.24	0.31*	-1.32	0.27*	0.36***
You are lighthearted	-0.31	-0.33*	1.14	0.04	0.02
You feel mentally exhausted	0.50**	0.50***	-3.78***	0.44	0.49***
You have trouble relaxing	0.56***	0.50***	-0.86	0.51***	0.61***
You feel loaded down with responsibility	0.21	0.33*	-1.02	0.34**	0.44***
You have enough time for yourself	-0.09	-0.28*	-0.09	0.29**	0.25**
You feel under pressure from deadlines	0.29	0.27*	0.12	0.31**	0.36***

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

Principal components analysis of all 230 General PSQs yielded seven factors with eigenvalues greater than one (Table VI); all interfactor correlations were $r < 0.4$. Factor names were assigned appropriate to the contributing items: harassment, overload, irritability, lack of joy, fatigue, worries, and tension. The relations of the factors to demographic variables, alternative measures of stress, and health outcomes are reported in Tables VII and VIII. There were associations ($p < 0.05$) of rectal inflammation with 'harassment'; of minor somatic symptoms with 'harassment' and 'tension'; of trait anxiety with 'overload', 'irritability', 'lack of joy' and 'tension'; of self-reported stress with 'fatigue'; and with Cohen's PSS 'irritability', 'worries' and 'tension'.

The final PSQ is presented, with scoring instructions, in the Appendix.

DISCUSSION

The present data demonstrate the favourable psychometric characteristics of the Perceived Stress Questionnaire and show that it correlates well with alternative instruments commonly used to measure similar psychological constructs.

There is, however, no gold standard for validating a measure of stress. If the individual is for instance asked how much stress he or she is under, stress may be reported quite differently, as reported above, according to the context in which the question is asked. When our subjects were asked to judge their 'stress' levels just after completing the PSQ, levels correlated strongly with the PSQ. When the same question was asked at the end of psychologist's interview, answers correlated well with depression and weakly with the PSQ—perhaps due to the interview's emphasis on negative life events. It is possible that simple self report would be more reliable in English-speaking countries, since the word 'stress' is in Italy a recent foreign borrowing of perhaps as yet unsettled significance.

The best form of validation consists in the ability of a test to predict outcomes in the real world. The present research aimed to produce a scale capable of predicting adverse health outcomes, and was successful in three ways. First, both the General and the Recent PSQs were highly correlated with minor physical symptomatology in basically healthy individuals. This correlation must be interpreted with some

TABLE VI.—FACTOR ANALYSIS OF PERCEIVED STRESS QUESTIONNAIRE: THE HIGHEST LOADING FOR EACH ITEM IS INCLUDED, AS WELL AS (IN PARENTHESES) ANY ADDITIONAL CONTRIBUTIONS OF ≥ 0.25

TABLE VI.—FACTOR ANALYSIS OF PERCEIVED STRESS QUESTIONNAIRE: THE HIGHEST LOADING FOR EACH ITEM IS INCLUDED, AS WELL AS (IN PARENTHESES) ANY ADDITIONAL CONTRIBUTIONS OF ≥ 0.25

Item	Factor						
	Harrassment	Overload	Irritability	Lack of joy	Fatigue	Worries	Tension
You feel that too many demands are being made on you	0.28					(-0.25)	(-0.28)
You find yourself in situations of conflict	0.33						
You are under pressure from other people	0.40						
You feel criticized or judged	0.33						
You have too many things to do		0.31					
You have too many decisions to make		0.19					
You feel loaded down with responsibility		0.25					
You have enough time for yourself		-0.30					
You are irritable or grouchy			0.56				
You feel calm			-0.47				
You feel lonely or isolated					0.23		
You feel you're doing things you really like					-0.15		
You feel you're in a hurry					0.23		
You feel safe and protected					-0.33		(0.29)
You enjoy yourself					-0.46		
You feel you're doing things because you have to...					0.25		
You are lighthearted					-0.37		
You feel rested						-0.48	(0.25)
You feel tired						0.37	
You are full of energy						-0.35	
Your problems seem to be piling up						0.25	
You fear you may not manage to attain your goals							0.30
You have many worries							0.18
You feel discouraged							0.24
You are afraid for the future							0.50
You feel under pressure from deadlines							0.47
You feel frustrated							0.19
You feel tense							0.37
You feel mentally exhausted							0.43
You have trouble relaxing							0.59
% of total variance explained by factor	15%	13%	8%	6%	2%	8%	8%

Perceived stress (Cohen) (Rec. PSQ)
r

0.36***
0.02
0.49***
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factors with $r < 0.4$.
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TABLE VII.—CORRELATIONS OF PERCEIVED STRESS QUESTIONNAIRE FACTORS WITH CONTINUOUS VARIABLES

	Harrassment	Overload	Irritability	Lack of joy	Fatigue	Worries	Tension
Cohen's PSS	0.01	0.01	0.23*	0.04	0.13	0.23*	0.22*
Trait anxiety	0.18	0.45***	0.36**	0.54**	0.25	0.15	0.46***
Somatic symptoms	0.21*	0.06	0.18	0.08	0.002	0.05	0.34**
Age	0.13	0.29***	0.07	0.34***	0.01	0.04	0.003
Self-reported stress	0.09	0.15	0.04	-0.05	0.16	0.04	0.15
'Stress I'	0.09	0.23	-0.22	0.16	0.15	-0.08	0.21
'Stress II'	0.08	0.06	0.17	-0.34*	0.19	0.19	0.08

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

TABLE VIII.—RELATION OF PERCEIVED STRESS QUESTIONNAIRE FACTORS TO DICHOTOMOUS VARIABLES

	Harrassment	Overload	Irritability	Lack of joy	Fatigue	Worries	Tension
Hospitalization status							
in-patient	0.08	0.47	0.03	0.39	0.07	0.1	0.04
out-patient	-0.24	0.20	0.12	0.29	0.03	-0.1	0.05
Rectal inflammation in ulcerative colitis							
inflammation	0.46	-0.02	0.15	0.06	0.55	0.02	0.72
no inflammation	-0.76*	0.72	0.01	0.24	-0.29	0.29	-0.31
Stressful life events							
life event	-0.23	0.05	0.52	0.33	0.15	-0.15	0.15
no life event	-0.57	0.57	-0.14	0.37	-0.27	0.21	-0.01
Sex							
male	-0.07	0.13	-0.1	-0.01	-0.10	0.15	-0.21
female	0.04	-0.14	0.07	0.03	0.11	-0.12	0.18*
Occupational status							
high	-0.11	0.42	-0.03	0.17	0.1	-0.06	0.02
low	0.02	-0.24***	-0.003	-0.07	-0.04	0.03	-0.03

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

caution, because of the possible confounding of explicitly psychological and putatively somatic measures by a common psychological state [8]. Second, the General PSQ was significantly higher in hospitalized than in non-hospitalized patients, a difference which might, however, have been conditioned by differences in illness severity or chronicity.

The PSQ's third success in predicting negative health outcomes is free of such methodological problems: it was significantly higher in asymptomatic ulcerative colitis patients with an inflamed rectal mucosa than in similar patients with a normal-appearing rectum. Patients who perceived their life situation as stressful in the long run were particularly likely to show rectal inflammation. Here, confounding by the distress-creating effect of symptoms was eliminated by choosing only patients in clinical remission and by a rigorously double-blind design.

Ulcerative colitis, a chronic and often devastating disorder with autoimmune features, is a good test case for investigating the relation of life stress to disease activity. In a recent survey, gastroenterologists gauged psychosocial factors quite important in triggering exacerbations [24], and their view is supported by a number of studies using a retrospective and/or anecdotal approach [25-27]. The older literature is rife with methodological flaws [28], however, and three recent attempts

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CONTINUOUS

es	Tension
*	0.22*
	0.46***
	0.34**
	0.003
	0.15
	0.21
	0.08

US VARIABLES

es	Tension
	0.04
	0.05
	0.72
	-0.31
	0.15
	-0.01
	-0.21
	0.18*
	0.02
	-0.03

to show a temporal relationship between stress and flare-ups using a prospective methodology have been negative [3, 29] or inconclusive [30]. The present pilot investigation succeeded in demonstrating a relationship between psychological factors and objective evidence of disease activity while avoiding recall bias as well as symptom effects.

Scores on the PSQ were modestly, though significantly, associated with stressful life events. Now that reliable techniques exist to assess recent life events [2, 21], the search for antecedent stressors has become invaluable for studying the influence of psychosocial factors on disease, and virtually the only approach viable for retrospective research. But since any pathogenic potential lies not in the stressor event but in the stress emerging from its interaction with the individual [31], the attempt to study stress-illness links by looking for preceding life events has built-in limits.

On the one hand, many genuine life events will be irrelevant to the disease being examined. An apparently important event may have little impact on the individual involved, or may lead to reactive depression [2] rather than those ongoing states of autonomic hyperarousal that are linked, for example, to coronary artery disease.

On the other hand, some stress-related disease can be missed by investigating life events alone. Common sense dictates that an individual can be under great stress without having encountered any discrete life event. The asymptomatic ulcerative colitis patients reported above illustrate this point: of 27 patients, only four had had a moderate-to-severe stressful life event during the previous 6 months and none of these showed rectal inflammation, despite the highly significant relation of perceived stress to inflammation. It follows that not all stress severe enough to be related to somatic changes can be subsumed under the category of major life events; the Paykel interview, like most life events instruments but unlike Brown's Life Events and Difficulties Schedule, does not investigate 'chronic difficulties'.

In contrast to life events scales, the PSQ is frankly subjective. It does not attempt to list specific 'worries', but only asks whether a person feels under pressure from them—the final common denominator of stress. This makes the questionnaire less valid than a rigorous life events interview in studies which attempt retrospectively to understand the antecedents of current disease; in retrospective research, subjective instruments are vulnerable to confounding by the distress-generating effects of illness [8]. That very subjectivity, on the other hand, is intended to maximize sensitivity to ongoing stress and to make the PSQ more useful for prospective studies of organic disease, or in cross-sectional investigations whose dependent variable (e.g. mucosal inflammation) is beyond patient awareness.

The 'Hassles' scale is somewhat similar to the PSQ in that it seeks to measure a sense of invasion of self by the outside world, but it is limited and made more culture-specific by its attempt to specify individual 'hassles'. As a measure of perceived stress, the Hassles scale may be said, paradoxically, to be confounded by the chance occurrence of those same minor events it asks about. Its length (137 items) also presents a practical barrier to serial use in longitudinal studies; reporting fell off month by month even among paid validation subjects [5].

The PSQ includes such items such as 'You feel tense' and is strongly associated with Trait Anxiety. There is reason to think that the two tests tap different dimensions of experience, however, since three of the seven PSQ factors are poorly correlated with anxiety and since only the PSQ was related to rectal inflammation

in asymptomatic ulcerative colitis. In fact, several of the PSQ items that are most predictive of disease activity are unrelated to anxiety (Table V). The more cognitive construct which we are calling 'perceived stress' jibes with clinical experience—patients attempting to explain their diseases are more likely to say, 'I've been under a lot of stress', than, 'I've been a nervous wreck lately'.

The validity of the perceived stress concept for psychosomatic interactions is supported by evidence that high scores on Cohen's Perceived Stress Scale [7], which is conceptually similar to the present questionnaire as well as correlated with it, are associated with susceptibility to the common cold [32].

In fact, psychological processes capable of producing organic disease may not always be mediated by states of conscious distress. According to the alexithymia theory, the people likely to develop organic psychosomatic disease are those least able to experience and verbalize their own emotions, thereby in some way discharging their destructive energy [33]. Thus the very people who deny anxiety may be the ones most susceptible to psychosomatic phenomena. Although this hypothesis is unproven, it seems reasonable not to stack the cards against it. For this reason the PSQ, while including items which directly reflect anxiety, has been weighted toward perceptions of constraints experienced as arising outside the individual psyche: 'pressure from others', 'deadlines', 'conflicts', 'worries', 'isolation'.

Further indirect confirmation of the validity of the PSQ concept emerges from the factor analysis: 'harassment', the factor most closely related to actual physical outcomes, is not significantly correlated with any alternative stress measures.

It is pertinent that women are likely to report more anxiety and more life events both major [34] and minor [6], while such diseases as myocardial infarction and peptic ulcer have a marked male predominance, hinting that women may have if anything less tendency to develop organic stress-related pathology. This is the reason for attempting, successfully in the case of the General form, to design the PSQ to be free of gender differences. Changes made to eliminate sex bias were of some interest in themselves: men were more likely to admit to being 'irritable or grouchy' than to being 'nervous'; 'I am calm' showed more male/female difference than 'I feel calm'—men may not easily report *feeling* upset, but they are still less likely to admit to losing the *appearance* of being in control.

While the Recent PSQ had a stronger association than the General PSQ with self-reported stress, with Cohen's PSS, with life events, and with the somatic symptoms elicited by Kellner's questionnaire, the General scale correlated better both with hospitalization status and with rectal inflammation. Thus the 'General' scale, which integrates an individual's stress 'in the long run', may be a superior predictor of health status, though the 'Recent' variant is particularly indicated for serial use in prospective studies.

The findings with serial questionnaires confirm that, as desired, responses to items in the Recent PSQ vary from month to month: while the coefficient of variation was lower for individual subjects than between different subjects, indicating that the PSQ reflects stable individual response patterns, the considerable month-by-month variability means the instrument is sensitive to temporal fluctuations in the stress experience.

In various settings, several approaches to identifying that elusive concept, 'stress', have proved useful in psychosomatic medicine. The new Perceived Stress Question-

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naire, which emphasizes cognitive perceptions more than emotional states or specific life events, has high internal consistency, high reliability, and demonstrated construct validity, and proved superior to alternative measures for predicting selected healthy outcomes. These findings suggest that the Perceived Stress Questionnaire may be a valuable addition to the research armamentarium.

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APPENDIX

*The Perceived Stress Questionnaire**Instructions for the General questionnaire*

For each sentence, circle the number that describes how often it applies to you in general, *during the last year or two*. Work quickly, without bothering to check your answers, and be careful to describe your life *in the long run*.

	Almost never	Sometimes	Often	Usually
1. You feel rested	1	2	3	4
2. You feel that too many demands are being made on you	1	2	3	4
3. You are irritable or grouchy	1	2	3	4
4. You have too many things to do	1	2	3	4
5. You feel lonely or isolated	1	2	3	4
6. You find yourself in situations of conflict	1	2	3	4
7. You feel you're doing things you really like	1	2	3	4
8. You feel tired	1	2	3	4
9. You fear you may not manage to attain your goals	1	2	3	4
10. You feel calm	1	2	3	4
11. You have too many decisions to make	1	2	3	4
12. You feel frustrated	1	2	3	4
13. You are full of energy	1	2	3	4
14. You feel tense	1	2	3	4
15. Your problems seem to be piling up	1	2	3	4
16. You feel you're in a hurry	1	2	3	4
17. You feel safe and protected	1	2	3	4
18. You have many worries	1	2	3	4
19. You are under pressure from other people	1	2	3	4
20. You feel discouraged	1	2	3	4
21. You enjoy yourself	1	2	3	4
22. You are afraid for the future	1	2	3	4
23. You feel you're doing things because you have to not because you want to	1	2	3	4
24. You feel criticized or judged	1	2	3	4
25. You are lighthearted	1	2	3	4
26. You feel mentally exhausted	1	2	3	4
27. You have trouble relaxing	1	2	3	4
28. You feel loaded down with responsibility	1	2	3	4
29. You have enough time for yourself	1	2	3	4
30. You feel under pressure from deadlines	1	2	3	4

Instructions for the Recent questionnaire

For each sentence, circle the number that describes how often it applied to you *during the last month*. Work quickly, without bothering to check your answers, and be careful to consider *only the last month*.

Score 5—circled number for items 1, 7, 10, 13, 17, 21, 25, 29

Score circled number for all other items

PSQ Index = (raw score-30)/90.

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