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MODELING THE PSYCHOLOGICAL DETERMINANTS OF LIFE QUALITY

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ABSTRACT. Personality and social psychologists have recently focused on a number of issues which life quality researchers have also examined. This study combines these two perspectives on well-being to address the following two questions: (1) To what extent are perceptions of stress, internal and external control, social support, performance, anxiety, and depression determinants of life quality? (2) To what extent are the predictors of different aspects of life quality (affective, cognitive, global, specific domains) similar or different? Data were collected from 675 respondents in a longitudinal study. Respondents were interviewed four times, six weeks apart. Bivariate analyses, stepwise regressions, and structural modeling were used to analyze the data. The modeling results suggested that internal control, social support, and performance caused increased life quality, whereas stress and depression caused decreased life quality. Control by others did not relate to life quality. The positive affect component of life quality related most strongly to 'positive' psychological concepts. Similarly, the negative affect component of life quality related most strongly to 'negative' psychological concepts. The implications of these findings for future life quality research are described.

INTRODUCTION

Psychosocial Factors and Well-Being

During the past fifteen years substantial progress has been made in finding effective ways to measure people's sense of well-being, in learning how measures of various aspects of life quality interrelate, and in reporting how people from many national and demographic groups assess their well-being with respect to both life-as-a-whole and numerous specific life domains. National-level studies include those by Allardt (1976) (Scandinavian countries), Andrews and Withey (1976) (USA), Atkinson (1979) (Canada), Campbell, *et al.* (1976) (USA), Headey (1981) (Australia), Rabier (1974) (European Economic Communities countries), and Shin, Kim, and Lee (1982) (South Korea), among others; and an extensive bibliography has been assembled by Gilmartin, *et al.* (1979). As the interest and psychometric tractability of social indicators of perceived well-being have been demonstrated, it becomes important to address a fundamental underlying question: How is it that

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people come to feel as they do about their well-being? While this issue is not yet well explored, at least three different approaches have been examined and will be described briefly here.

One of the surprising findings to emerge from early explorations of the question is that standard demographic or social classification variables – e.g., age, sex, race, education, income, marital status, stage in the family life cycle – show only modest relationships, if any, to most self-assessments of life quality. Most of the national studies cited previously show that even when several such factors are used together in a multivariate analysis, they explain less than 15% of the variation in assessments of quality of life-as-a-whole, and rarely much more than that in assessments of specific life domains. The relationships that do appear are in the expected directions (e.g., assessments of health decline with age, and evaluations of material well-being increase with income), but demographic and social classification factors do not seem to have the potential for being the major explainers of variation in perceived well-being. Other factors will have to be found.

Another approach to understanding how people assess their life quality has been to focus on the hypothesized 'gap' between what people have and what they aspire to (e.g., Andrews, 1981; Mason and Faulkenberry, 1978; Michalos, 1980 and 1983). The key notion is that people whose actual life conditions are close to what they aspire for will assess their life quality as much higher than will people for whom there is a large gap between actuality and aspirations. This line of inquiry is theoretically appealing and shows considerable promise. However, before much further progress can be made, additional conceptual and empirical work is needed on the determinants of aspirations.

Still a third approach, and the one explored here, is to try linking the perceived well-being concepts from the social indicators movement to some of the currently promising concepts from psychology. Psychologists are interested in individuals' sense of well-being and should have something to contribute. Among previous forays into this area are those by Dupuy (1977), Kammann *et al.* (1979), and Costa and McCrae (1980). For a sample of about 200 college students, Dupuy related scores from his General Well-Being Schedule to a variety of scales from the Minnesota Multiphasic Personality Inventory and several smaller batteries and found substantial correlations (–0.5 to –0.7) with measures of depression and anxiety. Kammann *et al.*, using data from forty-five New Zealand adults, have found a correlation of

about −0.7 between Kammann's Happiness Inventory and Eysenck's Neuroticism scale and a near-zero relationship with Extraversion. In several other samples of subjects, Kammann *et al.* found correlations of about −0.7 between the Happiness Inventory and the Beck Depression Inventory. Costa and McCrae found significant correlations between Extraversion and Neuroticism with affective measures of life quality. While these studies alert us to the likelihood that well-being measures may be substantially related to measures of mental illness (as they should be), we believe the empirical results to be reported in this paper include a broader range of psychosocial concepts – assessed on a larger and more heterogeneous group of people – than have been examined previously.

Affective and Cognitive Components of Life Quality

In addition to examining the linkages between life quality concepts and a variety of psychosocial factors, a second purpose of this paper is to investigate the similarities and differences among several ways of conceptualizing global life quality. The social indicators literature includes discussions about the conceptual and empirical distinctions among assessments that tap positive affect (i.e., positive emotional responses such as happiness), negative affect, and cognitive assessments (i.e., 'intellectual' evaluations that take account of some implicit or explicit criteria). Relevant studies include those by Andrews and McKennell (1980), Bradburn (1969), Kammann *et al.* (1984), McKennell and Andrews (1980), McKennell (1978), Moum (1980), and Warr *et al.* (1983). Collectively, these studies suggest the usefulness of distinguishing the three components and begin to elucidate the conditions under which positive and negative affect will or will not be statistically independent from each other. The analyses described in the present paper contribute further empirical results to these topics.

Conceptual Model

The essence of our conceptual model is simple. We assume that people's interactions with their social world will affect a number of social psychological factors, which will in turn affect their own internal states of depression and anxiety, which will in turn affect their sense of well-being. The key

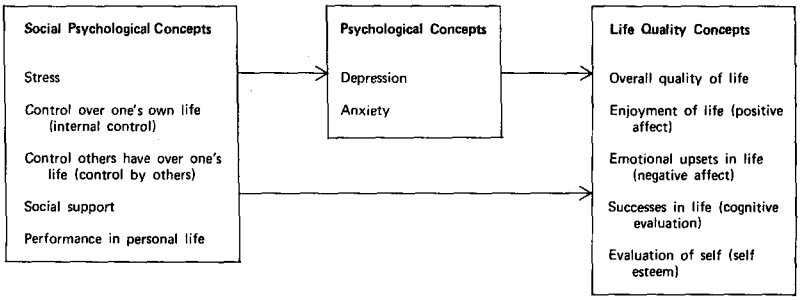


Exhibit 1. Schematic form of causal linkages among social psychological, psychological, and life quality concepts.

elements of the model explored in this paper appear in Exhibit 1. Shown there are the five social psychological concepts that will be linked analytically to two psychological concepts and five life quality assessments.

Social Psychological and Psychological Concepts

Researchers concerned with how people cope with life crises have hypothesized that a number of social and psychological factors influence adjustment (Abbey *et al.*, 1983; Billings and Moos, 1981; Caplan, 1979; French, *et al.*, 1974; Lazarus, 1981; Pearlin and Schooler, 1978; Silver and Wortman, 1980). Many of the outcome measures examined in their theories and research are well-being measures. Consequently it seemed likely that concepts which related to the outcome measures examined in this literature would also relate to life quality. Seven psychosocial concepts were selected for examination in this study as potential predictors of life quality. These concepts, which are displayed in Exhibit 1, are described briefly below.

Stress. An extensive research literature documents the negative impact which stress typically has on well-being (Caplan, 1983; Holmes and Rahe, 1967; Pearlin *et al.*, 1981; Selye, 1956 and 1980). The impact of life events such as death of a loved one or relocation (Dohrenwend and Dohrenwend, 1978; Vinokur and Selzer, 1975; Williams *et al.*, 1981) as well as the impact of chronic stressors such as long-term conflict at work or within the family (French *et al.*, 1982; House *et al.*, 1979) have been examined. People under stress are more susceptible to illness, depression, anxiety, low self-confidence,

and dissatisfaction than are people not experiencing stress (Caplan *et al.*, 1980; Kahn *et al.*, 1964; Rabkin and Struening, 1976).

Three indicators of stress were examined in the analyses reported in this paper: role ambiguity, negative life events, and social conflict. Role ambiguity refers to the extent to which a person is unsure about how to carry out a particular role (Caplan *et al.*, 1980), in this case, the personal life role (i.e., home, family and social life responsibilities). Social conflict refers to the extent to which significant other people express negative affect and disregard, and fail to validate the individual's feelings (Abbey *et al.*, 1981). It was hypothesized that stress would relate negatively to life quality.

Control over one's life versus control others have over one's life. The term 'control' refers to individuals' beliefs about who or what determines outcomes in their lives. The extent to which individuals believe that they personally determine what happens in their lives reflects their sense of internal control. The extent to which individuals believe that other people determine what happens in their lives reflects their sense of being controlled by others (Lefcourt, 1982; Levenson, 1973; Rotter, 1975).[1]

It has been hypothesized by a number of researchers that perceptions of internal control are associated with well-being (Abbey *et al.*, 1983; Abramson *et al.*, 1978; Johnson and Sarason, 1978; Wortman, 1976). Prolonged experience with a lack of internal control has been associated with impaired cognitive, affective, and behavioral fuctioning (Seligman, 1975). Consequently, it was hypothesized that perceptions of internal control would relate positively to life quality, while perceptions of control by others would relate negatively to life quality.

Social support. Social support refers to the extent to which significant others express positive regard, affection, and encouragement, and validate an individual's feelings (Abbey, 1983; Cobb, 1979; Kahn and Antonucci, 1980; Sarason *et al.*, 1983; Veroff *et al.*, 1981). An extensive literature demonstrates the beneficial effects of social support on well-being. Individuals experiencing a variety of life crises including bereavement, rape, job loss, and illness have all been found to cope better when they receive social support (see House, 1981, for a review). Social support has also been related to decreased depression and anxiety and improved life quality in previous research (Abbey,

Abramis, and Caplan, 1981). Consequently, it was hypothesized that social support would be positively related to life quality.

Performance. Performance refers to individuals' perceptions of how successfully they are fulfilling role demands. Performance has most frequently been examined in the work setting (French *et al.*, 1982; Katz and Kahn, 1978), although performance of personal life demands (the domain we have selected for study) has also been examined (Pearlin and Schooler, 1978). Performance is usually conceptualized as an outcome measure. Stress, perceptions of control, and social support have all been hypothesized to affect performance (Abbey, 1983; Conway *et al.*, 1983; French *et al.*, 1982). We further hypothesize that individuals' perceived performance will influence their life quality. Individuals who feel that they are performing well are likely to have a strong sense of competence, which should produce an increased sense of well-being; individuals who feel that their performance is inadequate are likely to feel incompetent and to experience a diminished sense of well-being.

Depression and anxiety. Depression and anxiety are both commonly experienced emotional states which have been extensively researched (Beck, 1976; Coyne, 1976, Coyne *et al.*, 1981; Derogatis *et al.*, 1974; Goldberger and Breznitz, 1982). Like performance, depression and anxiety are frequently viewed as outcome measures which stress, perceptions of control, and social support are thought to influence. Depression and anxiety are common reactions to stress. Both social support and perceptions of control have been found to reduce anxiety and depression as well as to moderate the relationship between stress and these affects (Barrera, 1981; Dean and Lin, 1977; La Rocco *et al.*, 1980; Schaefer *et al.*, 1981). Consequently, as can be seen in Exhibit 1, we hypothesized that stress, perceptions of control, social support, and performance would influence individuals' anxiety and depression, which would in turn influence their quality of life. Anxiety and depression are negative affects which should directly impact on the negative affect component of life quality.

Life Quality Concepts

The life quality concepts explored in this paper represent an implementation

and extension of previous work on perceived well-being. Two fundamental ideas determined the design of the life quality measures.

One of these ideas was that a general evaluation of life quality might consist of three components: a positive affective response, a negative affective response, and a cognitive evaluation. In this usage, 'affect' refers to an emotional, 'from-the-gut' reaction, and 'cognitive' refers to an intellectual, 'from-the-head' evaluation. These components tie closely to what are believed to be fundamental components of all attitudes. They have potential relevance to understanding life quality evaluations because such evaluations can be regarded as one type of attitude. The distinction between affect and cognition in life quality research has been explored by Andrews and McKennell (1980). The separation of affective responses into distinct positive and negative reactions has figured prominently in work by Bradburn (1969) and has been found useful by most of the life quality investigators cited earlier in this paper.

The second fundamental idea that influenced the design of the life quality concepts was that evaluations of life-as-a-whole (i.e., 'global' evaluations) result from combining evaluations of relevant life domains – e.g., health, work, personal life, etc. The separate treatment of global and domain-level life quality measures has been widespread over the past decade and can be seen in many of the works on life quality cited previously.

In combination, these two fundamental ideas define the conceptual grid presented in Exhibit 2. In the study from which the data analyzed here were drawn, one or more measures exist for each cell in the grid. However, only life quality measures corresponding to the cells with X's in them are reported upon in this paper.

METHOD

Data Source

The data described in this paper come from a longitudinal panel study of 675 outpatient pharmacy users selected for a study of tranquilizer use. The purpose of this study and its respondent selection procedures have been described in detail elsewhere (Caplan *et al.*, 1984) so only the major points will be summarized here.

	General	Positive Affect	Negative Affect	Cognitive Evaluation
Global				
Life-as-a-whole	X	X	X	X
Domains				
Self	X			
Personal life	X			
Work life	X			
Health	X			

Exhibit 2. Conceptual grid defining the design of the life quality measures. Each cell in the grid represents a life quality concept. Results for the concepts with *X*'s are reported in this paper.

Thirty-nine pharmacies, selected to represent the various neighborhoods of the Detroit metropolitan area, agreed to allow access to their prescription records.[2] Client names were randomly selected from these lists with the following constraints: (1) 50% males and 50% females (2) 67% people who had filled a prescription for Valium within the prior six weeks, and 33% who had filled a prescription for another medication which did not have sedative effects within the prior six weeks.[3]

Potential respondents were contacted by a trained survey research interviewer. Sixty percent of the individuals contacted were successfully interviewed at least once. Eighty-six percent of the respondents were successfully interviewed at all four timepoints of the study; the analyses reported here were restricted to those 675 individuals.

Respondents were interviewed four times, approximately six weeks apart. Interviews were conducted in person, usually in the respondent's home. The study was presented to respondents as a study of the effects of stress on health, work, and everyday life. Through the use of a structured interview, respondents were asked questions regarding all the concepts described in this paper as well as questions about their health, their work life, and their medication use. Respondents were asked the same questions at each interview so that change could be assessed.

Description of Measures

All the major concepts were measured with indices. Factor analyses were used to confirm that items conceptualized as multiple indicators of the same concept did load on the same factor. Then Cronbach *alphas* were computed for each index and are reported below. In all cases, the magnitude of the Cronbach *alpha* was comparable at each wave of data collection. Questions were asked in terms of the 'last seven days'; for example, respondents were asked how much respect they had received in the last seven days as one measure of social support.

Quality of life was measured with four different response scales. A general evaluation of life quality in four specific life domains and of life-as-a-whole (see Exhibit 2) was obtained using 7-point Likert-type scales with response options which ranged from 'terrible' to 'delighted'. Most of these items had been used in previous research (Andrews and Withey, 1976). To measure the positive affect, negative affect, and cognitive components of quality of life, new items were derived. Each of these aspects of quality of life was assessed with five items: one global item and four domain-specific items (personal life, work life, health, and self). To assess the positive affect component of life quality, respondents were asked how much they 'really enjoyed' the five areas of their life. To assess the negative affect component of life quality, respondents were asked how much they felt 'emotionally upset' about the five areas of their life. Both the positive and negative affect items used 5-point

Likert-type scales which ranged from 'not at all' to 'a great deal'. To assess the cognitive component of life quality, respondents were asked to what extent these five areas of their life had 'been what you wanted it to be'. The cognitive items used 5-point Likert-type scales which ranged from 'not at all' to 'all'. In addition, the questionnaire included an item about happiness ("... would you say you're very happy, pretty happy, or not too happy these days?") that appears in some of the analyses reported later in this article. Finally, a 5-item global life quality scale was constructed by combining the happiness item with items tapping the four concepts in the top row of Exhibit 2. The Cronbach *alphas* for the various quality of life scales ranged from 0.78 to 0.91 at Time 1.

Stress was assessed by indices measuring role ambiguity in the personal life domain, negative life events and conditions, and social conflict. Role ambiguity was measured by five items assessing 'how sure or unsure' respondents were about their ability to fulfill various demands such as making the right decisions and doing what others expected of them. These items used 5-point Likert-type scales which ranged from 'very sure' to 'very unsure'. The Cronbach *alpha* for this measure at Time 1 was 0.73. Negative life events were measured by respondents' answers to several open-ended questions about the events which they had been encountering in their lives. A 5-point scale was developed which ranged from 'zero negative life events' to 'at least one very serious life event'. Inter-rater agreement on the coding of this item was 84%. Social conflict was measured with four items assessing how much 'some one person' misunderstood or disliked the respondent. These items used 5-point Likert-type scales which ranged from 'not at all' to 'a great deal'. The Cronbach *alpha* for this measure at Time 1 was 0.77.

In some of the analyses of stress these three measures were combined into one index called 'multiple stress'. Respondents who had high scores on role ambiguity, negative life events, *and* social conflict were coded high on multiple stress; those with low scores on all three received low scores on multiple stress; and those with other patterns received medium scores on multiple stress. The logic of this stress measure is based on the assumption that individuals experiencing high levels of several types of stress *simultaneously* will experience the most stress.

Internal control was measured with two 2-item indices, one assessing internal control in the personal-life domain and one assessing internal control over one's emotions and feelings (a component of the self domain). Control

by others was also measured in the same two domains. Responses were made on 5-point Likert-type scales which ranged from 'not at all' to 'a great deal'. Cronbach *alpha*s for the control measures at Time 1 ranged from 0.62 (internal control over one's personal life) to 0.81 (control by others over one's emotions).

Social support was measured with two 3-item indices. Esteem social support items assessed how much others loved and respected the respondent. Informational social support items assessed how much others provided the focal respondent with information and encouragement. Responses were made on 5-point Likert-type scales which ranged from 'not at all' to 'a great deal'. The Cronbach *alpha* at Time 1 for informational social support was 0.71; for esteem social support it was 0.77.

Personal life performance was measured with two indices. Social performance was measured with three items assessing how well the respondent was performing social tasks such as getting along with others. Technical performance was measured with two items assessing how well the respondent was performing technical tasks such as decision-making. Responses were made on 5-point Likert-type scales which ranged from 'very poorly' to 'exceptionally well'. The Cronbach *alpha* at Time 1 for social performance was 0.67; for technical performance it was 0.68.

Depression and anxiety were measured with subscales of the Hopkins Symptom Checklist (Derogatis *et al.*, 1974). Respondents were asked how much various symptoms had bothered them in the last seven days. Responses were made on 4-point Likert-type scales which ranged from 'not at all' to 'extremely'. The Cronbach *alpha* at Time 1 for the depression measure was 0.86; for anxiety it was 0.81.

Descriptive Characteristics of Respondents

Respondents in this study were not intended to be representative of all American adults. For the purposes of the original study, they were selected to represent people with health problems and to insure that a large number of them would be Valium users.

However, a few demographic comparisons were made with 1979 U.S. Census Bureau data for descriptive purposes (Statistical Abstract of the United States, 1980). Respondents in this study were highly similar to the adult American population with respect to distributions on sex and age, and

also roughly similar on education. With respect to race, differences were more pronounced. Respondents in this study were more likely than American adults as a whole to be black (20.5% compared to 9.8%) and less likely to be white (78.6% compared to 88.4%). This difference is explainable by the geographic region from which the respondents were drawn; the percentage of blacks in the Detroit area is greater than for the country as a whole.

Comparisons were also made between these respondents' ratings of their life quality and those which have been made by respondents in national random sample surveys (Andrews and Withey, 1976). These comparisons were not exact because the time spans differed (the last seven days in this study versus the extended present in the national studies), a few question phrasings were slightly different, and historical changes may have occurred. Non-users of Valium in this study tended to rate their life quality at a level comparable to that of respondents in the national studies. (Valium users in this study tended to rate their life quality slightly lower than did respondents in the national studies – usually by about 0.4 on a 7-point scale.)[4]

RESULTS

Relationships Versus Causal Effects

It is widely recognized that 'relationships do not imply causality', and in this research we carefully distinguish between the two. We first examine relationships (both simple bivariate ones and more complex multivariate ones) and then move on to discuss results from several causal models. A causal modeling analysis cannot prove that variation in one phenomenon causes simultaneous or later variation in another phenomenon. However, a causal modeling analysis will indicate how strong the causal effect of one phenomenon on another would be if the linkages represented in the model actually occurred in the world. Furthermore, a modeling analysis provides several checks on the reasonableness of the causal assumptions. Models that are unable to closely reproduce the observed data, or that require theoretically or empirically unreasonable parameters to do so, are surely not accurate representations of how the world actually works.

The models estimated in the later portion of this paper carry the results significantly beyond our earlier reporting of conventional relationships between the measured variables. They have at least three advantages. One

advantage of the models is that they segregate out the unwanted effects of random measurement error and provide estimates of both the interrelationships and causal effects among the underlying *concepts*. A second advantage is that the models permit the overall relationship among each pair of concepts to be disaggregated into portions attributable to a direct causal effect, indirect causal effects, and non-causal components due to joint dependence on common factors or pre-existing covariation. Third, the causal models are useful heuristically: They force one to be explicit about how the concepts are assumed to affect one another in order to produce the relationships that are observed.

Our longitudinal data set is particularly helpful in the causal modeling analyses. If all information refers to just a single point in time, or the same short time span, it often is impossible to determine the direction of causality among related concepts. (To what extent does Concept A affect B, and to what extent does B affect A?) Causal models estimated on one-time data make assumptions about causal directions and may produce interesting results, but there usually remains the possibility that causality runs in the opposite direction. With longitudinal data, however, the situation is clearer, because causal effects show up either simultaneously or with some time lag, but do not operate backwards in time. Hence, if the variation in Concept B occurs later than the variation in Concept A, one can be sure that the later B did not cause the earlier A. While the use of multi-time data cannot remove all ambiguity about causal directions (e.g., continuing the example above, earlier variation in Concept A might be caused by still earlier but unmeasured variation in Concept B), multi-time data does allow confidence in the causality-direction assumptions within a particular model. In the modeling analyses reported later in this paper, results from both simultaneous (i.e., one-time) and lagged (i.e., multi-time) models are discussed.

Bivariate Relationships

The analysis of bivariate relationships was the broadest of the several analyses reported in this paper. In addition to the intrinsic interest of the bivariate relationships themselves, the bivariate analyses produced information on how to reduce the total number of variables to a smaller and more efficient set for the later multivariate and causal analyses. Hence, it is important to briefly note the full scope of the bivariate explorations.

As described earlier, the study involved four waves of data collection at intervals of approximately six weeks. Nearly all concepts were assessed at each wave, and two of the concepts used in this paper – anxiety and quality of life-as-a-whole – were assessed at every one of the 24 weeks of the study. After checking to ensure that bivariate relationships among all concepts were essentially linear, Pearson *r*'s were examined for simultaneous measurements and also for all possible lagged measurements (i.e., where one variable preceded the other by 6, 12, or 18 weeks, and vice versa).

The concepts examined in the bivariate analyses included the following: four domains of life quality (self, personal life, work life, and health), several aspects of global life quality (life-as-a-whole in general, positive affect, negative affect, cognitive evaluation), two psychological factors (depression and anxiety), six social psychological phenomena (social support, social conflict, internal control, control by others, stress, and performance in personal life), and a set of demographic and social classification variables (sex, race, education, marital status, family income, and socio-economic status).[5]

Six general conclusions emerged:

(1) With respect to time, the results were consistent and important: For any particular pair of psychosocial or life quality variables, the simultaneous relationships were virtually always higher than the lagged relationships. Empirical information about the time-lag characteristics of life quality evaluations and their correlates is helpful for understanding how people make their assessments of life quality. These results suggest that life quality evaluations most closely reflect the *current* state of psychosocial factors. Exhibit 3, which presents results for the only pair of variables assessed in each of the 24 weeks, shows a clear sharp maximum in the relationship between ratings of quality of life-as-a-whole and anxiety at lag 0. Measures of other concepts, which were measured only every six weeks, show a similar but less sharp pattern. Hence, these findings support the hypothesis that life quality evaluations and the psychosocial factors examined here are principally *concurrent* phenomena.[6]

(2) With just a couple of exceptions, the psychosocial factors were not highly related to one another. However, there was a tendency for 'positive' factors like social support, internal control, and performance to relate positively to one another and negatively to 'negative' factors (social conflict, control by others, stress, anxiety, and depression). Most of these relationships were not

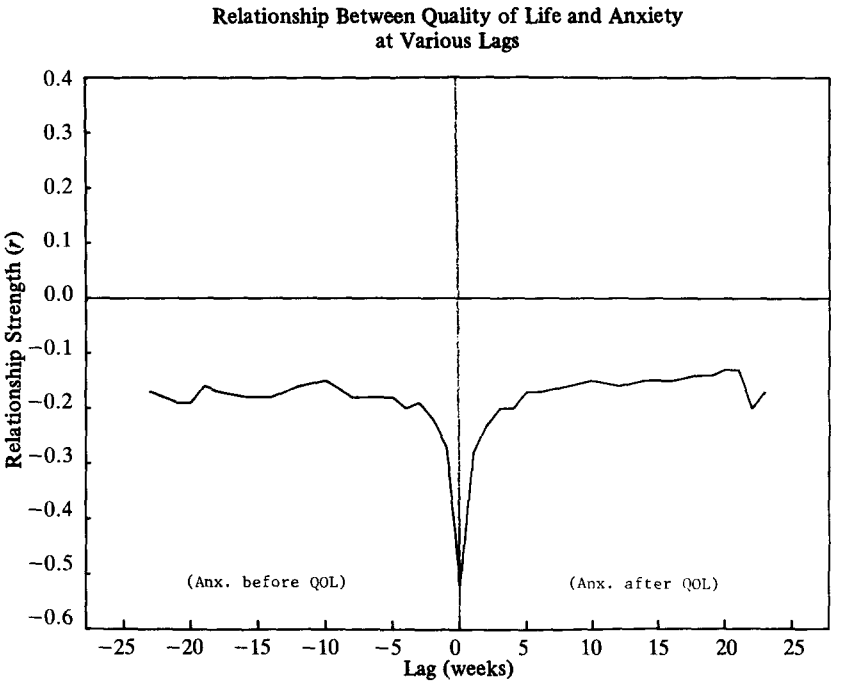


Exhibit 3. Mean relationships of quality of life-as-a-whole to anxiety at indicated time lags.

so high as to suggest substantial overlap in the conceptual meaning of the various psychosocial factors. The major exception was a 0.75 relationship between anxiety and depression – a result that replicates the substantial relationships reported in the psychiatric literature (Derogatis *et al.*, 1974).

Exhibit 4 shows bivariate correlations at Time 4 for selected variables and includes one measure for each major concept we shall discuss.[7]

(3) Measures of the specific life domains of health, work life, and personal life tended to show similar patterns, but weaker magnitudes of covariation, with the psychosocial factors than did the measures of *global* well-being or the domain of self. (This helps to locate the general conceptual area where phenomena of interest to psychologists will intersect with, and have relevance to, life quality phenomena.) As a consequence, we decided not to perform further detailed analysis on the domains of personal life, work life, and health. We did, however, retain the self domain because it tended to show the highest

Exhibit 4. Correlations among selected psychosocial and life quality measures at time 4

	1	2	3	4	5	6	7	8	9	10	11	12
1. Social support (esteem)												
2. Social conflict	−0.14											
3. Internal control over personal life	0.26	−0.07										
4. Control by others over personal life	−0.01	0.24	−0.11									
5. Multiple stress	−0.22	0.75[a]	−0.18	0.25								
6. Performance in personal life (technical)	0.35	−0.20	0.33	−0.12	−0.33							
7. Depression	−0.20	0.42	−0.20	0.22	0.54	−0.43						
8. Anxiety	−0.09	0.36	−0.13	0.28	0.45	−0.31	0.75					
9. Quality of life-as-a-whole	0.30	−0.35	0.29	−0.25	−0.52	0.51	−0.69	−0.54				
10. Positive affect quality of life	0.33	−0.30	0.32	−0.16	−0.47	0.53	−0.63	−0.49	0.83[b]			
11. Negative affect quality of life	−0.20	0.44	−0.21	0.28	0.57	−0.41	0.73	0.67	−0.77[b]	−0.69		
12. Cognitive evaluation of quality of life	0.17	−0.22	0.16	−0.07	−0.34	0.31	−0.45	−0.36	0.82[b]	0.82	−0.69	
13. Evaluation of self	0.35	−0.36	0.35	−0.27	−0.52	0.60	−0.68	−0.54	0.82	0.80	−0.73	0.80

[a] This relationship is high partly because the stress index contains social conflict as one of its three components.

[b] This relationship is high partly because quality of life-as-a-whole contains the other measure in this relationship as one of its five components. In an analysis not presented here, a two-item global quality-of-life index which did not include items assessing these affective and cognitive components was correlated with the other variables in this table. The pattern of results was comparable in all cases, although the magnitude of the relationships was diminished.

relationships of the four domains. Furthermore, the self might be thought of as a fairly global concept (i.e., one's sense of self is a broad concept).

(4) When the demographic and social classification variables were related to life quality and psychosocial factors, all relationships were weak (none was stronger than 0.20, and most were weaker than 0.10). In the light of previous research on perceived well-being, this came as no surprise. As noted earlier, nearly all studies have found only weak relationships between global measures of well-being and demographic and classification variables. Thus in this respect these findings nicely replicate prior life quality results. Because of these consistently weak relationships we concluded it was not important to include demographic or social classification variables in the multivariate and causal modeling analyses reported later in this paper.

(5) The measures of positive affect life quality and negative affect life quality showed a substantial negative relationship to one another (–0.69 at Time 4) and some interesting differences in their patterns of relationship to other variables.[8] These different patterns of relationship to other concepts suggest that positive affect and negative affect are somewhat distinct – i.e., that they are not merely opposite ends of a single dimension. Positive affect tended to correlate more strongly than did negative affect with 'positive things' (social support, internal control, and performance); and negative affect tended to correlate more strongly with 'negative things' (social conflict, control by others, stress, anxiety, and depression). Details can be seen in Exhibit 4.

(6) The measure intended to tap cognitive evaluations of life quality showed relationships to the psychosocial factors that were consistently weaker than those shown by either positive affect or negative affect. Furthermore, the *pattern* of the cognitive evaluation relationships to the psychosocial factors tended to fall between the patterns shown by the positive and negative affect measures (see Exhibit 4). On the basis of these results we conclude that the way cognitive evaluation was assessed in this study failed to produce a measure that was fundamentally different (or better) than the affect measures. Whether this reflects a flaw in theorizing about the components of life quality or an inappropriate operationalization of the cognition concept cannot be determined here and awaits further investigation.

Stepwise Regressions

Stepwise regression was used to examine the combined effects of the psycho-

logical and affective correlates of life quality. We were interested in finding commonalities and differences in the predictors of various components of life quality. Stepwise multiple regression, a statistical procedure that sequentially adds independent variables to a prediction equation according to their ability to account for the remaining unexplained variance in a dependent variable, is a useful approach for exploratory analysis. It provides an effective way to maximize predictive power (within the additive linear constraints of multiple regression) using the smallest possible number of predictor variables from a given set. It must be recognized, however, that the selection of independent variables solely on their predictive ability is not a theory-based approach, and that the resulting prediction equation is not necessarily an accurate representation of the true causes of variation in the dependent variable. Nevertheless, the level of predictive power achieved, and the particular predictors used to achieve it, often have an intrinsic interest and can help researchers identify the concepts that need to be included in causal models.

Regressions were run for five different quality of life indicators: quality of life-as-a-whole, positive affect quality of life, negative affect quality of life, cognitive quality of life, and quality of life regarding the self. These life quality indicators were selected for two reasons. First, they tended to correlate highest with the predictor variables (as seen in Exhibit 4). Second, they all represent fairly global aspects of life quality.[9]

Ten predictor variables were used in most analyses: social support (esteem), internal control over one's personal life, internal control over one's emotions, control by others over one's personal life, control by others over one's emotions, multiple stress, technical performance in the personal life domain, social performance in the personal life domain, anxiety, and depression.

Eight series of stepwise regressions were run using the above-mentioned variables.[10] Both cross-sectional and lagged analyses were conducted. The following discussion describes only those predictors which produced a statistically significant *t*-ratio *and* explained at least an additional one percent of the total variance (after adjusting for expected shrinkage in a replication).

When Depression was included as a predictor variable, it was always the first predictor to enter the equation for each of the quality of life measures. Technical performance also consistently predicted all five quality of life measures.[11] Stress was a frequent but somewhat less consistent predictor. When Depression and Anxiety were not included as predictor variables, Technical performance and Stress were significant predictors of each quality

Exhibit 5. Stepwise regressions: cross-sectional analyses of psychological and affective predictors of quality of life

Outcome Measure:			
Quality of life-as-a-whole			
Predictor entered	*Step*	R^2 [a]	*Standardized beta* [b]
Depression	1	47.7	−0.49
Technical performance	2	53.4	0.24
Stress	3	55.5	−0.17
Quality of life positive affect			
Predictor entered	*Step*	R^2	*Standardized beta*
Depression	1	39.2	−0.46
Technical performance	2	47.0	0.20
Social performance	3	48.8	0.16
Internal control PL [c]	4	50.2	0.13
Quality of life negative affect			
Predictor entered	*Step*	R^2	*Standardized beta*
Depression	1	53.0	0.40
Stress	2	57.4	0.21
Anxiety	3	60.4	0.23
Control by others EM [d]	4	61.7	0.13
Quality of life cognitive			
Predictor entered	*Step*	R^2	*Standardized beta*
Depression	1	39.8	−0.43
Technical performance	2	46.1	0.22
Internal control PL	3	48.4	0.16
Stress	4	49.8	−0.15
Quality of life self			
Predictor entered	*Step*	R^2	*Standardized beta*
Depression	1	46.0	−0.44
Technical performance	2	57.7	0.28
Control by others EM	3	60.0	−0.16
Internal control PL	4	61.5	0.13
Social performance	5	62.6	0.12

[a] The R^2's shown here include an adjustment for degrees of freedom and hence provide an estimate of how well this prediction equation would work in a replication sample.
[b] Betas are from the prediction equation at the final step shown.
[c] Personal life.
[d] Emotions.

of life measure. The Time 4 cross-sectional results are presented in Exhibit 5. As can be seen from the table, the significant predictors explained 50–63% of the variance in the quality of life measures. The most variance was explained in the quality of life-self and negative affect measures; the least variance was

explained in the positive affect and cognitive life quality measures. (When depression was not included as a predictor, 38–54% of the variance in the life quality measures was explained.) In all cases, most of the explained variance was accounted for by the first two predictors.

As can be seen in Exhibit 5, there was a great deal of overlap in what constituted the best predictors for different life quality measures. There were, however, some differences in the predictors of positive and negative affect. Internal control, social support, and social performance were significant predictors for Positive affect but not for Negative affect.[12, 13] Stress, anxiety and control by others were significant predictors for negative affect but not for positive affect. This parallels the trend observed in the bivariate analyses for positive psychological variables to relate more strongly to positive aspects of quality of life and for negative psychological variables to relate more strongly to negative aspects of life quality.

These cross-sectional Time 4 analyses were repeated with Time 1 data. The same basic pattern of results was found, thereby greatly increasing our confidence in them.

These findings were also replicated in two sets of lagged analyses in which the predictors were measured at Time 3 while life quality was measured at Time 4. In the first set of these analyses, the Time 3 measure of the life quality variable was *not* included as a predictor of itself at Time 4, in the second analysis it was.

When the prior level of the outcome measure was not included as a predictor, the lagged results were comparable to the cross-sectional results. Depression and Technical performance were significant predictors of each quality of life measure. Anxiety was a significant predictor of every quality of life measure except quality of life-as-a-whole. The amount of variance explained was smaller than that in the cross-sectional analyses; however, it was still sizable (32%–46%).

When the prior level of the outcome variable was included as a predictor, it was always the first predictor entered into the equation. Furthermore, it explained virtually all of the variance which was explainable (41–59%). The most variance explained by a second predictor was 2%; technical performance explained an additional 2% of the variance in positive affect life quality while depression explained a comparable amount of variance in negative affect life quality.

Structural Modeling

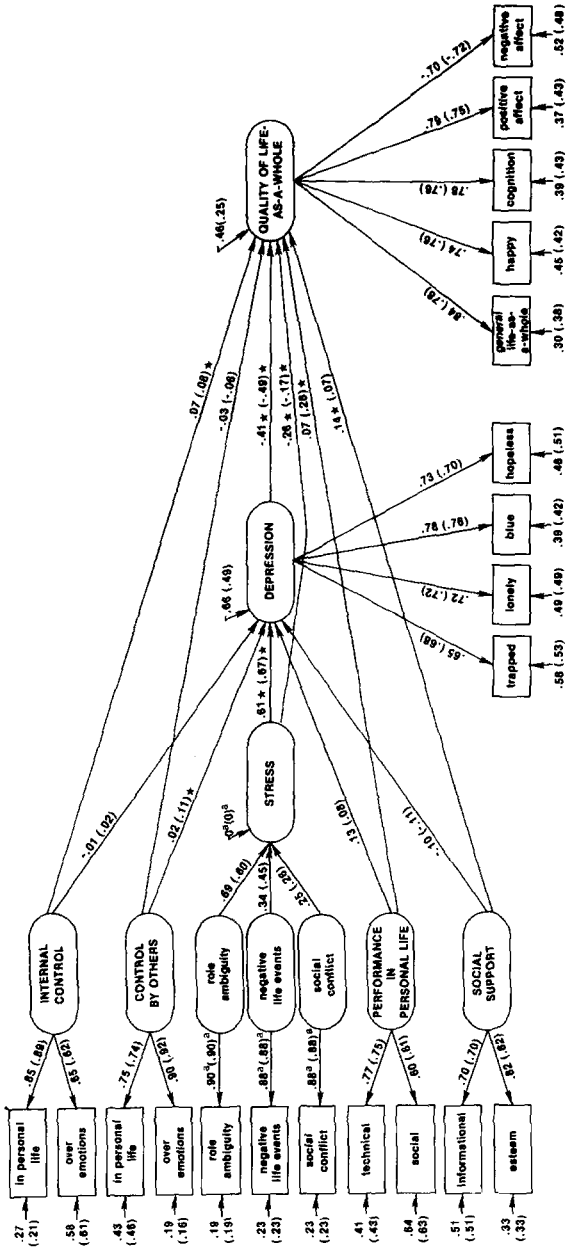
Based on our prior theorizing and the results of the bivariate analyses and stepwise regressions, a basic causal model was generated for quality of life-as-a-whole. Internal control, control by others, stress, performance, social support, and depression were all hypothesized to affect global life quality. It was hypothesized that increased internal control, performance, and social support would lead to improved perceptions of life quality. Control by others, stress, and depression were hypothesized to have negative effects on life quality. In addition, internal control, performance, and social support were expected to reduce depression, while control by others and stress were expected to increase it. As is customary, all possible linkages were allowed among the exogenous variables, so the model would perfectly represent their observed interrelationships.

Lisrel IV (Joreskog and Sorbom, 1978) was used to analyze the data.[14] This analysis technique allows estimation of both a measurement model and a causal model. The inclusion of multiple indicators of latent (i.e., unobserved) constructs permits estimation of the relationships among the latent variables without the confounding effects of measurement error.

Each latent concept in the model was measured with two to ten observed indicators. All of the latent variables except stress were modeled in the conventional, factor-analytic fashion. Consequently, the linkages between the latent variables and their measured indicators can be interpreted as factor loadings. Stress, however, was modeled as an induced or "block" variable (Marsden, 1982). Role ambiguity, negative life events, and social conflict were not conceptualized as alternative indicators of the identical, underlying construct. Individuals experiencing role ambiguity are not necessarily experiencing negative life events, but individuals experiencing any one (or more) of these concepts is experiencing stress. In support of this argument, the Pearson product moment correlations between these three indicators were modest (r's ranged from 0.14 to 0.39 at Time 4). The links between these concepts and the stress factor can be interpreted as regression coefficients.

Basic models. Several different models were examined both for their theoretical meaning and their relative fit. Differences in chi-square to degrees-of-freedom ratios were examined to compare alternative models (Joreskog and Sorbom, 1978). Only the best models will be described.[15]

Exhibit 6. Lagged and cross-sectional causal models relating psychological concepts and global quality of life-as-a-whole[b]



a Fixed.

b Standardized parameters for the lagged model appear first; those for the cross-sectional model follow in parantheses. Significant β's and γ's (except those linking the stress indicators to stress) are indicated with a *.

Exhibit 7. Links between exogenous variables (standardized)

	1	2	3	4	5	6
1. internal control						
2. control by others	−0.03[a] −0.03[b]					
3. role ambiguity	−0.26 −0.25	0.39 0.38				
4. negative life events	−0.05 −0.05	0.23 0.23	0.33 0.33			
5. social conflict	−0.01 −0.01	0.50 0.49	0.42 0.42	0.25 0.25		
6. performance	0.34 0.34	−0.28 −0.29	−0.69 −0.70	−0.26 −0.26	−0.38 −0.38	
7. social support	0.38 0.37	−0.06 −0.06	−0.38 −0.38	−0.01 −0.01	−0.27 −0.27	0.53 0.54

[a] Lagged model.
[b] Cross-sectional model.

Exhibits 6 and 7 provide information about two models: (1) a lagged model in which internal control, control by others, stress, performance, and social support were measured at Time 2, depression was measured at Time 3, and quality of life-as-a-whole was measured at Time 4; and (2) a cross-sectional model in which all concepts were measured at the same point in time. As can be seen from Exhibits 6 and 7, the lagged and cross-sectional models were quite comparable, although some parameter values reached significance in one model but not in the other. The fit of both models is good (χ^2/df ratios = 2.48, 2.90, respectively; average absolute residuals = 0.026, 0.028; and Hoelter's CN's (Hoelter, 1983) = 319.6, 273.4).

All linkages between observed measures (shown in rectangles) and theoretical concepts (shown in ovals) were of a reasonable magnitude (range from 0.60 to 0.92). This indicates that the observed measures tapped the relevant underlying concepts adequately.[16]

As can be seen in Exhibit 7 the magnitude of the links (ϕ's) between the exogenous variables ranged from −0.70 to 0.54. As hypothesized, perceptions of internal control and control by others were unrelated. The three stress indicators (role ambiguity, negative life events, social conflict) were moderately, positively related. Role ambiguity was strongly, negatively related to

performance.[17] And control by others was strongly, positively related to social conflict.

As can be seen in Exhibit 6, there was only one major predictor of depression. Stress related strongly and positively to depression ($\beta = 0.61, 0.67$ in the lagged and simultaneous models respectively). (Control by others related significantly to depression in the cross-sectional model but not the lagged model.)

As can also be seen in Exhibit 6, psychological factors had substantial direct effects on life quality. Increased depression led to decreased life quality ($\beta = -0.41, -0.49$ respectively). Increased stress also led to decreased life quality. The direct effects of stress were -0.26 and -0.17, and the total effects (which include the direct plus the indirect effects, mainly attributable to stress's impact through depression) were -0.51 and -0.50. Internal control, performance, and social support each had small, positive direct effects on life quality (γ's ranged from 0.07 to 0.26); these three factors had no significant indirect effects on life quality. Control by others did not significantly affect life quality either directly or indirectly.

After allowing for the attenuating effects of random measurement error, these psychological factors, taken together, accounted for 75% of the variance in evaluations of life-as-a-whole when it was measured simultaneously with the psychological factors. Fifty-four percent of the variance in life-as-a-whole was accounted for when it was measured six weeks after the psychological factors.

Subgroup models. As described in the introduction, it is frequently hypothesized that internal control and social support have moderating effects. Individuals high on internal control are hypothesized to handle stress better than individuals low on internal control. Similarly individuals with high levels of social support are hypothesized to cope better than individuals with low levels of social support.

Structural models only examine main effects, not interactions. The same model can, however, be run separately for subgroups to determine if the same model fits each subgroup equally well. Consequently six additional lagged models were run. In one series of three, internal control was omitted from the model and the model was estimated separately for three groups: respondents with high levels of internal control ($N = 265$), respondents with low levels of internal control ($N = 295$), and all respondents ($N = 660$). In a second series

of three, social support was omitted from the model and the model was estimated separately for three groups: respondents with high levels of social support ($N = 246$), respondents with low levels of social support ($N = 261$), and all respondents ($N = 660$).[18]

Most of the parameter values for the subgroup models were comparable to those found in the models displayed in Exhibit 6. The fit was less good (given the smaller sample size) in the subgroup models, but was still reasonably high (χ^2/df ratio = 1.56 for high internal control subgroup, 2.22 for low internal control subgroup, 1.68 for high social support subgroup, and 1.99 for low social support group). Models for the various subgroups were comparable, with two noteworthy exceptions. For respondents with low levels of internal control, social support related positively and significantly to life quality ($\gamma = 0.23$), whereas for respondents with high levels of internal control there was virtually no relationship between social support and quality of life ($\gamma = 0.08$).[19]

In a complementary fashion, for respondents with low levels of social support, perceptions of internal control related positively and significantly to life quality ($\gamma = 0.15$), but for respondents with high levels of social support there was virtually no relationship between internal control and quality of life ($\gamma = 0.03$).

These findings support the hypotheses presented earlier. For individuals lacking social support, internal control increases life quality. Similarly, for individuals lacking internal control, social support increases life quality. Experiencing high levels of both social support and internal control seems to be no more beneficial than experiencing high levels of only one of them. But for individuals experiencing a low level of either social support or internal control, experiencing high levels of the other is beneficial.

DISCUSSION

The results of this study provide strong support for the hypothesis that psychological concepts relate to perceptions of life quality. The causal modeling results indicate that stress and depression relate strongly and negatively to perceptions of life quality. Internal control, performance, and social support relate moderately and positively to perceptions of life quality. Individuals who feel under stress or depressed report feeling worse about their lives than unstressed or happy individuals do. In contrast, individuals who feel

in control of what occurs in their lives, or who receive social support from others, or who perform well report feeling better about their lives than do other individuals. Examination of bivariate analyses indicates that these relationships are strongest when all concepts are measured at the same point in time. However, lagged effects are also strong (54% of the variance in quality of life-as-a-whole could be explained by psychological characteristics present six weeks earlier). Quality of life researchers might want to consider including these psychological measures in their instruments in order to obtain a better understanding of how their respondents' life quality assessments are made.

The modest relationship found in this study between subjective life quality and various demographic and social classification variables, such as education and race, replicate the results of a number of previous studies (e.g., Andrews and Withey, 1976). Similarly, the strong negative relationships found in this study for depression and anxiety with life quality replicate previous research by Dupuy (1977) and Kammann *et al.* (1979). This study extends the results of this previous research by including a larger number of psychological concepts.

There was a small but consistent effect, demonstrated in both the bivariate and stepwise regression analyses, for positive concepts to relate most strongly to positive affect while negative concepts related most strongly to negative affect. The relationships between positive affect and internal control, social support, and performance were stronger than the relationships between negative affect and these concepts. Similarly, the relationships between negative affect and stress, control by others, anxiety, and depression were stronger than the relationships between positive affect and these concepts. This differential pattern of relationships supports the separation of positive and negative affect into two separate (but not necessarily completely independent) concepts. These findings suggest that when people try to determine how much enjoyment they are getting out of life, they focus on positive determinants of well-being, including internal control or social support. In contrast, when people try to determine how emotionally upset they are, they focus on negative determinants of well-being such as control by others or stress. Previous research indicates that mood affects memory; people in happy moods recall more positive occurrences while people in depressed moods recall more negative occurrences (Bower, 1981). The effect found in this study may be related to this memory phenomenon.

Costa and McCrae (1980) present evidence which indicates that individual

differences in extraversion and neuroticism relate to life quality ten years later. They found that extraversion related positively to positive affect (and was uncorrelated with negative affect) while neuroticism related positively to negative affect (and was uncorrelated with positive affect). They argue that stable personality differences may affect individuals' perceptions of their life quality throughout their lives. The differential relationship found in this study between positive and negative affect and psychological phenomenon may reflect these personality differences.

Alternatively, this tendency for positive affect to relate most strongly to positive psychological concepts and negative affect to relate most strongly to negative psychological concepts may represent some kind of response bias. However, all positive and negative items were not measured on the same response scales, nor did they occur together on the questionnaire. So if this effect is due to a response bias, it must be a fairly complex and general phenomenon.

The conceptual distinction between cognitive and affective components of quality of life was not supported in these analyses. The cognitive measure of life quality did not produce stronger relationships or a different pattern of relationships than did positive affect or the general measure of quality of life-as-a-whole. While the index measuring cognitive life quality in this study had reasonable face validity and internal reliability, it is possible that it did not adequately capture the uniquely cognitive aspects of life quality assessments. Further research with alternative indicators is needed to see if they would produce different results.

Quality of life regarding the self consistently related strongly to the various psychological concepts. None of the other life domains examined (health, personal life, or work) related as highly to the psychological variables. In the stepwise regression analyses, the predictors consistently explained the most variance in life quality regarding the self. Numerous theorists have described the importance of self-esteem (Wells and Marwell, 1976; Wylie, 1974–1979), a concept akin to quality of life regarding the self. Consequently, it is not surprising that psychological concepts such as depression, internal control, social support, and performance related strongly to how individuals felt about themselves.

Researchers interested in the effects of aspirations, and the gap between aspirations and what one has, on life quality assessments may want to consider the relevance of the psychological concepts in this study. For example,

person-environment fit theory has conceptualized both stress and control in a 'gap' framework (Conway *et al.*, 1983; French *et al.*, 1974). A potential stressor, such as workload, is only viewed as stressful if the person has either more (overload) or less (underload) work than he or she desires; any discrepancy is stressful and should also reduce perceptions of life quality. This theoretical framework might profitably be applied to life quality theory.

The moderating effects found in the causal models suggest that internal control and social support work in tandem; for individuals experiencing low levels of either social support or internal control, experiencing a high level of the other relates to increased life quality. Social support somehow 'makes up' for the detrimental effects of a lack of internal control, and internal control 'makes up' for the detrimental effects of a lack of social support. Internal control may provide people with the confidence they need to seek out social support while receiving social support may enhance individuals' sense of internal control. While these alternative hypotheses cannot be adequately tested with these data, further examination of the relationship between social support and internal control seems warranted.

While the respondents in this study did not represent a random sample of any population, they did closely resemble the United States adult population on several demographic characteristics and levels of life quality. Caution should be used in generalizing these results to other populations. There are, however, important applied implications of this study's findings. Stress, depression, internal control, social support, and performance may all be determinants of a person's sense of life quality. Individuals interested in improving subjective life quality might want to develop techniques for reducing perceived stress and depression and increasing perceived internal control, social support, and performance. While this is not an easy task, at least these data suggest a direction for furture efforts.

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NOTES

[1] A third component of control, control by chance factors (i.e., luck, random circumstances), has been described by many theorists (cf., Levenson, 1973). This aspect of control was measured in this study. Based on the results of unpromising preliminary analyses, however, this component of control has been left out of the models and analyses described in this paper.

[2] According to Michigan law, the State Board of Pharmacy can approve direct access to pharmacy records for research purposes. This study was conducted with the Board's approval.

[3] For reasons of confidentiality, a small number of names drawn from mailing lists were added to the pharmacy lists. Therefore, interviewers did not know if a potential respondent was a patient or not prior to conducting the interview.

[4] A number of preliminary analyses were conducted to compare the responses of Valium users and non-users of Valium. Valium users and non-users were comparable with respect to age, education, gender, and income. Valium users reported significantly more stress, anxiety, and depression and a significantly lower quality of life than did non-users. These differences were most pronounced at Time 1, although they persisted at all four waves of data collection.

Data from Valium users and non-users were analyzed separately for a large number of bivariate and multivariate analysis including structural modeling. In all cases, results were comparable for both groups. It appears that while Valium users may have been at a different level than non-users on some of these concepts, the relationships between concepts was similar for the two groups. Consequently, in the analyses presented in this paper, no distinction is made between Valium users and non-users.

[5] Several additional concepts were also included but proved to be so weakly related to other concepts we decided to give them minimal attention. These included: past and expected future changes in quality of life-as-a-whole, anger, cardiovascular symptoms, coping and defense, and control over one's life by chance factors.

[6] Furthermore, the magnitude of the relationships between any particular pair of these variables tended to be about the same at all instances of the same lag. (For example, about the same relationship was observed in each of the four simultaneous – zero lag – instances.) This implies that the system was stable – not that the people being studied were unchanging, but that the causal dynamics showed no major changes over the half-year period of the study. Hence, the data were 'well behaved' and appropriate for the analyses reported later. This stability also means that the presentation of any one set of lag-zero relationships will convey nearly all of the important information about the patterns; Time 4 results are presented in the text.

[7] The complete matrix of relationships among all variables examined, for all four time points, is available on request.

[8] Warr, Barter, and Brownbridge (1983) insightfully discuss reasons why some studies using measures of positive and negative affect that were different from those used here have found a surprising near-zero relationship between these concepts. The results we obtained are in agreement with findings by Kammann and his colleagues (1984) and by Warr et al. (1983).

[9] As noted earlier, quality of life regarding the self can be conceptualized as self-esteem, a global variable.

[10] Two of these analyses are not described in the main body of the text. In one, the components of multiple stress were included as predictors, rather than multiple stress itself. The results indicated that role ambiguity often accounted for a significant additional amount of variance in life quality, negative life events occasionally did, and social conflict never did.

In the second analysis, the two-item quality of life-as-a-whole index was used. This

measure does not include items tapping global positive affect, negative affect, or cognition. The five-item index used in the analyses reported in the main body of this section does include these components of global life quality. Results were comparable for both the two-item and the five-item index.

[11] Technical performance significantly entered the cross-sectional negative affect equation, but it predicted slightly less than one percent of the accounted for variance, so it was not included in Exhibit 5.

[12] Usually when internal control significantly entered an equation, it was in the personal life domain. When control by others significantly entered an equation, it was usually in the emotional domain. From other analyses, however, it is clear that the two domains in which control was measured overlap extensively. Consequently, which domain enters an equation may be somewhat arbitrary.

[13] Social support significantly entered the cross-sectional positive affect equation but it predicted slightly less than one percent of the accounted for variance so it was not included in Exhibit 5.

[14] Lisrel assumes linear relationships and multivariate normal distributions. The data did not seriously violate these assumptions.

[15] A brief description of a few of the rejected models is warranted. Leaving depression totally out of the model sharply increased the magnitude of the link between stress and life quality, but the values of the other parameters remained comparable. Several models were run which included only one indicator of performance, either technical or social. Models which included only technical performance fit the data slightly better than the models presented in the text. Because the differences were small, we prefer models which include both because of the broader conceptual base.

[16] The lambdas for role ambiguity, negative life events, and social conflict could not be determined because there was only one indicator of each. Consequently, following standard practice, lambda was set to the square root of the Cronbach *alpha* reliability coefficient for each scale. The *gammas* which link role ambiguity, negative life events, and social conflict to stress indicate those concepts' contributions to the global stress concept.

[17] Several researchers have hypothesized that role ambiguity negatively affects performance (e.g., Caplan et al., 1980; French, Caplan, and Harrison, 1982). We were not interested in testing this hypothesis in these analyses; however, it may explain the strong link between these concepts.

[18] High and low subgroups were formed such that respondents with values at the median were excluded.

[19] The *gamma* coefficients here and in the following paragraph are standardized (i.e., assume variances of 1.0 for all variables in all groups). The same pattern of results is obtained for the unstandardized coefficients.

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