Worker burnout: a dynamic model with implications for prevention and control

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This paper explores the dynamics of worker burnout, a process in which a hard-working individual becomes increasingly exhausted, frustrated, and unproductive. The author's own two-year experience with repeated cycles of burnout is qualitatively reproduced by a small system dynamics model that portrays the underlying psychology of workaholism. Model tests demonstrate that the limit cycle seen in the base run can be stabilized through techniques that diminish work-related stress or enhance relaxation. These stabilizing techniques also serve to raise overall productivity, since they support a higher level of energy and more working hours on the average. One important policy lever is the maximum workweek or work limit; an optimal work limit at which overall productivity is at its peak is shown to exist within a region of stability where burnout is avoided. The paper concludes with a strategy for preventing burnout, which emphasizes the individual's responsibility for understanding the self-inflicted nature of this problem and pursuing an effective course of stability.

In this world there are two tragedies. One is not getting what one wants, the other is getting it. (Oscar Wilde)

The survival of mankind as a species may well depend on the successful management of stress. (Greenwood 1979, xii)

The negative consequences of unrelieved stress have become increasingly evid over the last few decades. In a fast-moving, achievement-oriented society, individu may easily become worn down and unable to function effectively if they are careful. Excessive stress can lead not only to chronic fatigue but also to a wide vari of psychological, medical, and behavioral problems ranging from irritation, depı sion, and loss of appetite to violence, alcoholism, mental illness, and heart dise (Cherniss 1980; Greenwood 1979, 117–163; Holt 1982, 427–433). These proble affect both the individual and the society at large and have had a clear depress effect on economic productivity in the United States. It has been estimated that out could be boosted by at least 10 percent if the work loss and impaired job performa attributable to mismanaged stress were eliminated (Greenwood 1979, 128–163; Iv cevich 1980, 18). As most executives surely now realize, the connection betw distress and the bottom line is indeed real.

Since work plays a central role in the lives of most people, it should not surprising that a great deal of potentially harmful stress originates in the workpl In recent years many researchers in the area of occupational safety and health h turned their attention to the issue of occupational stress. Potential sources of st at work are many and include irritants in the physical or social environment, pı lems of role or responsibility, poor job fit, inadequate rewards or support, and dead pressure (Greenwood 1979, 103; Holt 1982, 420–427; Ivancevich 1980, 96). Some j tend to be more stressful than others; studies have shown, for example, that air tra controllers are much more susceptible to stress-related diseases and behavioral pı lems than the average person. The same is probably true for lawyers, doctors, so workers, and salespeople (Ivancevich 1980, 171). But because tension may aris any situation where personal needs are not being satisfied, every job has the poter for being stressful (NDACTRD 1980, 225).

When work-related stress becomes severely debilitating, the affected indivic may be said to be "burned out." Burnout has been defined broadly as "a proces which individuals become exhausted by making excessive demands on en strength" (NDACTRD 1980, 1). It is generally agreed that at the root of the prob is the individual's own overcommitment to frustrating work. The source of a burı victim's frustration is the inability to attain high expectations set by others or, n frequently, by the individual. The entire process may take weeks, months, or y (Freudenberger 1980, 13–16; Greenwood 1979, 47; NDACTRD 1980, 1, 125). S have said that organizations or even entire societies may burn out if they p themselves too hard (Greenwood 1979, 126).

The burnout process begins when the individual attempts to meet unmet expe tions by working longer hours. Longer hours mean more exposure to the normal st

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of work and consequently more of a drain on the individual's finite store of "adaptation energy" and less time available for recovery of that lost energy (Greenwood 1979, 31–43; Ivancevich 1980, 176; Selye 1974, 38–40). This drain of energy may, in turn, render the individual weaker and less capable of reaching his or her goals. The response to continued inadequacy of performance is to work harder, which depletes energy further (Freudenberger 1980, 5–6). In addition, the worker's growing frustration at work increases the very stressfulness of that work, so that energy is drained still more rapidly (Greenwood 1979, 47; Selye 1974, 78, 96). If the individual refuses or is unable to take time out to recover, the vicious cycle of frustration-exhaustion-dysfunction will ultimately produce chronic and severe problems which *force* him off the job, a burned-out ember of his former self (Ivancevich 1980, 96; NDACTRD 1980, 151).

The ideal context for burnout combines a workaholic personality type with a disagreeable, and therefore highly stressful, job. In general, a nonworkaholic will simply be unwilling to work unusually long and stressful hours and certainly will not seek out such a position. Workaholics or high achievers, on the other hand, create conditions of work overload for themselves and feel uneasy when they are not working (Ivancevich 1980, 177; Machlowitz 1980, 87; McClelland 1961). They compete most strongly with themselves, essentially expanding their goals whenever necessary to maintain the challenge they inherently need; current accomplishments are never quite enough (Freudenberger 1980, 49; Machlowitz 1980, 27, 122). The fact that most workaholics can push themselves this way for many years without burning out speaks well for their ability to find work that is so fulfilling as to minimize the wear and tear of long hours (Machlowitz 1980, 103, 117). But put a self-driven workaholic in a disagreeable work setting—for example, one lacking in tangible rewards—and the prescription for burnout is complete: Unmet goals become more of a burden than a motivating challenge (Freudenberger 1980, 42; Machlowitz 1980, 109; NDACTRD 1980, 128).

It is worth looking more closely at the workaholic personality. Workaholism is a way of life for perhaps 5 percent of American adults. Beneath their energetic and intense surface lies an obsessive perfectionism associated with the fear of failure or boredom (Machlowitz 1980, 6, 26–32, 41–46). Their inability to relax, compromise, seek assistance, or admit limitations often arises first in childhood, reflecting in part the internalization of family values regarding the importance of determined effort, self-reliance, and self-improvement (Freudenberger 1980, 11, 32; Machlowitz 1980, 39; NDACTRD 1980, 108). But the relatively recent phenomenon of workaholism is not attributable solely to the American work ethic, which, after all, goes back many generations. The difference in America today is that with the rapid and widespread erosion of traditions and support systems, few activities outside of the workplace continue to give the individual the sense of meaning and control that they once did. As a result, ". . . our expectations from work become disproportionate to what, in most cases, it can provide" (Freudenberger 1980, 186, 198). Since workaholics invest little of themselves outside work, they risk losing all if work itself ceases to be rewarding.

Strategies for the prevention and amelioration of burnout are as numerous as the writers who propose them. But they all seem to fall into one of three categories: (1) work less, (2) minimize the stress of work, and (3) relax more effectively when not working. Working less may involve working fewer hours per day or taking more frequent vacations (Freudenberger 1980, 158; Machlowitz 1980, 133; Selye 1974, 40). Minimizing work stress may involve shifting tasks or reducing expectations or learning through techniques such as assertiveness training and "stress inoculation" consciously to defuse and to redirect potentially stressful situations (Cameron 1982, 702; Freudenberger 1980, 158, 175; Holroyd 1982, 29; Ivancevich 1980, 230; Janis 1982, 82; NDACTRD 1980, 192; Stoyva 1982, 754). Minimizing stress also may require action by the supervisor or employer, such as clarifying goals or roles, providing more rewards and "strokes," allowing for more personal initiative, and generally improving the work climate (Ivancevich 1980, 207–214; Kiefer 1982, 6; Machlowitz 1980, 133–137, NDACTRD 1980, 192–202). More effective relaxation may involve exercise, hobbies, loafing, close friendship, meditation, biofeedback, body realignment therapy, or any of several techniques specifically designed to elicit the calm state of "passive attention" (Greenwood 1979, 175–211, 229; Freudenberger 1980 136, 206; Ivancevich 1980, 176, 217; NDACTRD 1980, 186–191; Stoyva 1982, 749–753).

Because the sources of stress are manifold and varied, there exists no single panacea for this complex problem. But each of the preceding techniques can be helpful; in contrast, palliatives that are themselves addictive, such as drinking and gambling clearly are not effective in managing stress and may only worsen the situation (Freudenberger 1980, 99; Greenwood 1979, 171; Maslach 1978). The prevention of burnout ultimately depends on maintaining a healthy balance of activities, giving adequate time to both active coping and rest (Freudenberger 1980, 210; Greenwood 1979, 220–221; Stoyva 1982, 746).

While the literature provides graphic descriptions of the process of burnout and offers many pieces of advice, it does little to address the question of what actually happens following burnout, that is, during and after recovery. Presumably, the individual can regain lost energy during the time off from work, but what then? If he o she returns to stressful work following recovery, without adopting measures to manage energy more effectively, another round of burnout would seem likely.

Although repeated cycles of burnout are apparently undocumented in the literature they were, in fact, my experience from 1981 to 1983, the two years of researchin and writing my doctoral thesis. Perhaps four times during this long and often lonel effort, I experienced periods of moderate burnout, the symptoms including exhaustion, confusion, anger, headaches, stomach pains, and depression. My productivit plummeted during these periods, and I would finally take time off to recover m strength. When I returned to work, I would not only feel refreshed but also have more relaxed attitude toward work, with lower expectations for my weekly output. could meet these new goals without working too hard, but soon I would find m expectations rising and work hours increasing, true to the workaholic profile. Firs my evenings disappeared, then my weekends, and it was only a matter of time befor I would start to feel tired and confused again.

Purpose and approach

The purpose of this paper is to present a dynamic model of worker burnout, consistent with both the literature and with my personal experience, which can suggest guidelines for attaining greater stability and higher productivity. The model is tested to determine whether stabilizing policies do in fact raise overall accomplishment; uncertainty on this point arises because the ways of the burnout candidate are precisely those of the high achiever. Can one actually push less and achieve more?

The next section describes the structure of the small (four-level, nineteen-equation) system dynamics model used for the subsequent analysis, first in overview and then in detail. This is followed by an investigation of model behavior: First, a description and causal-loop explanation of the base run; and second, an exploration of policies to prevent and control burnout cycles, culminating in the idea of an "optimal work limit." The paper concludes with a general strategy for fighting worker burnout, based on insights provided by the model.

Model structure

Overview

The model of worker burnout presented here focuses on the psychological dynamics underlying the problem, namely, the dynamics of workaholism. (See the Appendix for a complete model listing.) The model has four major elements: (1) accomplishments per week, the outcome measure of interest; (2) expected accomplishments per week, the outcome goal set by the worker; (3) hours worked per week, also adjusted by the worker and one determinant of the weekly accomplishment rate; and (4) energy level, which determines hourly productivity, this being the other factor determining weekly accomplishment. The energy level is depleted by the stress of work and replenished during periods of rest; thus, longer hours at work lead to faster depletion and slower recovery of energy. The frustration that comes from accomplishment falling short of expectations can also accelerate energy depletion. If current accomplishment seems adequate or nearly so, the textbook workaholic will increase expectations; the worker's goals drift downward only if they appear far too high given current output. On the other hand, he or she will tend to work longer hours if accomplishments are perceived to be inadequate; and will decrease hours only if goals are exceeded or if the energy level is so low as to make time off unavoidable.

The model does not attempt to account for the individual's basic approach to and compatibility with his work. Thus, the factors that define the workaholic personality are exogenous, as is the worker's normal level of stress. Also beyond the model's boundary are those personal and environmental factors that determine the individual's basic ability to relax. In addition, hourly output at a given energy level, determined in real life by such factors as preparation for the task at hand, native intelligence, and assistance from others, is exogenous. The model is not concerned with learning curves or organizational dynamics. This is not to say that changes in the individual or the surroundings are not important; indeed, the role of sensitivity testing is precisely to analyze the importance of various exogenous factors. Rather, the mo(is intended to show how the workaholic syndrome can by itself lead to burno without the aid of other dynamic factors. One need not examine changes in t individual's career goals, for example, in order to explain the month-to-month (namics of burnout, though such longer-term changes may be central to an explanati of a midlife "achievement crisis" (Dabiri 1979).

Equation description

A note on parameter values: The values ascribed to constants and table functions the baseline model are entirely based on logic and considered judgment. The num ical data of interest are simply not to be found in the literature, nor have I attemp to measure these parameters myself. The numbers were drawn primarily in an i pressionistic fashion from my own experience as a victim of burnout. Note that burnout cycle reference mode itself was presented in descriptive, not numeri(terms. Thus, lacking numerical data on both structure and behavior, attempts historical accuracy or prediction are obviously out of the question. Still, if the dogenous structure is potent enough, one can learn much about the generic proc through careful model testing. The baseline set of parameters is treated simply a takeoff point for investigating model behavior under a variety of circumstances. 7 results can thereby be considered applicable to a whole spectrum of individuals ε work settings.

```
AW.K = (AH.K)(HWW.K)                     A, 1

AH.K = TABLE(TAH,EL.K,0,1,.2)            A, 2
TAH = 0/.2/.4/.6/.8/1                    T, 2.1

    AW = Accomplishments per week (A-units/week)
    AH = Accomplishments per hour (A-units/week)
    HWW = Hours worked per week (hours/week)
    TAH = Table for accomplishments per hour
    EL = Energy level (0-1)
```

The worker's weekly output is the product of hourly productivity and numbe hours worked per week. Output is measured in units of accomplishment (A-un the meaning of which depends on the kind of work involved. For simplicity's sa it has been assumed that the worker can produce at most one accomplishment hour. Hourly productivity is determined by the worker's energy level: When o energy level (and correspondingly, one's levels of rationality and self-esteem) is l one is easily distracted from the task at hand and prone to erratic performance poor decision making (Greenwood 1979, 125; Ivancevich 1980, 201; Janis 1982, 99). Indeed, hourly accomplishment might be thought of as an operational defini of the energy level, implying the linear relationship depicted in Eq. 2.1. When worker has no energy at all, he produces nothing, while at full energy he produ at maximum hourly rate.

```
HWW.K = HWW.J + (DT/TAHWW)(IHWW.J -                L, 3
 HWW.J)
HWW = HWWI                                         N, 3.1
HWWI = 40                                          C, 3.2
TAHWW = 1                                          C, 3.3

IHWW.K = MIN(LHWW,HWW.K*EELHW.K*EPAHW.K)           A, 4
LHWW = 80                                          C, 4.1

    HWW = Hours worked per week (hours/week)
    HWWI = Hours worked per week, initial (hours/week)
    TAHWW = Time to adjust HWW (weeks)
    IHWW = Indicated hours worked per week (hours/week)
    LHWW = Limit on hours worked per week (hours/week)
    EELHW =  Effect of energy level on hours worked
    EPAHW = Effect of perceived adequacy on hours worked
```

The number of hours worked per week, initialized at a standard value of 40, is adjusted by the worker toward an "indicated" value more in line with his perception of the current situation. It is assumed here that hours are flexible and the adjustment can be made within one week's time. The indicated workweek may be longer than the current workweek if output is perceived as inadequate and may be shorter if output is perceived as more than adequate or if the energy level is low (see Eqs. 5 and 6 following); but the workweek is assumed never to exceed some upper limit (or to exceed it so rarely as to be insignificant). This weekly work limit may be determined by the worker or by others and may be explicit or implicit; in any case, it represents the maximum workweek the individual is willing to put in, on a continuous basis if need be. Many people regularly work 60 to 90 hours per week (Ivancevich 1980, 17); the baseline model assumes a work limit of 80 hours per week.

```
EELHW.K = TABLE(TEELHW,EL.K,0,1,.2)                  A, 5
TEELHW = 0/.4/.7/.9/1/1                              T, 5.1

EPAHW.K = TABLE(TEPAHW,PAA.K,0,1.6,.2)               A, 6
TEPAHW = 2.3/1.9/1.6/1.35/1.15/1/.9/.8/.75           T, 6.1

    EELHW = Effect of energy level on hours worked
    TEELHW = Table for EELHW
    EL = Energy level
    EPAHW = Effect of perceived adequacy on hours worked
    TEPAHW = Table for EPAHW
    PAA = Perceived adequacy of accomplishment
```

Figure 1 shows the "time off" effect that a low energy level may have on hours worked. The function becomes steep only in the region of lower energy, reflecting the workaholic's natural reluctance to break away from work unless the situation is desperate. Workaholics feel guilty and anxious about leaving work and so tend to skip or shortchange vacation time (Machlowitz 1980, 93–99). But should the worker's

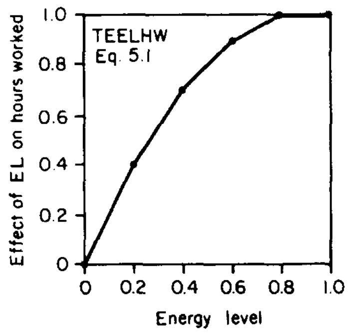


Fig. 1. Table for effect of energy level on hours worked

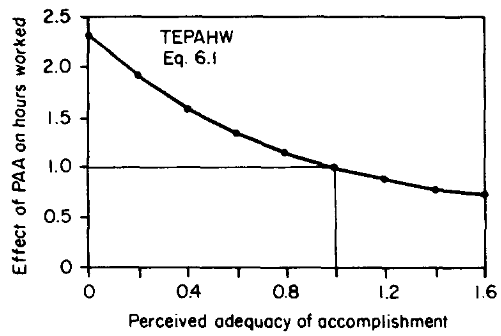


Fig. 2. Table for effect of perceived adequacy of accomplishment on hours worked

energy drop toward zero, a vacation will become a matter of necessity rather choice.

Figure 2 depicts the "work harder" response to performance that falls short of c goals; studies have shown that the further the goal is, the harder people will wo achieve it (Welford 1973). Experience and the logic of symmetry suggest that ach ment exceeding one's goals tends to call forth a more relaxed attitude with f hours worked. The concave function used here represents a response roughly portional to the perceived degree of inadequacy or surplus for values of input i normal range, but considerably less than proportional in the region of very adequacy. The latter reflects a natural resistance to radical increases in the work over a short period of time.

```
PAA.K = PAW.K/XAW.K                                  A, 7

PAW.K = PAW.J + (DT/TPAW)(AW.J - PAW.J)              L, 8
PAW = AW                                             N, 8.1
TPAW = 1                                             C, 8.2

    PAA = Perceived adequacy of accomplishment
    PAW = Perceived accomplishments per week (A-uni
          week)
    XAW = Expected accomplishments per week (A-units/wee
    AW = Accomplishments per week (A-units/week)
    TPAW = Time to perceive accomplishments per w
           (weeks)
```

The worker's satisfaction with his performance has both psychological and behavioral consequences and reflects a comparison of perceived accomplishment with expected accomplishment. The dimensionless ratio measure used here seems a reasonable approximation to the informal calculus done in real life. The worker assesses his output rate by averaging it over some recent time period; the smoothing time of one week used here reflects the attentive self-observation typical of a high achiever.

```
XAW.K = XAW.J + (DT)(XAW.J*FCXAW.J)              L, 9
XAW = XAWI                                        N, 9.1
XAWI = 40                                         C, 9.2

FCXAW.K = BFCX + FCXPA.K                          A, 10
BFCX = .1                                         C, 10.1

FCXPA.K = TABLE(TFCXPA,PAA.K,0,1.6,.2)            A, 11
TFCXPA = -.7/-.5/-.35/-.2/-.1/0/.1/.25/.4         T, 11.1

    XAW = Expected accomplishments per week (A-units/week)
    XAWI = XAW, initial (A-units/week)
    FCXAW = Fractional change in XAW (1/week)
    BFCX = Bias for fractional change in expectations
          (1/week)
    FCXPA = Fractional change in expectations from per-
          ceived adequacy (1/week)
    TFCXPA = Table for FCXPA
    PAA = Perceived adequacy of accomplishment
```

The worker's expectation for weekly output, initialized to equal actual output, is adjusted up or down in response to the perceived adequacy of his performance. The high achiever pushes to expand his goals once they have been met. This is represented in the model by a bias causing the increase of expected output whenever perceived adequacy is neutral (PAA = 1). When accomplishment is more than just satisfactory, the worker will feel encouraged to expand his goals even faster than this bias, as shown in Figure 3. Conversely, when output is inadequate, the individual will nat-

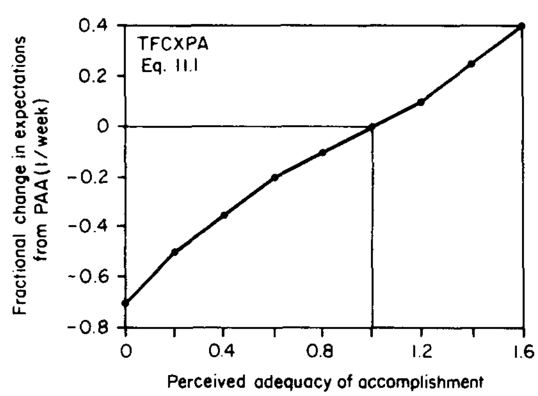


Fig. 3. Table for fractional change in expectations from perceived adequacy of accomplishment

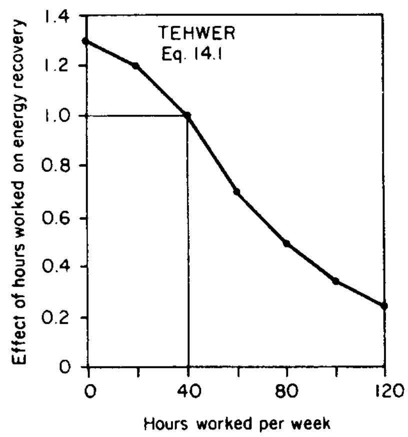
urally be tempted to draw back his goals somewhat to avoid undue frustration.[1] In the baseline model this reaction overcomes the upward bias and causes an actual shrinking of expectations whenever perceived adequacy is less than 0.8.[2] Figure 3 indicates that this response becomes stronger as the worker's dissatisfaction becomes more acute.

```
EL.K = EL.J + (DT)(ER.JK - ED.JK)                    L, 12
EL = ELI                                             N, 12.1
ELI = 1                                              C, 12.2

ER.KL = (ERN)(EHWER.K)(EHEFR.K)                      R, 13
ERN = .3                                             C, 13.1

EHWER.K = TABLE(TEHWER,HWW.K,0,120,20)               A, 14
TEHWER = 1.3/1.2/1/.7/.5/.35/.25                     T, 14.1

EHEFR.K = TABHL(TEHEFR,EL.K,.8,1,.05)                A, 15
TEHEFR = 1/.9/.7/.4/0                                T, 15.1

    EL = Energy level (0-1)
    ELI = Energy level, initial (0-1)
    ER = Energy recovery (1/week)
    ED = Energy depletion (1/week)
    ERN = Energy recovery normal (1/week)
    EHWER = Effect of hours worked on energy recovery
    TEHWER = Table for EHWER
    HWW = Hours worked per week (hours/week)
    EHEFR = Effect of high energy on further recovery
    TEHEFR = Table for EHEFR
```

The individual's energy level, initialized at its maximum value of 1, is affected b rates of depletion and recovery. The state of low energy known as exhaustion c fatigue is generally associated with other psychological problems, which may includ irritability, sadness, detachment, disorientation, and low self-esteem (Freudenberge 1980, 17–18; Holt 1982, 427–433).

Energy is recovered during periods of leisure, relaxation, and of course, sleep. Th recovery rate is normalized at a point where the individual is working 40 hours pe week and has an energy level lower than 0.8; the recovery rate in this situation is 3 percent per week. But a longer workweek leaves less time for recovery and therefoı a slower rate of recovery, as indicated in Figure 4 (Breznitz 1982, 5; Ivancevich 198(176). This effect becomes proportionately greater as the workweek increases to cı into evenings, weekends, and even late nights. When the energy level exceeds 0. the "effect of high energy on further recovery" acts to suppress the recovery ra somewhat, simply because not much lost energy remains to be recovered. This effe becomes stronger as the energy level approaches 1, at which point the recovery ra must equal zero.

Fig. 4. Table for effect of hours worked on energy recovery




```
ED.KL = (EDN)(EPAED.K)(EHWED.K)(ELEFD.K)             R, 16
EDN = .06                                             C, 16.1

EPAED.K = TABLE(TEPAED,PAA.K,0,1.6,.2)                A, 17
TEPAED = 5/4/3.1/2.3/1.6/1/.6/.4/.3                   T, 17.1

EHWED.K = TABLE(TEHWED,HWW.K,0,120,20)                A, 18)
TEHWED = .3/.6/1/1.5/2/2.5/3                          T, 18.1

ELEFD.K = TABHL(TELEFD,EL.K,0,.2,.05)                 A, 19
TELEFD = 0/.4/.7/.9/1                                 T, 19.1

   ED = Energy depletion (1/week)
   EDN = Energy depletion normal (1/week)
   EPAED = Effect of perceived adequacy on energy deple-
           tion
   TEPAED = Table for EPAED
   PAA = Perceived adequacy of accomplishment
   EHWED = Effect of hours worked on energy depletion
   TEHWED = Table for EHWED
   HWW = Hours worked per week (hours/week)
   ELEFD = Effect of low energy on further depletion
   TELEFD = Table for ELEFD
   EL = Energy level (0-1)
```

Energy is depleted as the result of repeated exposure to stress. The depletion rate is normalized at a point where the perceived adequacy of accomplishment is neutral, the workweek is 40 hours, and the energy level is greater than 0.2; the depletion rate in this situation is only 6 percent per week. But should the work become frustrating or the hours at work increase, the normal stress of work can be greatly compounded, as illustrated in Figures 5 and 6 (Greenwood 1979, 42, 47; Howard 1965; Ivancevich 1980, 77, 176; Lazarus 1979; NDACTRD 1980, 1; Selye 1974, 96).

Fig. 5. Table for effect of perceived adequacy of accomplishment on energy depletion

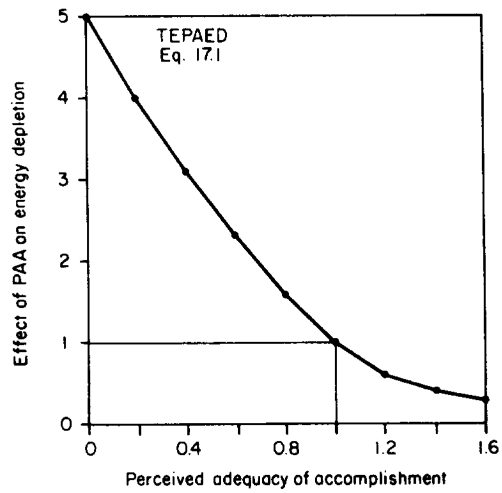
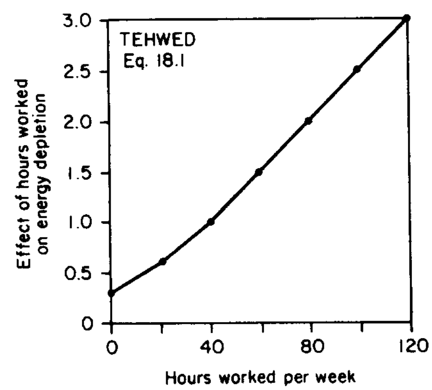


Fig. 6. Table for effect of hours worked on energy depletion



Frustration has been defined as the result of experiencing "undue delay in th fulfillment of a desired goal" (Greenwood 1979, 85), which may be interpreted hei as a perceived inadequacy of accomplishment. Figure 5 indicates that as frustratio increases, so too will its draining effect on energy. Figure 6 indicates that as th workweek increases, so will the exposure to work-related stressors, again resultin in faster depletion of energy. But note that energy depletion occurs even when tł individual is not working at all, as a result of frustration, guilt, or boredom (Mac lowitz 1980, 114; Selye 1974, 73; Weiman 1977). After all, "Ability brings with it tł need to use that ability" (Albert Szent-Györgi, quoted in Selye 1974, 73). When tł energy level falls below 0.2, the "effect of low energy on further depletion" acts suppress the depletion rate somewhat, because not much energy remains to be los This effect becomes stronger as energy falls to zero, at which point the depletion ra

Model behavior

Description and explanation of baseline behavior

The model's baseline behavior is presented in Figures 7 and 8, over a 75-week time horizon. During this time, the weekly accomplishment rate rises three times, only to fall precipitately along with the energy level as part of a self-sustaining burnout cycle. The observed limit cycle has a period of 30 weeks, one-third of this period being the decline phase during which accomplishment drops to one-sixth of its peak value.

The burnout cycle may be understood most clearly by referring to the causal-loop diagram presented in Figure 9. Initially, the perceived adequacy of accomplishment is relatively high, leading to increased expectations via loop 2. Rising expectations keep the worker somewhat dissatisfied with his output, which drives the "work

Fig. 7. Base run: accomplishment and hours worked per week

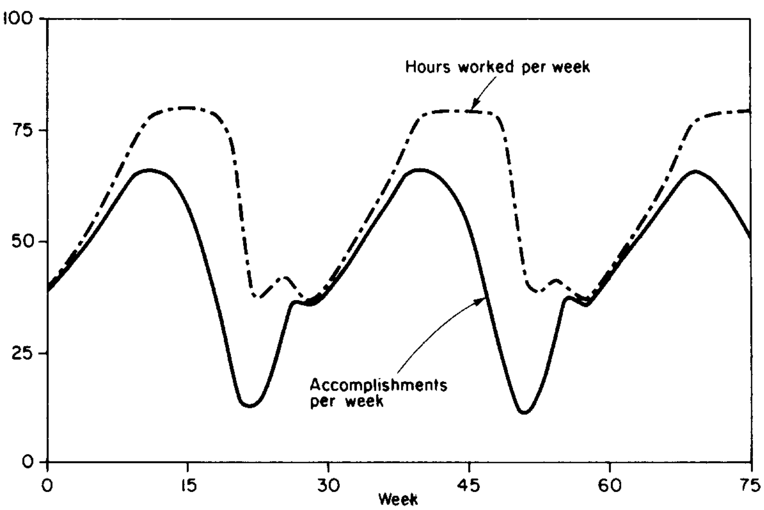


Fig. 8. Base run: energy level and perceived adequacy of accomplishment

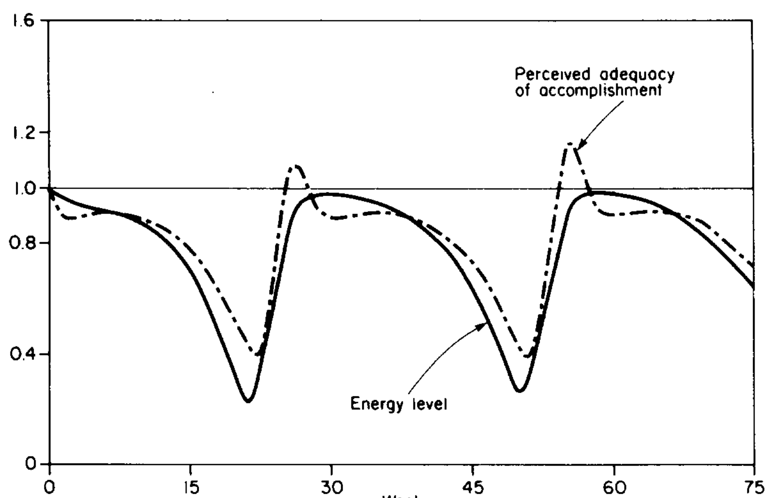
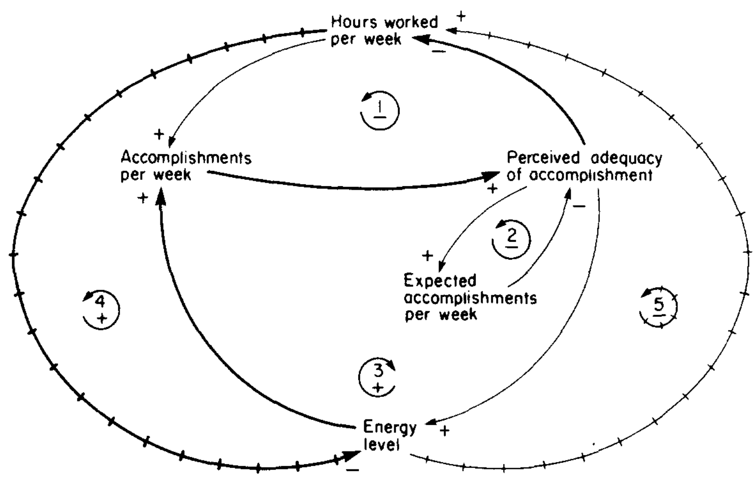


Fig. 9. Causal-loop structure underlying burnout cycles



harder" response of loop 1. Weekly accomplishment rises accordingly and continue to do so as loops 1 and 2 combine to "bootstrap" the workweek upward toward i limit.

But as the hours worked increase, so does the stress of work, causing the energ level to decline. Falling energy puts a damper on output, leading to greater dissati faction and the beginnings of frustration. Dissatisfaction causes the individual t continue working hard, while frustration makes work even more stressful, both (which further speed the drain of energy. If the vicious cycles just described, seen i Figure 9 as positive loops 3 and 4, grow strong enough relative to the individual ability to recover energy during nonwork periods, then a collapse of energy an output like that seen in the base run will result.

Recovery from burnout is made possible by less work and reduced expectation When energy falls to a low enough level, the individual finally breaks free of tl addictive "work harder" response and reduces hours at work; in the base run, hou worked per week fall rapidly from their peak of 80 to a trough of about 40.[3] Th "time off" response finally stems the decline of energy, as suggested by loop 5, ar indeed allows lost energy to be reclaimed. While the workweek has been reduced, : have achievement expectations. Loop 2 now counters dissatisfaction by bringi output goals down to a level more in keeping with the exhausted worker's depresse capability.

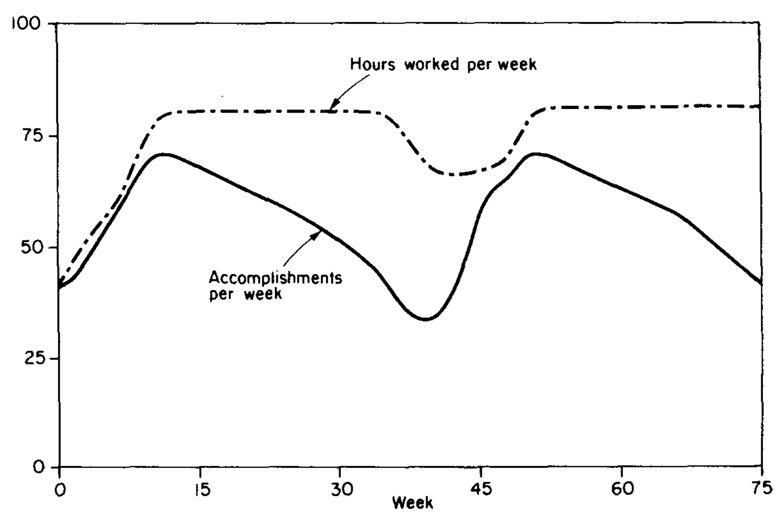
The final stage of the cycle comes when modest expectations and rising ener enable the worker to achieve at a rate that is satisfying without having to put in a l of hours to do so. As seen in the base run, the perceived adequacy of accomplishme actually bounces back to exceed the neutral level of 1, at a time when the individu is working a relatively short workweek. But this euphoric period of "coasting" short-lived, lasting only a couple of weeks (as corroborated by my own experienc Why? Because satisfaction is unnatural for workaholics and only encourages them expand their goals and begin the cycle once again.[4]

Searching for stability

In seeking to stabilize the limit cycle of burnout, it is instructive to examine first whether and under what conditions a stable equilibrium can be found. As it turns out, one can state the conditions for stable equilibrium with a single inequality comparing the forces affecting energy depletion with those affecting energy recovery. Interestingly, such an equilibrium has the individual working steadily at his or her work limit. Taking the duration effects on depletion (TEHWED, Eq. 18.1) and recovery (TEHWER, Eq. 14.1) and the frustration effect on depletion (TEPAED, Eq. 17.1) as givens, stability can be said to be threatened by (1) a high depletion normal (EDN, Eq. 16.1); (2) a low recovery normal (ERN, Eq. 13.1); (3) a high upper limit on hours worked (LHWW, Eq. 4.1); (4) a large bias to expand expectations (BFCX, Eq. 10.1); and (5) downwardly inflexible expectations (TFCXPA, Eq. 11.1). On the other hand, stability is independent of the steepness of both the "work harder" (TEPAHW, Eq. 6.1) and "time off" (TEELHW, Eq. 5.1) functions affecting hours worked per week.[5]

Model tests verify that these five factors can be adjusted to stabilize the burnout cycle. The results of one such test, in which the energy depletion normal is reduced by 20 percent, from 0.06 per week to 0.048 per week, are shown in Figure 10. Although a limit cycle is still observed, its amplitude is considerably less than that of the base run (weekly accomplishment falls by less than 60 percent, compared with more than 80 percent in the base run), and its period is considerably longer (39 weeks versus 30). Another noticeable difference is that the decline phase now accounts for more than two-thirds of the entire cycle, compared with one-third in the base run. In effect, the vicious cycles causing burnout have been rendered less vicious, so that the decline is a slower and milder one, and one requiring less time off for recovery. As a result, weekly accomplishment averaged over the full 75 weeks of output is raised by 17 percent relative to the base run.[6]

Fig. 10. Energy depletion normal reduced by 20 percent



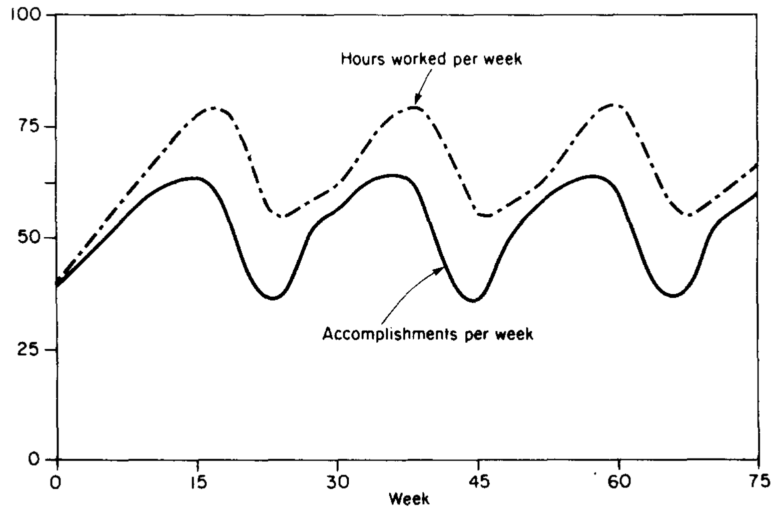


Fig. 11. Steeper effect of energy level on hours worked

The results of this test are similar to the results of all those tests in which th described stability condition is closer to being satisfied. The limit cycle becom smaller in amplitude, longer in period, more drawn out in the decline phase, an faster in the recovery phase. The average workweek increases, as does average weekl accomplishment. If the stability condition is actually satisfied, the limit cycle replaced by a critically damped oscillation, with significantly higher average weekl accomplishment over the 75 weeks. For example, by reducing the energy depletic normal to 0.04 instead of 0.048 (a 33 percent reduction from the baseline instead 20 percent), average weekly accomplishment is raised by 42 percent relative to th base run (instead of 17 percent) and a consistent 80-hour workweek is maintaine Thus, stabilizing policies do have the effect of increasing overall accomplishmen permitting the individual to work longer hours and to spend less time recuperatin from exhaustion.

If the "time off" response to exhaustion does not affect the condition for stab equilibrium, one might wonder what effect this reasonable-sounding policy does ha on behavior. Figure 11 shows the results of a run in which the individual is le reluctant than in the base run to break away from work during periods of reduc energy; in other words, the "time off" function falls more steeply than that seen Figure 1.[7] As in the previous test, the limit cycle's amplitude is significantly reduc relative to the base run, a direct result of acting earlier to escape the vicious cycl of collapse. But this earlier response also leads to a cycle of shorter period, thou similar in shape to the base run's cycle. The general impact is to shrink and spe up the cycle, rather than to stabilize it. In terms of overall output, though, this impa is beneficial; average weekly accomplishment is 12 percent higher in this test ru than in the base run.

While a policy to reduce work hours in response to lower energy cannot stabili the burnout cycle, a policy that reduces the limit on hours worked (LHWW) ca recall that this limit enters the condition for stable equilibrium. The essential diff

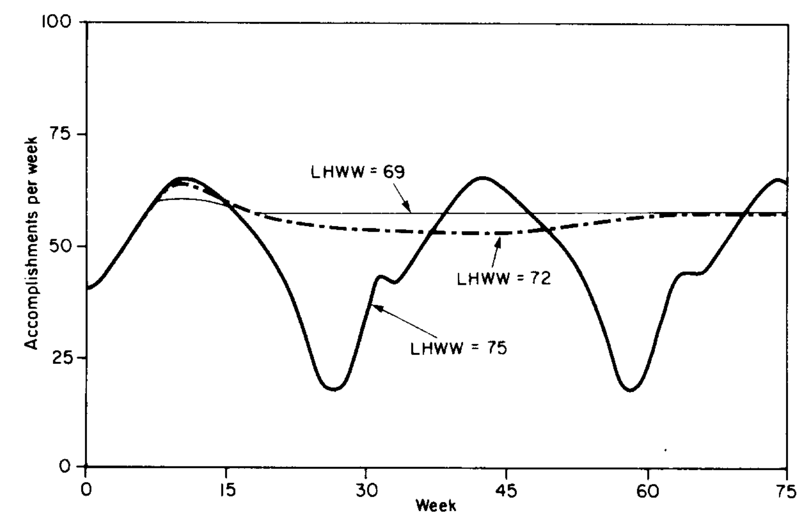


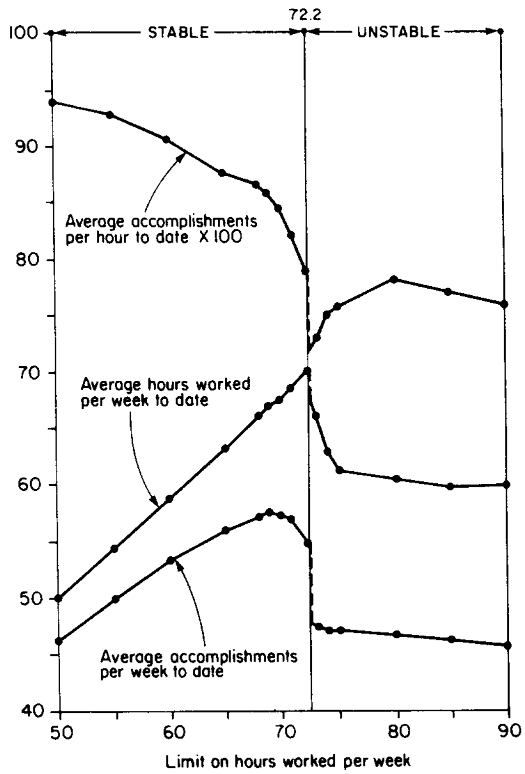
Fig. 12. Three tests with reduced limit on hours worked per week

ence between these two workweek policies is that the former is reactive, responding only when a problem has already surfaced, while the latter is proactive and preventive in nature. Also, as a practical matter, it may be easier to implement a shorter work limit (perhaps, as Machlowitz (1980, 133) suggests, by locking the office doors after certain hours) than to fight the workaholic's natural reluctance to take time off to relieve fatigue. Figure 12 shows the results of three test runs in which the work limit has been reduced from its baseline value of 80. When LHWW = 75, a limit cycle is still produced, though it has a smaller amplitude and longer period than the base run cycle. When LHWW = 72, the limit cycle is replaced by a damped oscillatory mode that achieves stable equilibrium by week 60, after an initial overshoot and protracted undershoot. When LHWW = 69, the behavior is even more stable, consisting of a single small overshoot and virtual equilibrium soon after week 15. In terms of average accomplishment, stability again wins out; the first run improves on the base run by only 1 percent, the second run by 20 percent, and the third by 23 percent.

Figure 13 offers a broader view of the effect of the work limit (LHWW) on overall results.[8] Three 75-week summary statistics—average accomplishments per week to date, average hours worked per week to date, and average accomplishments per hour to date—are graphed against values of LHWW ranging from 50 to 90.[9] These graphs show clearly the difference between stability and instability, as far as total output and hours worked are concerned. Within the region of stability (where LHWW $\leq$ 72.2 hours per week),[10] a longer work limit means more hours worked (since HWW = LHWW in equilibrium) but also lower hourly productivity (since longer hours reduce the energy level). Because the depressive effect of longer hours on average energy, small at first, accelerates as the region of instability is approached, a point of maximum average weekly accomplishment exists; given all other baseline parameter values, this "optimal work limit" is approximately 69 hours per week.

A tradeoff of hours and energy no longer exists once the region of instability is entered. A longer limit on hours worked does not increase the average number of

Fig. 13. 75-week summary statistics as affected by work limit



hours worked in this region. Instead, its effect is to increase the amplitude ; decrease the period of the limit cycle; that is, to destabilize the behavior further fact, changes in the work limit have little effect on any of the cumulative measu shown in Figure 13. It is only in the transition from stability to instability that m; differences appear; both average accomplishment and average hours worked d significantly when the burnout cycle is introduced. Burnout both reduces availa energy and requires more time off from work. The advantages of stability are un scored by the following sort of comparison: As shown in Figure 13, the indivic can accomplish more on the average with a work limit of 55 hours per week t with a work limit of 75 hours per week, while actually working fewer hours per w on the average.

In noting that the optimal work limit is found within the region of stability but far from the critical point of transition to instability, one is led to an impor conclusion: The more advantageous the other parameters affecting stability are, higher the *critical* work limit will be, so the higher the *optimal* work limit will b well. In concrete terms, this means that if the individual can (1) reduce stress at w (by finding ways to make the basic tasks more enjoyable, or by adopting a less pu or more flexible approach to setting goals), or (2) relax more effectively when working, then he will be able to work longer hours and accomplish more witl risking burnout.

Conclusion

Probably the most effective first step in attempting to fight a complex problem like burnout is to understand its dynamic source. Burnout is not caused by a stressful work environment alone but, more importantly, by the individual's workaholic response to that environment. As many psychiatrists and counselors would agree, real progress begins only when the client has understood clearly his or her own role in creating the problems and has accepted the responsibility to adopt healthier behavior. I can personally attest to the powerful impact of (1) seeing my own burnout cycles reproduced by a computer model, (2) adjusting behavioral parameters until a stable solution was found, and (3) realizing then that my problem was not inevitable but, to a large degree, a product of my own work habits. It was particularly enlightening to discover that even from the point of view of productivity, psychological stability is preferable to instability.

The model suggests not only that stability is preferable to instability but that it is generally attainable, even in a normally stressful work setting, through proper adjustment of one's work limit.[11] Chronic feelings of moderate tiredness or irritability at work must be met directly by a firm commitment to reduce one's maximum workweek permanently, or at least until the completion of a particularly stressful project. If the signs of incipient burnout later return even at this lower work limit, then the limit should be reduced again. It is important not to return to the old work limit, even when one is feeling rested and alert again; as the model demonstrates, vacations alone (the "time off" response) do not prevent a recurrence of burnout.

The model also demonstrates the potential benefit of reducing the normal stress at work, or relaxing better when not working, through methods such as those described at the beginning of this paper. By adopting ways that make one less vulnerable to the negative consequences of stress, one expands the region of stability described in the previous section. This means that one can work longer hours without risking burnout and so accomplish more. An increased ability to (1) anticipate and counteract potential sources of stress, (2) relax without feeling guilty, or (3) adopt more realistic and flexible goals, can do much to make life as a high achiever more enjoyable and satisfying and return to the individual a sense of control.

Appendix: Worker burnout model listing

```
     *  WORKER BURNOUT CYCLES
     NOTE BY J. B. HOMER, APRIL 1984
1    A  AW.K=(AH.K)(HWW.K)
2    A  AH.K=TABLE(TAH,EL.K,0,1,.2)
     T  TAH=0/.2/.4/.6/.8/1 A-UNITS/HR
3    L  HWW.K=HWW.J+(DT/TAHWW)(IHWW.J-HWW.J)
     N  HWW=HWWI
     C  HWWI=40 HRS/WK
     C  TAHWW=1 WK
4    A  IHWW.K=MIN(LHWW,HWW.K*EELHW.K*EPAHW.K)
     C  LHWW=80 HRS/WK
5    A  EELHW.K=TABLE(TEELHW,EL.K,0,1,.2)
     T  TEELHW=0/.4/.7/.9/1/1
6    A  EPAHW.K=TABLE(TEPAHW,PAA.K,0,1.6,.2)
     T  TEPAHW=2.3/1.9/1.6/1.35/1.15/1/.9/.8/.75
7    A  PAA.K=PAW.K/XAW.K
8    L  PAW.K=PAW.J+(DT/TPAW)(AW.J-PAW.J)
     N  PAW=AW
     C  TPAW=1 WK
9    L  XAW.K=XAW.J+(DT)(XAW.J*FCXAW.J)
     N  XAW=XAWI
     C  XAWI=40 A-UNITS/WK
10   A  FCXAW.K=BFCX+FCXPA.K
     C  BFCX=.1 PER WK
11   A  FCXPA.K=TABLE(TFCXPA,PAA.K,0,1.6,.2)
     T  TFCXPA=-.7/-.5/-.35/-.2/-.1/0/.1/.25/.4
12   L  EL.K=EL.J+(DT)(ER.JK-ED.JK)
     N  EL=ELI
     C  ELI=1
13   R  ER.KL=(ERN)(EHWER.K)(EHEFR.K)
     C  ERN=.3 PER WK
14   A  EHWER.K=TABLE(TEHWER,HWW.K,0,120,20)
     T  TEHWER=1.3/1.2/1/.7/.5/.35/.25
15   A  EHEFR.K=TABHL(TEHEFR,EL.K,.8,1,.05)
     T  TEHEFR=1/.9/.7/.4/0
16   R  ED.KL=(EDN)(EPAED.K)(EHWED.K)(ELEFD.K)
     C  EDN=.06 PER WK
17   A  EPAED.K=TABLE(TEPAED,PAA.K,0,1.6,.2)
     T  TEPAED=5/4/3.1/2.3/1.6/1/.6/.4/.3
18   A  EHWED.K=TABLE(TEHWED,HWW.K,0,120,20)
     T  TEHWED=.3/.6/1/1.5/2/2.5/3
19   A  ELEFD.K=TABHL(TELEFD,EL.K,0,.2,.05)
     T  TELEFD=0/.4/.7/.9/1
     NOTE SUMMARY STATISTICS
20   A  AVAWD.K=AD.K/(TIME.K+1E-7)
21   L  AD.K=AD.J+(DT)(AW.J)
     N  AD=AW*1E-7
22   A  AVHWWD.K=HWD.K/(TIME.K+1E-7)
23   L  HWD.K=HWD.J+(DT)(HWW.J)
     N  HWD=HWW*1E-7
24   A  AVAHD.K=AD.K/HWD.K
     NOTE CONTROL STATEMENTS
     SPEC  DT=.25/LENGTH=75/PLTPER=1.5/PRTPER=15
     PRINT  AVAWD,AVHWWD,AVAHD
     PLOT  AW=A,HWW=H(0,100)
     PLOT  EL=E,PAA=P(0,1.6)
     RUN  BASE
```

Notes

1. This response of accommodation is known in the stress literature as syntoxic, in contrast with the catatoxic, or fighting, response of working harder to meet one's goals. Both responses are considered homeostatic, because their purpose is to reduce potentially harmful stress. See Selye (1974, 41, 47).
2. For values of PAA less than 0.8, BFCX + FCXPA < 0. Equilibrium can occur only when PAA = 0.8.
3. In this case of moderate burnout an extended full-time vacation is not needed.
4. In postscript to the explanation of the burnout cycle, it should be noted that loops 3 and 5—the "frustration" and "time off" loops— are not strictly necessary for generating the cycle. Model tests show that if the work is normally disagreeable enough (i.e., if the energy depletion normal EDN is large enough), the draining power of long hours can generate a collapse without the added stress of mounting frustration. But in the baseline model (with its relatively small value of EDN), removal of the aggravating effect of loop 3 does result in stable behavior. Other model tests show that when the individual does not respond to exhaustion by taking time off, expectations eventually fall so low that they can be satisfied even while working less. The resulting respite from work permits a recovery of energy and a renewal of higher accomplishment. But the removal of loop 5 does delay the recovery, resulting in a considerably more severe and protracted period of burnout.
5. Equilibrium requires that hours worked per week (HWW), expectations of weekly accomplishment (XAW), and the energy level (EL) all be unchanging. An equilibrium at which HWW is less than its limit (LHWW) can be shown to exist under certain circumstances, but this equilibrium is unstable in the sense that any small perturbation of certain exogenous parameters will trigger a limit cycle. The condition for a stable equilibrium requires that HWW = LHWW. Labeling EHWED as f, EHWER as g, and EPAED as h, the condition may be stated as follows:

   $$EDN * h(PAA') * f(LHWW) \leq ERN * g(LHWW)$$

   where FCXPA(PAA') = −BFCX

   In the baseline model the left-hand side of the inequality equals 0.19, while the right-hand side equals 0.15: The condition for stable equilibrium is not met and a limit cycle results.
6. Average accomplishments per week to date, or AVAWD, increases from the baseline value of 47.0 to 55.1.
7. In the test run, TEELHW = 0/.3/.5/.7/.9/1, compared to the base run's TEELHW = 0/.4/.7/.9/1/1.
8. This figure summarizes the results of a number of model tests, like those in Figure 12, in which the work limit was altered. Recall that LHWW = 80 in the base run.
9. DYNAMO equations for these three summary statistics may be found in the Appendix, listed as AVAWD, AVHWWD, and AVAHD, respectively. AVAWD is computed by integrating accomplishments per week (AW) over time and then dividing by the total time elapsed. AVHWWD is similarly computed by intergrating hours worked per week (HWW) and then dividing by time elapsed. AVAHD is found by dividing cumulative accomplishments (accomplishments to date, AD) by cumulative hours worked (hours worked to date, HWD).
10. The analytic stability condition is satisfied in this region. When LHWW = 72.2, the left-hand (depletion) side equals the right-hand (recovery) side.
11. The person-environment fit may conceivably be so poor that the optimal work limit is less than a standard workweek or even nonexistent. In such cases, an individual in search of full-time work is best advised to find it elsewhere. Why court disaster?

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