TOWARD AN ECOLOGICAL THEORY OF ADAPTATION AND AGING

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Abstract

The environmental docility hypothesis suggests that environmental stimuli ("press", in Murray's terms) have a greater demand quality as the competence of the individual decreases. The dynamics of ecological transactions are considered as a function of personal competence, strength of environmental press, the dual characteristics of the individual's response (affective quality and adaptiveness of behavior), adaptation level, and the optimization function. Behavioral homeostasis is maintained by the individual as both respondent and initiator in interaction with his environment. Hypotheses are suggested to account for striving vs. relaxation and for changes in the individual's level of personal competence. Four transactional types discussed are environmental engineering, rehabilitation and therapy, individual growth, and active change of the environment.

Recent work in the psychology of stimulation (1) has led to theoretical advances in the area of social ecology. We propose an elaboration in this area that is middle-range, in the sense of attempting to account for a limited aspect of human behavior. This contribution to the theory of man-environment relationships deals with the aspects of human responses that can be viewed in evaluative terms, that is, behavior that can be rated on the continuum of adaptiveness, and inner states that can be rated on the continuum of positive to negative. This is, perhaps, a limited view of the human response repertory, but it stems from the traditional concern of the psychologist with mental health and mental illness. Similarly, our view of environment for this purpose is limited to the "demand quality" of the environment, an abstraction that represents only one of many ways of dimensionalizing the environment. We shall use our knowledge from the area of gerontology to provide content for the theoretical structure, but suggest that the constructs are more generally applicable to any area involving the understanding of mental or social pathology [see Lawton and Nahemow, (2) for a more complete discussion].

One way to begin is to look at the old ecological equation

\[ B = f (P, E) \]

to acknowledge its veracity and familiarity, but linger on a few of its implications:

1. All behavior is transactional, that is, not explainable solely on the basis of knowledge about either the person behaving or the environment in which it occurs.
2. Multiple antecedents may lead to the same behavior. Different personal qualities in different contexts may behave similarly, but the "meaning" of the behavior is not comprehensive unless both person and situation are analyzed.

3. The homeostatic principle is illustrated, in that the same behavior can be maintained in the face of a change in either the behaving individual or the environment, providing an appropriate change occurs in the second of the pair of determinants.

4. Behavior change may be instigated at either the personal or the environmental level.

If we add the evaluative element to behavior (adaptive vs. non-adaptive behavior or positive vs. negative affect), the equation also implies that

5. Even in the "best" environments, some individuals will be unable to behave in an adaptive manner.

6. Even the most capable individuals may not behave in an adaptive manner in the most malign environments.

The above implications are concerned with the prediction of the outcome of various person-environment transactions. Very early in our association with social gerontology it became plain that environmental solutions, as opposed to personality-change solutions, were prescribed for the problems of older people. It was clear that social planners, designers, and people in the helping professions were operating on the basis of the "environmental docility hypothesis". This hypothesis states: "...the more competent the organism—in terms of health, intelligence, ego strength, social role performance, or cultural evolution—the less will be the proportion of variance in behavior attributable to physical objects or conditions around him....With high degrees of competence he will, in common parlance, rise above his environment. However, reduction of competence, or deprived status, heightens his behavioral dependence on external conditions" (3).

This hypothesis was formulated on the basis of their finding that elderly apartment dwellers who were female, or foreign-born, or in poorer health, were more likely to choose physically proximate neighbors as friends than were males, native-born, or healthy tenants. Other research has provided findings consistent with this notion. Rosow (4), for example, found that working-class (low status) elderly were more dependent upon their local neighborhoods for social interaction and help than were middle-class elderly. Mangum (5) used multiple regression analysis to determine the relative contributions of environmental and personal factors in predicting adjustment to planned housing. For the low-income tenants, environmental factors were most predictive while for the higher-income tenants, personal factors were more predictive.

The model that we are proposing requires the following definitions:

1. **Individual competence** is the enduring ability that enables an individual
to function--the analogue of "personality trait" as the inner aspect of behavior. Actually, competences are many, depending on the area, such as intelligence, motor and perceptual ability, social tact, and so on. The designation of degree of competence should specify the particular area of competence, and is meant to refer to intra-individual, enduring characteristics that vary within minimum and maximum limits.

2. Environmental press are used in Murray's (6) sense to refer to aspects of the environment that act in concert with a personal need to evoke behavior by the subject. At this level we refer to external aspects of the environment that are presumed to have some motivating force for the individual whether he is aware of them or not ("alpha press," in Murray's terms). Aspects of the environment defined as those that are perceived as important to the individual ("beta press") are not included here, nor are the infinite number of aspects of the environment that do not impinge on the subject in any way. "Demand character" is the index of the total magnitude of the environment's effect on the individual, whether he is aware of the effect or not. The demand character may sometimes be estimated statistically in terms of the proportion of variance accounted for by environmental factors. The demand quality in extreme form may be termed "stress", though by no means are all press stressful.

3. Adaptive behavior is the externally observable behavior of the individual evaluated either in terms of social norms or of an a priori value system based on the assumption that pleasure to others, fulfillment of one's own potential, and the performance of complex tasks are separate but equally important bases for the establishment of norms.

4. Affective response is the self-evaluated quality of experience, ranging from positive through neutral to negative. Every person-environment transaction may be evaluated in terms of either and sometimes both the adaptive quality of the behavior involved and the quality of affect.

Further elaboration of the model requires the use of Helson's (7) concept of adaptation level (AL) and Wohlwill's optimization function (1).

5. Adaptation level is the perceiver's receptor status when the value of a stimulus is perceived as neutral, that is, as neither warm nor cool, loud nor soft, pleasant nor unpleasant. Much of the time we are at adaptation level with respect to our environment. A major aspect of our capacity to cope with the tasks of living involves our being able to screen out awareness of our proximate visual, auditory, thermal, and other environments, in order to concentrate attention and effort on focal tasks.

6. The "optimization function" suggests that for moderate levels of stimulation positive affect is engendered by stimuli that depart in either direction from AL (8, 1). As stimuli proceed further toward either higher or lower levels of intensity, they may begin to evoke a negative inner response.
The theoretical model, represented graphically in Figure 1, shows individual competence, which is represented on the ordinate, and environmental press, shown on the abscissa. The diagonal line labeled AL represents a theoretical mean adaptation level for individuals of differing competence interacting with their environments. For an individual in a particular environment, the ebb and flow of environmental press remain within a constant range, resulting in the establishment of the adaptation level for that individual. Individuals of a given level of competence would be distributed normally to the right and left of the AL point for that level. Their AL fluctuates at different points in time and with respect to specific stimuli in accordance with the conditions elaborated by Helson (7).

There is a range of environmental press adjacent to the individual's adaptation level where he experiences an inner sense of wellbeing vis-a-vis his environment and his behavior is adaptive (the shaded area of Figure 1). To either side of this positive outcome area is an area where higher and lower levels of press may test the limits of affective and behavioral adaptation. When the environmental
press are either much greater or much less than those to which the individual has grown accustomed, he will experience a sense of discomfort and his behavior will become maladaptive. The region of positive affect and adaptive behavior is wider for persons of high competence. The dynamics of adaptation level are based upon homeostatic principles. Constant temporal variation occurs in both individual competence and environmental press. The beta component of environmental press (the perceived environment) will typically vary within what seems to be an objectively constant environment. Adaptation level is thus a theoretical point around which both personal competence and environmental press vary. For individuals who are both high and low in competence, the impact is vastly different for the competent and incompetent. For a highly competent person the zone of positive affect is sufficiently large so that normal oscillation in strength of environmental press will very rarely throw the individual beyond the shaded central zone. As we travel down the scale in competence, the central zone shrinks and the buffer zone, the area of tolerable affect, similarly shrinks. This means that for an individual of very low competence random variation in press will take him beyond the central zone where he has a sense of environmental mastery. This differential impact of environment press is stated by the environmental docility hypothesis.

The low point of environmental press might occur in sensory deprivation situations, the high point in many types of stressful or overloading situations. Individuals of high competence have a wide latitude of capacity to interact with the environment in ways that maximize positive affect. Note that as the individual's competence increases, the variability in environmental press which he can comfortably tolerate increases. Consequently, few high-competence individuals will show the breakdowns in behavior or affect that occur beyond adaptation range. Within that range, the following homeostatic reactions occur. When the environmental press are high, the person will become increasingly sensitized to his environment and try to make sense of it. When he is successful the perceived environmental complexity will be reduced. In Murray's terms, the beta component will be simplified. When occupying a region where environmental press are at a minimum, exploration and sensation-seeking will occur so as to increase the beta component of environmental press.

There are two different kinds of outcomes which concern us in the transaction between individual and environment: an affective and a behavioral response. Wohlwill's (1) concept of optimization deals with the affective response to a stimulus as a function of its deviation from adaptation level. Slight variations from AL produce positive affect, but large variations produce negative affect. The gradient is the same for both positive and negative discrepancies from AL. The present theory incorporates this aspect of Wohlwill's theory. When we consider the variable of performance, however, we find that the zone of maximum performance is found to be at an environmental press level which is above adaptation level. For example, when environmental press increase slightly, the problems the individual faces are increased but still remain within the individual's capacity to solve. He is therefore put on his mettle. Frustrations may increase but the satisfactions derived from achievement increase as well and the person experiences positive affect. If the individual receives less challenge than usual from his environment, frustrations diminish and he relaxes. This comfort is more immediately rewarding,
but there is less of the delayed gratification that comes from achievement, or increasing one's competence. Thus, the zone of positive affect includes levels of environmental press that are both higher and lower than AL. However, the subjective nature of the feeling is quite different in the two directions. We have therefore labeled one side the region of maximum performance, the other the region of maximum comfort.

This ecological theory of aging posits that the individual is operating at his best when the environmental press are moderately challenging. If the environment offers too little challenge, the individual adapts by becoming lethargic and thus operates below his capacity. On the other hand, it may be that the environment is too stressful and he has adapted by turning off. Actually, it is possible for both conditions to occur sequentially. Consider the example of a widower who had become used to having many services performed by his spouse. Overwhelmed by the unaccommodated demands of the new life, he retreats psychologically and as a consequence is placed in a nursing home. At first the simplified environment is appropriate to his psychologically weakened condition. Press level and personal competence are well matched. However, as the person gains confidence in coping with his simplified and benign environment, he gradually discovers that it is excessively simple. In fact, he is operating near the low-press borderline of his own positive adaptation area. Within his affective comfort zone he relaxes, but unchallenged he becomes dull.

When the environmental press are very strong the individual may panic and attempt to escape from the field either physically or psychologically. This escape-oriented behavior is not geared to dealing with the situation represented by the immediate environment, but it is adaptive in the sense that it may remove the person from an intolerable situation. In our model, this would mean a reduction in competence as well, which would result in his being diagnosed as "disturbed," but still might represent the best possible temporary solution to the stress situation.

The following illustration exemplifies a situation in which the dynamics of the system diminish an individual's competence. An eighty year-old woman who is showing signs of declining competence, but who is still able to function in accustomed surroundings is relocated. The environmental press increase beyond her tolerance level and her functioning is markedly impaired. A danger for the person of declining competence is that of being removed to a too-supportive environment. The person of moderate competence who, with some help, could continue to function in the community, might also adapt downward to the limited environment of an institution, that is, become too content with functioning in the zone of comfort. In this case, she finds herself in a situation where it is difficult either to seek or to find stimulation. However, the environmental press are not so constantly low that she is really driven to the extremity of "maladaptive behavior." She seemingly adjusts very well to the home environment, but her powers decline markedly. What has happened is that in a situation with consistently low environmental press, the trans- actional balance adjusts with an adaptation level at lowered press, which leads to diminution of competence.
It is also possible for the dynamics of the system to improve the individual's level of functioning. Sivadon (9) attempted to design a mental hospital in which the person was introduced to challenging environments in small doses so that he gradually built up a tolerance for greater environmental press, and ultimately changed his adaptation level. An increase in competence would theoretically follow.

An important element in the theory is the relationship of time to the dynamics of adaptation. Typically, environmental press diminish over time as a natural consequence of the adaptation process. Thus, there tends to be a drift of AL from the right to the left in the diagram. The individual forms a cognitive map of his surroundings, develops concepts to reduce the environment to manipulable chunks, adjusts his coping mechanisms to the outer world and engages in other behaviors consistent with the process of adaptation. When entering a new environment, just the right amount of stimulation may be forthcoming for an individual at that moment in time. With increased familiarity, however, the environmental press gradually diminish. At first it was challenging, then comfortable, and finally dull.

The environment of many older people is reduced in complexity, in terms of lowered role demands, less economic freedom, dwindling inter-personal worlds, and in some cases deprived physical surroundings — a weakening of environmental press. Concomitantly, their competence may be reduced by comparison to younger people. It is our thesis that reduced press extended over a long time may lead to adaptation levels for sensory and affective experience that are significantly lower than those of younger people and ultimately lead to reduced personal competence.

For every individual there is an area in which changing environmental press are associated with positive outcome and an area in which self-initiated or externally initiated action may have a considerable impact upon the level of environmental demand in his behavioral world. As individual competence decreases, the area where maladaptive behavior and negative affect are risked becomes enlarged. Small changes in level of environmental press in people of low competence may evoke gross changes in quality of affect or behavior. Consequently, environmental intervention for therapeutic goals may be most fruitfully applied to this population.

Applications of these concepts to intervention schemes may be illustrated by the ecological change model implied by the basis ecological equation. Intervention may be applied either to the environment or to the individual. The individual's role may be as initiator or as a respondent to an external change. This transaction may be represented by the following dichotomies which suggest the fourfold prescriptive model for change shown in Figure 2:
1. MAN-ENVIRONMENT RELATIONS: THEORY

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Figure 2 - Ecological change model

The traditional concerns of the helping professions are represented in change attempts applied to the individual by trained therapists (cell C). While one may argue that effective change requires much active initiatory behavior from the subject, his independence is much more complete in the processes of growth and self-actualization (cell D). Our large body of design professionals operates primarily in cell A, where we presumably take into account not only the needs of individuals of low competence but the fact that life is made easy for most of us by programming a substantial amount of our everyday behavior. That is, we are at AL most of the time for very good reasons, and it is therefore appropriate to attempt to design in such a way as to free our attention for what really counts. Presumably in cell B the individual is initiating environmental change which may be either rewarding in itself (stimulus-seeking, tension creation) or in its outcome, whether that be ultimately an outcome that raises his competence, re-establishes an adaptation level that is within the bounds of positive affective experience, or enables him to shift his AL toward the "comfort" side.

Thus change may be approached from four points of view, any of which may, given the right person and the right situation, optimize the functioning level of the individual. It is clear that for any given level of supportive service, there will be some people who are too well and some who are too sick to enable a positive outcome. Our institutionalized widower may find that his socially engineered environment has made too many pre-digested decisions for him, and that there is practically no way for him to construct actively any part of his environment. Another institutional resident of lower competence may attempt more environmental change than he can handle (e.g., hoarding, fecal decoration, or occupation of another's territory) and downward environmental programming--e.g., increased support or institutional control--may be necessary. Other areas of application of these principles may be found in housing, the operation of neighborhood services, or the design of parks and recreation areas. In any of these pursuits, the important principles are (a) that support and demand are equally important in maintaining behavior and (b) that both tension reduction and tension creation are personally satisfying, depending on the person and the situation.
References


