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THE DEVELOPMENT AND TEST OF A MARKOV CHAIN MODEL OF THE NEED HIERARCHY CONCEPT

By

John Michael Rauschenberger

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ABSTRACT

THE DEVELOPMENT AND TEST OF A MARKOV
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HIERARCHY CONCEPT

By

John Michael Rauschenberger

For many years, industrial/organizational psychologists have used Maslow's (1943) concept of a hierarchy of human needs to explain human motivation in work-related contexts. More recently, Alderfer (1972) has developed a hierarchical need theory based upon existence (E), relatedness (R), and growth (G) needs which he believes operate in organizational settings. However, empirical research has been unable to substantiate the validity of the need hierarchy concept.

The purpose of the present research was to develop and test a Markov chain model of the need hierarchy concept. The chronic strength of existence, relatedness, and growth needs was measured for 547 high school graduates from a midwest urban area at three time periods, separated by ten month intervals, using a modified version of Alderfer's (1972) E. R. G. Need Questionnaire. Subjects were asked to rate the importance of 12 need strength items (four each for existence, relatedness, and growth) in terms of the job they would like to get. The states in a Markov chain model were

logical precursor to the need hierarchy posited by Maslow. Alderfer's (1972) modification of Maslow's theory solves some of these problems but not all of them. The only version of Alderfer's theory which could account for the positive correlation between need strengths also predicted that the need means would be in the exact opposite order from that found in the data. Alderfer's theory also goes beyond Maslow in offering detailed predictions about the path of change over time, but none of these predictions were borne out in the data. Since this study used measurement based directly on Alderfer's own instruments, these contrary results must be taken as a disconfirmation of his theory.

Approved: __________________________

Date: __________________________

Dissertation Committee:

Dr. Neal Schmitt, Chair
Dr. John E. Hunter
Dr. T. H. Patten
Dr. John H. Wakeley

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INTRODUCTION

Maslow

Much of the research on work motivation by industrial and organizational psychologists has been influenced by the writings of A. H. Maslow. Maslow (1943) presented a theory of human needs which contemporary industrial/organizational psycholgists have used to help formulate theories of work motivation. Maslow's theory is basically twofold in that it (1) provides a classification of human needs and (2) relates these needs in a hierarchical manner. His needs, in ascending order of prepotency, include: physiological, safety, belongingness (love), esteem, and self-actualization. According to Maslow, a person's behavior is dominated by the lowest-order unsatisfied need. When this need is fulfilled, the person's behavior becomes dominated by the next higher order need and this process continues until the person eventually "self-actualizes." Maslow further stated that one can conceptualize these needs in deficiency and growth dimensions. Physiological, safety, belongingness, and esteem needs are deficits while self-actualization (to become what one is capable of becoming) represents the growth dimension.

The implications of Maslow's theory to students of work motivation are rather straightforward. To the extent that a person's behavior on a job or work activity is dominated by one or more unfulfilled needs, one can postulate various causal links between those needs and the motivation to perform the job or activity. When the performance of some job or activity increases deficiency on the need dimension currently dominating an individual, the person's motivation to perform that job or activity would be low. Conversely, when the performance of the job or activity operates to help an individual satisfy a dominant need, the individual's motivation to perform that job or activity would be high.

The aspect of Maslow's theory that has most interested industrial/organizational psychologists is the hierarchical nature of these needs. Among need theorists, Maslow is not alone in proposing a classification of needs (see Langer, 1937 and Murray, 1938, for example), but Maslow was the first to introduce the notion of a hierarchy of needs. Thus, Maslow not only attempts to describe what needs a person has, but also how these needs operate to predict behavior. With this notion of a hierarchy of needs, students of work motivation can draw inferences about the way these needs relate to work motivation.

The popularity of Maslow's need hierarchy theory among industrial/organizational psychologists is somewhat surprising in light of the lack of supportive empirical evidence accompanying it. In fact, it was not until the mid 1960's that researchers systematically began to empirically investigate Maslow's hypotheses in work situations. Wahba and Bridwell (1976) note a number of studies which fail to reproduce Maslow's five need categories. These factor analytic studies consistently find that certain needs load highly on more than one factor. However, factor analysis with orthogonal factors is inappropriate to Maslow's theory since his theory predicts mutually exclusive generalized need states and hence negative correlations between factors. Most of the overlapping needs identified in these studies have not even been in adjacent need states.

Wahba and Bridwell identified another group of studies which attempted to more directly test the hierarchical nature of Maslow's theory. These studies employed a rank ordering technique. Subjects were asked to rank order Maslow's five needs either according to their importance or their desirability. The authors concluded that there was no consistent evidence to support Maslow's hierarchical postulate, however, Wahba and Bridwell (1976) claim that a rank ordering technique is not an appropriate method for testing Maslow's hierarchical notion since any given individual's rank ordering of the needs is affected by his/her most dominant current need. Actually the problem is not with the use of rank orders but with the data analysis procedures used. Subjects at different points on the hierarchy would not give the same rank order, rather each would give the highest rank to his or her dominant need and lesser ranks to those adjacent to it. The appropriate analysis for such data is Coomb's (1964) unfolding analysis. In any case, Maslow (1943) believed that the unconscious role of needs was much more important in determining behavior than the conscious element and therefore people might not know their true rank order.

Perhaps part of the reason for the lack of clear and consistent support for Maslow's theoretical notions in both the factor analytic and rank orderings studies can be traced to the types of questionnaires employed in these studies. Wahba and Bridwell reviewed six different instruments. These included Porter's (1962) Need Satisfaction Questionnaire (NSQ), and questionnaires developed by Blai (1962), Beer (1966), Goodman (1968), Schneider (1968), and Huizinga (1970). Only Huizinga's was designed to represent all five of Maslow's need categories. Most questionnaires used only the author's opinion to select the items for the scales and varied in their orientation between assessing a person's motivation on a specific job at the moment (Porter, Schneider, Goodman) and assessing general work motivation (Huizinga). Questionnaires by Beer and Blai assess both orientations. None of these questionnaires report test-retest reliabilities or predictive validities. Finally, the NSQ and Blai's questionnaire were not originally designed to explicitly test Maslow's conceptualizations, yet they have been used to draw inferences about Maslow's need hierarchy theory. Some of the lack of consistency in scale design and orientation can be attributed to Maslow's formulation of the theory. Maslow provided no guidelines for empirical researchers interested in testing his theory, and researchers have varied greatly in their interpretation and operationalization of his concepts.

Wahba and Bridwell (1976) summaried the research on Maslow's need hierarchy theory as follows:

> Taken together, the results of the factor analytic studies and the ranking studies provide no consistent support for Maslow's need classification as a whole. There is no clear evidence that human needs are classified in five distinct categories, or that these categories are structured in a special hierarchy (p. 224).

Alderfer

In light of some of these problems, a few researchers have proposed modifications of Maslow's theory. Two of these researchers (Barnes, 1960; Harrison, 1966) have focused on the two dimensional (deficiency and growth needs) aspect of the hierarchy. More recently, however, Alderfer (1969, 1972) has proposed a reformulation of Maslow's need hierarchy theory based on three needs he views as important in organization settings. He calls these needs existence (E), relatedness (R), and growth (G) and discusses them in light of what he calls "E.R.G. Theory." Alderfer (1972) identified four general ways in which his theory differs from Maslow's:

> The differences concern (1) how the categories of needs are formed, (2) the presence or absence of a strict prepotency assumption, (3) how frustration of higher-order needs affects lower-order desires, and (4) how chronic desires relate to satisfaction (p. 24).

With respect to the first difference, Alderfer posited three rather than five needs. His existence needs include Maslow's physiological and <u>material</u> safety needs. Relatedness needs refer to Maslow's notions of <u>interpersonal</u> safety (i.e., freedom from enemies and hostile others), love (belongingness), and interpersonal esteem (i.e. esteem a person gets from association with others). Finally, his growth needs include Maslow's notions of self-actualization and self-confirmed esteem (i.e.

esteem a person gets from an internal sense of achievement In classifying needs in this manner, Alderfer felt that he was removing some of the ambiguity which existed in Maslow's need classification scheme, as well as making E.R.G. theory more parsimonious than Maslow's.

Alderfer also sought to eliminate further ambiguity in Maslow's definition of generalized need states by distinguishing between episodic (of the moment) and chronic (enduring) need strength. Defining need strength in terms of desire, he notes that:

> Episodic desires tend to be situation specific, and they change in response to relevant changes in the situation. Statements about episodic changes in desires are intended to apply across people, without regard for individual differences. Chronic desires, on the other hand, reflect more or less enduring states of a person. They are seen as being a consequence both of episodic desires and of learning. To partial out the effects of chronic and episodic desires would require a study which, to some degree, was longitudinal (1972, p. 8).

Another difference between the two theories relates to the hierarchical structure. As Alderfer (1972) notes "E.R.G. theory retains the notion of a need hierarchy without requiring it to be strictly ordered. (p. 27)" The essence of this difference is that Maslow's theory requires lower level need gratification as a prerequisite for higher order need activation while Alderfer's theory does not. Alderfer (1972) does, however, have two propositions which relate lower level need gratification to higher order need activation. These are:

> P3. The more existence needs are satisfied, the more relatedness needs will be desired.
> P6. The more relatedness needs are satisfied, the more growth needs will be desired (p. 13).

The third difference between the theories reflects Alderfer's (1972) postulates concerning "the need hierarchy principle working in reverse; if a higher-order need is frustrated, the next lower order need is activated (p. 27)." His specific propositions are:

P2. The less relatedness needs are satisfied, the more existence needs will be desired.
P5. The less growth needs are satisfied, the more relatedness needs will be desired (p. 13).

Thus, satisfied needs can remain motivators of behavior by acting as substitutes for frustrated higher-order needs which have not been satisfied. Maslow hypothesized that needs, once gratified, fail to play an active role in determining behavior. With respect to the final general way in which these theories differ, Alderfer extends Maslow's formulations by considering not only how need satisfaction affects need desire (for a given need), but also how a chronic need desire affects satisfaction of that need. In a series of propositions, Alderfer defines, for a given need, conditions which lead to differential predictions with respect to how chronic desires for a need affect a person's satisfaction of that need.

Alderfer (1969, 1972) designed a questionnaire (based on earlier work by Schneider, 1968) with scales designed to assess an indivdiual's chronic and episodic desires for, and satisfactions with, existence, relatedness, and growth needs in organizational settings. Because no single organizational setting would allow a test of all ten of his theoretical propositions, he contacted, between 1965 and 1969, a number of different organizations. The organizations willing to participate in his studies included: a medium sized manufacturing firm and bank, two college fraternities, a boy's prep school, an adult and adolescent training laboratory, and a group of M.B.A. students undergoing recruitment interviews for summer or permanent jobs. The sample sizes in these settings ranged from about 50 to over 200. Alderfer was able to collect longitudinal data from the boy's prep school and both the adult and adolescent training laboratories. The time lag between administrations of his questionnaire ranged from a few days (adult laboratory) to 2 1/2 months (boy's prep school). The validation evidence Alderfer presents relates to his concerns for the adequacy of the scales in his questionnaire as well as the ability of those scales to predict a variety of criteria. In an attempt to assess the convergent and discriminant validity of his need satisfaction measure, he employed the Campbell and Fiske (1959) Multi-Trait, Multi-Method (MTMM) matrix approach to the data collected from the manufacturing sample. An open-ended interview served as the alternate measure to assess an individual's satisfaction with various E, R, and G needs. The results indicated some evidence for both convergent and discriminant validity. It should be noted, however, that the questionnaire was converted to factor scores for this analysis and orthogonal factors force apparent discriminant validity. Alderfer used the Bank study data to factor analyze the episodic desire measure in an attempt to replicate results he had obtained for this scale in some of his earlier work (1967). While the

results were not identical with the earlier study, Alderfer concluded that the overall pattern of these results was similar, i.e., the episodic desire items tended to load on the a priori expected, E, R, or G dimensions. The results obtained from the M.B.A. recruitment interviews were used to compute split-half reliabilities for the chronic desire measures. The coefficients ranged from .63 to .88 for the various E, R, and G factors measured. Finally, in an effort to demonstrate some predictive validity for his need satisfaction measure, Alderfer correlated it with a number of external criteria. These criteria included organizations, demographic, and behavioral variables as well as measures of work related attitudes. In the manufacturing sample, E, R, and G need satisfactions were correlated with job complexity, education, seniority, and annual pay for both employees and managers. Similarly, these need satisfaction measures were correlated with job complexity, customer contact activities, education, seniority, annual pay, and sex among the Bank sample employees and officers. In the two fraternities, need satisfactions were correlated with such organizational variables as: number of offices held, number of members seen, and whether or not the subject was living in the house.
The Bank study data also provided Alderfer with the opportunity to investigate the relationship between E, R, G need satisfaction and job related attitudes such as job involvement, job and organizational satisfaction, top management and superior confidence, tension, and fatigue for both employees and officers. The data from the adolescent training laboratory sample was used to correlate need

satisfaction with behavioral indicators such as: amount of program participation, expression of feelings, and a subject's willingness to try new behavior in the program. Over all these organizational settings, the correlations between E, R, and G satisfaction and the external criteria, where significant, tended to be low but were generally significant where, and in the directions, hypothesized by the theory.

Alderfer (1972) interprets the results of these studies as generally providing substantial evidence of the convergent, discriminant, and predictive validity of his E, R, and G measures. While the evidence he presents is somewhat supporting, it appears that the scales measuring chronic and episodic need desires did not receive the same amount of rigorous investigation as did the scales measuring E, R, and G need satisfaction. For the chronic desire scales he provides little more than internal consistency reliability estimates, and for the E, R, G episodic desire scales the evidence consists of a replication of earlier factor analytic results. The E, R, G need satisfaction scales, on the other hand, were factor analyzed, used in the MTMM analysis, and correlated with a variety of outside criteria. One wonders why Alderfer was not as rigorous in analyzing the desire scales when the core of his theory, as reflected in his ten propositions, is concerned with the relationship between need satisfaction and need desire. Nevertheless, Alderfer (1972) proceeded to use these measures to test his theory's propositions in the organizational settings noted earlier.

For the purposes of the present research, it is not necessary to review Alderfer's (1972) evidence concerning all ten of his theoretical propositions, but as noted earlier, some of them do relate to his hierarchical notions and these particular propositions require close examination. Recall that generally Alderfer (1972) differs from Maslow (1943) on the hierarchy issue in that Alderfer, unlike Maslow, does not require lower-level need satisfaction as a prerequisite for higher-level need activation. Alderfer's propositions related to the need hierarchy were presented earlier, but are reiterated here:

> P3. The more existence needs are satisfied, the more relatedness needs will be desired.
> P6. The more relatedness needs are satisfied, the more growth needs will be desired.
> P2. The less relatedness needs are satisfied, the more existence needs will be desired.
> P5. The less growth needs are satisfied, the more relatedness needs will be desired (p. 13).

Recall that the last two propositions (P2, P5) refer to Alderfer's postulates concerning the need hierarchy working "in reverse," i.e., when a higher-order need is frustrated, the next lower-order need is activated as a substitute.

With respect to proposition 3, Alderfer (1972) used the data from the Manufacturing and Bank firms, as well as those from the two Fraternities, to investigate the relationship between existence need satisfaction and relatedness need desire. All of the data are in the form of static correlations. Of 28 coefficients computed, nine were significant ($P < .05$; range, -.17 to -.54), but none of these significant coefficients were in the predicted direction.

Alderfer concluded that these data did not support the proposition. He provided two possible reasons for the lack of support: First, most of the people in these organizations were rather affluent and therefore there may not have been enough variance in the negative portion of the scale. While this would explain why correlations were low, it would not explain why the correlations had the wrong sign. Second, he felt that the opposite direction effect might be explained by a "learning" function that may have been in operation in these organizations, i.e., people "learn" to use others to advance their own material gains and only desire interaction with them when those existence needs are relatively dissatisfied. But this explanation ignores Alderfer's own distinction between chronic and episodic needs. The fact that a manipulator sees something to be gained from a temporary interaction with some target is strictly situational and has nothing to do with that person's chronic needs. The manipulator's chronic relatedness need is zero throughout the transaction.

Alderfer (1972) used both static and dynamic correlations to test proposition 6; the extent to which relatedness need satisfaction affects growth need desire. Fourteen static correlations were computed using data from the same sources noted earlier. Only three of these were significant ($P < .05$; range, -.26 to +.28) and only one of them in the predicted direction. The results from the dynamic correlational analysis (using data from the Adult laboratory and Boy's school) provided some, though little better, support. Of

5 coefficients computed, two were significant ($P < .05$; range; +.23 to +.33) and in the predicted direction, but both were from the Adult laboratory sample. These dynamic correlations were between change scores for need satisfaction and need desires, and were adjusted for initial values via partial correlations as suggested by Vroom (1966). Alderfer concluded that these results tended to show some support for the proposition, but that there is a need for "specifying the conditions under which it is valid" (p. 135).

Proposition 2, the first of Alderfer's (1972) "reverse hierarchy" propositions, is concerned with the relationship between relatedness need satisfaction and existence need desire. Using again the data from the Manufacturing, Bank, and two Fraternity samples, static correlations were computed between the variables. Of 28 coefficients, nine were significant ($P < .05$; range, -.14 to -.35) and all were in the predicted direction. While Alderfer claimed that this evidence provided some general support for the proposition, he also noted that it was stronger in some organizational settings than it was in others.

Employing data from the same samples noted above, Proposition 5, relating growth need satisfaction to relatedness need desire, was tested with static correlations. Of 14 coefficients, three were significant ($P < .05$; range, -.25 to -.57) and in the predicted direction. Alderfer (1972) concluded that these results provided no general support for the proposition.

The four propositions reviewed above represent Alderfer's (1972) need hierarchy notions for E.R.G. Theory. Taken together, the rather limited support received for these propositions provides no substantive support for those notions. While it can be argued that the predominant use of static correlations to test essentially dynamic hypotheses is less than optimal, the one instance in which dynamic correlations were employed offered little better support. In the last chapter of his book, Alderfer (1972) "reformulated" his propositions based upon the evidence they received from empirical tests. The new list of propositions does not include propositions 3 and 5, and propositions 2 and 6 were changed as follows:

> P2. (Revised) When both existence and relatedness needs are relatively dissatisfied, the less relatedness needs are satisfied, the more existence needs will be desired.
>
> P6. (Revised) When both relatedness and growth needs are relatively satisfied, the more relatedness needs are satisfied, the more growth needs will be desired (p. 149).

Unfortunately, Alderfer does not explicitly discuss the impact that these changes have on his theoretical position with respect to the need hierarchy issue, especially as it relates to Maslow's hierarchical position. The two remaining (revised) propositions deal with: (1) how individuals move "up" the hierarchy, but only with respect to relatedness and growth needs (P.6 Revised) and (2) how individuals "reverse" the hierarchy but only with respect to existence and relatedness needs (P.2 Revised). These two propositions do not constitute a structured and comprehensive treatment of the need hierarchy issue.

Summary

Need theorists such as Maslow and Alderfer (as well as researchers attempting to operationalize their concepts) have differed in their approaches to classifying human needs. Maslow (1943, 1954, 1970), for example, offered five types of needs, while Alderfer (1969, 1972) postulated three types when viewed in the organizational setting, and Barnes (1960) and Harrison (1966) have opted for a two-dimensional (deficiency, growth) explanation. The one aspect which these theorists and researchers have in common, however, is some notion of a hierarchical structure for these needs. In general, these theorists and researchers have identified both "lower-order" and "higher-order" needs, and have argued that the strength (or at times, desire, satisfaction, importance) of higher-order needs is, in some way, dependent upon, or related to the strength (etc.) of lower-order needs. While most empirical tests of these hierarchical notions have not been supportive, the tests themselves can be criticized on a number of conceptual and methodological points (Wahba and Bridwell, 1976).

Longitudinal Studies

Both Maslow (1943, 1954, 1970) and Alderfer (1969, 1972) view their theories as dynamic in nature. Wahba and Bridwell (1976) have argued that longitudinal studies provide the "best test" of need hierarchy theories (p. 233). Since need hierarchy theories are intended to be dynamic and since an investigation of an individual's need hierarchy structure requires an examination of <u>changes</u> in <u>chronic</u> (enduring) need strength over time, static or cross-sectional research designs cannot fully test the need hierarchy concept. This conclusion is shared by both Hall and Nougaim (1968) and Lawler and Suttle (1972) who conducted longitudinal studies of Maslow's need hierarchy theory.

Therefore, industrial/organizational psychologists interested in testing the need hierarchy concept in a job or work-related context should employ longitudinal designs which investigate chronic need strength changes.

Purpose of the Present Research

The purpose of the present research was to test the need hierarchy concept in light of the conceptual and methodological points just reviewed. More specifically, this was accomplished through the development and empirical test of a Markov chain model of the need hierarchy concept. Although industrial/organizational psychologists have never employed Markov chain models in their study of need hierarchy theory or more generally, work motivation, Vroom and MacCrimmon (1968) have noted the efficacy of this approach for problems of interest to industrial/organizational psychologists through their study of managerial careers. Basically, a Markov chain model is a dynamic probabilistic model which investigates the likelihood of movement from a given "state" (i.e., some defined condition and/or property of an entity being studied) to any other state over some specified time interval. The particular models of interest in this research are outlined below.

Models of Change

These models assume Alderfer's (1969, 1972) three-fold need hierarchy formulation. With respect to job-related concerns it was assumed that people have three types of needs: Existence (E), Relatedness (R), and Growth (G) as defined by Alderfer (1969, 1972). The chronic strength (importance) of these three needs was used to define the states (s) of each model.

States

The states are defined by comparing an individual's scores on a "lower-order" and "higher-order" need. In light of Alderfer's (1969, 1972) three-need formulation, three related Markov processes were generated with the following states (s):

Existence versus Relatedness

s_1 : E > R (a state in which a person's chronic existence need strength is greater than the person's chronic relatedness need strength)

s_2 : E = R (a state in which a person's chronic existence need strength is equal to the person's chronic relatedness need strength)

s_3 : R > E (a state in which a person's chronic relatedness need strength is greater than the person's chronic existence need strength)

Relatedness versus Growth

s_1 : R > G

s_2 : R = G

s_3 : G > R

Existence versus Growth

s_1 : E > G

s_2 : E = G

s_3 : G > E

In each case the states are mutually exclusive and exhaustive. These properties of the states are required for Markov chain models. The third Markov process represents the "dual-level" need hierarchy notion which Lawler and Suttle (1972) and Wahba and Bridwell (1976) suggest should receive more empirical test.

<u>Model Assumptions</u>

There are two assumptions which must be considered in the formulation of a Markov chain (Kemeny and Snell, 1960). The first of these is called the Markov property which states that the probability of a subject occupying a given state at a future time point is equal to some function of the current, and only the current, state occupied. Mathematically,

$$P(s_{n+1}) = f(s_n)$$

where: P = probability

s = state in the model

n = time

f = some function

A need hierarchy can be formulated in these terms, i.e., moving to a higher-order need in the hierarchy is hypothesized to be a function of being in the need state immediately below that higher-order need state. For example, in terms of Maslow's (1943) formulation, the strength of safety needs for a person is a function of the satisfaction and strength of the person's physiological needs (the need state immediately below safety needs in the hierarchy). Similar conclusions can be drawn for Alderfer's (1969, 1972) ERG theory. A Markov process is a Markov chain if the transition probabilities among states do not change over time. In other words, if the probability of moving from a given state (s_1) at time one to another state (s_2) at time two is equal to, say, p, then the probability of moving from s_1 at time two to s_2 at time three should also be equal to p. More formally,

$$P(s_{n+1} \mid s_n) \text{ is equal for all } n \text{ (time)}$$

This property allows one to power the matrix of transition probabilities to look at predicted behavior over long time periods, i.e., to predict the unfolding of the need hierarchy over time.

Let A = a lower-order need and B = a higher-order need. The states in each Markov process can then be summarized as follows:

$$s_1 = A > B$$

$$s_2 = A = B$$

$$s_3 = B > A$$

The general form for the matrix of transition probabilities becomes:

		time n + 1			
		s_1	s_2	s_3	
	s_1	p_{11}	p_{12}	p_{13}	1.0
time n	s_2	p_{21}	p_{22}	p_{23}	1.0
	s_3	p_{31}	p_{32}	p_{33}	1.0

The "p" entries in this matrix represent the probabliities of movement from a particular state at time n to the same, or some other, state at time n + 1. For example, p_{12} represents the probability of a person moving from s_1 (the state in which the strength of a lower-order need is greater than the strength of a higher-order need) at time n to s_2 (the state in which the lower and higher-order needs are of equal strength) at time n + 1. Notice that the entries in each row of the matrix must sum to 1.00. The values that these "p" entries take on have different implications for need hierarchy theory.

Example 1: Pure Random Transition

transition matrix

time n + 1

		s_1	s_2	s_3	
	s_1	.33	.33	.33	1.0
time n	s_2	.33	.33	.33	1.0
	s_3	.33	.33	.33	1.0

long term matrix

time n + ∞

		s_1	s_2	s_3	
	s_1	.33	.33	.33	1.0
time n	s_2	.33	.33	.33	1.0
	s_3	.33	.33	.33	1.0

Consider, for example, the matrix of transition probabilities and the long term probability matrix (computed by powering the matrix of transition probabilities) in Example 1. In essence, these results represent the null hypothesis, i.e., there is no hierarchical relationship between lower-order and higher-order need strength.

Example 2: No Change

transition matrix (time n + 1)

		s_1	s_2	s_3	
time n	s_1	1.0	.00	.00	1.0
	s_2	.00	1.0	.00	1.0
	s_3	.00	.00	1.0	1.0

long term matrix (time n + ∞)

		s_1	s_2	s_3	
time n	s_1	1.0	.00	.00	1.0
	s_2	.00	1.0	.00	1.0
	s_3	.00	.00	1.0	1.0

In Example 2, the present state is a perfect predictor of the future state. However, this model assumes that a person never changes need states.

Example 3: Deterministic Upward Transition

transition matrix (time n + 1)

		s_1	s_2	s_3	
time n	s_1	.00	1.0	.00	1.0
	s_2	.00	.00	1.0	1.0
	s_3	.00	.00	1.0	1.0

long term matrix (time n + ∞)

		s_1	s_2	s_3	
time n	s_1	.00	.00	1.0	1.0
	s_2	.00	.00	1.0	1.0
	s_3	.00	.00	1.0	1.0

In Example 3, an individual will always move to the next highest state in the model until the highest state s_3 is reached, with no further change. In this example, all individuals will eventually end up with higher-order needs stronger than lower-order needs, which is consistent with need hierarchy theory. In the Maslow (1943) sense, this implies that, eventually, everyone will end up "self-actualizing." Unfortunately, this model implies that individual's must have total "fate" and/or environmental control since no one ever experiences the Alderfer (1972) "reverse hierarchy" phenomenon.

Example 4: Maslow

transition matrix (time n + 1)

time n	s_1	s_2	s_3	
s_1	p_{11}	p_{12}	p_{13}	1.0
s_2	.00	p_{22}	p_{23}	1.0
s_3	.00	.00	1.0	1.0

long term matrix (time n + ∞)

time n	s_1	s_2	s_3	
s_1	.00	.00	1.0	1.0
s_2	.00	.00	1.0	1.0
s_3	.00	.00	1.0	1.0

Example 4 is Maslow's theory. The numbers above the diagonal (p_{12}, p_{13}, p_{23}) represent rates of change from lower-order states to higher-order states. These numbers are left unspecified since Maslow said little about such rates. The crucial numbers are the three zeros below the diagonal. The meaning of these three zeros is that people never go back to lower-order states. Since Maslow hypothesized 5 general needs, there would be 10 pairs of needs and hence his model would consist of 10 related Markov processes.

Example 5: Alderfer

transition matrix (time n + 1)

time n	s_1	s_2	s_3	
s_1	.60	.30	.10	1.0
s_2	.10	.60	.30	1.0
s_3	.10	.10	.80	1.0

long term matrix (time n + ∞)

time n	s_1	s_2	s_3	
s_1	.20	.28	.52	1.0
s_2	.20	.28	.52	1.0
s_3	.20	.28	.52	1.0

Alderfer distinguishes himself from Maslow in assuming that there can be a small amount of movement back down the hierarchy. Thus for Alderfer, the numbers below the diagonal can be greater than zero, though he would expect them to be smaller than the probabilities above the diagonal. Example 5 above is a transition matrix such as Alderfer's theory would predict. Movement up a notch is at a rate of 30% while movement down a notch is at a rate of 10%. However, the long term predictions of this model are very different from those described by Alderfer. This model does NOT predict a long term drift to the highest motivational state, but rather convergence to a probability distribution in which the highest state is merely the most frequent of the three states. Indeed once a group has reached this distribution, then during any succeeding time interval there will be as many people moving down the hierarchy as moving up.

Alderfer's propositions about backward movement have profoundly different implications from Maslow's theory. Maslow predicts ultimate self-actualization while Alderfer predicts that people will randomly drift from one state to another (though over long periods of time).

Empirical Identification of States

The states in the model were constructed by comparing an individual's scores on a "lower-order" and "higher-order" need. Since the raw scale scores for each need strength measure are not perfect measures of the underlying true scores due to unreliability, a direct comparison of raw scores was not used. Rather, using the standard error of measurement (SEM), a range of scores was computed around each obtained score which would, at some specified probability, capture the underlying true score (Magnusson, 1966, pp. 78-82). Comparing the range of scores for an individual on a given "lower-order" and "higher-order" need strength measure, the extent of overlap in these ranges was noted and the following decision rule employed:

1. If the lower-order need score minus 1 SEM was greater than the higher-order need score plus 1 SEM, the lower-order need was considered to be stronger than the higher-order need.

2. If the lower-order need score plus 1 SEM was less than the higher-order need score minus 1 SEM, the higher-order need was considered to be stronger than the lower-order need.

3. If conditions 1 or 2 above were not satisfied, the lower-order and higher-order needs were considered to be of equal strength. One SEM was chosen as an optimal balance point to ensure that the majority of cases would not systematically satisfy condition 3 above. The probability is .68 that an individual's true need strength score lies within the interval of $\pm$ 1 SEM from the obtained score.

Time Interval

Maslow believed that passage through the hierarchy of needs is a slow process spread over most of the life cycle. This would suggest that the time interval between observations be as long as possible in order to maximize the number of people changing from one generalized need to another. At the same time, methodology dictates at least three observations. Between these contingencies, the time interval for the present study was determined. Only two years could be allotted for the collection of data, and hence the observation points were set 10 months apart (the excess time was consumed by the mails).

Relationship Between Model and Sample

Most of the research on need hierarchy theory to date has been done with subjects who were currently occupying full-time jobs ranging in nature from executives to clerical workers. The present study used high school graduates who were about to either pursue a full-time job or continue on with higher education or some form of job-related training. These students are facing a time in their lives which involve the making of important career decisions (e.g., going to college, getting a job, etc.), and it was reasonable to assume that their need strengths would change as they relate their current situation to their future career expectations. It also appeared reasonable to assume that changes in need strengths during this time period of their lives might be somewhat greater than at ten-month time intervals taken at a different point in their lives, e.g., in middle-age where career changes might tend to be somewhat less frequent and dramatic in scope.

METHOD

Subjects

Three waves of data were collected from 547 high school graduates from 11 different high schools in a Midwest urban area over ten month intervals. Subjects were paid three dollars to complete a questionnaire package containing the need scales employed in this study as well as other background, demographic, and attitudinal measures. Questionnaire return rates for the three time periods are presented in Table 1.

Table 1

Questionnaire Return Rates

Time Period	Number of Questionaires Mailed	Number of Questionnaires Received	Percent Returned
1	3850	1088	28
2	1088	787	72
3	787	547	70

The percent of questionnaires returned for the three time periods as a function of the total number mailed at time 1 was 14%.

With respect to background and demographic characteristics, the sample was 66% female and 93% white. All subjects were approximately 18-19 years of age at time period one. The average self-reported high school grade point average was 3.25 on a 4.0 scale. Ninety-nine percent of the sample were unmarried at time 1, 93% at time 3. Sixty-three percent of the sample reported an average annual net family income in excess of $17,000. The median score for father's occupation on the Duncan (1961) socio-economic index was 62. This scale has a theoretical range of 0-99. The range in the present sample was from 6-96. The data for these subjects were collected as part of a larger study designed to develop a psychological model of individual labor force behavior.

In an attempt to check on the effects of mortality, some background and demographic characteristics of the present sample were compared with the figures computed by a number of high school administrators in the area. With the exception of the sex composition, there were few significant differences between the present sample's characteristics and the characteristics of other high school graduates in the past on variables such as: percent going to college, percent taking a job, etc.

Instrument

A modified version of Alderfer's (1972) "E.R.G. Need Questionnaire" was employed in this study. The Appendix contains the E, R, and G need strength items and response scale used as well as the instructions given to the subjects. While all of the

E, R, and G items were contained in the same section of the questionnaire at each administration, they were randomly ordered within the section. Emphasis on chronic need strength is indicated by asking the subjects to evaluate the items "in terms of the job you would like to get." This response set was chosen so as to avoid responses based on the subject's current or immediate past activity or job experience, which would be more indicative of episodic need strength.

Researchers have used a variety of words to evaluate need strength. The word "important" was chosen for this research since it has been the one most frequently used in need hierarchy research and because Wahba and Bridwell (1976) suggest that it probably more accurately reflects the theory's underlying contentions (p. 221). While it can be argued that the word "important" can mean different things to different people, (e.g., important = "how often will I think about" some object, versus important = "how much of an object will I need"), by asking subjects to evaluate the importance of an item in a "future" sense (i.e., for the job they hope to get), there may be a greater tendency for subjects to respond in a manner similar to the second "important" frame of reference noted above.

RESULTS

Psychometric Analysis of Scales

In order to determine the extent to which the existence (E), relatedness (R), and growth (G) need strength items used in the questionnaire formed three distinct clusters, a cluster analysis using communalities (Hunter, 1977) was performed on these items. Table 2 contains the item-cluster correlations and cluster intercorrelations (corrected for attenuation) from this analysis. The underlined item-cluster correlations in this Table represent those places where, on the basis of item content, a given item was hypothesized to have its highest correlation. In almost every case, the underlined correlations are largest. Table 2 also contains the matrix of cluster intercorrelations. The underlined elements in this matrix represent the one-step (time 1 - time 2) and two-step (time 1 - time 3) test-retest correlations corrected for attenuation. These test-retest reliabilities ranged from .54 (G1, G2) to .79 (E2, E3). The intercorrelations among the clusters for a given time period tended to be somewhat high, especially between the relatedness and growth measures. But these correlations, corrected for attenuation are far less than 1.00. Thus, the cluster analysis clearly confirmed the a priori content-defined existence, relatedness, and growth need strength measures used in this study.

Table 2

Item-Cluster Correlations and Cluster Intercorrelations with Communalities for Existence, Relatedness, and Growth Need Strength Items Over Three Time Periods

	E1 ITEM				R1 ITEM				G1 ITEM			
	1	2	3	4	1	2	3	4	1	2	3	4
E1	57	48	69	76	33	40	34	36	23	28	30	47
R1	31	48	26	37	54	72	68	61	41	48	36	50
G1	29	42	28	30	38	55	45	41	61	71	65	50
E2	40	34	51	50	11	21	17	25	14	11	21	26
R2	18	27	21	22	27	41	40	40	21	27	20	23
G2	11	17	18	17	6	20	17	11	35	32	30	36
E3	42	32	50	43	10	22	18	18	7	13	19	24
R3	18	29	21	25	29	44	40	40	23	31	14	29
G3	16	27	13	21	21	37	32	28	42	46	37	45

	E2 ITEM				R2 ITEM				G2 ITEM			
	1	2	3	4	1	2	3	4	1	2	3	4
E1	45	44	52	53	22	20	23	29	14	18	12	23
R1	16	27	18	20	35	36	41	44	16	15	9	17
G1	17	20	23	22	23	22	27	25	37	36	33	36
E2	70	48	82	77	33	31	37	37	25	27	29	35
R2	33	48	29	32	60	62	79	67	49	44	37	38
G2	25	36	30	30	41	41	52	37	72	67	69	58
E3	55	43	62	58	12	12	16	24	15	13	16	20
R3	27	37	26	27	30	47	47	55	20	23	15	23
G3	14	21	19	15	26	30	35	31	40	38	37	44

Table 2 - Continued

	E3 ITEM 1	E3 ITEM 2	E3 ITEM 3	E3 ITEM 4	R3 ITEM 1	R3 ITEM 2	R3 ITEM 3	R3 ITEM 4	G3 ITEM 1	G3 ITEM 2	G3 ITEM 3	G3 ITEM 4
E1	40	39	49	54	27	21	20	24	8	18	17	27
R1	16	27	14	18	32	37	40	40	29	30	22	24
G1	20	18	18	13	22	28	25	22	34	37	41	45
E2	53	48	55	58	24	29	23	29	10	15	8	24
R2	12	26	9	18	36	42	43	45	27	34	19	24
G2	14	18	17	16	12	23	24	16	30	35	37	35
E3	71	50	76	75	26	27	23	27	8	16	6	26
R3	28	43	22	21	55	66	70	58	44	49	32	40
G3	17	26	12	11	37	52	53	38	63	58	64	44

CLUSTER

	E1	R1	G1	E2	R2	G2	E3	R3	G3
E1	100								
R1	56	100							
G1	51	71	100						
E2	70	29	29	100					
R2	35	58	36	51	100				
G2	25	22	54	44	63	100			
E3	67	27	25	79	24	24	100		
R3	37	60	39	42	67	30	42	100	
G3	31	46	69	25	46	60	24	72	100

NOTE: All decimals have been omitted.
A letter followed by a number for this and all following tables represents the need strength measure at a given time point, e.g., E1 represents "existence need strength at time one."

Table 3 contains some summary statistics for the E, R, and G need strength measures. The first nine rows (for narrative purposes, section 1) contain the raw score means, standard deviations, number of subjects, coefficient alphas, and standard errors of measurement for the E, R, and G need strength scales at various time points. The middle nine rows (section 2) analyze change scores for a particular need measure at different times, while the last nine rows (section 3) analyze difference scores between higher-order and lower-order needs at a particular time point.

Coefficient alphas were generally in the low to mid .70's, with the exception of the growth need strength measure at time three which was .66. The standard errors of measurement for the various need measures at different times, used in defining the states of the Markov model, are also given in this section of Table 3. The difference score reliabilities in sections 2 and 3 ranged from .37 to .65 and thus were less than the coefficient alphas in section 1. This is not surprising however since difference scores contain the summated error variances from two fallible (unreliable) sources (Guilford, 1954, p. 236).

Mean Change

The results in section 1 of Table 3 show rather high mean responses for all three need strength measures over all three time periods. The theoretical range of the scales for all need measures is 4-16. All three measures over all time periods showed a definite negative skewness. The means and standard deviations for a given

Table 3

Summary Statistics for Existence, Relatedness, and Growth Need Strength Measures and Difference Scores Over Three Time Periods

VARIABLE	MEAN	SD	N	z	ALPHA	SEM
E1	13.15	1.97	546		.72	1.04
E2	13.42	2.10	544		.78	.98
E3	13.48	2.00	545		.77	.96
R1	14.14	1.74	547		.73	.90
R2	14.45	1.75	543		.76	.86
R3	14.42	1.58	546		.71	.85
G1	14.21	1.76	543		.71	.95
G2	14.53	1.68	543		.76	.82
G3	14.65	1.40	539		.66	.82
E2-E1	.28	1.97	543	3.38	.47	
E3-E2	.06	1.77	542	NS	.41	
E3-E1	.34	1.95	546	4.13	.48	
R2-R1	.31	1.85	543	3.88	.55	
R3-R2	-.04	1.66	542	NS	.46	
R3-R1	.27	1.77	546	4.00	.50	
G2-G1	.33	1.88	539	4.00	.54	
G3-G2	.13	1.66	535	NS	.47	
G3-G1	.45	1.64	535	6.29	.37	
R1-E1	1.00	2.03	546	12.38	.53	
R2-E2	1.03	2.15	543	11.44	.62	
R3-E3	.94	2.11	545	9.40	.62	
G1-R1	.06	1.72	543	NS	.42	
G2-R2	.08	1.76	542	NS	.54	
G3-R3	.24	1.51	539	3.29	.37	
G1-E1	1.06	2.09	542	11.78	.54	
G2-E2	1.11	2.20	543	12.33	.65	
G3-E3	1.18	2.20	538	11.70	.65	

NOTE: SEM = standard error of measurement. The z statistic is for the difference between means for correlated data. All z's presented are significant at $p < .01$.

Difference score reliabilities were computed using a formula developed by Mosier (1951).

need over different time periods were fairly constant though there were some significant differences which will be noted shortly.

The means for the difference scores presented in section 2 of Table 3 were generally positive and very small. The mean change from time 1 to time 2 was .28 on a 12 point scale from 4 to 16, and was statistically significant only because the significance test was a within groups test with a sample size of 543. The mean change from time 2 to time 3 was .05 which is not even significant under these conditions. In all cases, the change was from highly important to a slightly higher value.

The data in section 3 of Table 3 contain differences between higher and lower need strength measures at particular time periods. As the z statistics reveal, only the differences between G1, R1 and G2, R2 were non-significant. Relatedness and growth means were significantly higher than existence means at all three time periods. Thus, in general, higher-order needs tended to be stronger than lower-order needs at all time points, with the exception of the growth and relatedness comparison where all but the time 3 differences were non-significant. As with the data in section 2, the differences here, though statistically significant, tended to be rather small.

Markov Chain Analyses

The results presented in Table 4 contain the analyses for the three related Markov chains developed earlier, while Table 5 contains the raw frequencies upon which the actual transition probabilities in Table 4 are based. Times 1, 2, 3 are denoted

Table 4

Transition Matrices for the Three Need Pairs

		ACTUAL t2				ACTUAL t3				AVERAGE t+1				PREDICTED t3				ACTUAL t3			χ^2_A	χ^2_B
		E>R	E=R	R>E		E>R	E=R	R>E		E>R	E=R	R>E		E>R	E=R	R>E		E>R	E=R	R>E		
	E>R	.23	.56	.21		.28	.59	.13		.26	.57	.17		.16	.54	.30		.33	.46	.21	11.00**	2.50
t1	E=R	.14	.55	.31	t2	.12	.63	.25	t	.13	.59	.28	t1	.13	.52	.35	t1	.12	.62	.26	11.70**	1.16
	R>E	.05	.36	.59		.04	.40	.56		.05	.38	.57		.09	.47	.44		.03	.44	.53	12.35**	3.76
		R>G	R=G	G>R		R>G	R=G	G>R		R>G	R=G	G>R		R>G	R=G	G>R		R>G	R=G	G>R		
	R>G	.36	.60	.04		.24	.64	.12		.30	.62	.08		.17	.69	.14		.23	.71	.06	4.91	2.91
t1	R=G	.13	.72	.15	t2	.10	.81	.09	t	.12	.76	.12	t1	.13	.71	.16	t1	.10	.76	.14	5.39	1.99
	G>R	.03	.59	.38		.04	.41	.55		.04	.50	.46		.10	.63	.27		.05	.53	.42	10.80**	1.02
		E>G	E=G	G>E		E>G	E=G	G>E		E>G	E=G	G>E		E>G	E=G	G>E		E>G	E=G	G>E		
	E>G	.33	.51	.16		.33	.39	.28		.33	.45	.22		.16	.50	.34		.33	.39	.28	8.75*	1.05
t1	E=G	.09	.63	.28	t2	.11	.62	.27	t	.10	.62	.28	t1	.11	.52	.37	t1	.10	.60	.30	7.93*	0.47
	G>E	.05	.33	.62		.02	.35	.63		.04	.34	.62		.07	.44	.49		.03	.36	.61	12.60**	0.54

NOTE: t = time period

χ^2_A is for the predicted t1, t3 and actual t1, t3 comparison

χ^2_B is for the average t, t+1 and actual t1, t3 comparison

*p < .05

**p < .01

Table 5

Frequencies for the Transition Matrices for the Three Need Pairs

		t2 E>R	t2 E=R	t2 R>E	%	Total
	E>R	12	29	11	(10)	52
t1	E=R	39	153	85	(51)	277
	R>E	10	76	127	(39)	213
		61	258	223		542
		(11)	(48)	(41)		(100)

		t3 E>R	t3 E=R	t3 R>E	%	Total
	E>R	17	36	8	(11)	61
t2	E=R	30	162	65	(48)	257
	R>E	9	89	125	(41)	223
		56	287	198		541
		(10)	(53)	(37)		(100)

		t3 E>R	t3 E=R	t3 R>E	%	Total
	E>R	17	24	11	(10)	52
t1	E=R	32	172	73	(51)	277
	R>E	7	94	114	(39)	215
		56	290	198		544
		(10)	(53)	(36)		(100)

		t2 R>G	t2 R=G	t2 G>R	%	Total
	R>G	23	47	3	(15)	78
t1	R=G	48	265	54	(68)	367
	G>R	3	55	35	(17)	93
		79	367	92		538
		(15)	(68)	(17)		(100)

		t3 R>G	t3 R=G	t3 G>R	%	Total
	R>G	19	51	10	(15)	80
t2	R=G	36	294	34	(68)	364
	G>R	4	37	49	(17)	90
		59	382	93		534
		(11)	(72)	(17)		(100)

		t3 R>G	t3 R=G	t3 G>R	%	Total
	R>G	18	57	5	(15)	80
t1	R=G	36	276	49	(67)	361
	G>R	5	50	39	(18)	94
		59	383	93		535
		(11)	(12)	(17)		(100)

		t2 E>G	t2 E=G	t2 G>E	%	Total
	E>G	13	20	6	(7)	39
t1	E=G	25	184	82	(54)	291
	G>E	10	69	129	(39)	208
		48	273	217		538
		(9)	(51)	(40)		(100)

		t3 E>G	t3 E=G	t3 G>E	%	Total
	E>G	16	19	14	(9)	49
t2	E=G	29	163	73	(50)	265
	G>E	5	77	138	(41)	220
		50	259	225		534
		(9)	(49)	(42)		(100)

		t3 E>G	t3 E=G	t3 G>E	%	Total
	E>G	13	15	11	(7)	39
t1	E=G	29	172	85	(54)	286
	G>E	7	75	126	(39)	208
		49	262	222		533
		(9)	(49)	(42)		(100)

NOTE: t=time Numbers in parentheses are percentages t1, t2, t3 below. The first column of matrices in Table 4 contains the actual t1, t2 transition probabilities for the three need pairs, while the second column contains the actual t2, t3 transitions. It was hypothesized that these matrices would be equal, i.e., that there would be stability among the one-step transition probabilities. Inspection of these matrices revealed no difference greater than would be expected on the basis of sampling error (keeping in mind that the sample size for each such row is much smaller than the total sample size). If there actually is stability among the one-step transition matrices and the observed differences in probabilities are due to random error, then averaging the two observed one-step transition matrices produces a more stable estimate of the population matrix. The third column of matrices in Table 4 contains the average of the two one-step transition matrices for each need pair. Assuming that this matrix is the best estimate of the stable one-step matrix, one can then square this matrix to obtain the predicted t1, t3 transition matrix. The fourth column of matrices in Table 4 contains the predicted t1, t3 transition matrix for each need pair. By comparing the predicted t1, t3 matrix with the actual t1, t3 matrix, one can determine the degree of fit between the model-predicted transition probabilities and the actual transition probabilities. The fifth column of matrices in Table 4 contains the actual t1, t3 transition probabilities for each need pair. A chi-square test was used to test for the goodness of fit between the model-predicted and actual two-step transition matrices. If these two matrices are essentially identical, then the chi-square values computed for each state in the model should be non-significant. These values are the first column of chi-square values (χ^2_A) in Table 4, however, one can see that most of these values are significant. These results disconfirm the Markov chain model.

The diagonal elements of the actual t1, t3 matrices tend to be larger than the diagonal elements of the predicted t1, t3 matrices, i.e., the Markov model systemmatically overpredicts the amount of change taking place among the states. In fact the diagonal entries of the observed two-step matrix appeared to be as large as the diagonal entries of the one-step matrix. Closer examination suggested that there was no systematic difference between the one-step and two-step matrices at all. To check this, another chi-square test was used to test for equality between the actual t1, t3 matrices and the average one-step matrices. These are the values presented in the second column of chi-squares (χ^2_B) in Table 4. All are non-significant.

Misclassification and a "No Change" Analysis

The striking feature of Table 4 is that where the two-step transition matrix is very different from the predicted two-step matrix, it is very similar to the one-step matrix. This clue suggests that there is no change at all. If there were change from time 1 to time 2 and further change from time 2 to time 3, then there would be greater change from time 1 to time 3 than shown in either of the shorter intervals (as is predicted in the squared one-step matrix). Since the change apparent in the time 1 to time 3 matrix is not greater than that apparent in the short time matrices, it suggests that the results are distorted by some artifact. One problem which would create the appearance of change without real change is error of measurement. The generalized need scales had high reliability, but were certainly not perfect. Thus some proportion of the people were misclassified.

Could such misclassification create a pattern of spurious change? Suppose that random errors in the measurements at time 1 falsely placed the person in state 3. Then with very high probability, the errors would be in some other direction at time 2, and the person would be placed in state 2 (or even in state 1). Thus even though there was no true change in the person's state, the error of measurement would falsely register a downward movement from state 3 to state 2. Hunter and Rauschenberger (1978) have written a computer program called MISCLAS which estimated the extent of misclassifications due to error of measurement. Basically, this program uses the mean, standard deviation, and reliability of the difference scores for each of the two need variables composing a need state at each time period, along with the number of need states (three in every instance) and the cutoff scores (used in the decision rule to form the need states) to compute the matrix of transition probabilities one would expect to observe if there were, in fact, no real change in need strengths over time. The first column of matrices in Table 6 contains these predicted one and two-step transition matrices for each need pair, while the

Table 6

Comparison of Predicted and Actual Transition Probabilities Under a No-Change Hypothesis

	PREDICTED			ACTUAL			χ^2
		t1-t2			t1-t2		
	E>R	E=R	R>E	E>R	E=R	R>E	
E>R	.37	.59	.04	.23	.56	.21	(4.32)*
E=R	.09	.66	.25	.14	.55	.31	16.39**
R>E	.01	.38	.61	.05	.36	.59	(0.17)
		t2-t3			t2-t3		
E>R	.41	.56	.03	.28	.59	.13	(4.35)*
E=R	.10	.68	.22	.12	.63	.25	2.92
R>E	.01	.38	.61	.04	.40	.56	(2.29)
		t1-t3			t1-t3		
E>R	.38	.58	.04	.33	.46	.21	(0.62)
E=R	.10	.67	.23	.12	.62	.26	3.02
R>E	.01	.39	.60	.03	.44	.53	(4.36)*
		t1-t2			t1-t2		
	R>G	R=G	G>R	R>G	R=G	G>R	
R>G	.38	.59	.03	.36	.60	.04	(0.15)
R=G	.13	.72	.15	.13	.72	.15	0.02
G>R	.02	.57	.41	.03	.59	.38	(0.44)
		t2-t3			t2-t3		
R>G	.29	.67	.04	.24	.64	.12	(1.07)
R=G	.10	.74	.16	.10	.81	.09	12.35**
G>R	.02	.58	.40	.04	.41	.55	(7.82)**
		t1-t3			t1-t3		
R>G	.26	.70	.04	.23	.71	.06	(0.51)
R=G	.10	.74	.16	.10	.76	.14	1.62
G>R	.02	.61	.37	.05	.53	.42	(0.81)
		t1-t2			t1-t2		
	E>G	E=G	G>E	E>G	E=G	G>E	
E>G	.38	.58	.04	.33	.51	.16	(0.36)
E=G	.09	.64	.27	.09	.63	.28	0.23
G>E	.01	.34	.65	.05	.33	.62	(0.81)
		t2-t3			t2-t3		
E>G	.41	.55	.04	.33	.39	.28	(1.41)
E=G	.09	.66	.25	.11	.62	.27	2.61
G>E	.01	.32	.67	.02	.35	.63	(1.82)
		t1-t3			t1-t3		
E>G	.37	.58	.05	.33	.39	.28	(0.22)
E=G	.09	.63	.28	.10	.60	.30	1.09
G>E	.01	.33	.66	.03	.36	.61	(2.73)

NOTE: Values of chi square in parentheses were tested with 1 d.f. since cells with expected frequencies less than 5 were collapsed, other chi square values are at 2 d.f.

*p < .05
**p < .01

second column contains the actual one and two-step transition matrices. In order to test the significance of the changes in need states, a chi-square test was performed on each row of the one and two-step transition matrices. The 27 chi-square values generated are presented in the last column of Table 6. Only 6 of the chi-square values were significant at $p < .05$ or less and none of them occurred in the existence-growth comparison. There appears to be no consistent pattern of need states or time periods which attained statistical significance. Thus, the results of these analyses generally tend to support the no change hypothesis suggested by the results of the Markov analyses.

Correlational Test for Change

As a more sensitive test of the no change hypothesis, a correlational analysis was performed on the data. This analysis is not restricted by the a priori defined need states constructed for the Markov chain model analyses. The general format for the correlational analysis to follow was developed in a recent article by Tosi, Hunter, Chesser, Tarter, and Carroll (1976). This analysis looks at the relationships between static, dynamic, cross-lag, and impact correlations. Static correlations are those between variables at a given time point. Dynamic correlations are those betweeen the change in one variable with the change in another variable. Impact correlations are between one variable at a given time point and the change over time in another variable. A special type of impact correlation is the "self" impact correlation between a variable at a given time point and the change in that same variable.

The no change correlational model assumes that:

1. There is no real change in true score need strength over time.
2. Apparent change (i.e., the differences between observed and true scores) is a function of some error component which is common to all responses in the questionnaire instrument.

Tosi, et. al. (1976) labeled this component "mood," i.e. some response set employed by a subject when answering the questionnaire. Given these two assumptions, the no change correlational ("mood") model makes the following predictions:

1. All static correlations will be positive because any two need strength variables measured at the same time point will have "mood" (m) as a common component.

2. The static correlations will be larger than the cross-lag correlations because cross-lag correlations don't have mood as a common component as do the static correlations.

3. All dynamic correlations will be positive because any two need strength change scores will have Δm (change in mood) as a common element.

4. Static correlations will be larger than dynamic correlations because static correlations have m as a common element while dynamic correlations have Δm as a common element.

5. All impact correlations will be negative and all self impact correlations will be large and negative because any initial need strength score will have the component m_t, while the change

score for that and other need variables will have Δm ($m_{t+1} - m_t$) as a component. Thus, m_t will act negatively producing a negative correlation.

Table 7 contains the static, dynamic, cross-lag, and impact correlations for the existence, relatedness, and growth need strength measures. The underlined elements in the cross-lag matrices of this table are the one and two-step test-retest reliabilities, while the underlined elements in the impact matrices are the self impact correlations. Notice that the data in this table support all of the predictions noted above, once again indicating support for the no change in need strength hypothesis. The initial prediction of the no change correlational model is that the two-step test-retest reliabilities (r_{13}) should be equal to the one-step reliabilities (r_{12}, r_{23}), i.e., $r_{13} = r_{12} = r_{23}$, for each of the need strength measures. The test-retest correlations presented in Table 7 also tend to support this prediction of the no change correlational model. The average one-step test retest correlation is .49 while the average two-step test retest correlation is .48. Notice that these results are similar to the results presented in Table 4, where it was shown that the actual t1, t3 matrices did not significantly differ from the average t, t+1 matrices.

The no change hypothesis also predicts that there will be no changes in the means and standard deviations for the existence, relatedness, and growth need strength measures over time. However, the data presented in Table 3 showed that there were statistically significant differences in the means over time (t1, t2) and some

Table 7

Static, Dynamic, Cross-Lag, and Impact Correlations for Existence, Relatedness, and Growth Need Strength Measures

	t1			t2			t3			t2-t1			t3-t2			t3-t1		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
E1 (1)	-			53	26	19	51	27	22	-43	-13	-18				-50	-17	-21
R1 (2)	41	-		22	44	16	21	44	32	-17	-52	-34				-20	-59	-28
G1 (3)	38	52	-	23	27	40	20	28	48	-13	-23	-58				-18	-27	-66
	(static)			(cross-lag)			(cross-lag)			(impact)						(impact)		
E2 (4)				-			62	31	18				-50	-11	-19			
R2 (5)				39	-		19	51	32				-26	-57	-21			
G2 (6)				34	48	-	19	23	43				-20	-29	-65			
				(static)			(cross-lag)						(impact)					
E3 (7)							-											
R3 (8)							31	-										
G3 (9)							18	50	-									
							(static)											
E2-E1 (10)										-								
R2-R1 (11)										31	-							
G2-G1 (12)										27	49	-						
										(dynamic)								
E3-E2 (13)													-					
R3-R2 (14)													24	-				
G3-G2 (15)													18	40	-			
													(dynamic)					
E3-E1 (16)																23	-	
R3-R1 (17)																16	38	-
G3-G1 (18)																16	38	-
																(dynamic)		

NOTE: t = time
all correlations based on N = 528 or greater
all decimals have been omitted

slight decrease in the standard deviations of the need strength measures over time, especially from times 2 to 3.

Subgroup Analyses

Additional analyses were performed to see if the lack of support for the model was due to some lack of homogeneity in the sample. Separate analyses were performed for males and females. The results of these analyses lead to the same conclusions. Another set of analyses were performed on subjects' career choices. Three groups were identified: a "work-only" group consisting of individuals who were only working at a full-time job and not going to school; a "school only" group consisting of individuals who were only going to some type of school (four or two year college) and not working; and a group of individuals who were both going to school and working (either part or full time). The conclusions were again the same. Unfortunately, the sample size for non-whites was too small to do separate analyses by race.

DISCUSSION

Measurement of Needs

Maslow (1943) and Alderfer (1972) assert that needs can be grouped on more than semantic grounds, they assert that there is an underlying need structure. Particular needs are aspects of the underlying generalized needs. This implies a strong measurement model for needs, i.e., the cluster analysis model with the particular needs in each set related to a generalized need as congeneric tests are related to a true score.

This model fits the data. Needs were grouped according to Alderfer's (1972) generalized needs, and this grouping fit the data exactly. The cluster analysis showed each need group to be unidimensional and parallel in their relations to other needs measured at the same or other times.

The need clusters met normal psychometric standards with an average coefficient alpha of .73 and a test retest reliability of .49. The average intercorrelation between generalized needs measured at the same time is .53 corrected for attenuation. Thus the generalized needs are sharply distinct from one another statistically. The generalized needs met all tests for convergent and discriminant validity. These results explain why every attempt on the part of researchers to extract uncorrelated need measures using traditional factor analytic techniques met with failure.

The generalized needs defined in this study were adapted from Alderfer (1972), each set of four needs is a subset of the needs used by Alderfer in his work. The fit of the unidimensional model to each such set guarantees that there is a real underlying generalized need for that set. This in turn means that the measurement of that underlying factor is independent of the particular needs chosen to represent that generalized need, only the reliability would vary from one set to another. Thus correction for attenuation is equivalent to using a much larger set of particular needs in each case. The strong cluster analytic results guarantee that the present measures are valid measures of the generalized needs defined by Alderfer (1972).

Alderfer's generalized needs are different from the 5 needs defined by Maslow (1943), and thus the needs defined in the present study are not directly valid measures of Maslow's needs. There is, however, an exact equivalence between Maslow's notion of "belongingness" and "relatedness" as defined in the present study. The "growth" category defined by Alderfer is actually a collapsed category consisting of the set union of Maslow's "esteem" and "self-actualization." However in the present study, the "esteem" need is represented only by the item "self-esteem" which was perfectly parallel to the other growth items. Thus the realization of "growth" in this study appears to be exactly comparable to Maslow's "self-actualization." The one generalized need which cannot be unequivocally linked to Maslow's theory is "existence needs." Is the need for pay, fringe benefits, etc., a representation of

Maslow's "safety" needs? The question which might be raised is this, "What is the money to be spent on?" If the money is to be spent on food, clothing, etc. or if it is to be saved for a rainy day, then the underlying need is probably "safety" as defined by Maslow. However, if the money is to be spent on dating or trips to visit one's family, then the underlying generalized need might be "belongingness."

There is an empirical test of the hypothesis that "existence needs" is an amalgam of other needs, since this hypothesis implies that existence needs should be more highly correlated with other needs than those needs are with each other. The average corrected correlation between relatedness and growth is .69. The average corrected correlation between existence and relatedness is .50 and the average corrected correlation between existence and growth is .40, with a grand average of .45. Thus the correlation between existence and the other needs is <u>lower</u> than their correlation with each other which directly contradicts the hypothesis that existence is an amalgam of other needs.

The conclusion is that either "existence needs" correspond to Maslow's "safety needs" or they correspond to a need not noted by Maslow. In either case, the predictions made about data analyses in this study are identical: existence, relatedness, and growth needs should function as mutually exclusive hierarchical generalized needs.

Need Dominance

Maslow (1943) argues that any given point in time a person will be dominated by one of five generalized needs. That is, one need will be high and the rest will be low. This implies that the correlation between any two needs will be negative. For example, if people were equally spread out among 5 generalized needs, then the correlation between needs would be -.25. If we assume that there are virtually no persons dominanted by physiological needs in this post high school population, then there are only effectively 4 generalized needs and the expected correlation would be -.33.

The data are clearly contradictory to Maslow's assertions. The average correlation between generalized needs is not negative, but positive, average r = .53. In particular the average correlation between relatedness and growth is .69. This finding is corroborated by similar correlations in several other studies (Hall and Nougaim, 1968; Alderfer, 1972; Lawler and Suttle, 1972), and stands as a severe disconfirmation of Maslow's theory.

Alderfer (1972) avoids talking about the extent of mutual exclusion between needs. Yet the development of need states is clearly implied by his change propositions. Before one can desire relatedness needs, one must have satisfied existence needs. Before one can desire growth needs, one must have satisfied relatedness needs. The variable measured in the present study is need strength, i.e., the "importance" of needs. Alderfer's (1972) data showed this to be equivalent to "desire." The question then is what happens to a need which has been satisfied: is it rated as "important" or as "unimportant"? If satisfied needs are rated as "unimportant," then Alderfer's theory would predict mutually exclusive generalized needs just as Maslow does, and hence predict negative correlations between needs. This is clearly counter to the data. Thus if Alderfer's theory is true, then satisfied needs must be rated as "important." This implies that ratings of importance on the three generalized needs must function as a Guttman scale (1944), and the correlation between existence and growth needs should be the product of the correlations between existence and relatedness and the correlation between relatedness and growth. This hypothesis predicts that .40 should be the product of (.50) (.69) = .345. The difference of .055 is only slightly greater than one standard error for N = 500 which is far from significant. Thus the positive correlations between generalized need states is consistent with Alderfer's theory if we assume that people always continue to rate satisfied needs as "important."

If, however, the three generalized needs form a Guttman scale, then the mean for existence needs should be higher than the mean for relatedness needs which should be higher than the mean for growth needs. These means averaged across times are 13.35, 14.34, and 14.46 (on a sclae from 4 to 16) which are in the exact opposite order to that predicted by Alderfer's (1972) theory. Thus neither Maslow's nor Alderfer's concepts of need dominance fit the data in this study.

Change Over Time

The Markov analyses found no significant differences between one-step and two-step matrices and hence suggested that there was no change over time in the states defined. This conclusion was corroborated by a misclassification analysis which showed that the apparent change in the one-step matrices could be accounted for by the less than perfect measurement of the generalized needs. A correlational analysis was performed to obtain a more sensitive measure of change, and the data fit a model of no change as developed by Tosi, et. al. (1976). However, faint traces of change were found in the means, a mean change of .28 (on a sclae from 4 to 16) from time 1 to time 2 and a mean change of .05 from time 2 to time 3. The first change is barely significant even though it is a within subject test with a sample size of 543; the equivalent point biserial correlation is .006.

For Alderfer's theory, the crucial analysis is the Markov analysis. For each of the three need pairs, there were a considerable number of persons who were "dominated" by the lower-order need and hence many of these people should have shifted. The Markov analysis found no trace of such shifts. Thus Alderfer's (1972) dynamic theory was disconfirmed in this data. Similarly, there is no evidence in the data to suggest that when changes did occur, they did so in a hierarchical fashion (i.e., from lower to higher-order needs). Rather, all of the needs increased. This finding is similar to that of Hall and Nougaim (1968) and Lawler and Suttle (1972).

Conclusion

Maslow's (1943) need hierarchy theory has been a dominant theory of motivation in industrial/organizational psychology for some time. Yet almost all empirical evidence has been counter to that theory, and this study is no exception. The high positive correlations between needs clearly disconfirm the need dominance concept which is the logical precursor to the need hierarchy.

Alderfer's (1972) modification of Maslow's theory solves some of these problems but not all of them. The only version of Alderfer's theory which could account for the positive correlation between need strengths also predicted that the need means would be in the exact opposite order from that found in the data. Alderfer's theory also goes beyond Maslow in offering detailed predictions about the path of change over time, but none of these predictions were borne out in the data. Since this study used measurement based directly on Alderfer's own instruments, these contrary results must be taken as a disconfirmation of his theory.

If there is to be a need hierarchy theory which can fit these data, then it must be one which is rather different from those theories currently available.

APPENDIX

APPENDIX

EXISTENCE, RELATEDNESS, AND GROWTH NEED STRENGTH ITEMS, RESPONSE SCALE, AND INSTRUCTIONS TO SUBJECTS

Instructions to Subjects:

Indicate the importance of each of the following items in terms of the job you would like to get. Use the scale below to show how important the items are:

Response Scale:

1. VERY IMPORTANT
2. OF SOME IMPORTANCE
3. OF LITTLE IMPORTANCE
4. OF NO IMPORTANCE

Existence Need Items:

1. Good pay for my work
2. Sense of security
3. Frequent raises in pay
4. A complete fringe benefit program

Relatedness Need Items:

1. Coworkers who will cooperate with me
2. Opportunity to develop friendships with associates
3. Trust between me and my associates
4. Being accepted by others

Growth Need Items:

1. Opportunities for personal growth and development
2. Developing new skills and knowledge at work
3. Opportunity to think and act on my own
4. Self esteem

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