The Mstat-I: A New Measure of an Individual'S Tolerance for Ambiguity

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THE MSTAT-I: A NEW MEASURE OF AN INDIVIDUAL'S TOLERANCE FOR AMBIGUITY*

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This paper describes a new 22-item measure of an individual's tolerance for ambiguity. This new measure is based on a revised construct definition which more comprehensively addresses characteristics of ambiguous stimuli and individuals' reactions to perceived ambiguity. Reliability and convergent and discriminant validity evidence support the psychometric quality of this new measure.

AMBIGUITY is the term we apply to perceived insufficiency of information regarding a particular stimulus or context. Individuals appear to differ in reaction to perceived ambiguity and such differences have played a role in theory and research regarding prejudicial attitudes (Frenkel-Brunswik, 1949), rational decision making (Ellsberg, 1961) and perceptual psychology (Budner, 1962). The advancement of knowledge in these and other fields requires a reliable and valid measure of tolerance for ambiguity.

Widely used measures of ambiguity tolerance have been criticized for psychometric weakness (MacDonald, 1970; Ray, 1988). Conceptual and methodological advances and possibly changes in the way individuals interpret scale items have occurred in the decades since Budner (1962) developed the most widely used scale for measuring

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ambiguity tolerance. This paper describes the development of both constitutive and operational definitions of an individual's Multiple Stimulus Types Ambiguity Tolerance (MSTAT).

Construct Definition

At least three conceptual perspectives on ambiguity tolerance exist. Budner (1962) defined perceived ambiguity as a source of threat and identified three types of ambiguous stimuli: novel, complex and insoluble, i.e., subject to multiple incompatible interpretations. Uncertainty regarding future states of nature was not addressed. Ellsberg (1961) equated ambiguity with second order probability, that is, the degree of certainty with which an individual could estimate the probability associated with each branch of a decision represented in the extensive form. The third perspective, associated with authoritarianism and prejudice, describes intolerance of ambiguity as intolerance of diversity among people (Frenkel-Brunswik, 1949).

A definition of tolerance for ambiguity must separately define and integrate the concepts ambiguity and tolerance. Tolerance/intolerance describes a range of reactions. Tolerance suggests begrudging acceptance; intolerance suggests rejection but, as used here, tolerance extends along a continuum from rejection to attraction. The common feature of any ambiguous stimulus is a lack of information. Ambiguity describes the perception of inadequate information to clearly understand stimuli or their temporal or spatial interrelationships. Ambiguous stimuli may be perceived as new and unfamiliar, unpredictable, or may be too complex to understand. Ambiguous stimuli may also be perceived as having multiple and incompatible interpretations. Tolerance for ambiguity is defined here as a range, from rejection to attraction, of reactions to stimuli perceived as unfamiliar, complex, dynamically uncertain, or subject to multiple conflicting interpretations.

Method

A pool of over 40 items was developed, tested, refined and reduced in number. The resulting set of 22 items (the MSTAT-I) was administered to 148 undergraduate organizational behavior students at a medium sized midwestern university. The MSTAT-I was designed for Likert responses; the seven response anchors ranged from 1, *strongly disagree* to 7, *strongly agree*. Alpha reliability for the MSTAT-I was .86.

Scale Validity

Evidence for the convergent validity of MSTAT-I scores was obtained by administering the MSTAT-I with other ambiguity tolerance measures. The three alternative measures were (reliability, alpha, in parentheses): Budner's (1962) 16-item scale (.60), Storey and Aldag's (1983) 8-item scale (.71), and MacDonald's (1970) 20-item scale (alpha .58).

Nomological network evidence of the validity of the MSTAT-I was pursued by relating MSTAT-I scores to measures of willingness to take risks, cognitive complexity, dogmatism and receptivity to change. Willingness to take risks refers to an individual's aversion to or attraction for risky stimuli (MacCrimmon and Wehrung, 1986). Individuals more tolerant of ambiguity should react less negatively to the uncertain risks of some ambiguous alternatives. Willingness to take risks was measured with a modification of MacCrimmon and Wehrung's (1986) 7-item version of the sensation-seeking scale originally developed by Zuckerman, Kolin, Price, and Zoob (1964) (alpha .36).

More cognitively complex individuals discriminate sensed information into relatively more independent (MacNeil, 1974) and more numerous dimensions (Bieri, 1955). More cognitively complex individuals are better able to manipulate dimensional categorization and gradation of incoming data. Such individuals should react more positively than others to ambiguous stimuli which are complex, unfamiliar or insoluble. Integrative dimensional cognitive complexity was measured with Downey, Hellriegel and Slocum's (1977) modified version of Bieri's (1955) measure (alpha .58).

Change may be characterized by newness, complexity, uncertain consequences or multiple interpretations. More ambiguity tolerant individuals will thus be more receptive to change (Dunham, Grube, Gardner, Cummings and Pierce, 1989). Receptivity/resistance to non-specific changes in an organizational environment was measured with an 18-item instrument developed by Dunham et al. (1989) (alpha .87).

A dogmatic individual has a relatively closed cognitive organization of beliefs and disbeliefs about reality (Rokeach, 1960) and should be averse to ambiguous stimuli which may not fit his or her belief structure. In summary, tolerance for ambiguity will be positively related to willingness to take risks, cognitive complexity, and receptivity to change and will be negatively related to dogmatism. Dogmatism was measured using Troldahl and Powell's (1965) 10-item version of Rokeach's (1960) scale (alpha .68).

Statistical Analyses

A common factor analysis (principle axis components), oblique rotation of the solution and a scree test were chosen to verify the dimensionality of the MSTAT-I. A p-value of .05 or less was chosen as the statistical significance criterion for assessing the correlation coefficients between MSTAT-I scores and scores obtained with the other ambiguity tolerance measures and measures of the nomological network constructs.

Results

MSTAT-I items, factor loadings on the first factor and item communalities are presented in Table 1. Factor analysis supported a single dimensional solution: general tolerance for ambiguity.

Table 2 presents correlations between the MSTAT-I, other ambiguity tolerance measures, and the nomological network construct measures. Convergent validity evidence supports the MSTAT-I. Correlations between the MSTAT-I and the three alternative tolerance for ambiguity scales were positive and significant at $p < .05$. Nomological network evidence for the MSTAT-I was partially supportive. MSTAT-I scores were positively correlated with willingness to take risks ($r = .38, p < .05$) and receptivity to change ($r = .58, p < .05$) and were negatively correlated with dogmatism ($r = -.34, p < .05$). MSTAT-I scores were not significantly correlated with cognitive complexity.

Discussion

A refinement of the constitutive and operational definitions of an individual's tolerance for ambiguity was successfully accomplished. The definition was built on previous interdisciplinary perspectives, more recent theoretical advancements, and explication of the component constructs. The MSTAT-I measures a common reaction to several types of ambiguous stimuli, is purged of stimulus-specific language, and exhibits acceptable psychometric properties for an instrument in the early stages of development.

Some concerns regarding the MSTAT-I remain. Caution is warranted when interpreting findings drawn only from one homogenous sample. MSTAT-I and cognitive complexity scores failed to exhibit the expected relationship. Poor reliability of the cognitive complexity scale (alpha = .58) may help explain this finding. Despite this outcome, the weight of the evidence gathered in this study supports

TABLE 1
Factor Loadings and Item Communalities Derived for the First Factor on the MSTAT-I

	Factor Loading	Item Communality
1. I don't tolerate ambiguous situations well.	.63	.51
2. I find it difficult to respond when faced with an unexpected event.	.48	.46
3. I don't think new situations are any more threatening than familiar situations.	.51	.41
4. I'm drawn to situations which can be interpreted in more than one way.	.38	.35
5. I would rather avoid solving a problem that must be viewed from several different perspectives.	.41	.34
6. I try to avoid situations which are ambiguous.	.61	.44
7. I am good at managing unpredictable situations.	.37	.35
8. I prefer familiar situations to new ones.	.55	.47
9. Problems which cannot be considered from just one point of view are a little threatening.	.40	.27
10. I avoid situations which are too complicated for me to easily understand.	.57	.40
11. I am tolerant of ambiguous situations.	.50	.36
12. I enjoy tackling problems which are complex enough to be ambiguous.	.55	.46
13. I try to avoid problems which don't seem to have only one "best" solution.	.59	.47
14. I often find myself looking for something new, rather than trying to hold things constant in my life.	.34	.38
15. I generally prefer novelty over familiarity.	.40	.40
16. I dislike ambiguous situations.	.84	.73
17. Some problems are so complex that just trying to understand them is fun.	.31	.37
18. I have little trouble coping with unexpected events.	.47	.40
19. I pursue problem situations which are so complex some people call them "mind boggling."	.31	.35
20. I find it hard to make a choice when the outcome is uncertain.	.48	.39
21. I enjoy an occasional surprise.	.18	.22
22. I prefer a situation in which there is some ambiguity.	.56	.48

NOTE. Factor loadings, first factor, appear in parentheses following each item. Reliability, coefficient alpha, for the 22-item scale = .86.

the continued development and use of the MSTAT-I. Future evaluation and refinement of the MSTAT-I may be accomplished by testing other relationships and administering the scale to diverse sample groups.

TABLE 2
Correlations of the MSTAT, Three Measures of Ambiguity Tolerance, and Measures of Dogmatism, Receptivity to Change, Cognitive Complexity, and Sensation-seeking (N = 148)

	1	2	3	4	5	6	7
2	.37*						
3	.36*	.00					
4	.58*	.34*	.25*				
5	−.34*	−.25*	−.19*	−.45*			
6	.58*	.22*	.35*	.33*	−.23*		
7	.09	.02	−.02	.06	−.15*	.11	
8	.38*	.33*	.23*	.30*	−.06	.32*	.01

* $p < .05$.
Legend: 1 MSTAT-I
2 Ambiguity Tolerance (Budner, 1962)
3 Ambiguity Tolerance (Storey and Aldag, 1983)
4 Ambiguity Tolerance (MacDonald, 1970)
5 Dogmatisim (Troldahl and Powell, 1965)
6 Receptivity to Change (Dunham et al., 1989)
7 Dimensional Integrative Cognitive Complexity (Downey et al., 1977)
8 Sensation-seeking (MacCrimmon and Wehrung, 1986)

REFERENCES

Bieri J. (1955). Cognitive complexity-simplicity and predictive behavior. *Journal of Abnormal and Social Psychology*, 51, 263–268.

Budner J. (1962). Tolerance of ambiguity as a personality variable. *Journal of Personality*, 30, 29–40.

Downey, H. K., Hellriegel, D., and Slocum J. W. Jr. (1977). Individual characteristics as sources of perceived uncertainty variability. *Human Relations*, 30(2), 161–174.

Dunham, R. B., Grube, J. A., Gardner, D. G., Cummings, L. L., and Pierce, J. L. (1989). The development of an attitude toward change instrument. Unpublished Manuscript, University of Wisconsin–Madison.

Ellsberg, D. (1961). Risk, ambiguity, and the Savage axioms. *Quarterly Journal of Economics*, 75 (November), 643–669.

Frenkel-Brunswik, E. (1949). Intolerance of ambiguity as an emotional and perceptual personality variable. *Journal of Personality*, 18, 108–143.

MacCrimmon, K. R. and Wehrung, D. A. (1986). *Taking risks: The management of uncertainty*. New York: The Free Press, A division of MacMillan, Inc.

MacDonald, A. P. (1970). Revised scale for ambiguity tolerance: Reliability and validity. *Psychological Reports*, 26, 791–798.

MacNeil, L. W. (1974). Cognitive complexity: A brief synthesis of theoretical approaches and a concept attainment task analogue to cognitive structure. *Psychological Reports*, 34, 3–11.

Ray, J. J. (1988). Cognitive style as predictor of authoritarianism, conservatism, and racism: A fantasy in many movements. *Political Psychology*, 9(2), 303–308.

Rokeach, M. (1960). *The open and closed mind*. New York: Basic Books.

Storey, R. G. and Aldag, R. J. (1983). Perceived environmental uncertainty: A test of an integrated explanatory model. Paper presented at the 43rd Annual meeting of the National Academy of Management.

Troldahl, V. and Powell, F. (1965). A short form dogmatism scale for use in field studies. *Social Forces*, 44, 211–214.

Zuckerman, M., Kolin, E. A., Price, L., and Zoob, I. (1964). Development of a sensation-seeking scale. *Journal of Consulting Psychology*, 28, 477–482.