Q METHODOLOGY AND THE MEASUREMENT OF SELF PERCEPTION

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ABSTRACT: By conceptualizing verbal behavior with self reference as operant behavior, the assumption that self awareness is achieved through observation of self becomes tenable. In this paper we describe a computer psychometrics approach to the measurement of self perception that allows interpretation within the theoretical context provided by Q methodology. The construct validity in support of this approach to measurement derives from philosophical and statistical considerations which are compatible with behavior theory in psychology and quantum theory in physics.

Daryl Bem's self-perception theory (1972) and B.F. Skinner's theory of verbal behavior (1957) assert that individuals achieve self awareness through a process of attribution, where they come to know themselves through experience. In essence, these theoretical positions contend that you acquire know-

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Operant Subjectivity, 1987(Jul), *10*(4), 114-124

ledge about yourself in the same way that you know others--by observing behavior. That is to say, you stand apart from yourself and observe your own behavior as if it were the behavior of another person. If this is so, then an individual's self awareness must be understood in terms of the act of observation. As in science, observations function as the raw material from which models of reality are built.

Both physics and psychology are changing their conceptualization of how theories, or models of reality, are built from observations. Heisenberg in *Physics and Philosophy* (1958) asserts that the laws of nature no longer deal with an objective reality, but with our knowledge of that reality. In this same regard Morowitz (1980) has noted that if objectivity is recognized as a conceptual illusion, then contemporary physics has set itself the task of understanding the contents of the mind. The Newtonian classical mechanics view of causality in a clockwork universe, where the observer stands apart from that which is observed and is thus able to obtain objectivity, has given way to a science of subjectivity where there are no observers, only participants (Bohr, 1958; Zukav, 1979).

Psychology has long recognized the inadequacy of classical mechanics when dealing with problems of perception. William James, for example, defined psychology as the study of mental life. The structuralists, much to their misfortune, used the method of introspection in an attempt to analyze the contents of the mind. Much of Gestalt psychology was an attempt to emphasize the importance of mental life by developing perceptual paradoxes and then focusing attention on the often unexpected behavioral consequences which resulted from these illusions. At a more contemporary level, the work of Richard Gregory has focused on a dynamic approach to the study of perception, where perceptions are viewed as representations of reality and not "samples of reality which a passive theory of perception would maintain" (Miller, 1983:45).

If self awareness is achieved through observation of self, then the importance of conceptualizing the act of observation as a perceptual process is evident. Quantum physics, like phenomenological psychology, has evolved to the realization that not only does the

act of observation affect what is being observed, it helps to make it what it is. Understanding that observations are filtered through perception is also pivotal because it emphasizes the fact that we are dealing with a process and not a product, a process which is both ephemeral and dynamic rather than tangible and as the term self concept would imply.

Even though psychology has recognized the inappropriateness of classical mechanics and the importance of understanding mental life as a perceptual process, relatively little progress has been made toward achieving a science of subjectivity. With perception, as with any process, the significant methodological problem facing the researcher is one of measurement. Rate of responding and resistance to extinction are dependent performance measures which have made it possible to study the process of learning, but no comparable dependent measures have evolved operationalizing self perception.

It is William Stephenson's contention that Q methodology offers a procedure whereby an individual's operant behavior, with self reference, can be used to assess perceptual meaning (Stephenson, 1953, 1980a). Stephenson's Q methodology is a very Skinnerian approach in that it emphasizes description of an individual's on-going operant behavior as opposed to the description of a phenomenon for a more or less homogeneous group of individuals. This is the basic distinction between Q and R methodology (Block, 1955). Using Q methodology, a description of the relative tendency of an individual to behaviorally discriminate or generalize defines subjective meaning. For this reason, the phrase "operant subjectivity" is often used in reference to Stephenson's approach (Brown & Brenner, 1972; Stephenson, 1977). Before considering the specific measurement techniques derived from Q methodology, it is important to understand its significance in the context of both the history of psychology and the theory of probability description in quantum mechanics.

It is often incorrectly assumed that behaviorism rejected the introspective methodology of structuralism. What behaviorism found objectionable was that the structuralists and the functionalists both appealed to hypothetical mental states or initiating agents in an attempt to achieve causal explanation.

Skinner (1981) suggests that this type of mentalism is similar to the error of classical mechanics in that the person is being viewed as the cause of the behavior. In describing the historical development of behaviorism as a philosophy, Skinner (1974) also makes a distinction between radical and methodological behaviorism. The latter is more similar to logical positivism in that mental life is judged to be inappropriate for scientific investigation since there can be no public agreement about mental events. Radical behaviorism on the other hand does not reject the value of self observation or self knowledge: "It restores introspection but not what philosophers and introspective psychologists had believed they were 'specting'..." (Skinner, 1974:14). It is Skinner's contention that while mentalism neglected the importance of antecedent events (genetic and environmental histories) methodological behaviorism went to the other extreme: "...by dealing exclusively with external antecedent events it turned attention away from self-observation" (pp. 14-15).

In addition to being dissatisfied with the mentalism which seemed inherent to the technique of self observation, the early behaviorists were frustrated by an inability to achieve effective measurement, and as a result turned their attention to other areas where measures of behavior were more readily accessible. Interestingly enough, in physics the rejection of classical mechanics (psychology's mentalism) led to a reliance on techniques which are not dissimilar to those of Q methodology: "It happens that factor theory in psychology is the same as quantum theory in physics, both rooted in the same mathematics, and for comparable purposes in the two disciplines alike" (Stephenson, 1980b:97).

The discovery of Heisenberg's uncertainty principle resulted from the realization that Newton's laws of motion do not apply to subatomic phenomena. It is not possible to measure both the position and momentum of a particle. The process of measuring momentum changes the particle's location, and measuring position disturbs its momentum. The more we know about one, the less we are able to determine about the other. Knowing a particle's momentum does not mean its position is unknown--it is unknowable. Stated differently, acquiring certainty about one in-

creases uncertainty regarding the other. Thus, "...there exists an ambiguity barrier beyond which we can never pass without venturing into the realm of uncertainty" (Zukav, 1979:111).

If we are unable to predict with certainty, then of necessity we are restricted to describing the probability of alternative outcomes. Arriving at probability descriptions of reality is the major distinguishing characteristic of quantum physics. In psychometrics, probability description has achieved its ultimate status in factor theory and factor analysis. Simply stated, factor analysis is correlation in more than two dimensions involving a matrix of coefficients which are literally factored, in the same sense that factoring in algebra involves simplifying expressions by removing common multipliers (Gould, 1981). The factors extracted in a correlation matrix can be thought of as metacorrelations which simplify the information contained in a large number of measures to a few dimensions, just as the correlation coefficient describes two dimensional information in a single linear dimension. The sense in which Charles Spearman (1904), the father of factor analysis and Stephenson's mentor, intended these factors to be conceptualized was in terms of the amount of ambiguity reduced or explained by describing the commonality among dimensions (Gould, 1981).

Since the correlation coefficient functions as a descriptive statistic which summarizes information and as a result reduces uncertainty, it is inextricably related not only to probability theory, but to a theory of communication (Brown & Brenner, 1972; Stephenson, 1969). It is Stephenson's contention that in confronting the undeterministic problem of mind we are attempting to acquire knowledge by describing a particular kind of communication--the communication of the individual with self reference. Stephenson's unique contribution is in providing a methodology for achieving such a description: "Personal knowledge, in the final analysis, has self reference. This we can submit to experiment, by providing operant data on self reference in terms of factor theory" (Stephenson, 1980b:98).

Because Q methodology provides a way of measuring subjective meaning we are able to statistically describe an individual's self perception. This is ac-

complished by taking advantage of the fact that human vebal ability offers a rich source of operant behavior (Skinner, 1957) which can be assessed using Q sorts of descriptive adjectives with self reference (Stephenson, 1980a). The Q sort requires an individual's sorting of descriptive adjectives into a Q distribution. This is a quasi-normal distribution which reflects some underlying dimensions, e.g., desirability, or similarity to self. Using the Q distributions which result from sorting the same set of adjectives with varying conditions of instruction, it is possible to obtain a correlational, factor, or cluster analysis of the operant behavior and thus a description of self perception. It is important to emphasize again that the correlations or factor structures which emerge from such an analysis are descriptions of an individual's communication with self reference. As such, they provide information concerning the dynamics of a perceptual process conceptualized as a representation of reality. "The structures are not fixtures of mind, however, but tapping into live experience" (Stephenson, 1980b:101).

Over the past five years we have collected data using a computer administered Q-sort procedure (Knight & Frederickson, 1978; Frederickson & Knight, 1982). This instrument, which is called the Self Perception Inventory (SPI), uses self-descriptive adjectives taken from Anderson (1968) and requires Q sorts for the individual's perception of self, the ideal person, and the most undesirable person. In the remainder of this paper we will describe the computer psychometric considerations involved in developing the SPI procedure.

SPI and Computer Psychometrics

Advancement in computer technology has allowed the development of systems which are particularly attractive with regard to standardized data collection and psychometric measurement (Knight, Frederickson & Martin, 1981). Using mainframe or micro-computers, large databases can be loaded into memory and incorporated with interactive programs which in essence function as the experimenter, giving instructions, randomizing procedures, recording

responses, using multiple data sources for statistical analysis, providing customized printouts, and accumulating data for later reference.

In 1978, we began developing a computer psychometrics procedure for administering Q sorts. In the company of others attracted by the potential of computer technology, we made the fatal error of underestimating the flexibility afforded by the computer in the design of procedures. In reality, our first efforts produced little more than a mechanized paper-and-pencil test. The first version of SPI provided a list of self-descriptive adjectives, labels for each of nine categories ranging from "most unlike" to "most like," and proceeded to ask the subject to first select an adjective and then select the category to which the adjective was to be assigned. The program always used the same 25 adjectives and did not randomize their position within the list or the order in which conditions of instruction for each sort were presented. While this program did improve standardization and reliability for recording data, the procedure was essentially that which would be used by a human under similar conditions. The significant difference between computer testing (i.e., simply using the computer to perform routine tasks) and computer psychometrics results from being able to conceptualize the design of the procedure in terms of what can be accomplished by taking advantage of the computer's memory, which is virtually unlimited, and speed of information processing. The design of the SPI procedure evolved from repeatedly failing to think like a computer. We found ourselves continually writing algorithms which contained procedural instructions reflecting our own limitations. Rarely were we able to anticipate these limitations. Most often we recognized a better procedure only after receiving behavioral feedback from the program user.

Once the design of the SPI procedure was completed we began collecting normative data using approximately 50 computer terminals which are available for student use in the library and computer center on our campus. Our interactive timesharing system is maintained using a VAX 8600 mainframe with Digital Decwriter IV terminals. The account number and password for accessing the SPI program were widely

circulated and used by a variety of individuals in various colleges within the university.[1]

After logging on to the computer system, individuals were asked to give their name, age, and gender, and then instructed that they would be presented with a list of personality and behavioral characteristics and asked to make judgments about them. At this point, the SPI program randomly selects 25 adjectives from Anderson's (1968) norms for 555 personality trait words rated for likeableness. Each time the program is accessed, a different set of 25 adjects is selected. Early on in our research we found that test-retest reliability was unaffected by the specific adjectives used (Knight & Frederickson, 1978). This replicated Hilden (1958) and offers a distinct advantage in that the instrument has, effectively, an infinite number of parallel forms. From the theoretical perspective of Q methodology, the particular adjectives sorted should not make a difference because the meaning of a word is defined by what the individual projects into it. What is being measured is the relationship between various conditions of instruction relative to that projected meaning, not the individual's understanding of the word as assessed using some external criterion. If factor structures are stable, and our data suggest that they are, then they will be reflected in operant behavior regardless of the particular words being used for self reference. An example run from the SPI program, similar to the way it would appear on the computer terminal, is presented in Table 1.

In addition to the SPI program, we have recently implemented a computer administered program called I-SPI (an Individualized Self Perception Inventory) which will allow up to 30 sorts to be performed by the individual in rapid succession. These data are then subjected to cluster and factor analysis, and immediately printed out along with the correlation

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1. We are submitting data from 2,152 administrations of this computer program to *Psychological Documents*. Copies of the complete paper, including these data, can be obtained from Mike Knight, Department of Psychology, Central State University, Edmond, OK 73060-0176.

Table 1
EXCERPTS FROM AN EXAMPLE RUN OF THE SPI

Ask yourself the question, "What am I like?"

1 purposeful	4 admirable	7 skilled
2 overcritical	5 honorable	8 conservative
3 excited	6 indecisive	9 sophisticated
		...etc.

Select 1 characteristic *similar* to *yourself*
What is your selection? 1
You have stated that you are *purposeful* (T,F)? T
Select one characteristic *dissimilar* to *yourself*
What is your selection? 14
You have stated that you are not *disturbed* (T,F)? T

. . .
. . .
. . .

Ask yourself the question, "What would the ideal person be like?"

1 moral	4 conservative	7 excited
2 spirited	5 disrespectful	8 unsporting
3 unentertaining	6 sophisticated	9 honorable

From those remaining, select 4 characteristics *similar* to the *ideal* person
What is your first choice? 7
What is your second choice? 9
What is your third choice? 7
That word has already been chosen
What is your third choice? 2
What is your fourth choice? 6
You have stated the ideal person is *excited, honorable, spirited, sophisticated* (T,F)? T

matrix. What used to require man weeks of effort is accomplished in a matter of minutes. The awesome power of high technology combined with the sensitivity of measurement provided by Q methodology

will, in our opinion, make a science of subjectivity accessible.

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There are two worlds: the world that we can measure with line and rule, and the world that we feel with our hearts and imagination. (Leigh Hunt)