

Two Alternative Epistemological Frameworks in Psychology: The Typological and Variational Modes of Thinking

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It is suggested that variability within psychological phenomena—both inter-individual (synchronic) and intra-individual (diachronic)—is a centrally important characteristic of these phenomena, and should be studied as such. Two modes of thinking that psychologists have followed in their research—the typological and the variational—are outlined and compared. It is argued that the traditions in psychology that have used the typological mode of thinking have guided psychology in a direction that would not afford the study of psychological processes that underlie the phenomena. These traditions have extracted static aspects of the psychological phenomena and disregarded variability within the phenomena as "error" or "chance." As an alternative, it is suggested that the variational mode of thinking about psychological phenomena can be adopted by psychologists. That approach would afford asking research questions that could reconstruct the processes that generate the full range of the occurrence of the particular psychological phenomena under study. The variational mode of thinking affords treatment of psychological phenomena in terms of open systems, in which case the phenomena are conceptualized as being interdependent with their contexts of existence.

Contemporary psychology struggles with an abundance of problems that have interested philosophers for centuries. Perhaps one of the most fundamental issues that psychology has to deal with is variability in the phenomena of the organism and its life world. First, different organisms that belong to the same class (e.g., different specimens in a species) differ from one another in certain aspects while remaining similar in others. Furthermore, an individual specimen of a class—for example, an individual human being—demonstrates variability in thinking and behavior over time. Many aspects of that variability are necessary for adequate and flexible adaptation of the person to dynamically changing environments, mak-

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ing it possible for the organism to develop into a qualitatively new state of its existence. Finally, both different specimens within a class at a given time, and the same specimen from one class at different times, exist in different environmental conditions that can be unique for the particular organism. Since the world around us is inherently variable, psychologists' knowledge cannot capture the centrally relevant aspect of the phenomena under investigation, as long as psychologists dismiss such variability as scientifically uninteresting or as error variance.

The aim of this article is to analyze how psychology treats the issue of variability in its phenomena. This article outlines two alternative epistemological frameworks within which psychologists have tried to conceptualize the variability that is inherent within psychological phenomena. An explicit analysis of these frameworks may help us to clarify for ourselves what kind of knowledge about the world our discipline has constructed, as well as what kind of knowledge has escaped our interest.

Constancy and Change as Complementary Facets of Psychological Phenomena

Any attempt to study psychological phenomena—be it behavioral, introspective, or physiological—is based upon assumptions that determine for the investigator which aspects of the phenomena are important to study. These basic assumptions about the phenomena are inevitably anchored in culture-mediated human activities. The assumptions give rise to decisions of how to examine the phenomenon under study, and what facets to abstract from it. Such assumptions may be present in the thinking of an investigator before the beginning of a particular research project. Cultural socialization—for the psychologist and layperson alike—establishes these basic assumptions. Since the cultural socialization of a psychologist necessarily precedes one's professional education, it is not surprising that psychologists' way of conceptualizing issues for research are isomorphic with the "common sense" epistemology of the given culture. Furthermore, whereas it has been posited that laypersons think as "naive scientists" (Kelley, 1973; Sternberg, Conway, Ketron, and Bernstein, 1981), the reverse—that psychologists are sophisticated laypersons—is also true. Basic axioms about the world that the given culture entertains are carried over from common sense to psychology, both through psychologists' professional socialization (that turns some laypersons into psychologists), and via societal demands that are always being communicated to psychologists by laypersons who want to make some use of the representatives of that mysterious profession.

An example of the influence of basic assumptions about the world that psychologists share with laypersons is the overwhelming emphasis on the

static aspect of the psychological phenomena. In a particular culture, and starting from the use of ordinary language, emphasis is upon capturing the ontological aspect of the world rather than its dynamic/changing aspects. In psychology matters stand in a very similar way. Different static (ontological) aspects of the psychological phenomena are readily abstracted from those phenomena by psychologists, and the instabilities in these phenomena are often treated as "error." The reality, however, from which behavior is abstracted, may of course include both the static and dynamic aspects of phenomena. Obviously, organisms are always in flux, even if, for some time, they retain the appearance of a relatively stable steady state. When organisms exist in steady state, it is quite easy for psychologists to apply to them the ways of thinking that may be adequate for macro-physical systems in their state of relative stability. This application can be further enhanced by the socially (consensually) created reputation that methods taken over from the *hard* science of classical physics help psychology gain the halo of being *hard* as science as well. What human thinking seeks first is to identify the constancy of phenomena, and the changing nature of these phenomena can easily remain unattended to. In psychology we can observe the abundance of concepts used to denote some constant aspect of psychological phenomena (e.g., personality traits, abilities, cognitions, capacities, attitudes, behaviors, etc.) which are aimed at revealing and measuring different aspects of constancy in these same phenomena.

In contrast, the interest towards *instability* of the world as an important and legitimate aspect of knowledge has been quite rare in the sciences. It is in the realm of modern physics (Bohm, 1980) and thermodynamics (Jantsch, 1980; Nicolis and Prigogine, 1971; Prigogine, 1973, 1976) that attempts have been made to understand principles that underlie processes of fluctuation and change in the physical and biological realms of phenomena. Efforts by psychologists to study the reasons for instabilities in their areas of interest have also begun to appear in contemporary psychology (Brent, 1984; Hogarth, 1982; Kugler, Kelso, and Turvey, 1980; Kugler, Turvey, and Shaw, 1982; London and Thorngate, 1981; Shaw and Turvey, 1981; Thorngate, 1974). These efforts, as will be seen below, are made possible when investigators overcome the traditional static view of psychological phenomena and begin to take interest in variability in those phenomena as an object of investigation.

Epistemology of the Static World View: The Typological Mode of Thinking in Psychology

The typological mode of thinking in psychology is characterized by *thinking in static categories* that are considered to constitute the essence of the psychological phenomena. These categories are freed from relation-

ships to temporal or spatial contexts, that is, they are *context-free*. The pervasiveness of seeking essentialistic explanations for behavior through the projection of personality traits, intelligence, temperament, and other constructs, into the mind or behavior of a human being, is a straightforward example of the way the typological mode of thinking functions both in everyday life and psychology. Gregory Bateson (1976, p. 55) has captured this essentialistic projection of typological explanatory categories into the organism:

One habitual error . . . is the trick of drawing a generalization from the world of external observation, giving it a fancy name, and then asserting that this named abstraction exists *inside* the organism as an explanatory principle. Instinct theory commonly takes that monstrous form. To say that opium contains a dormitive principle is no explanation of how it puts people to sleep.

The explanatory "trick" to which Bateson draws attention can be applied in psychology (and common sense) in different forms, all of which remain projections of some labelled generalized knowledge somewhere in the world as if those labels were causal and explanatory in and by themselves. A sample of persons may be found to form different clusters, according to some psychological "personality inventory." The clusters are then labelled, either by a common-sense term (e.g., "easy babies" in temperament, or "securely attached" children, vs. "difficult babies" and "insecurely attached" children), or a technical one (e.g., "g-factor" in intelligence). These labels then acquire causal-explanatory power in the thinking of psychologists (and, quite often, laypersons). Attribution of causal explanatory principles into human beings has been the prerogative of psychology ever since its separation from philosophy. Psychology has historically been concerned with phenomena inside persons, as the phenomena have been separated from the social context (Super and Harkness, 1981). However, such causal-explanatory projections can also be made onto the world that lies outside the person—to the environment, to supernatural agents, etc. For example, attributing causality for crime in a society to some societal phenomenon (e.g., "increase in unemployment") is a "dormitive principle" in Bateson's sense. Such explanations are convenient and, more importantly, intuitively plausible (culturally believable) accounts of the phenomena—accepted by many individuals (psychologists and laypersons alike) as necessary and sufficient for the existence of the phenomenon itself. Such reasoning creates a multiplicity of labelled essences which are treated as causes and have the status of "black boxes," i.e., consensual agreements satisfied by certain kinds of explanations without proceeding with further inquiry (see Bateson, 1972). The set of common-sense concepts that can be used as acceptable labels for naming essentialistic causes is rich in any culture's knowledge base. In

principle, psychologists can at any time draw yet another term from that base to classify and re-classify the complex reality in a slightly novel way. However, the nominalistic nature of that way of establishing knowledge remains the main strategy which a typologically thinking psychologist would use in scientific endeavours.

Examples from psychologists' discourse for such construction of explanatory principles are easy to find. Some psychologists may try to explain an adolescent's aggression towards peers at school through attributing that observable outcome to the "need for destruction," or to the personality trait of "aggressivity." In either case, the labelled essences (needs, traits) are projected into the particular subject. Or, likewise, a teacher may explain that adolescent's behavior by attributing it to "bad education" at home, or to "peer-group influence" at school. In this case, labelled causes are projected into the environment of the hypothetical adolescent. Finally, another psychologist, who may label (sic!) him- or herself "an interactionist," would be tempted to explain the adolescent's aggression through reference to the "interaction" of "aggressivity" and "peer-group influence." All these explanations involve the projection of static causal essences into either the person, or the environment, or into the interaction of person and environment. However, in their epistemological status, these explanations remain within the realm of typological thinking (see Valsiner, 1984a, for a further analysis of different forms of causal attribution in psychology).

Another issue that is symptomatic for the typological mode of thinking is the *assumed constancy* of the causal essences used to explain phenomena. Psychologists, largely following the traditions of classical physics, have attempted to "find" explanations that in themselves are constant, rather than variable. However, psychological phenomena constitute open systems (like all biological phenomena—see Bertalanffy, 1981; Omodeo, 1983), and are therefore constantly in a process of change. This aspect of psychological phenomena makes it necessary for typologically-minded investigators to discount the evidence of instability as unessential for the (static and absolute) "laws" of psychology. Two means are used to reach that goal—averaging and prototyping.

History of Averaging in the Social Sciences: Abstraction of Static Ideal Types from the Flux of Reality

Quantification is the rule in psychologists' reduction of the richness of their phenomena into the data. When the phenomena are quantified (often in epistemologically dubious ways—see Kvale, 1983), abstraction of a static representation of the phenomena can easily be accomplished by the use of averaging. In the course of averaging, individuality of the

particular cases is overlooked, and the average may become the basis for a psychologist's further thinking about the phenomena. Lewin (1933, p. 591) made an astute observation of averaging in psychology:

The statistical method is usually compelled to define its groups on the basis not of purely psychological characteristics but of more or less extrinsic ones . . . so that particular cases having quite different or even opposed *psychological* structure may be included in the same group. Especially to be emphasized, however, is the following consideration: the calculation of an average, for example, of "the one-year-old child," is designed to eliminate the "accidents" of the environment; the determination of the average "situation" . . . is to exclude individual variations. But the very relation that is decisive for the investigation of *dynamics*—namely, that of the position of the actual individual child in the actual, concrete, total situation—is thereby "abstracted." An inference from the average to the concrete particular case is hence impossible. The concepts of the average child and the average situation are abstractions that have no utility whatsoever for the investigation of dynamics.

After the operation of averaging is applied to the data, the investigator is limited to thinking in terms of static, ontological entities that do not afford analyses of any possible dynamic processes in the reality observed. In fact, the static character of the phenomena is often *presupposed* once averaging is performed, and variations within the phenomena studied tend to be treated as "accidents," or "noise" that obscure the "ideal picture" of the supposedly static phenomena. Lewin has demonstrated the connections of averaging with the principles of Aristotelian physics,¹ which define the lawfulness of phenomena through the frequency of their occurrence (Lewin, 1931). The Aristotelian mode of thinking considers frequently occurring events lawful, and things that occur only infrequently are suspected of happening by chance, not by law. Lewin demonstrated that psychology has almost invariably been based upon the Aristotelian notion of lawfulness (Lewin, 1931, pp. 144-145):

The concept formation of psychology is dominated, just as was that of Aristotelian physics, by the question of regularity and indeed of regularity in the sense of frequency. This is obvious in its immediate attitude toward particular phenomena as well as in its attitude toward lawfulness. If, for example, one shows a film of a concrete incident in the behavior of a certain child, the first question of the psychologist usually is: "Do all children do that, or is it at least common?" And if one must answer this question in the negative the behavior involved loses for the psychologist all or almost all claim to scientific interest. To pay attention to such "exceptional case" seems to him a scientifically unimportant bit of folly.

In order to understand the background of the use of averaging in psychology, a short outline of the history of the application of statistics in

¹It has to be emphasized that what is usually called "Aristotelian" thinking by contemporary authors actually applies to a limited sample of the ideas of that Greek philosopher, since Euro-American cultures have selectively accepted different ideas from ancient Greece and modified them (Delbrück, 1971).

the social sciences is in order.

Statistics in the Social Sciences

Statistical methodology emerged from the Platonic and theological philosophy of the Middle Ages. Although it has differentiated itself from that philosophical content directly, thanks to its mathematical nature, some of that philosophical heritage remains hidden within its texture. In the early classical works on statistical philosophy (e.g., in A. DeMoivre's writing—see Walker, 1929) that differentiation was not yet in place. However, by the beginning of the 19th century, for example in Laplace's philosophy, the connection between theology and statistical ideas was no longer directly evident. Indirectly, however, it remained intact—in the form of the emphasis on the belief that, in principle, the world is static in its nature. Laplace, following Jacques Bernouilli, believed that

one may draw this consequence which ought to be regarded as a general law, namely, that the ratios of the acts of nature are very nearly constant when these acts are considered in great number It follows . . . that in a series of events indefinitely prolonged the action of regular and constant causes ought to prevail in the long run over that of irregular causes. (1951, pp. 61-62)

This statement may serve as an adequate perspective for astronomers, whose interest in the movement of planets within the solar system provides them with multiple repetitive observations. However, the transfer of the world view based on "constant causes" to the social or biological realm may be unwarranted. Laplace, however, tended to generalize his world view well beyond the realm of astronomy and physical sciences, thinking that history and the "moral life" of society could also be explained within that view (Hilts, 1973, pp. 209-211).

The aggregation of particular instances in order to reach the approximation of the *true* value of some measure has been the concern of many social scientists ever since Laplace's work, and another 19th-century astronomer, Lambert Adolphe Quetelet, introduced statistical ideas into the study of social phenomena. The operation of averaging became precisely stated and propagated in Quetelet's writings. His emphasis on the "average man" as an ideal type for the particular nation, or for the whole of humankind, illustrates the beginning of inductive essentialism that has benefited from the application of averaging in the social sciences. According to Quetelet (1842/1969; see also Hankins, 1908), the "average man" served as the archetype of perfection, beauty, goodness, and intellect. The "average man" was *the* type around which accidentally caused variations occurred. The status of the ideal type was ascribed to the "average man" axiomatically by Quetelet—largely on the basis of his democratic ideal for

society.

The emphasis on averaging as an operation to arrive at typological essences of social and psychological phenomena received some witty comments from another important figure in the history of psychological statistics, who, incidentally, did not share Quetelet's basic trust in the democratic ideas of society. Francis Galton (1889, p. 62) remarked:

It is difficult to understand why statisticians commonly limit their inquiries to Averages, and do not revel in more comprehensive views. Their souls seem as dull to charm of variety as that of the native of one of our flat English counties whose retrospect of Switzerland was that if its mountains could be thrown into its lakes, two nuisances would be got rid of at once.

Galton, however, did not attempt to replace the typological mode of thinking with a variational one—even though his interest in evolutionary theory did prompt him to pay attention to variability. His explicit goal was to reveal the “wonderful form of cosmic order” (Galton, 1889, p. 66) that rules the apparent anarchy of happenings in the observable world. Laws of that order were to be found in counting recurrent observances as data, and applying statistical methodology to these counts. Galton did not give much thought to the issue of what kind of “laws” can be constructed in this way. He (as well as psychologists ever since his time) did not distinguish *populational* and *individual* perspectives of application of the “laws” (see Valsiner, in press). As a result, many statistical generalizations that may be adequate representations of populations (to which a particular sample belongs), have often become interpreted as also applicable to individuals within the sample (that represents the population). For example—an anthropometric finding that the average height of the *population* of Exwayland is 173 cm can be an adequate (albeit typological!) representation of that population at the given time. Any concrete inference about *individual* Exwaymen and -women, based on that average, is a very difficult task practically, and is unwarranted theoretically. However, such inferences from populations to individuals are habitually made by psychologists and laypersons alike, often on the basis of the halo effect of truthfulness that the application of statistical methodology may introduce into psychological data.

The wide dissemination of statistical methodology in different areas of psychology in the 20th century has directed psychologists towards conceptualizing their research problems within the mindset of the typological mode of thought (Allport, 1940). The present author has analyzed the way data have been presented in tables that belonged to research articles in two child psychology journals (*Child Development* and *Journal of Genetic Psychology*) in 1930, 1955, and 1980. Whereas in 1930, up to 30% of tables included in the journals' volumes for that year presented data on

individual subjects (as well as group statistics), in 1980 individual subjects' data were almost impossible to find. Likewise, summary statistics illustrating variability within samples of subjects studied have become conspicuously less frequent over that 50 year period. This sociological-stylistic tendency illustrates the strengthening of the typological mode of thinking, as the information about variability within samples—a "nuisance" from the perspective of a typologically minded psychologist—simply cannot be found in many published articles, at least in child psychology. From the perspective of the ideas put forward in this article, the decreasing interest of psychologists in the variability of psychological phenomena is judged to be detrimental to the knowledge base of our discipline.

Prototyping in the Establishment of Static Essences of Phenomena

Thinking with the help of categories is a universal psychological characteristic of *Homo sapiens* that is crystallized in the human language. Although boundaries between categories of objects or events may be considered fluid (Wittgenstein, 1953), it has been argued that the typical specimen within a category of objects or events can be specified at least in some abstract form (Rosch, 1978). Prototypes of categories are "... the clearest cases of category membership defined operationally by people's judgements of goodness of membership in the category" (Rosch, 1978, p. 36). As contrasted to averages, prototypes can be thought of in terms of their structure. Thus, prototyping does not necessarily require reduction of the structure of a psychological phenomenon to some quantitative measure that eliminates that qualitative structure from further consideration. However, averaging can be used to arrive at the prototype of a class of objects. For example, let us imagine that we need to find the prototype for a class of "rectangles," a sample of which (including many different specimens of rectangles) is available for measurement. We can proceed to measure the heights and widths of the specimens in the sample, calculate averages for the parameters of the rectangles separately, and then construct the "average rectangle" on the basis of the averages of height and width of all rectangle specimens.

Prototypes can be (and very often are) established on the basis of actions other than averaging, of course. In fact, *assignment* of the prototype status to particular specimens of a class of objects seems to be a most universal characteristic of human thinking. It is a semiotic undertaking—the prototype is established as a sign that becomes the representation of the whole class of objects. The assignment of the prototype status can be accomplished through many different ways, the criteria for

which can often remain unclear. That makes human thinking and communication open to flexibility: prototypes, once established, can be changed if conditions require. The arbitrary nature of coding in language affords that flexibility.

Establishment of prototypes takes place in the thinking of individual persons, which is intertwined with their social discourse. Through individual assignment of prototypicality, there are subtle differences between people in their understanding of the world. Prototypicality is therefore not determined in a universal way. For example, a person may assign the status of prototype to one specimen (e.g., she may consider "John Smith" the prototype of "man"), but her friend may consider another person (e.g., "James Jones") to be the prototype "man." Both these individuals use different criteria to ascribe the prototypic status to the men of their choice, and they might never agree between themselves about which of the two males is "more" a "man" than the other. As human interaction cannot continue endlessly with disputes about ascription of prototype status to phenomena, different socially derived short cuts may be utilized to establish generality of the prototypes. In cultures with historically developed traditions of democracy, voting to establish the prototype status through the dominance of the opinion of the majority over that of the minority is often used for that purpose. Certainly the minority is expected to honor the decision of the majority in these cases, rather than counteract it. This method of establishing prototypicality need not be the only social short cut to establish prototypic generality. In social conditions where one person (or social group) is in a position which involves control over the fate of other persons (or social groups), prototypicality can easily be established and enforced by the person/group in power, using all the methods in society that they control. It is important to understand that neither of these ways of establishing generality of prototypes—voting nor dictation—can be considered objective procedures in themselves. All ascriptions of the prototypic role to some specimen of a class are subjective in their nature—even in cases where all persons agree that the particular specimen is indeed the clearest instance of class membership.

This brings us to one of the basic processes in human psychology where prototyping is excessively used—the *double projection*. The prototype for a category is first established through the first projection—a certain specimen is ascribed the status of the prototype of the whole class. This projection is established through selection of a specimen that fits the whole class best, out of the set of all specimens. After that selection is established, the second projection takes place—*abstract and context-free ideal attributes of the essence of the category are attributed to the prototype*. For example, when a particular chair is selected to be the prototype for the

category of "chairs," the features ascribed to the whole category are attributed to it. In a similar vein, ascription of a given specimen (chair) to the class of "chairs" (e.g., the statement "this is a chair") projects the essence of "chairness" into that particular chair (Miller, 1978, p. 318).

Assumptions about Psychological Phenomena: Homogeneous or Heterogeneous Classes?

The double projection is a psychological mechanism that is used to reduce the variability and fluidity of the world to its reflection in terms of stability. When categorized, the heterogeneity of the world is homogenized. Scientific process thus proceeds on the basis of categorized (homogenized) data which are constructed on the basis of heterogeneous phenomena through processing the latter with the help of the double projection.

Classical physics—the model discipline for much of psychology—is based on a world view that accepts homogeneity of phenomena. The physical world is united: the same laws govern the courses of stars, falling of stones, flight of birds. This unification has been the result of transcending the boundaries of immediately observable (empirical) phenomena, and intuitively feasible explanations, in favor of highly abstract, "pure" cases that are considered under "ideal" conditions (e.g., movement of objects in frictionless environment). Physics has moved forward from the Aristotelian understanding of lawfulness and categories, to the ideal general case of Galileo's object of experimentation. Astronomy has experienced a long series of transformations, from the Babylonians' calculations of the average position of the sun (cf. Gregory, 1981) and the intuitively feasible idea of the geocentric planetary system, to the counterintuitive (but adequate) understanding of the heliocentric nature of the solar system. The history of the physical sciences reveals how understanding of a particular area of reality develops, and at a certain time starts to transcend the limits of everyday experience and common sense. In the physical sciences this transcendence has already occurred. In psychology, that has not yet happened. In our discipline, we continue to rely heavily upon a frequency-based notion of lawfulness, and usually verify the adequacy of our scientific findings using common sense as the criterion.

Perhaps the major obstacle that psychologists meet in their conceptualization of psychological phenomena is the lack of clear understanding about the nature of these phenomena. As opposed to the phenomena of classical physics and astronomy (which may be characterized as closed systems), biological and psychological phenomena are open systems, capable of development. These living (Thom, 1972) and psychological (Gottmann, 1982) systems maintain their existence as structured wholes,

through interdependence with the environment. Given the open systems nature of psychological phenomena, the most central issue for psychology to study is the emergence, maintenance, and dissipation of forms of morphological organization in the behavior of organisms and consciousness of human beings.

The structured nature of psychological phenomena makes it necessary to elaborate further concerning the differences between physical and organic worlds. Elsasser (1966, 1970, 1981) has outlined the basic differences between physical and biological worlds. Physical theory represents its phenomena in terms of *homogeneous* classes. All the members in a homogeneous class are similar to one another. If nonhomogeneity is observed among members of a class of physical phenomena, it can be treated as "error" and averaged out. When phenomena in a given area of science are homogeneous, then general laws in that science apply adequately to all members in the class (Elsasser, 1970, p. 144). For example, all atoms of a kind are considered to be identical. If this is the case, it does not matter which atoms are tested in an experiment—the sampled atoms represent themselves, as well as every other atom. Even the field of quantum mechanics does not alter this picture to any great extent.²

The assumption of homogeneity of classes is not adequate for thinking about biological phenomena, however. According to Elsasser, biological phenomena are better characterized as forming heterogeneous classes. In the case of heterogeneous classes, members of the class differ from one another while still remaining members of the class. This heterogeneity within classes of biological phenomena is due to the open systems nature of these phenomena. As open systems, these phenomena may develop into structurally new forms in the course of their existence, and are therefore always a source for generating intra-class heterogeneity (see Elsasser, 1970, p. 145). In this case, the typological mode of thinking with all its rich traditions rooted in common sense, and mimicking classical physics, may prove quite useless for a psychologist's thinking. Other ways of thinking that could more adequately capture the heterogeneity of psychological phenomena may have to be developed. In the following portions of this article, I outline the basis of one such framework—the variational mode of thinking—and provide a short overview of its existence in the history of psychology.

²Atoms and molecules can exist in different quantum states. The same atom can change from one state to another. Since the state can be altered by measurement procedures which add to the unpredictability of the behavior of the atoms, measurements in quantum mechanics produce probability distributions as results. The probability distributions are based on the behavior of different atoms that all belong to the same homogeneous class. Since individuality of atoms is ruled out by the initial assumption that we are dealing with a homogeneous class, construction of the state probability distribution is possible for the whole class of atoms on the basis of the few measured ones.

Epistemological Framework of a Dynamic World View: The Variational Mode of Thinking in Psychology

The variational mode of thinking treats the inherent variability within psychological phenomena—both within populations (inter-individual variability), and across time within individuals in populations (intra-individual variability)—as the centrally important aspect of the phenomena. Instead of concentrating one's attention on the average or prototypical cases within a class of phenomena, a variationally-minded scientist would treat the *whole range of variation* within the class as an important aspect of the phenomena. The difference in the approaches of the typological and variational modes of thinking were well expressed by the psychologist Raymond Dodge many years ago:

The differences between a science that seeks a relatively stable system of things and their qualities and a science that would investigate variability is not merely that the equations of the latter are more complex. The latter regards the changing complex sub-total of conditions not simply as a changed system, but as a system of changes. The former asks, "What are the unanalyzable elements of mental life? What is a given person's reaction, mental age, or intelligence quotient?", etc. The latter asks, "What are the different consequences of successive stimulation? How is a reaction affected by antecedent and concurrent processes? What are the interactive processes that we call attention, consciousness, and personality?" This is what some of us mean by dynamic or conditional psychology. (1924, p. 265)

Some concrete examples may help to clarify the distinction between the two modes. Let us consider the personality of a hypothetical Mr. X. It can be studied from two perspectives. From the perspective of the typological mode of thinking, a psychologist may try to decide, on the basis of some observations, what is the "true" (typical) nature of Mr. X's personality. Such a typologically-oriented investigator, after finding that during the overwhelming majority of on-spot observations, Mr. X displayed indications of "being extrovert," and only in the minority of cases did he look like an "introvert" person. The psychologist following the typological mode of thinking and using prototypization, would be likely to conclude that Mr. X has an "extrovert personality." But what, then, about these observations that revealed that Mr. X behaved sometimes in ways similar to an "introvert" person? These observations can be easily explained away as being "atypical" for Mr. X, or caused by factors external to his personality, and therefore, unimportant for the establishment of Mr. X's "true" (stable) personality type.

Another psychologist, following the variational mode of thought, would approach the whole issue of Mr. X's personality from a different angle. The psychologist begins from the axiomatic understanding that, dependent upon the circumstances of the environmental settings in which

Mr. X acts, he can sometimes display symptoms of "extroversion" and other times those of "introversion." In other terms—Mr. X's *personality is characterized by variability* that ranges from symptoms of "extroversion" to those of "introversion." Mr. X is neither "extrovert" nor "introvert," but is at times one and at other times the other—in ways interdependent with the set of environmental conditions within which Mr. X lives. For the variationally-minded psychologist, the relevant scientific issue is to find out under what circumstances is Mr. X likely to *change* from one condition to another, and vice versa. The interdependence of Mr. X's personality and his life environment is taken for granted and retained in the analysis of his personality. The emphasis in the research is no longer on "what Mr. X is like," but on "how would Mr. X act under conditions A, B, or C."

At this point in our discussion it is worthwhile to emphasize that the variational mode of thinking is not necessarily foreign to human psychology and common sense. For example, in their everyday lives, children very quickly learn to understand under what conditions their parents may change from their praising/rewarding mode of acting into a punitive/restrictive mode, and how that change can be triggered (or avoided) by something the child does (or refrains from doing). Under conditions of cohabitation, a husband and wife learn how to live together: under what conditions the other may become happy or unhappy, frustrated or satisfied, generous or unkind. Again, simple typological knowledge (e.g., the wife knows that her husband is "generous" in his personality and the husband considers her to be "happy" in her marriage to him) can obscure the intricate psychological processes that help both of them to live with each other. In reality, people tend to use the variational mode of thinking in solving some of their everyday problems—even if they may talk about their life using typological terminology.

Nor is the variational mode of thinking foreign to psychologists in their research. Even though efforts at studying the relevance of variability of psychological phenomena have been rare, these efforts have nevertheless been noteworthy in the history of psychology. A brief examination of this history reveals that explicit attempts to deal with the variability issue were occasionally attempted. For example, Edwards (1928) defined intelligence on the basis of variability of behavior that was supposed to create the basis onto which successful and creative problem-solving could be built. Duffy (1941) emphasized the role of behavioral flexibility in human adaptation. Empirical research on the behavior of psychologists' beloved animal model—the rat—revealed the existence of variability in the behavior of those laboratory subjects, and demonstrated the relevance of that variability for adaptation to the alternating conditions of the mazes (Elliott, 1934; Hamilton and Ellis, 1933; Krechevsky, 1933, 1937a,

1937b, 1937c). These efforts by a few psychologists never had an overwhelming effect on mainstream thinking within psychology, which has remained closely dependent upon the culture and common sense of psychologists. That dependence is a powerful force that has guided psychologists into the realm of the typological mode of thinking and away from problems of treating the issue of variation within psychological phenomena.

The Variability of Psychological Phenomena and their Context

Since the variational mode of thinking in psychology is built upon the understanding that psychological phenomena constitute open systems, the system's interdependence with the context is of decisive importance for its existence. Therefore, the variational mode of thinking has to include the context within which variability exists in the analysis of psychological phenomena.

Interest in the environmental context of psychological phenomena is not new in our discipline (see Buss, 1978). From time to time psychologists have turned to the environment of their subjects to look for explanations for some psychological issue. However, very often that environment is looked upon as a causal agent, rather than as the context in which the acting subject is inevitably interdependent. This interdependence can produce a variety of particular (observable) instances of a psychological phenomenon, each of which is intrinsically organized (see Bohm, 1980, for an analysis of the meaning of intrinsic organization).

The variational mode of thinking is capable of capturing the whole range of variability within a psychological phenomenon, as its specific instances are observed. However, in order to construct psychological theories that would explain the existence of the full range of observable instances, new concepts that would fit with the variational mode of thinking must be developed. In this article I point to one such theoretical possibility. It is possible to consider the variability in the phenomenon (be it behavior or cognition) together with the *constraints* that the environmental context sets upon that variability. In other terms, variability within a phenomenon is not the essence of the phenomenon in itself, but is scientifically meaningful when viewed together with the system of person-environment relationships that generates that range of variability. An illustration may clarify the importance of this statement. Consider the case of normal distribution: an empirical phenomenon that occupies an important position in psychologists' thinking and serves as justification for different manipulations of the data. Usually we consider the normal distribution as a general characteristic of phenomena in nature and society. As a distribution, it clearly captures the whole observable varia-

bility of a given phenomenon. In psychology the crucial question—*what are the characteristics of a system that generates normal distributions* in the case of a particular psychological phenomenon?—is very seldom asked. The lack of interest in that question is a natural result of outcome-oriented psychological theorizing, which cannot reveal how psychological processes function (see Werner, 1937). However, it is exactly that question—how (by what systemic conditions) are distributions (normal and non-normal) of psychological phenomena generated?—that psychologists should try to ask, and answer, if our discipline is to develop towards greater scientific adequacy. Or, to put it emphatically, normal distributions that are observed in psychological research themselves need explanation.

A possible manner in which psychological theories can take the variability in the phenomena into account is to utilize concepts that would specify the boundary conditions that limit the total range of possible variability in the phenomena. An example of how that has been accomplished in the history of psychology is again taken from the work of Lewin. Lewin provided conceptual grounds for capturing the constraints on possible variability of behavior:

The first presupposition for the understanding of the child is the determination of the psychological "place" at which the child concerned is, and of his *region of freedom of movement*, i.e., of the regions that are accessible to him and of those regions that psychologically exist for the child but which are inaccessible to him by reason of the social situation (prohibition by the adult, limitation by other children, etc.) or because of the limitations of his own social, physical, and intellectual abilities. Whether his region of freedom of movement is large or small is of decisive significance for the whole behavior of the child. (1933, p. 598, italics added)

Although in this quote Lewin speaks directly of children, his suggested concept of the *region of freedom of movement* within an organism's life space is of wider application (see Cartwright, 1959, for an overview of applications of Lewin's conceptual framework in psychology). Region of freedom of movement is defined by the *boundary conditions* that limit the variability in acting or thinking which is available for a given person at a given time and in a given setting. Within the region of freedom of movement we can observe variances of acting or thinking by the given organism. Information about the whole range of observed variability in behavior (i.e., the *actual* range of variability), together with additional information about the context (i.e., the boundaries of the region of freedom of movement, or *possible* range of variability), would serve as a basis for constructing scientific models that explain how the organism functions within its environment. Furthermore, as a result of the organism-environment transaction, the boundaries of the range of freedom of movement are constantly re-defined, so the behavioral variability of the active organism can lead to the widening of the range of freedom of

movement.

However, very often it may be the case that the observed behavioral variability of an organism constitutes only a small portion of its possible range of variability (range of freedom of movement). That "unused but available" portion of the range of freedom of movement constitutes a resource for the organism. From psychology's perspective, however, it constitutes an epistemological difficulty for which our conceptual systems are poorly prepared. Psychology has traditionally emphasized information about phenomena that have been observed (have occurred), and has not paid much attention to those phenomena that *could* occur, but do not. In other words, psychology has tried to predict future phenomena (behavior, thought) on the basis of what has actually taken place. This perspective creates a paradox for our science: on the one hand, our subjects can be expected to create *new* psychological phenomena (e.g., behave in novel ways or start thinking in new ways), but our efforts to predict or explain novel events are restricted to the actual occurrence of past events. We assume that history repeats itself, for example, in the way that a computer program can be re-run and predicted to perform the function for which it was created. Contrary to that assumption, our subjects constantly come up with psychological innovations for which there has been no precedent in their previous behavior or thinking. These innovations illustrate the case of increasing variability of the phenomena (e.g., if an organism in a certain situation has always behaved in a fixed set of ways in the past, and at a certain time adds another behavior to that "repertoire," then the variability of the *actual* behavior has increased). A variational mode of thinking, together with an emphasis on the existing outer boundaries of possible variability, can serve as the basis for a scientific explanation of the psychological possibilities for future actualities in behavior. In contrast, the typological mode of thinking in psychology is unlikely to serve adequately as the conceptual basis for future-oriented psychological explanations.

It can also be the case that the boundaries of the region of free movement of an organism are narrower than the organism's actual behavioral variability range. In this case, these boundaries suppress the actual behavioral variability by reducing it into a narrower range than it would have occupied without such narrow definition of the range of freedom of movement. Everyday life in every society provides numerous examples of how the range of freedom of movement is changed for some people by others, in order to regulate life in that society. Criminals sent to prisons by courts obviously live through a dramatic narrowing of their region of freedom of movement. However restricting that change may be for them, some prisoners experience difficulties of adjustment to the widening of their region of freedom of movement when they are released after serving

their sentences. Ordinary persons in their everyday lives construct restrictions on their regions of movement themselves (e.g., by devising new social conventions, or policies regulating previously unorganized domains of life) so that the difficulty of making choices out of too great a number of options can be reduced. Contrary to the basic assumption in contemporary environmental psychology—that people work towards maximizing their freedom of choices in their environments (see Proshansky, Ittelson, and Rivlin, 1972, p. 32)—the reality of human lives seems to tell us the story that sometimes maximization of that freedom is sought, but at other times that freedom of choice can be purposefully reduced so that the organism can function more adequately in the given environment. In that respect, Krechevsky's (1937a, 1937b, 1937c) experiments with rats' behavior in mazes of different complexity are instructive. He found that rats with brain lesions—which were expressed in behavior by reduction of their variability of behavior—performed *more* successfully than normal rats in *less complex* mazes. In the case of more complex mazes, however, the normal rats (with higher variability in behavior) were observed to perform better than brain-lesioned rats. In this respect, variability in behavior can set the stage for *flexibility* in the particular organism's adaptation process to environmental conditions that demand solving problems in complex environments. In contrast to variability-as-flexibility, the lowest possible variability condition in behavior—stereotypic repetition of the same behavior—provides no space for changes in the *status quo* of the organism, and can be highly nonadaptive when environmental conditions change. Ironically, for much of the typologically-oriented psychology of the past, it is the instance of low variability (maximum behavioral constancy and predictability) that has been cherished as an ideal state for our science—which is proclaimed to aim at "prediction" and "control" of behavior! Stereotypic behavior (and thinking) is indeed highly predictable from the point of view of the psychologist, but is of low value for an organism who has to confront its constantly changing life environments. The variational mode of thinking can conceptualize behavioral adaptability of organisms, whereas the typological mode of thinking provides very few possibilities for treatment of adaptation.

The Variational Mode of Thinking and the Study of Development in Psychology

Out of different disciplines in biological and psychological sciences it is those disciplines which explicitly set out to study *development* in their phenomena (developmental biology, developmental psychology, etc.) for which the variational mode of thinking is the most relevant. Development, in its most general sense, is the process by which new forms of

organization of a phenomena emerge from those that preceded them in time. Development always implies *morphogenesis* (a systematic change in organizational form), *generativity* (each structure involved in a developmental process is an active agent in the process of generating new structures), and *creativity* (systematic innovative changes in organization are involved, see Brent, 1984, pp. 155-156). It is not possible to study development using conceptual systems that are not suited for capturing the moment of change in the phenomena studied. That means that the typological mode of thinking is antithetical to the goals of developmental psychologists who try to understand how developmental processes are organized.

Even in developmental psychology there are not many examples of how development could be conceptualized on a non-typological basis. A number of developmental psychologists (Piaget, 1977; Vygotsky, 1978; Werner, 1937) have emphasized the need for studying the *process* of development contrary to the widespread tradition of looking at *outcomes* of these processes (e.g., children's scores on achievement tests) only. The problem for many developmental psychologists has been (and remains) how to conceptualize these processes of development.

The variational mode of thinking may serve as a convenient basis for the theoretical needs of developmental psychologists. First, the emphasis on the whole range of variability as it is observed in an organism, and how it relates to what is available for the organism, can serve as a basis for constructing a developmental theory. Vygotsky's emphasis on the "zone of proximal development" [ZPD] (see Vygotsky, 1978, pp. 84-91) can be seen as a step in that direction. The ZPD ". . . permits us to delineate the child's immediate future and his dynamic developmental state, allowing not only for what already has been achieved developmentally but also for what is in the course of maturing" (Vygotsky, 1978, p. 87). Although Vygotsky himself does not emphasize the role of variability of behavior and thinking in child development directly, his concept of ZPD implies the existence of a set of functions that are in the process of moving from the realm of what is possible into the domain of what is actual in the child's psychological functioning. In another context (see Valsiner, 1984b), I have attempted to further develop Vygotsky's concept of ZPD by integrating it with the ideas concerning the role of *bounded variability* of psychological phenomena in child development. The emphasis in psychological theory on boundedness of variability in behavior and thinking would move scientific discourse in the discipline from the typological to the variational mode of thought. Furthermore, such a move can provide the tools for conceptualizing psychological phenomena that are not yet observed in the case of a developing organism, but if conditions afford, will develop sooner or later in the life course of that organism.

Concluding Remarks

This article outlined two modes of thinking in psychology—the typological and the variational. The first of these types extracts the moment of stability from the psychological phenomena and attempts to explain these phenomena in their ideal (average or prototypical) cases. The second mode takes the whole range of variability within the phenomena into account and tries to explain that variability as it constitutes a lawful phenomenon. The two modes are approaching psychological phenomena from opposite perspectives—what is “error” or “irregularity” for the first constitutes the target phenomenon for the second, and vice versa.

For its entire history, psychology has followed the lead of classical physics in setting its methodology onto scientific grounds (Haslerud, 1979). However, the open systems nature of psychological phenomena has been largely overlooked by psychologists. That nature does not warrant elimination of variability of behavior and thinking from consideration as irregularity, but instead highlights variability as one of the central targets for psychological explanation. This article outlines the need for adopting the variational mode of thinking in the context of an open-systems perspective on psychological phenomena. Certainly there exists a multitude of ways psychologists can benefit from taking the variational perspective in their research. It was argued that this mode of thinking is particularly useful for developmental psychology, but can also provide fresh insights for psychologists interested in adequate conceptualization of any psychological processes.

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