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Fundamental Principles of Brunswik's Representative Design

Mainly between 1941 and 1955, Brunswik developed the basic outline for a completely new design on how to conduct experiments, which he called Representative Design (Brunswik, 1943, 1949, 1952, 1955, 1956a, 1956b; 1966). He used this new approach in experiments in the psychology of perception, mainly in experiments regarding object constancy. Representative Design is the generic term for methodological procedures in which information regarding human behavior is gained mostly from investigating individual behavior the variety of natural situations in which the individual functions. The focus of this approach is not individual differences, but rather the question of how a single human being copes with a representative, but rich sample of the ecology (or environment) around him.

As part of this new design, it was important to grant these situations and the environment an adequate position. By emphasizing this situation-oriented representation, however, Brunswik did not question the approach of person-oriented representation in general. He attributed a high value to this traditional approach which is closely connected to the field of differential psychology.

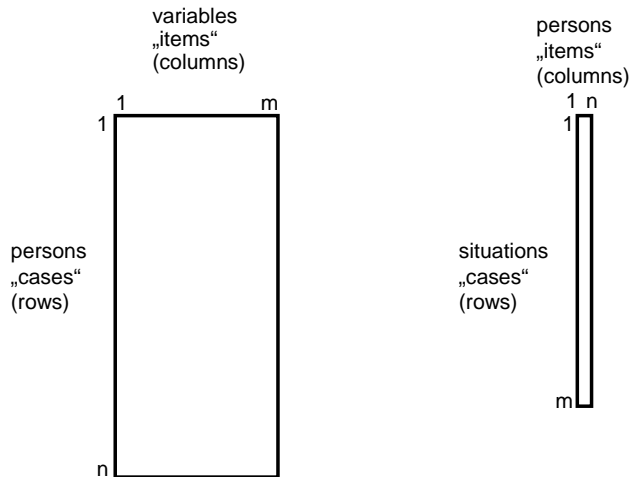
The novelty of Representative Design can be seen in the abandonment of the practice of drawing samples involving a large number of persons. This practice had been customary in the field of psychology and was taken for granted due to a one-sided reference to classical statistical theory. In Representative Design, only a few persons are usually involved, while drawing a sample from a varied and extensive array of situations is given priority. This is a goal if only a small number of persons (or even only one) are analyzed. This different formal approach is supposed to enrich research into the question of "How does the human being cope with the ecology?"

The renunciation of an extensive person sample in favor of a large situation sample, which is diverse and representative with regard to the ecology, does not require single case analyses, however. The consideration of only one human being depicts an extreme case which in Representative Design is possible, but representative designs involving multiple persons are possible.

The central feature of Representative Design consists in a turn of the viewpoint through 90° with regards to the samples of subjects and situations. The data matrix traditionally used in psychology has rows based on a large person sample, and on columns based on a situation sample which is small to medium size. Representative Design, by contrast, puts in its rows great emphasis on a sample of situations rich in information, concentrating on

a small number of persons (or even only one) in the columns. These different structures of samples can be illustrated in figure 1.

Figure 1: Classic and Representative Design – Ideal cases



Already in an early American publication (his contribution to the famous Brunswik-Hull-Lewin-symposium at Chicago, 1941) Brunswik (1943, p. 262-263) explains the formal procedure of Representative Design:

"In particular, the extension of the principles of such an instrument as correlation statistics from individual differences to stimulus-response relationships involves, firstly, that instead of correlating two variables (e.g., different test performances), paired by being drawn from the same sample of individuals characterized in their structure and functioning only as members of a general reference population, one would have to correlate two variables (namely, a set of stimulus values and a set of response values) paired by being drawn from the same sample of situations or tests, characterized merely as belonging to the class, or 'population', of living conditions of a particular individual (or category or species). In short, individuals are replaced by situations or tasks (which is to be distinguished from the mere exchange of the role of individuals for tests as in Stephenson's 'inverted' correlation technique). The achievement of a single subject, or even of a single subject in a certain particular attitude, could then be represented by a correlation coefficient based on a variety of test situations involving the stimulus variable in question.

To make the analogy complete, one would, secondly, have to insist on representative sampling of situations or tests, just as in the field of individual differences one has to insist on the representative sampling of individuals from a population to ascertain at least some kind of generality for the result. Proper sampling of subjects is thus replaced by proper sampling of objects or objectives. For general adjustment this would mean a randomization of tasks, a sampling of tests carefully drawn from the universe of the requirements a person happens to face in his commerce with the physical or social environment, as the defining class.

According to Brunswik, the introduction of situational representation in studies is connected to the expectation of getting information about the process and the structure of the organism's ability to adapt to the surrounding ecology. With the situational representation, this adaptation should be possible more easily than with traditional methods. When the results of Representative Design are evaluated, the statistical methods of the traditional research designs could be used within the new strategy.

"To obviate the intrinsic shortcomings of the artificial, 'systematic' designs of which factorial design is but an elaborate case, I have advocated that in psychological research not only individuals be representatively sampled from well-defined 'populations' but also stimulus situations from well-defined natural-cultural 'ecologies'; only by such representative design of experiments can the ecological generalizability of functional regularities of behavior and adaptation be ascertained. Representative sampling of situations from the ecology allows us to take cognizance of the occasional major failures that result from the fallibility of perceptual cues or behavioral means while at the same time fully recognizing the favorable cases also. Generalization of the achieved degree of success to the ecology as a whole becomes possible with the use of the routine technical criteria for sampling statistics hitherto confined to differential psychology." (Brunswik, 1956b, p. 159).

The following quote shows that one can arrive at statements on how the organism is functioning by means of a large situation sample:

"According to the much-stressed requirement of 'representative sampling' in differential psychology individuals must be randomly drawn from a well-defined population; in the same manner, the study of functional organism-environment relationships would seem to require that not only mediation but especially also focal events and other situational circumstances should be made to represent, by sampling or related devices, the general or specific conditions under which the organism studied has to function. This leads to what the writer has suggested to call the 'representative design of experiments'." (Brunswik, 1952, pp. 29-30).

Representative Design also gives us insight into the "achievement" of human beings. The following quote points also to the usefulness of classical statistics under the new perspective, and to the wide variability in the samples of the environment with regard to how the organism processes information.

"Representative sampling of situations. As we cannot possibly hope to encompass the entire population of individuals in research, but must sample representatively, we must sample instances in the study of functional achievement. Taking the cue from differential psychology, we may transfer the entire formal statistical instrumentarium developed in the study of personality to functional problems as a new content. This will assure, to any desired degree of approximation, a balanced view of psychological function as it comes about by a synopsis of performance under comfortable conditions, manageable vicissitudes, and a due proportion of risks or well-nigh insurmountable odds.

In terms of experimental design there results a combination of constraint and license in which the experimenter is in no more than supervisory control over the adequacy of sampling. There will be a limited range and a characteristic distribution of conditions and condition combinations. If in this manner psychological experiments take on the character of statistical surveys, we may speak of 'representative design'. " (Brunswik, 1955, pp. 198-199)

In a critical analysis, "Representative Design" is differentiated from "Systematic Design" (Brunswik's terminology), which is characterized in more detailed by terms such as "nomothetical ideal" and "traditional experimental psychology". Even approaches like the "multivariate design" or the "more complex analysis of variance" (by Fisher), which at the time of the Berkeley period of Brunswik seemed new and modern, can only be seen as further developments of a basic assumption which was in need of change. Systematic design, with its search for regularities and strictly experimental arrangements which are designed to eliminate any source of friction, leads to artificial, perfect connections or perfect separations of variables. This is, according to Brunswik, not in accordance with reality. Instead of searching for general laws, Representative Design calls for an analysis of a natural environment, a goal that can not be accomplished by using the traditional experimental designs (see Brunswik, 1943, pp. 262-263; 1955, pp. 194-197, and 202-203; 1956b, p. 159).

Most importantly, the Representative Design is not an isolated formalism, but instead an integrated part of his theory, "probabilistic functional". Brunswik needed Representative Design because the systematic design was too narrowing, channeling, and did not clearly show the essential feature of how human behavior functions. If the process feature "vicarious functioning" is of crucial importance for human behavior, as Brunswik believed, then research needs a formal approach, such as Representative Design, that permits the subject to display such "vicarious-functioning processes" and to enable a closer connection to real life. In addition, such a formal approach must give justice to the probabilism of the mediation processes. Representative Design is the key to an adequate behavior analysis. If one uses Brunswik's process feature of the lens model as a basis, then Representative Design leads the way in order to analyze both how the rays of the lens branch out, and how the lens is also able to focus on distal objects (compare Brunswik, 1952, pp. 26-27, and 29-30; 1955, p. 193 and p. 216).

In the following statement, Brunswik tries to demonstrate the advantages of Representative Design compared to the systematic design when trying to explore how the organism functions:

"By the extension of the principle of sampling from individuals to situations, representative design countermands a number of preconceived methodological notions of nomothetic experimentation. ... It further countermands the more general inclination to design experimental research in accordance with formalistic- 'systematic' patterns which are too narrow to bring out the essentials of behavioral functioning although they may involve a shift to 'multivariate' or to Fisher's 'factorial' design" (Brunswik, 1952, p. 30).

Representative Design is so valuable because the research is conducted in the human being's normal, familiar environment, rather than in artificial arrangements as can be found in classical experiments. Brunswik expresses this referring to the familiar ecology in the following sentence:

"'Representative design', that is, a large sample of everyday situations drawn from the ecology of an adult subject" (Brunswik, 1966, p. 489).

The following statement by Brunswik further explores this idea by establishing a connection between the two concepts of "vicarious functioning" and "molar adaptation" and the overall theory; he also explains the notion of a closer proximity to reality by introducing three specifying terms:

"The call for unrestricted vicarious functioning in studying gross behavioral adjustment ... injects a new element into the discussion of these issues. It is the requirement of normalcy, naturalness, 'closeness to life' (Lebensnähe), or, with a more methodological slant, that of 'situational representativeness.'" (Brunswik, 1952, p. 29).

Representative Design is a formal approach which lays the basic foundation for adequate research on how the human being interacts and copes with its environment. In order not to distort the results, the researcher should not interfere with or manipulate the ecology but accept it as he finds it. This notion contrasts the role of the classic researcher. With reference to the overall theory of probabilistic functionalism, Brunswik states:

"A program of functional research demands that [the situational instances in an ecology] must be left as they come. We must resist the temptation of the systematic experimentalist to interfere, and must introduce a laissez-faire policy for the ecology". (Brunswik, 1955, p. 198).

The reserved role of the researcher with regard to the ecology ensures that the naturalness of the environment is preserved.

"In controlling vicarious mediation, care must be exercised not to interfere with naturally established mediation patterns. These aspects of mediation must therefore be controlled 'passively', that is, be studied in a permissive laissez-faire manner with respect to their free dynamic flow; there must be deliberate neglect of 'active' control at least up to a certain point, despite the fact that the conditions involved either are definitely known to be relevant or at least potential mediators bridging the gap from one focus to another." (Brunswik, 1952, p. 26-27).

Brunswik doubted whether his methodological program of Representative Design would be widely accepted by the scientific community. In the following quotation, he is disappointed and emotionally engaged:

"The present writer has in himself experienced the required shift of emphasis as very slow going and hard to maintain, especially so far as consistent concrete application is concerned. The difficulties he encountered in explaining his point, after he had succeeded in establishing a bridgehead for himself in abstract terms and in a few concrete examples, have given him the impression of resistances approaching in intensity those encountered in the opening up of emotionally highly loaded topics, such as those dealt with in psychoanalysis. Indeed, the deliberate abandonment of 'systematic' policies, especially where such policies are technically feasible, in favor of statistical practices which by comparison seem slovenly, must on the surface seem to violate one of the most fundamental taboos developed in the traditional ideology of the 'exact' sciences. Even those among the researchers who are relatively unburdened by established intra-mural routines and to whom we are indebted for first tackling the problems of social perception on an inductive basis have not always felt the need, in their research practices, of paying to the sampling of social objects an attention they would, as a matter of course, pay to the sampling of judges. In the typical case, they have a pitifully small ecological N to go with a populational n of adequate size." (Brunswik, 1949, p. 179-180 or, 1956a, p. 39-40).

The establishment of representative procedures must be a priority task for our future research in the tradition of Brunswik's probabilistic functionalism.

(Note: See Dhami, Hertwig, and Hoffrage, 2004 for a discussion of the use of representative design in studies of cognition. A list of papers reviewed for their article can be found on the at <http://www.brunswik.org/resources/RepDesignRefs.pdf>.)

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