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Puzzle-solving in psychology: The neo-Galtonian vs. nomothetic research focuses

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ABSTRACT

We compare the neo-Galtonian and nomothetic approaches of psychological research. While the former focuses on summarized statistics that depict average subjects, the latter focuses on general facts of form ‘if conditions then restricted outcomes’. The nomothetic approach does not require quantification as a convenient way of statistical modeling. The nice feature of a general fact is its falsifiability by the observation of a single case. Hence, as a clear sense of scientific error is re-introduced in the research paradigm, we detail two kinds of puzzle-solving: repairing general facts by contraction or by expansion of the initial conditions. This style of research does not require that researchers depend on highly skilled engineers in data analysis, as the very structure of a general fact can be established by scrutinizing a contingency table.

The present article contrasts two research focuses in Psychology. As these research focuses define two classes of goals, we will call them paradigms. The first one has been called neo-Galtonian by Danziger (1987, 1990) and is most generally used in mainstream methodology in psychology, while the second one can be properly called nomothetic, as argued by Lamiell (1998) and Vautier (2011, 2013), and constitutes a blind spot of psychological research. Let P_1 and P_2 denote neo-Galtonian and nomothetic research, respectively. To describe concisely these two paradigms, the mathematical concept of a relation will be useful.[1] A (binary) relation from a set A on a set B is defined by a set of ordered pairs (a, b) such that a is in A ($a \in A$) and b is in B. (This set is called the graph of the relation.)

Whereas the P_1's researcher is used to being satisfied with relations that emerge from aggregates of persons but are logically irrelevant to depict phenomena at the scale of single persons (see, e.g., Danziger, 1987; Krause, 2011; Lamiell, 2003, 2013; Molenaar, 2004), the P_2's researcher inspects the same data to discover a special case of relations, what Vautier (2013) calls general facts, which are, by definition, true for any person. As depicted in Fig. 1, an easy to spot difference would be that, whereas P_1 focuses on expected point-values, P_2 focuses on a necessary set of values. P_1's slogan may be expressed as follows:

$$Y = f(X) + E, \quad (1)$$

where Y is the dependent variable, X is the independent variable and describes initial conditions, f is a function of these conditions, and E denotes a random component that obeys a convenient probability law. The crucial concept

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[1] According to French philosopher of science Gilles-Gaston Granger (1995), “Scientific knowledge based on experience always consists of constructing schemas or abstract models of this same experience and uses the relations between the abstract elements of these models to deduce–through logic and mathematics–properties that correspond with sufficient precision to directly observable empirical properties.” (p. 95, authors' translation).

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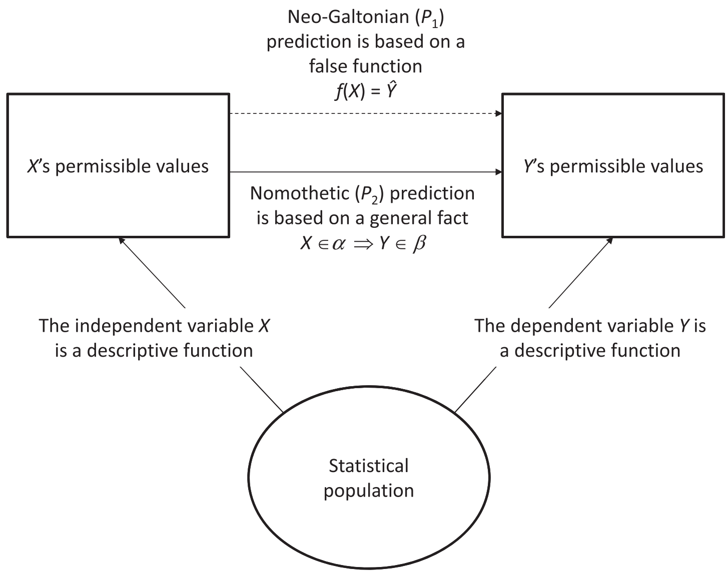

Fig. 1. The common statistical structure of neo-Galtonian and nomothetic forms of prediction, and their specific features.

here is that of a function, that is, the special case of a relation such that $f(X)$ is a *single* value.[2]

Contrastingly, P_2 's slogan can be formulated as follows:

$$X \in \alpha \Rightarrow Y \in \beta, \quad (2)$$

where α and β are non-empty strict subsets of X and Y's sets of permissible values (the respective codomains of X and Y). Thus, although P_2 does not preclude a functional relationship, it does not expect it. What is especially expected is that the descriptive device provided by X and Y's codomains will suggest that there is a least one subset of initial conditions which works as a sufficient condition for a *strict* subset of Y's codomain.

What is at stake is to move freely from one research paradigm to another, instead of defining opposite and mutually ignoring camps. Within P_1, psychologists are used to manipulate propositions pertaining to 'constructs' (Cronbach & Meehl, 1955); for critical views, see Maraun (1998) and Michell (2013). As a corollary, P_1-psychologists are trained to accept the institutional division of labor between the psychologist, whose expertise pertains to *substantive* theory, that is, the realm of constructs or the 'nomological network', and the statistician (or psychometrician), whose expertise deals with data analysis. A catastrophic consequence of this division of labor is that the sense of scientific error within the discipline becomes more and more esoteric or even socially irrelevant (see, e.g., Borsboom, 2006). This is why, if psychologists are motivated to make a science of their discipline (see, e.g., Borsboom, Cramer, Kievit, Scholten, & Franic, 2009; Lilienfeld, 2010; Vautier, 2011), they have to take intellectual responsibility for its epistemology and methodology. Within P_2, division of labor is superfluous. However, the required intellectual style obeys Monsieur Teste's injunction: "Always demand proof, proof is the elementary courtesy that is anyone's due" (Valéry, 1973, p. 65).

In the first section of the present article, it is argued that P_1's slogan mimics *functional* prediction in the natural sciences, but the price to be paid is that the sense of approximation that characterizes the natural sciences is lost. P_2's slogan rejects the functional imperative by acknowledging irreducible indetermination of prediction and instead hypothesizes *restricted* approximation. The second section opposes the infalsifiability of predictive statements in P_1 to the falsifiability of predictive statements in P_2. The third section exposes two kinds of puzzle-solving P_2 -researchers have to deal with.

1. Prediction: restricted vs. unrestricted range of approximation

Let us take Kuhn's (1996) words to get a sense of what empirical approximation means in this context:

> Perhaps the most striking feature of the normal research problems we have just encountered [in the physical sciences] is how little they aim to produce major novelties, conceptual or phenomenal. Sometimes, as in a wave-length measurement, everything but the most esoteric detail of the result is known in advance, and the typical latitude of expectation is only somewhat wider. Coulomb's measurements need not, perhaps, have fitted an inverse square law; the men who worked on heating by compression were often prepared for any one of several results. Yet even in cases like these the range of anticipated, and thus of assimilable, results is always small compared with the range the imagination can

[2] A (statistical) variable is also a relation, which is defined from the set of a population–called its domain–on the set of its admissible values–its codomain. The population is the domain of X and Y. The function f is a relation from the codomain of the independent variable X on the codomain of the dependent variable Y.