

Kansei Versus Extensional Reasoning: The Scientific Illusion of The Conjunction Fallacy in Probability Judgment

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Using Transcendental Psychology Methodology and Kansei/Chisei model it is shown that so called Conjunction Fallacy in Probability Judgment may be regarded as a sort of Scientific Illusion.

Key words: *Kansei, Chisei, Conjunction Fallacy, Probability Judgment, Illusion, Transcendental Psychology.*

Introduction

Subsequent to the investigations of Tversky and Kahneman (Tversky & Kahneman, 1983) it is well known that judgments under uncertainty are often mediated by intuitive heuristics that are not bound by specific scientific natural laws. For example, according to the conjunction rule a conjunction can be more representative than one of its constituents, and instances of a specific category can be easier to imagine or to retrieve than instances of a more inclusive category. The so called Representativeness and Availability Heuristics (RAH) therefore can make a conjunction appear more probable than one of its constituents, which breaks the most basic qualitative law of probability - conjunction rule: The probability of a conjunction, $P(A\&B)$, cannot exceed the probabilities of its constituents, $P(A)$ and $P(B)$, because the extension (or the possibility set) of the conjunction is included in the extension of its constituents. This phenomenon was regarded as cognitive illusion and demonstrated in a variety of contexts including estimation of word frequency, personality judgment, medical prognosis, decision under risk, suspicion of criminal acts, and political forecasting. The systematic character of violations of the conjunction rule makes it absolutely unclear - why such inadequate behavior takes place and occurs so often? In accordance with common normative views it raises a number of reasonable questions: Why do people often fail to take the logical form of statements into account when comparing their probabilities? (Bonini, Tentori &

Osherson, 2004) or: Why are we so disinclined to coordinate probability with logical structure? (Sides, et al., 2002). In the study of these questions and cognitive illusions much of the research has been conducted so as to compare intuitive inferences and probability judgments to specific fixed scientific results - the rules of statistics and the laws of probability, which, in our view, are erroneously used as objective measure of the perceptual and cognitive processes. So far considerable research has been devoted to the problem of Conjunction Fallacy. There have been proposed various solutions connected with it. Tversky and Kahneman explained the fallacious behavior by RAH and their so-called judgemental heuristics, which were criticized heavily as being far too vague to count as explanations: studies have emphasized potential ambiguity surrounding the word "probability" and concerned about misleading pragmatic influences and uncertainty about the conjunctive reading of categories (Sides A., et al., 2002). There have also been advanced special probability models explaining the fallacious behavior, e.g. the so-called theory of hints (Brachinger & Monney, 2003) and others.

Here we present a novel approach, called Transcendental Psychology Methodology (TPM), developed by A.I. Mirakyan (1929-1995) and his group at the Psychological Institute of the Russian Academy of Education (Mirakyan, 1999, 2004). The TPM approach was developed to overcome crucial limitations and

contradictions inherent in traditional approaches to perception (Artemenkov & Harris, 2005) and is more compatible with Kansei/Chisei model of understanding of psychic activities (Lee, Harada & Stappers, 2002) and specifically Kansei as “an ability to strongly feel in mind”. According to the TPM the abovementioned illusion and questions are based on the wrong presupposition. The basic concept of illusion has been seen as a cleavage between real performance and normative competence (rational computation). So modern researchers see classical models as impeccable norms against which human reasoning can be evaluated rather than as codifications of it: when the two diverge, it is concluded that there is something wrong with the reasoning, not with the norms (Chase, Hertwig & Gigerenzer, 1998). This type of understanding of illusive phenomena is common in many sciences connected with psychic activities. Following TPM it is defined by the usage of the underlying constrictive methodological paradigm called the Product Basis Paradigm (PBP). It means that researches are based on the concept of Identification of the characteristics of the psychic interaction process (based on Kansei) with its object-content results or intellectual processes and products (Chisei). This is connected with the important functional and practical significance of the adequate relationship between the object and the product of reflection for the successful human activity and, on the contrary, with the apparent lack of significance of the direct processes’ (Kansei) reflection aspect for this activity. As the result of the fact, that cognitive (Chisei) process has been more open for the consciousness of a practical person, the ensuing scientific way of product based thinking has become rooted in human convention. It is based on the correlation of the results of physical and mental events and the research of the natural phenomena and processes through the relations of initial state and final result or product (model) of the researched process. For example, we perceive oars immersed into the water as curved. This is usually regarded as a classical perceptual illusion. Meanwhile, in this case the direct sensorial impression is compared with the objective scientific notion of the oars known “as straight objects”. In reality this natural perception may be regarded as predictable behavior (providing the possibility to see difference between the two mediums so as to act accordingly) within the prevailing

conditions (Artemenkov & Harris, 2005). Using Kansei/Chisei model we can state that the kansei and chisei aspects are interrelated and can not exist one without the other.

Methods

Using the TPM it is possible to substantiate the RAH as based on and following the cognitive concept of Kansei. Representing perceptual and cognitive abilities Kansei has essentially complex affective nature, is highly contextual and inherently dynamic and includes relational, hierarchical and other features, which are not usually taken into account in simplified abstract scientific models (such as the model of the probabilistic continuum). TPM states that perceptual representations have complex polyfunctional nature with coexistence of alternatives allowing comparisons between them and providing the flexibility needed by any polyfunctional perceptual and cognitive system. It also assumes that the nature of cognition is different from common probability logic and that according to the world’s reality for any object it is more reliable to have many defined and related features than just one feature. From perceptual point of view an abstract object with no or a few features is less probable than an object with multiple correlated features. This means that RAH used in the Linda problem (Tversky & Kahneman, 1983) are more likely connected with the believability judgments (Hertwig & Gigerenzer, 1999) and the matter of how good predictions are fitted in with the overall model of the assumed reality.

To substantiate this model we undertook two sets of experiments, with their structure similar to Linda’s variant (Tversky & Kahneman, 1983). In the first set of the experiments we presented different pairs of A and A & B statements connected with a prediction of a certain person’s situation, shown in the preliminary description. It presented three different types of hints connected with different representative believability: verified by preliminary explanatory data (V), unverified – (U) and more or less neutral – (N). The experimental group consisted of 36 students who were asked to judge what statement in the pair is more probable. In parallel for security we used another type of judgment by means of ranking same statements separately on the scale of 10 levels. In addition we checked also two types of

situations: single object variant (S), when statements A & B belong to one object (person), and double object variant (D), when A & B belong to two different objects (persons). The second set of experiments was done for the additional check of the model. The A and A & B statements were designed on the base of believability judgments model using the results of the first set of experiments with the special purpose of achieving the more predictable confirmation of the answers with the conjunction rule. Comparison assignments had no initial hints or clues and statements represented more rare events, which might be understood as really accidental regardless of the level of their verification, e.g.: A - Paul has lost the keys, and B - Paul has a car accident or find a sum of money in the street.

Results

The results of the first set of experiments are presented in the text below and show the mean percentage of the Violation of the Conjunction Rule (VCR) for different types of comparison for one (S) and two (D) persons: S (N-N&V)- 73; D (N-N&V)- 81; S (U-U&N)- 50; D (U-U&N)- 65; S (N-U&N)- 27; D (N-U&N)- 19; D (V-V&U)- 4; D (U-U&U)- 27; D (V-V&V)- 81; D (U-U&V)- 77. It is possible to see that the addition of the positive statement V to the neutral statement N as in variants S (N-N&V) and D (N-N&V) is conducive towards the evident preference for the second joint statement (associated with the VCR). Contrary to that in the variant D (V-V&U), with addition of the unreliable statement U to the verified V, there is almost total preference for the first statement (almost no VCR). Other results have intermediate character depending on the comparative levels of believability of A and A & B statements. The number of persons (one or two) under consideration plays a much smaller role. The results (mean percentage of VCR) derived in the second set of experiments for S variant are more agreeable with the probabilistic prediction: (U-U&U)- 4; (V-V&U)- 20; (U-U&V)- 12; (V-V&V)- 24; (N-N&N)- 16. Without clues the results depended more heavily on the content of the statements, general attitudes and affective state of the person. The averaged percentage of VCR was not more than 13 %. Individual differences were moderate. People with “mathematical frame of mind” have been in better compliance with decisions based on classical probability theory.

Discussion

The results of the experiments are confirming the model of probability judgment, which is based on the Kansei/Chisei abilities. Kansei model goes far beyond the model of classical meaningless probability. It is known that human judgments are based on a perceptual and affective tendencies expressed in a causal set of multiple notions like representativeness, importance, believability, applicability, correspondence, conceivability, trustworthiness, reliability, etc. (Hertwig & Gigerenzer, 1999).

It is worthy of mentioning that the idea of comparison of the A and C = A & B statements in reality can not be easily fitted in with the classical probability model as A and C statements do not represent the elementary events in one category. More nuanced consideration shows that we are dealing here with separate spaces of possible elementary events, which is not easy to combine. This difficulty is similar to the situation which arises when, for example, every time we are throwing either one or two dice at once. Then the events' space, when only one dice is in the play, differs from the events' space of two dice when they come up jointly. The whole set of events may be regarded as implicitly “nonlinear” and vastly changing between the cases of choice. It is possible also to maintain that the overall probability problem arises from the rejection or inability to separate the evaluation meanings of the categories and individual instances of these categories. During kansei judgments person is concerned with the assessment of possible categorial plausibility, while in probability theory we are dealing with random instantiations (or events) falling under either of these categories. Events which are thought to be characterized by probability are themselves manifesting and evaluating the plausibility and correlation of categories. Obviously, correlation of categories is not strictly connected with the probability of individual events. Altogether Kansei, which corresponds to feeling or impression and implies interrelated hierarchical and anisotropic processing, is opposed to the classical probability theory, presenting the logical operations on the set of accidental similar possible events. So there is no any cogent reason to think that one of these models should be equal to the other. At the same time we see that it is possible to construct the statements in such way, that there will be almost no manifestation of VCR

tendency. That means that we can design contexts, in which people infer mathematical meanings of the term and are therefore more likely to conform to the conjunction rule (Hertwig & Gigerenzer, 1999).

Conclusions

TPM provides an overall epistemic methodology and ontological framework, which (in our view) is potentially useful in analyzing the methodological errors and identifying appropriate targets in studies of complex anisotropic and hierarchical processes with parallel structure and multiple functions. TPM analysis of the Conjunction Fallacy shows that presenting it as an illusion could be considered as a sort of scientific distortion (illusion) when some normative rational behavior is projected into the realms far beyond its utility and is deemed as being the only one universally applicable to any specific circumstances. Employing the TPM renders it possible to substantiate the RAH as being grounded in the Kansei/Chisei perceptual and cognitive concept/model, which has not only specific intellectual (chisei) but essentially complex (kansei) nature including relational, hierarchical, affective and other psychological features, which are not usually taken into account in simplified abstract scientific models. Our experiments are showing that probability judgments are mostly fulfilled on the level of specific rather broad set of criteria (including probability as the one but not necessary the most important technique of choice) and on the basis of the general causal scheme. It implies the existence of preferred alternatives (e.g. negative, neutral or positive) and plasticity of tendencies needed for task completion and for fitting into the whole model of represented reality. The causality of decisions is either produced by proposed hints (clues) or is taken from the meanings of the statements themselves. It has also been demonstrated that due to kansei the applicable set of the overall events may be regarded as implicitly “nonlinear” and vastly changing between the cases of choice. This makes it reasonable to presuppose the change in actual chances and so reasonable to accept hypotheses, which are regarded inadequate under ordinary scientific theoretical simplification. It is tempting to conclude that human judgment under uncertainty is a polyfunctional process which is characterized by a co-existence of different (unconscious and conscious) tendencies which contribute to the perceptual and cognitive ability

(Kansei) to feel, comprehend, and appreciate the appearance of an objects, situations and the unfolding of world around us. The individual interplay of these tendencies is manifested in its most suggestive varieties in more uncertain situations. Within these tendencies there is also a strand which is supposed by the extension reasoning and is represented by the classical probability theory (with different individual intensity of this tendency). But as a more recent entrant on the historical evolutionary stage and covering a limited type of events it is seen as both less significant and less applicable for evaluation of the everyday needs and events and fulfillment of the evaluation tasks in compliance with the general Kansei/Chisei model of the reality.

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