Explaining the Conjunction Fallacy: Probability vs. Confirmation

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Since the early Eighties, about a hundred scientific papers on the conjunction fallacy (CF) have been published. Such wide interest is easy to understand, as CF has become a key topic in the fervent debate on human rationality. Indeed, from the very beginning the CF phenomenon has been described as a violation of "the simplest and the most basic qualitative law of probability" (Tversky & Kahneman, 1983, p.293). The law at issue is the conjunction rule and states that the joint occurrence of a pair of events cannot be more probable than the occurrence of anyone of them. However, despite such a plethora of studies (see for example, Tentori et al, 2004; Bonini et al. 2004), CF still lacks a satisfactory interpretation as well as a model predicting under which general conditions its occurrence should be expected.

The original explanation in terms of the "representativeness heuristic" (Tversky & Kahneman, 1983) has been challenged as being "vague" (Gigerenzer, 1996) and at odds with scenarios involving forecasts and prognoses (Crupi et al., 2008). Alternative accounts postulate that people may assess the probability of a conjunction by a (non-normative) averaging rule as applied to the constituents' probabilities (Fantino et al., 1997) or represents CF as an effects of random error in the judgment process (Costello, 2008). An important common feature of these accounts is the prediction that CF rates will raise as the judged probability of the added conjunct does.

We developed a novel reading of the phenomenon (Crupi et al. 2008; Tentori & Crupi, 2009) as based on inductive confirmation, a central notion in Bayesian epistemology (Crupi et al. 2007) whose relevance has been recently documented in the psychology of reasoning (Tentori et al. 2007a; Tentori et. al 2007b).

Three studies will be presented as testing the diverging predictions of traditional accounts of CF as opposed to those arising from the confirmation-theoretic analysis. In our investigations, the probability of the added conjunct in CF problems has been systematically manipulated and dissociated from corresponding degrees of (Bayesian) confirmation in controlled conditions.

The data obtained strongly favor a confirmation-theoretic account of CF against competing hypotheses relying on the probability of the conjuncts as major determinants of the phenomenon. Apparently, intuitive assessments of confirmation relations are crucially involved in major probabilistic mistakes. Such a result sheds new light on the subtle connection between probabilistic and inductive reasoning in human cognition.

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