Causal attribution by sensing and intuitive types during diagnostic problem solving

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Abstract. Attempts by sensing and intuitive types to diagnose a malfunctioning industrial system by operating a computer-based data bank were compared in terms of (1) the extent of their causal attributions, and (2) their use of different information-gathering control operations. As predicted by Jungian type theory, intuitives made significantly more causal attributions to factors lying behind the immediately perceived malfunction (P<0.03). There were no significant differences between the two types' use of control operations. The implications of these findings for attribution theory, the theory of diagnostic error, and for the education of diagnosticians are discussed.

Introduction

Developing the cognitive skills necessary for diagnosing faults in complex systems is an important educational objective in a wide range of professions. A diagnostic problem may arise in the situation when a system (such as the human body, an engine or an industrial organisation) shows symptoms of malfunction, and a person responsible for the maintenance of that system has to take corrective action. Much research has been conducted in recent years on the biases of human judgment which can lead to symptoms being diagnosed incorrectly. The nature of these biases is important for educators, since much effort goes into eliminating them when they occur during practice. Among the diagnostic biases identified by previous research are the following: failing to generate sufficient hypotheses to explain the symptoms (Kozielecki, 1972; Manning et al., 1980; Boreham, 1985); “confirmation bias”, the preference for data which confirm rather than falsify the hypotheses under test (Mynatt et al., 1977), “pseudodiagnosticity”, the preference for data which give information about alternative hypotheses without actually discriminating between them (Doherty et al., 1979); “diagnostic conservatism”, the failure to draw all the inferences logically implied by a set of data (Edwards, 1968; Elstein et al., 1978); and “overinterpretation”, the drawing of inferences which are not warranted by the data (Elstein et al., 1978; Boreham, 1987).

The present study adds a further dimension to this typology by investigating the origin of diagnostic bias from the standpoint of the theory of causal attribution (Heider, 1958; Jaspars et al., 1983; Harvey and Weary, 1984). According to attribution theory, in order to cope with the situation confronting them, people sometimes feel the need to develop a deeper understanding of the causal factors which may be involved. The analysis of diagnostic judgment in medicine and clinical psychology from this standpoint has generated new insights into the social
dimensions of diagnosis (Fincham, 1983; King, 1983). Three current issues in attribution theory are particularly relevant to the problem of diagnostic bias.

(1) “The fundamental question, and it still remains, is... how people come to define or encode events as ones for which causal attributions need to be made” (Eiser, 1983). One response commonly made by people confronted by a malfunctioning system is to deal only with the symptoms themselves, without undertaking an in-depth causal analysis which might reveal the existence of previously unsuspected defects. The human and financial costs of superficial diagnosis are substantial (Borcherding et al., 1984). However, the decision of how far to trace a symptom back down the ultimately infinite chain of prior causes is a difficult one for a diagnostician to make. Counterbalancing the danger of failing to uncover an unsuspected fault in the system are the disadvantages of conducting the diagnostic search itself (e.g., damage to the system which exceeds the damage likely to result from leaving the fault alone; costs of investigation which exceed the value of the system even after it has been mended). Although many formal models of diagnostic judgment represent this dilemma as a rational decision based on prior probability, utility and rules for maximizing payoff (e.g., Taylor, 1971), there is an irrational element in diagnostic judgment which such models do not explain (Berne, 1977). An investigation into why individuals may or may not feel the need for causal analysis would help to explain why human judgment so often departs from the rational model.

(2) Related to this is the question of personality differences in the attribution process. Recently, it has been shown that the way an observer attributes an actor’s behaviour may be related to the observer’s own score on several major personality factors: extraversion-introversion (Monson and Hesley, 1982); anxiety (Smari, 1983); depression (Mukherji et al., 1982; Gudjonsson, 1984); and dogmatism (Thornton et al., 1982). If a diagnostician’s perception of causation is influenced in this way, then it may be a contributory factor in cases of diagnostic bias.

(3) A further relevant development in attribution theory is its increasing emphasis on constructivism (e.g., Lana and Georgoudi, 1983; Blank, 1984). Instead of explaining attributions by reference to objective features of the situation, constructivists seek to explain them in terms of the intentionality of the observer’s judgment. That is, perceptions of causality are regarded as one strand in the observer’s effort to create meaning out of an environment which in itself is without significance. The relevance of this for the present study is that diagnostic judgment is constrained by the subject’s mental model of the malfunctioning system (Kuipers and Kassirer, 1984). Research into diagnostic thinking has shown that such models are only rarely veridical images of the systems being diagnosed, but instead reflect the way the diagnostician personally reconstructs the problem (Geron, 1981). Since this can result in bias (Polich and Schwartz, 1974), an investigation into the way individuals use causal perceptions to construct meaning out of their environment might help explain diagnostic judgment.