UC Merced
Proceedings of the Annual Meeting of the Cognitive Science Society

Title
Is a Confirmatory Tendency to Blame for Poor Diagnostic Decisions?

Permalink
https://escholarship.org/uc/item/1p10q45g

Journal
Proceedings of the Annual Meeting of the Cognitive Science Society, 27(27)

ISSN
1069-7977

Authors
Hoenkamp, Eduardo
van Aarle, Edward

Publication Date
2005

Peer reviewed

eScholarship.org Powered by the California Digital Library
University of California

Is a Confirmatory Tendency to Blame for Poor Diagnostic Decisions?

Edward van Aarle (E.vanAarle@pwo.ru.nl)
Behavioral Science Institute (BSI), Montessorilaan 3
6525 HR Nijmegen, the Netherlands
Eduard Hoenkamp (hoenkamp@acm.org)
Nijmegen Institute for Cognition and Information (NICI), Montessorilaan 3
6525 HR Nijmegen, the Netherlands

Abstract

In diagnostic reasoning, especially in a clinical setting, practitioners often widely disagree about the causal explanation for a given case. Most studies have assumed that such disagreements result from judgmental mistakes due to biased reasoning, especially the tendency to seek confirmation for a theory or hypothesis they already entertain. Alternative explanations for these mistakes are: confusion about the type of requested diagnosis and a difference in knowledge available to the practitioner. The present paper introduces a method to control the latter two factors, for the first time enabling a study of the influence of the first factor in isolation. In the experiment, eighteen advanced postgraduate practitioners made a diagnosis in interaction with a computer program simulating various reading impairments. We found two surprising results: First, the confirmatory tendency was not as prevalent as commonly assumed and second, more important, that where it was employed it was conducive to sound diagnostic decisions.

Keywords
Heuristics, Confirmation Bias, Diagnostic Decision Making, Reading Problems.

Introduction

A cardinal principle in the literature and among practitioners is that treatment must be based on sound diagnostics (Vinsonhaler, Weinshank, Wagner, & Polin, 1983). As a consequence, a substantial part of clinical activity consists of causal analysis of the client' s problem, i.e. the finding of underlying causes to be targeted in subsequent treatment (Gambrill, 1990, p. 234).

Legion empirical studies, however, show that psychoeducational practitioners, when confronted with the same case, disagree widely about the causal explanations for it (Bus, 1989; Bus & Kruizenga, 1989; Bus & Van IJzendoorn, 1992; Jansen & Meijer, 1991; McDermott, 1980; Vinsonhaler, Weinshank, Wagner, & Polin, 1983; Ysseldyke & Algozinne, 1983). In brief, practitioners' diagnostic explanations are dismal. Unfortunately, this is true in other clinical fields as well (e.g. DeWitt, Kaltreider, Weiss, & Horowitz, 1983, 1998). How to account for this state of affairs is the subject of debate in the research literature on *heuristics and biases* (for reviews, see Davidow & Levinson, 1993, and Garb, 1998). The poor decisions are allegedly the result of the practitioners' tendency to apply inappropriate heuristics when performing their task. Among them the availability heuristic, the representativeness heuristic, and the anchoring-and-adjustment heuristic. Yet, only one heuristic seems to match the specific task of making a causal diagnosis: the *confirmatory strategy* (Ben-Shakhar, Bar-Hillel, Bilu, & Shefler,1998; Garb, 1994; Faust, 1986; Krems & Zierer, 1994, Skov & Sherman, 1986, and Snyder & Thomsen, 1987). Gambrill (1992) describes the confirmatory strategy as a collective term for attending to only some important data and overlooking others, as not attending to data that do not support a hypothesis, as ignoring negative instances, and as the tendency to selectively search for evidence that supports preconceptions and that encourages a focus on hits. According to Gambrill, the confirmatory strategy is perhaps the most common source of error in causal clinical decision making.

All these studies contend that the use of heuristics leads to poor causal decisions, but curiously enough, they offer little evidence to support this claim. In the present paper we first explain why the empirical evidence remains inconclusive and then report on an empirical study in which we tested the claim in an alternative paradigm. Let us first raise a number of objections against the methodologies of the heuristics and biases studies.

- The heuristics and biases approach only uses everyday language for defining the cognitive strategies underlying the heuristics. Gigerenzer (1991) concludes that the so-called heuristics and biases approach largely is based on undefined concepts that "can post hoc be tested to explain almost everything". The concepts are not presented in a consistent way either. Virtually all descriptions of the confirmatory strategy in the literature (e.g., Ben-Shakhar et al., 1998) only talk about the testing of hypotheses and omit a specification of the process of generating causal relations.

- The researchers in these studies seem to differ considerably in their conception of what constitutes a genuine causal diagnosis. McDermott (1980, p. 13), for example, found his clinicians to vary greatly in the type of given diagnoses: descriptive diagnoses (describing currently observable or detectable problems), etiological diagnoses (discovering causes or origins of the problems), or prognostic judgments (predicting the future course of the problems or planning preventative or restorative treatment). And Bus (1989) notes that "diagnoses mainly concerned reading and spelling; for example: low spelling level, weak word

recognition skills, many reading mistakes, reading below grade level (p.57-58)", showing the author's tendency to confuse descriptive diagnoses (e.g., "reading below grade level") and etiological diagnoses (e.g., "weak word recognition skill"). Likewise, Vinsonhaler et al. (1983, p. 144) fail to differentiate between descriptive diagnoses such as "poor oral reading" and "sight words low", and etiological diagnoses, such as "problem with visual memory".

- An obvious reason for the wide disagreement among practitioners may be their use of different scientific explanatory models or theories. For example, Jansen and Meijer (1991), Weisberg (1984, p. 210), and McDermott (1980, p. 21) all observed that their subjects used very different theories as background to explain the nature and causes of learning problems. Van Aarle and Van den Bercken (1999) review the area of reading and spelling impairment, and show that the scientific knowledge made available to practitioners is vastly heterogeneous.

Besides these methodological objections there is a theoretical objection to make. The tendency to seek a confirmation of one's theory or position is hardly disputed in the literature. Possibly the first, but definitely the most famous experiment in this paradigm was Wason's (1960) 2-4-6 experiment. Recall that in this experiment participants were asked to guess the rule governing triples of numbers, and that they were told that 2-4-6 conformed to this rule. Their task was to discover this rule by proposing new number triples, upon which the experimenter would tell whether it conformed to the rule. What could have been the rule the participant had first thought of? If the participant had thought of the rule 'increasing evens' (as many did), then she might announce 8-10-12 in an attempt to confirm this rule. Such an attempt is called a *positive strategy*. A *negative strategy* would have been to try 6-4-2, expecting this to be refuted by the experimenter, and therewith confirming the rule. So a negative strategy can be used to seek confirmation of the participant's rule as well. Hence, the term 'confirmatory strategy' may be misleading, and we will use 'positive strategy' instead. The positive strategy, Wason observed in his experiments, was far more prevalent than the negative strategy. The vast literature that followed Wason's (1960) 2-4-6 experiments, also found the positive strategy to lead to poor problem solving strategies. Hoenkamp (1989) however, showed that a negative strategy is not necessarily better than a positive one, and he showed under precisely what conditions one strategy would fare better than the other. (For example, if you want subjects to perform worse under a positive strategy, than Wason's rule follows from these conditions.) Hence, it could be that the diagnostic tasks studied in the literature are precisely those that would favor a negative strategy.

Given the objections above, we wanted to study the influence of the positive strategy on diagnostic decisions, but avoid the tar pit of confusion about the term 'diagnosis' or inadequate scientific knowledge. So first, the participating clinicians must know that they are required to make a causal analysis of the case, and that they have to find the causes underlying the (psycho-educational) diagnostic task. Differences in the use of explanatory knowledge were avoided by requiring every participant to use the same theory underlying the given psycho-educational problems. We could rely on experience from three different areas: (1) Brown and Burtons (1978) computer simulation for arithmetic, (2) our previous research on diagnostic reasoning from first principles (Hoenkamp & Grimbergen, 1997), (3) Barons conceptualization of the 'congruence heuristic' (Baron, 1994), and in Klayman and Has characterization of the 'positive testing'- strategy (Klayman & Ha, 1987) and (4) the intensively studied domain of reading problems (e.g. (Spear-Swerling & Sternberg, 1994)).
Our research question has two parts:

1. Do clinicians tend to use a positive strategy for generating and testing hypotheses?
2. Is the use of such a positive strategy related to poor diagnostic skill?

The remaining part of the paper will investigate this question experimentally.

Method

Participants

Eighteen Dutch postgraduate students in educational psychology, at the end of their practitioner's phase volunteered. All had at least 9 months of working experience in psycho-educational practice. Thirteen were trained in educational psychology, three in linguistics and speech problems, and two in developmental psychology. Their mean age was 24.3 years (SD 4.5).

Materials

A computer simulation incorporated as many elements as possible from current research literature in the field of normal and deviant reading development (Grimbergen, 1994).

Grimbergen's (1994) program could perform model-based diagnosis for reading problems, hence contained an elaborate component model for reading. The underlying model mapped written words (or rather letter features) to a pronounciation. By introducing malfunctions in the components, reading problems could be simulated. For the experiment, the program was confined to the seven components of Figure 1, and each component was extended with a uniform and consistent set of algoritms. Component 5, for example, could code for words having long vs. short vowels. (The words were in Dutch, but the English speaker can think of the different ways to pronounce vowels depending on the word in which they appear.) Next, six copies were made of this perfectly reading child and each copy was separately impaired to simulate a child who suffers from one (cases 1 and 3), two (cases 2, 5 and 6) or three (case 4) deficient components

Table 1: Overview of the six simulated cases of children with reading process deficiencies (component-defects; component number with fault type in parentheses) and an example of reading errors (input-output combinations for Dutch).

Case number	Case defects	Number of defects	Input word	Target pronunciation	Case's pronunciation
1	5(2)	1	hond	/h//o//n//t/	/h//o//t//n/
2	1 and 2	2	baken	/b//aa//k//u//n/	/p//aa//k//eu/
3	7(1)	1	krent	/k//r//e//n//t/	/k//r//e//n//t//u/
4	2, 4(1) and 6	3	baken	/b//aa//k//u//n/	/d//aa//k//ou/
5	4(1) and 5(1)	2	aarde	/aa//r//d//u/	/o//r//d//e/
6	4(2) and 7(2)	2	moment	/m//oo//m//e//n//t/	/m//oo//m//e//t//n/

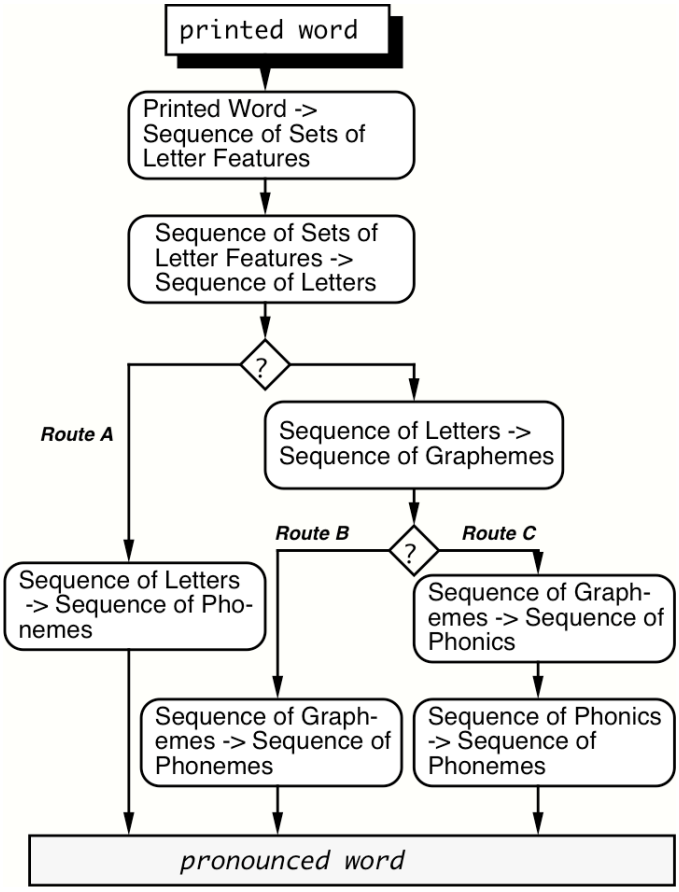


Figure 1: The diagram of the simulated reading process that the participants used when presented with a case. (The arrow '− >' stands for 'transforms into')

(see Table 1). Some of the components (numbers 1, 2, 3, and 6) could be damaged in only one way, the others (numbers 4, 5 and 7) in two. Case 2, for example, was damaged in components 1 and 2: component 1 reverts all vertical letter elements (e.g. b → p and d → q), and component 2 rotates a few letters into other letters (e.g. m → w). As a result, case 2 decodes the input word 'baken' into /paakeu/, while the correct target pronounciation would be /baakun/. Together with these computer programs, the participants received a copy of Figure 1, an introductory text describing the perfect reading theory, a list of the possible reading defects per reading component (i.e. the theory of disturbed reading), and a list of input words covered by the perfect reading model (the so-called List of Target Words). The experimenter used also material described in the procedure section that follows.

Procedure

All six tasks were presented in a single session, which lasted about 8 minutes and the total session lasted about 80 minutes. The general procedure was as follows: (1) Explanation of the aim of the diagnostic tasks and an overview of the session, (2) verbal and visual explanation of the theory of perfect reading, and (3) of the constructed theories of disabled reading, (4) practicing with a computer simulation of a perfectly reading child, and (5) of a malfunctioning child, (6) answering four standardized comprehension control questions; if the answers were inadequate, teaching and controlling was repeated until complete understanding, (7) execution of the six experimental diagnostic tasks. Materials were always available. Every task started with the same sample of three reading behavior instances of the simulated child. For every case, it consisted of two incorrectly read target words (e.g. for case 2, baken → /p//aa//k//eu/ and nu → /u//n/ for case 2) and of one correctly read input word (lezer → /l//ee//z//u//r/). Next, the participant was free to choose one of the following activities: identifying the underlying defect(s), generating a single hypothesis about one or more defects in one or more components, generating a set of alternative hypotheses, simply requesting the (simulated) child to read another word from the input word list without any hypothesis, or

requesting the (simulated) child to read a further word from the List of Target Words in order to test a hypothesis that had not been explicitly formulated. Also in the next step the participant remained free in all choices. When the participant had decided how to proceed, the experimenter asked to them verbalize this step, and if that implied either a specific hypothesis or an input word, the participant was asked to type it onto the computer screen (producing a log for later analysis). The participant was instructed to type in every hypothesis that came to mind on a separate line, and in the form of the code(s) of the postulated component fault(s) (cf. Table 1). If participants wanted to generate an input word, they had to check the List of Target Words for membership and spelling. Other words were not accepted by the program. If the participant had typed in an input word without prior hypothesis, the experimenter asked whether a prior hypothesis was generated and asked to type it in on the next line of the computer screen. In addition, the experimenter kept written and taped records of all verbal behavior of the participants. No upper or lower limits were put on the number of activities that the participant wished to perform before reaching the diagnostic conclusion. Once the participant had formulated a definitive diagnosis for the case, the experimenter recorded the required solution time (in a rounded number of minutes) and, finally, the experimenter asked the participant to indicate on a five-point scale (ranging from 1 = very uncertain to 5 = very certain) how confident the participant was about the diagnostic conclusion. The presentation order of cases 1 through 5 was varied across the participants following the Latin Square Method. An exception was made for case 6, which was presented as the final task to all participants, since it was the only case without a definitive solution. The correct solution was that the case was unsolvable because two incompatible hypotheses remained which could not be tested against each other. Since this task had a high risk of bringing about pro-active interference with the other tasks, it was placed at the end of the session.

The two research questions given in the introduction have been articulated as follows: Concerning research question 1, the clinician's examination of a case, was analyzed according to the number of times they followed exactly a particular sequence of steps. The procedure may seem tedious, but without very careful observations, it is impossible to draw conclusions about the relationship between strategy and performance. The steps are as follows:

1. Inspect the problem, namely the three *behavioral symptoms* that were presented first. A symptom is a specific response R_1, for example saying the word /mad/, following S_1, the visual word pattern for 'map'. After the symptom $S_1 - R_1$ the participant might generate a single hypothesis H_1 about some underlying cognitive failure(s) that would explain the symptom according to the theory. For example the child may not have detected the difference in spatial orientation between the up and down strokes and hence confused d and p.
2. Select one failure from the set of failures that constitutes H_1, and locate the component responsible for that failure as the target component to be tested. That would result in the first Partial Hypothesis PH_1 within H_1.
3. Select an S_2 for which the expected R_2 would provide affirmative information concerning PH_1
4. Input the S_2 and inspect if its outcome confirms PH_1
5. If R_2 comes out, accept PH_1, and include it in the final diagnosis.

We call any uninterrupted sequence of these five steps a positive strategy. We defined the main criterion for diagnostic skill as *efficiency* as is customary in tests for abilities (e.g. tests for word identification skill) and intelligence (e.g., the Wechsler Scales). Efficiency refers to the attained level of accuracy in proportion to the time needed for that level of accuracy. The level of attained accuracy has been scored by counting the times that the diagnosticians actually discovered all programmed defects of the given diagnostic case. The observed scores (M = 2.6, SD = 1.0), indicate that 43% of all cases were correctly diagnosed (this is different than the proportion of correctly identified faults, which was considerably higher [M = 6.8, SD = .33] and indicates a correct fault identification score of 62%). The subjects were found to spend 8.5 minutes (SD = 5.0) for diagnosing a case, on average. From these two basic scores, the efficiency score was constructed by classifying the subjects according to their medians. Those with both upper accuracy and upper speed scores were given 4 points, those with upper accuracy but lower speed 3 points, those with lower accuracy and lower speed 2 points and, finally, those with lower accuracy and upper speed 1 point. In this scale, speed has only an advantage if it co-occurs with high accuracy. In combination with low accuracy it may prevent higher accuracy, and therefore shows less skill than low speed and low accuracy. A mean efficiency value of 2.72 (SD = 1.1) was found.

Results

Subjects followed a positive strategy in 12% (SD = 13%; SE = 3%) of the cases, which significantly deviates from zero ($p < .01$). Separating the cases where subjects first generated a single hypothesis, the complete subsequent scenario of a positive strategy occurred in 18% of the cases. Note that the incidence of the strategy was fairly evenly distributed over the six cases, and over participants (irrespective their educational background).

The separate steps of the positive strategy had the following relative frequencies. Thirty-nine percent of all initially generated hypotheses were single hypotheses, 86% of which contained at least one consistent component, 79% of which was selected as the first target of testing, 82% of which was followed by testing that consistent component with a compatible research instrument, 33% of which was accepted without further testing.

The second research question predicted a negative correlation between the total number of times the subjects

applied a positive strategy and the resulting overall efficiency. A significant positive Pearson product-moment correlation was found, but in the opposite direction: $r = .53$ ($p = .012$, one-tailed). Replacing efficiency with mere accuracy, does hardly change the picture ($r. = .38$; $p = .06$, one-tailed).

Discussion and conclusions

The results of our experiment indicate that clinicians do use a positive strategy. Although this finding confirms existing consensus, the clinicians did not use it very often. In addition we found that using this strategy benefits rather than harms the diagnostic outcome. This contradicts the prevailing view in the heuristics and biases literature that a confirmatory tendency is to blame for poor diagnostic decision.

Recall the three potential explanations for the low quality of clinical diagnostic decision making distinguished in the introduction: (1) use of a confirmatory tendency, (2) discrepancies among clinicians about the aim of diagnostic decision making, and (3) the different kinds of theoretical knowledge clinicians prefer for explaining a child's problems. The present study argues that the first of these must be rejected.

One could object that the present study was too strict in the formulation of the positive strategy as it required a large number of consecutive steps. A less demanding definition might still corroborate the dominant view about the adverse effect of the confirmatory tendency. We actually looked at the various partial positive strategies, but did not find such an adverse effect: All correlations of these partial strategies with the diagnostic efficiency were close to zero, and not significant. This lack of statistical significance is remarkable, as the partial strategies produced more observations than the strategy in our more strict definition.

One could further object that the findings concerning the positive strategy do not have implications for the significance of a negative strategy. Indeed, a negative strategy could still be superior. In order to test that possibility, we looked in the present study for sequences of steps that we could a priori define as apparent attempts to generate and/or test alternative diagnostic hypotheses. For example, we inspected how often the diagnosticians generated a single initial hypothesis that consisted of component(s) that were neutral to the initial symptoms, i.e. that could not show any marks of the underlying deficiency of the child but at the same time could not yet be disconfirmed by those symptoms either. These events were observed in about 5% of the initial hypotheses, but that frequency did not significantly deviate from zero. A second example concerned the number of times that the clinicians generated a set of at least two initial diagnostic hypotheses. On the average, this event did occur in 20% of all initial hypotheses (SD = 8.2%), but it had no significant positive correlation with diagnostic efficiency ($r = .13; p > .30$), let alone a larger correlation with diagnostic efficiency than the positive strategy. All further similar analyses showed no significant relations with diagnostic effciency.

In brief, we found (1) that studies of biases and heuristics in diagnostic reasoning must be crafted much more carefully and detailed than those reported in the literature, (2) that lack of consensus among clinicians about diagnostic decisions cannot be simply attributed to heuristic and biases, and that especially a positive strategy cannot be blamed for poor diagnostic decisions, and (3) that contrary to received wisdom, a positive strategy can actually enhance decisions in the context of diagnostic causal reasoning.

References

Baron, J. (1994). *Thinking and deciding* (2nd edition). New York: Cambridge University Press.

Ben-Shakhar, G., Bar-Hillel, M., Bilu, Y., & Shefler, G. (1998). Seek and ye shall find: Test results are what you hypothesize they are. *Journal of Behavioral Decision Making, 11,* 235-249.

Brown, J.S., & Burton, R.R. (1978). Diagnostic models for procedural bugs in mathematical skills. *Cognitive Science, 2,* 155-192.

Bus, A.G. (1989). How are recommendations concerning reading and spelling disabilities arrived at and why do experts disagree? *Psychology in the Schools, 26,* 54-61.

Bus, A.G., & Kruizenga, T.H. (1989). Diagnostic problem-solving behavior of expert practitioners in the field of learning disabilities. *Journal of School Psychology, 27,* 305-316.

Bus, A.G., & Van IJzendoorn, W.J.E. (1992). How are judgments about children with learning problems arrived at by experts? *Revue Europénne de Psychologie Appliquée,* 42, 269-275.

DeWitt, K.N., Kaltreider, N.B., Weiss, D.S., & Horowitz, M.J. (1983). Judging change in psychotherapy. Reliability of clinical formulations. *Archives of General Psychiatry, 40,* 1121 1128.

Faust, D. (1986). Research on human judgment and its application to clinical practice. *Professional Psychology Research and Practice, 17,* 420-429.

Gambrill, E. (1990). *Critical thinking in clinical practice: Improving the accuracy of judgments and decisions about clients.* San Francisco: Jossey-Bass.

Garb, H.N. (1994). Cognitive heuristics and biases in personality assessment. In L. Heath, R. Scott Tindale, J. Edwards, E. J. Posavac, F. B. Bryant, E. Henderson-King, Y. Suarez-Balcazar, and J. Myers,(Eds.) *Applications of heuristics and biases to social issues* (pp. 73-90). New York: Plenum Press

Garb, H.N. (1998). *Studying the clinician: judgment research and psychological assessment.* Washington, DC: American Psychological Association.

Gigerenzer, G. (1991). How to make cognitive illusions disappear: Beyond Heuristics and Biases. *European Review of Social Psychology, 2,* 83-115.

Grimbergen, E.R.W. (1994). *Model-based diagnosis in the ill-defined domain of beginning reading.* Doctoral dissertation, University of Nijmegen, Nijmegen Institute of Cognition and Information.

Hoenkamp, E. (1989). 'Confirmation bias' in rule discovery and the principle of maximum entropy. In *Proceedings of the Eleventh Annual Conference of the Cognitive Science Society* (pp. 651-658). Hillsdale, New Jersey: Lawrence Erlbaum Associates.

Hoenkamp, E., & Grimbergen R. (1997). Advice on reasoning from first principles in a psychodiagnostic domain. In *Proceedings of the 19th Annual Conference of the Cognitive Science Society.* Hillsdale, New Jersey: Lawrence Erlbaum Associates.

Jansen, M.G.H., & Meijer, W. (1991). Gaan psychologen, (ortho)pedagogen en onderwijskundigen in de leerlingbegeleiding verschillend te werk [Do educational psychologists, orthopedestricians and educational pedagogues operate differently from each other in individual assessment]? *Tijdschrift voor Onderwijsresearch, 16,* 160-168.

Klayman, J., & Ha, Y.-W. (1987). Confirmation, disconfirmation, and information in hypothesis testing. *Psychological Review, 94,* 211-228.

Krems, J. F., & Zierer, Chr. (1994). Sind Experten gegen kognitive Täuschungen gefeit? Zur Abhängigkeit des confirmation bias von Fachwissen. *Zeitschrift fur experimentelle und angewandte Psychologie, 41,* 98-115.

McDermott, P.A., (1980). Congruence and typology of diagnoses in school psychology: An empirical study. *Psychology in the Schools, 17,* 12-24.

Skov, R.B., & Sherman, S.J. (1986). Information gathering processes: Diagnosticity, hypothesis-confirmatory strategies, and perceived hypothesis confirmation. *Journal of Experimental Social Psychology, 6,* 269- 284.

Snyder, M., & Thomsen, C.J. (1987). Interactions between therapists and clients: Hypothesis testing and behavioral confirmation. In D.C. Turk and P. Salovey (Eds.), *Reasoning, inference and judgment in clinical psychology* (pp. 124-152). New York: The Free Press.

Spear-Swerling, L. & Sternberg, R.L. (1994). The road not taken: An integrative theoretical model on reading disability. *Journal of Learning Disabilities, 27,* 91-103, 122.

Van Aarle, E.J.M., & Van den Bercken, J.H.L. (1999). The development of a knowledge-based system for supporting the diagnosis of reading and spelling problems (II). *Computers in Human Behavior, 15,* 693- 712.

Vinsonhaler, F.F., Weinshank, A.B., Wagner, C.C., & Polin, R.M. (1983). Diagnosing children with eduactional problems: Characteristics of reading and learning disabilities specialists, and classroom teachers. *Reading Research Quarterly, 18,* 134-164.

Wason, P. C. (1960). On the failure to eliminate hypotheses in a conceptual task. *Quarterly Journal of Experimental Psychology, 12,* 129-140.

Weisberg, R. K. (1984). How consistent is the clinical diagnosis of reading specialists? *The Reading Teacher, 38,* 205-212.

Ysseldyke, J.E., & Algozzine, B. (1983). On making psychoeducational decisions. *Journal of Psychoeducational Assessment, 1,* 187-195.