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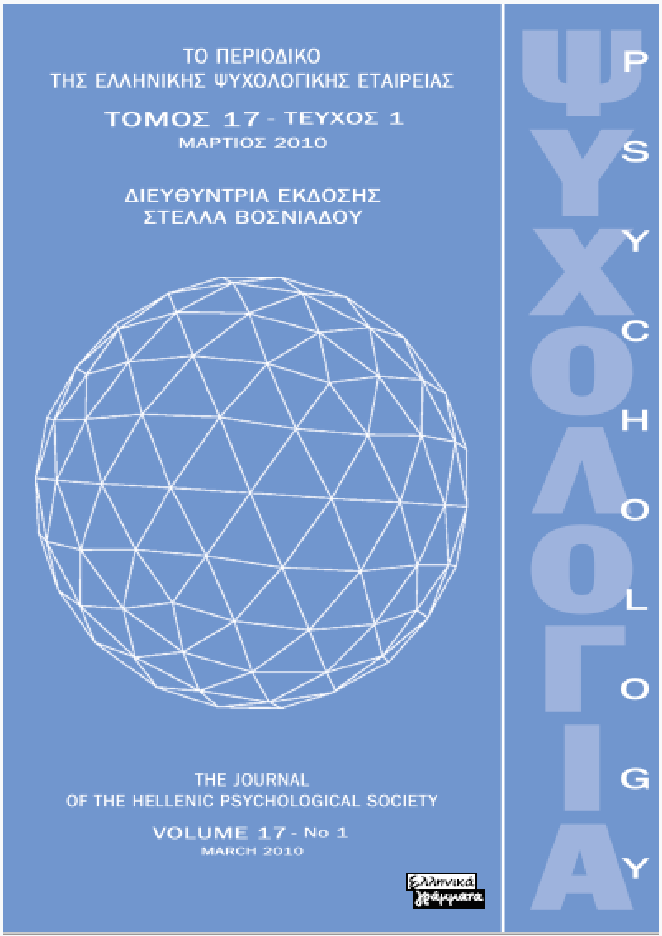

Determinants of diagnostic and pseudodiagnostic information selection

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Determinants of diagnostic and pseudodiagnostic information selection

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ABSTRACT

Pseudodiagnosticity refers to the tendency to select impoverished information in preference to equally available diagnostic data. Mynatt, Doherty, and Dragan (1993) reported that pseudodiagnostic reasoning was attenuated in problems in which the information selection had consequences for the reasoner's future actions in contrast to problems in which it did not. Girotto, Evans and Legrenzi (1996) denied that such "action" problems fostered better information selection because they argued that in Mynatt's et al.'s study action and non-action or inference varied in how the decision task was framed. It was predicted that for action problems there will be a higher frequency in informative data selection vs. both inference problems. In addition to that, a primacy effect for inference problems would occur irrespective of sequence of data presentation but not for action problems. We re-examined the way people reasoned about action problems and inference problems taking into consideration Girotto et al.'s criticisms. We found that even when the presentation and salience of the information was equated in both kinds of problems, diagnostic information selection was more likely for action that for inference problems.

Key words: Pseudodiagnosticity, Action problems, Inference problems, Diagnostic data.

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1. Introduction

In certain hypothesis testing situations, data must be gathered to adjudicate between two hypotheses. The diagnosticity of the data is indexed by the ratio of its probability given a target hypothesis over its probability and given an alternative hypothesis (or the likelihood ratio of Bayes's theorem). It has often been observed that when people are required to gauge the truth of two hypotheses they select information in a pseudodiagnostic manner (Beyth-Marom & Fischhoff, 1983. Doherty et al., 1979. Doherty et al., 1981. Ofir, 1988); that is, they select data in a way that does not permit the construction of the likelihood ratio. In addition, other studies that investigated individuals on selection and interpretation of information in a subtype of pseudodiagnosticity task found that when participants would consider the consequence of an action the rarity effect would weaken (Feeney, Evans and Venn, 2008) Thus, instead of choosing two proportions such as $p(D \mid H)$ and $p(D \mid -H)$, they choose $p(D_1 \mid H)$ and $p(D_2 \mid H)$. For example, in Doherty et al.'s (1979) study subjects had to determine whether archaeological artifacts came from one of two locations. These objects were described in terms of binary characteristics (e.g., a pot had a curved handle or not) and subjects had to choose among a set of four proportions a pair of conditional probabilities that could yield the most information as to the origin of the artifact. Where D_1 and D_2 refer to a binary feature and H_1 and H_2 to the two locations, the four proportions were $p(D_1 \mid H_1)$, $p(D_2 \mid H_1)$, $p(D_1 \mid H_2)$, and $p(D_2 \mid H_2)$. The only appropriate strategy in such a task is to select either $p(D_1 \mid H_1)$ and $p(D_1 \mid H_2)$ or either $p(D_2 \mid H_1)$ and $p(D_2 \mid H_2)$, that is, a pair of probability that unambiguously establishes the diagnosticity of a feature. However, the majority of subjects chose non-complementary pairs of proportions, such as $p(D_1 \mid H_1)$ and $p(D_2 \mid H_1)$, pairs that cannot gauge the diagnosticity of the data selected.

Mynatt, Doherty, and Dragan (1993, Experiment 1) replicated this pattern of information selection with the following problem:

> Your sister has a car she bought a couple of years ago. It's either a car X or a car Y. but you can't remember which. You do remember that her car does over 25 miles per gallon and has not had any major mechanical problems in the two years she's owned it. You have the following piece of information:
>
> 1. 65% of car Xs do over 25 miles per gallon.

Three additional pieces of information are also available:

> 2. The percentage of car Ys that do over 25 miles per gallon.
> 3. The percentage of car Xs that have had no major mechanical problems for the first two years of ownership.
> 4. The percentage of car Ys that have had no major mechanical problems for the first two years of ownership.
>
> Assuming you could find out only <u>one</u> of these three pieces of information, which would you want in order to help you decide what car your sister owns?

Based on Wason's selection task it was surmised that, individuals are more likely to choose a non-complementary option in order to predict or act upon the consequences of a given problem. In Wason's task, four cards were provided to participants containing a number and a letter on each side. The hypothesis was that if there is a vowel (A) on one side then an even number (2) would be on the other. Subsequently, the participants would have to choose the card that would determine whether the given hypothesis is true or false (card A, K, 2 or 7). It was concluded that human beings are more likely to engage in the rarity assumption. Option A is the valid option based on Popper's (1954) method falsification and Wason's selection task (1966, 1968). For the reason that, by choosing any other option except A would not predict that A is or is not equal to an even number (Oaksford & Chater, 1994). Thus, the best selection is choice (2) since knowing the percentage of car Ys that do over 25 miles per gallon would determine the diagnosticity of the given piece of information provided in the first paragraph. Yet 74% of the subjects did not make that choice.

Mynatt et al. (1993) sought to draw a distinction between the problem above, which they termed as an inference problem and a problem where the information selection is done to promote one of two actions, which will be thoroughly explained in the proceeding paragraph. They gave the following problem to their subjects (Experiment 1):

> "You're thinking of buying a car. You've narrowed it down to either car X or car Y. Two of the things you are concerned about are petrol consumption and mechanical reliability. You have the following piece of information:
>
> 1. 65% of car Xs do over 25 miles per gallon..." (...the rest of the problem was the same as the one cited above).

With this version of the problem, 51% of the participants chose option (2), the normative selection, which allows constructing the likelihood ration for petrol consumption. Mynatt et al. explained the difference between the two types of selection in terms of the focus of attention: the focus of attention for an inference is on a solution extrinsic to the reasoner and "the goal of the problem solver is being correct... to a state of the world" (p. 765). In turn, the focus of attention for an action is intrinsic, a dimension of utility, and "the available information is not a means to an end, but is itself a direct representation of an end" (p. 765). A simpler contrast may be drawn in terms of utilities. In an action problem the reasoner is invited to assume the choice as if it were his own, and hence the cost of a wrong decision and the benefits of a better one are naturally made more salient which in turn might make the logic behind the construction of likelihood ratio more compelling. On the other hand inference problems do not empower the reasoners from that personalised perspective.

In contrast, Girotto, Evans, and Legrenzi (1996) offered evidence suggesting that the difference between action and inference problems is a procedural artefact. Legrenzi, Girotto, and Johnson-Laird (1993) interpreted pseudodiagnosticity as a form of focusing on explicit information: "one major determinant of what is explicit in mental models is the verbal description of a problem" (p. 59). Girotto et al. (1996) based on Legrenzi et al. (1993) argued that action problems produced different data selections because they were framed differently. They suggested that in the inference problem readers "form a concrete mental model of the car in question" (p. 11) and given a piece of information for car X (petrol consumption) it is more likely to choose information for mechanical reliability for the same car X (focus on one object). On the other hand, for the action version the preamble does not focus on the car as such but rather provides information for two dimensions (viz., "Two of the things you are concerned about are petrol consumption and mechanical reliability"). At the very least, the preambles for action and inference problems should be equated before on may conclude that action problems foster more diagnostic reasoning than inference problems.

Girotto et al. (1996, Exp. 1) used the same inference and action problems used in Mynatt et al. (1993, Experiment 1) and also constructed new versions of these problems with a modified preamble. The preamble for the new inference problem emphasised the relevance of the two dimensions; it read as follows,

> "Your sister has a car she bought a couple of years ago. It's either a car X or a car Y, but you can't remember which. You do remember that two of the things your sister is concerned about are petrol consumption and mechanical reliability ..."

In turn, the preamble for the new action problem focused on the car read as follows,

> "You are thinking to buy a car. You have narrowed it down to either car X or car Y. You have still to decide but you do want your car to do more than 25 miles per gallon and to have no major mechanical

problems in the first two years that you will own it..."

[The rest of the problems was the same as in Mynatt et al. (1993, Exp. 1)].

For the problems taken from Mynatt et al. (1993, Exp. 1), the pattern of information selection replicated the earlier findings, namely the action problem encouraged more diagnostic information selection than the inference problem. However, the results were reversed with the new problems: the inference problem led to a more frequent selection of diagnostic information than the new action problem. These results suggest that diagnostic information selection is very sensitive to the way in which the problem is framed.

Mynatt et al. (1993) were well aware that framing was important: their second experiment showed no difference between action and inference problems with a subtle modification to the preamble. In the preceding experiment subjects were told that "35% of car Xs do over 25 miles per gallon". The difference in base rate from 65% in Experiment 1 to 35% in Experiment 2 shifted people's attention to the alternative hypothesis. That is, when $p(D_1 | H_1) = 0.35$ people should believe that H_1 is relatively unlikely to be true and considered the alternative hypothesis, and selected the same datum for both hypotheses for both action and inference problems.

Girotto et al. (1996, Exp. 4) proceeded further. They proposed that changing the anchor "less or greater than 0.5" (as Mynatt et al., 1993 suggested) for $p(D_1 | H_1)$ is enough to produce different information selection. Therefore, defocusing participants by not providing any anchor (65% or 35% of car Xs) would yield a low rate of pseudodiagnostic information selection. They gave the same preamble as in the original inference problem (Mynatt et al., 1993, Exp. 1) and the rest of it read as follows:

"You have the following piece of information:

1. The percentage of car Xs that do over 25 miles per gallon.
2. The percentage of car Ys that do over 25 miles per gallon.
3. The percentage of car Xs that have had no major mechanical problems for the first two years of ownership.
4. The percentage of car Ys that have had no major mechanical problems for the first two years of ownership.

Assuming you could find out only two of these four pieces of information, which would you want in order to help you decide what car your sister owns?"

In this version the informative dyads are (1, 2) and (3, 4) the dyads that involve the selection of the same datum (either 25 mpg or mechanical reliability) for both alternatives (either car X or car Y). Informative dyads were selected more frequently (58%) than pseudodiagnostic dyads. Girotto et al. (1996) concluded that the action-inference distinction was not useful and that defocusing people's attention on one of the two dimensions was sufficient to reduce pseudodiagnostic information selection.

However, careful inspection of their data reveals that 51% of their participants chose the dyad (1, 2) and only 7% chose the dyad (3, 4) suggesting a strong primacy effect. Girotto et al. did not counterbalance the order of the four options. Hence, their results might themselves be a procedural artefact. In addition, Girotto et al., did not design a direct comparison between action and inference problem when no anchor or focal hypothesis were given. The present study sought to remedy these methodological shortcomings in the following experimental design. The possible order effect was investigated with two inference problems formulated in a manner identical with Girotto et al.'s (1996, Exp. 4) problem but each with a different order of features, either (D_{1X}, D_{1Y}, D_{2X}, D_{2Y}) as in Girotto et al., or either (D_{1X}, D_{2X}, D_{1Y}, D_{2Y}), where D_1 refers to one of the two dimensions (viz. miles per gallon and mechanical problems) and the second subscript to car X or Y.

A third problem was an action problem formulated in the same way as the inference problem (i.e. no anchor, focal hypothesis, or cue in the preamble) with the features ordered either (D_{1X},D_{1Y},D_{2X}, D_{2Y}). Subject's selection preferences for this problem provided the much needed control condition absent in Girotto et al.'s design for their Experiment 4.

One fourth and final problem was an action problem with an extended preamble with the features ordered (D_{1X}, D_{2X}, D_{1Y}, D_{2Y}). As noted above the framing of the problem is important. An extensive preamble may encourage people to be more alert and shift their attention to both alternatives.

2. Method

Participants

The subjects were 200 undergraduates, 120 women (Mage= 34) and 80 men (Mage= 30), at Hertfordshire University naive to the purpose of the experiment. The participants were selected as part of their requirements in an introductory psychology course, 50 participants were randomly assigned to each problem and were individually tested, and demographic information was not requested because most studies suggest that it does not influence the process of the selection task in decision making.

Design and Procedure

Each subject was given a single sheet of paper containing one of the four problems; two of them were inference problems and two were action problems. The inference X Y problem (identical to Girotto et al.'s problem, 1996, Exp. 4) read as follows:

> Your sister has a car she bought a couple of years ago. It's either a car X or a car Y, but you can't remember which. You do remember that her car does over 25 miles per gallon and has not had any major mechanical problems in the two years she's owned it.

For the first inference problem, labelled Inference XY, the four pieces of information were presented in the order (D_{1x}, D_{1Y}, D_{2X}, D_{2Y}) namely

1. The percentage of car Xs that do over 25 miles per gallon.
2. The percentage of car Ys that do over 25 miles per gallon.
3. The percentage of car Xs that have had no major mechanical problems for the first two years of ownership.
4. The percentage of car Ys that have had no major mechanical problems for the first two years of ownership.

> Assuming you could find out only two of these four pieces of information, which would you want in order to help you decide what car your sister owns?

In the second inference problem, labelled Inference XX, the preamble was identical but the four pieces of information was presented in the order (D_{1x}, D_{2X}, D_{1Y}, D_{2Y}) namely,

1. The percentage of car Xs that do over 25 miles per gallon.
2. The percentage of car Xs that have had no major mechanical problems for the first two years of ownership.
3. The percentage of car Ys that do over 25 miles per gallon.
4. The percentage of car Ys that have had no major mechanical problems for the first two years of ownership.

In the first action problem, labelled Action XY, the preamble was phrased as follows:

> You're thinking of buying a car. You've narrowed it down to either car X or car Y. You have still to decide but you do want you car to do more than 25 miles per gallon and to have no major mechanical problems in the first two years that you will own it...(the rest of the problem and the order of presentation of the four pieces of information was the same as in problem Inference XY).

In the second action problem with the extended preamble, labelled Action (EP) XX problem the preamble read as follows:

> Imagine that you are a mechanical

Table 1
Diagnostic value of the six different dyads.

		Action(Ex) X X Inference X X			**Action X Y Inference X Y**	
		Diagnostic	**Pseudo-Diagnostic**		**Diagnostic**	**Pseudo-Diagnostic**
1	X car mpg	(b) 1, 3	(a) 1, 2	X car mpg	(a) 1, 2	(b) 1, 3
2	X car m. reliab.	(e) 2, 4	(c) 1, 4	Y car mpg	(f) 3, 4	© 1, 4
3	Y car mpg		(d) 2, 3	X car m. reliab.		(d) 2, 3
4	Y car m. reliab.		(f) 3, 4	Y car m. reliab.		(e) 2, 4

Note: *mpg*=miles per gallon; *m. reliab.*=mechanical reliability

engineer and you work for a company. This company is of the most prestigious ones. All your life you were hoping to get work there. After two years of hard work you have been promoted to manager. You are now responsible for production. Two projects for a car X and a car Y are presented to you by the research team. You know that this is your opportunity. The right choice will lead you straight to the top as head of the department. You will double your salary and you will have a lot of power. The wrong decision may jeopardise your current position.

You have three days before you present your idea to the Chief Executive. The research team provided you information concerning petrol consumption and mechanical reliability for car X and car Y. In order to do the presentation you have the following piece of information... (The rest of the problem and the order of presentation of the four pieces of information was the same as in the Inference XX problem).

Participants were run in groups of 45 to 55, but they worked on the problems individually. They randomly received one of the four possible problems. General instructions indicated that answers were anonymous and the experiment had to do with decision making and was not an intelligence test. Participants were instructed to feel free to choose any two pieces of information.

There are 6 possible ways of choosing two of the four pieces of information: (a) 1 and 2 (b) 1 and 3, (c) 1 and 4, (d) 2 and 3, (e) 2 and 4, and (f) 3 and 4. Given the order in which the four pieces of information was presented in problems Action (EP) XX and Inference XX choosing dyads (b) or (e) would be an informative data selection since they specify the diagnosticity of one feature or the other. Given the different order of presentation for problems Action XY and Inference XY, dyads (a) or (f) provide the diagnostic information. Table 1 summarizes the diagnostic value of each dyad for the four kinds of problems.

3. Results

The frequencies of dyad selection for all four problems are reported in Table 2. To facilitate the description of our data these selection frequencies were reclassified in three different ways. The first was in terms of diagnostic and pseudodiagnostic dyad selection frequencies (top portion of table 3). The second was in terms of whether the first piece of information in the selected dyad was actually

Table 2.
Frequency of dyads selection.

Dyads	Action(EP) XX	Inference XX	Action XY	Inference XY
(a) 1,2	4	8	**7**	**12**
(b) 1,3	**11**	**14**	13	17
© 1,4	6	16	1	13
(d) 2,3	5	1	0	1
(e) 2,4	**22**	**8**	3	5
(f) 3,4	2	3	**26**	**2**
Total	50	50	50	50

Diagnostic Dyads are in bold and framed.

the first piece of information encountered [dyads (a)-(c)] or not [dyads (d)-(f); middle portion of Table 3]. These frequencies revealed whether subject's selection reflected a primacy effect. The third way reclassified only the diagnostic dyad selection frequencies: The bottom portion of Table 3 reports the selection frequencies of the diagnostic dyad about petrol consumption and about mechanical reliability. Given the fact that alternative hypothesis is tested and contains three or more independent samples a new method was utilized in order to considerably simplify convention results. This cannot be possible in other many-sample cases with a range of expected patterns of ordering of sample rank means. The formula for the Rank Sum Analysis is presented on the appendix (see Table 4). The advantages of a chapter for independent samples are one of computational convenience because multiple block techniques for unequal size are quite importune. K x Q contrast frequency tables differ from traditional chi-square (homogeneity) which do not require ordered categories. Rank Sum Analysis procedures are superior to chi-square homogeneity. This is because; the order of information is always presented in Rank Sum Analysis Test. In addition, Rank Sum Tests can be evaluated in terms of trends and contrasts, which is not possible for homogeneity tests. The complexity and the number of tests were kept to the minimum. Parametric analysis is likely to raise questions about the nature of the data. Consequently, a non-parametric analysis was preferred, in order to minimise the number of chi-square χ^2, (see Meddis, 1984). We used a rejection criterion of 0.01 unless indicated otherwise.

Dyad Diagnosticity

As revealed in the top portion of Table 3, participants in both action problems chose diagnostic dyads in exactly the same proportion (33/50 or 66%). The inference problems fostered considerably fewer diagnostic dyad selections: Participants selected 22 diagnostic dyads in the inference XY problem (or 44%) and 14 diagnostic dyads in the Inference XY problem (or 28%). A rank sum analysis for contrast frequency tables showed that the dyad selection frequencies for the Action XY problem were significantly different than the selection frequencies in the Inference

Table 3
Selection frequencies classified in terms of diagnosticity (top third), primacy (middle third) and in terms of dimensions (bottom third).

Selection of diagnostic and pseudodiagnostic dyads								
Dyads	**Action(EP) XX**	**%**	**Infer. XX**	**%**	**Action XY**	**%**	**Infer. XY**	**%**
Diagnost.	33	66%	22	44%	33	66%	14	28%
Pseudo-Diagnost.	17	34%	28	56%	17	34%	36	72%
Total	50	100%	50	100%	50	100%	50	100%
Selection of dyads (a)-(c) and (d)-(f)								
(a) – (c)	21	42%	38	76%	21	42%	42	84%
(d) – (f)	29	58%	12	24%	29	58%	8	16%
Total	50	100%	50	100%	50	100%	50	100%
Selection of diagnostic dyads for miles per gallon (mpg) Or for mechanical reliability (M.Rel.)								
Mpg.	11	33%	14	64%	7	21%	12	86%
M. Rel.	22	67%	8	36%	26	79%	2	14%
Total	33	100%	22	100%	33	100%	14	100%

problems XX and XY, z = 5.18. The comparison between the Action (EP) XX and two inference problems yielded the same significant z value. Achi-square[4] test contrasting the selection frequencies in Inference XX and Inference XY problems was not significant [χ^2 (1) = 2.78, p= 0.096].

Primacy Effect

Participants chose dyads 1-3 for both action problems less often (42%) than for Inference XX and XY problems (76%) and (84%) respectively. A rank sum analysis for contrast frequency tables indicated that subjects in the Action XY compared to those assigned either Inference problems, selected significantly less often a dyad involving the first piece of information, z = 11.29 (the same z value was produced when contrasting the frequencies with the Action (EP) XX problem with those of the two inference problems). The selection frequencies in the two inference problems did not differ significantly [χ^2 (1) = 1, p= 0.318].

4. Footnote : In this analysis although two cells (both informative or non-informative) can vary there is only one degree of freedom. In this case the χ^2 is interpreted as the proportion of informative/non-informative dyads in one condition vs. the other condition (for an example see Everitt, 1977).

Diagnostic Dyad Type

Diagnostic dyads could involve information about petrol consumption for car X and Y or about their mechanical reliability. The bottom portion of Table 3 shows the frequencies with which these two types of diagnostic dyads were selected in the four problems. When assigned an action problem, participant's diagnostic dyad selection was predominantly in terms of mechanical reliability (67% in the Action (EP) XX problem and 79% in the Action XY problem) while inference problems fostered a diagnostic dyad selection in terms of petrol consumption (64% in the Inference XX problem and 86% in the Inference XY problem). A rank sum analysis for contrast frequency tables confirmed that participants in the Action XY and Action (EP) XX problems chose the diagnostic dyad focused on petrol consumption significantly more often than participants assigned one of the two inference problems, $\underline{z} = 2.8$, and $\underline{z} = 3.67$, respectively. The selection frequencies within both action problems did not differ significantly [χ^2 (1) =1.22, p= 0.27] nor did they within both inference problems [χ^2 (1) = 2.08, p= 0.15]

5. Discussion

As Mynatt et al. (1993) had observed, reasoners assigned to action problems were less likely to select pseudodiagnostic information than reasoners assigned to inference problems. Furthermore, the results were identical for both action problems even though the preamble and the sequence of the data were different. In our study, the fact that inference problems fostered pseudodiagnostic data selection cannot be attributed to the framing of the problem, to any anchor, focal hypothesis, or any cue in the preamble to focus people's attention on one or both alternatives.

Reasoners assigned to an inference problem also appeared more impatient in the consideration of the evidence as illustrated by their overwhelming tendency to select a dyad involving the first piece of information they came across (on average 80% of the time over Inference XX and XY problems). In contrast (42% p<0.01) of the selected dyads with the action problems involved the first piece of evidence. This strong order effect with inference problems explains why with such problems the diagnostic reasoners appeared to favour to contrast the cars along the petrol consumption dimension: data about petrol consumption were presented first (Girotto et al., 1996).

These results contradict Girotto et al.'s (1996) findings who argued that there was no difference between action and inference problems. We suggested that their analysis unfairly compared action and inference problems. First, in their (1996) study there was no direct comparison between action and inference conditions when no anchor, focal hypothesis, or cue in the preamble were provided to focus people's attention on one or both alternatives. Rather their comparison was between a problem like our Inference XY (Girotto et al., 1996, Exp. 4) and Inference XY problem in Mynatt et al.'s study, when an anchor and a focal hypothesis were given (1993, Exp. 1). Second, in their study (Exp. 4) participants chose diagnostic dyads 58% of the time but the four pieces of information were ordered D_{1X}, D_{1Y}, D_{2X}, $D_{2Y.}$ An impatient reasoner selecting the first two pieces of information for the sake of expediency would actually be counted as a diagnostic reasoner. The results of our own study suggest that reasoners assigned an inference problem selected a dyad involving the first piece of information. Thus the lack of an appropriate action control problem and the strong primacy effect in their data vitiate their conclusion.

Mynatt et al. (1993) claimed that action problems encouraged a more thorough examination of the evidence because "utilities are intrinsically tied to actions but are extrinsic to inferences" (p. 773). Action problems may foreground consequences of the selection and a Bayesian reasoning problem is transformed into a decision making one where reasoners' choices reflect their appreciation of the costs and benefits of their decisions. Judging by the fact that diagnostic dyad selection in action problems predominantly involved information about mechanical reliability it seems that subjects most easily resonated to the cost and

Table 4
Formulas for Rank Sum Analysis and K x Q frequency table test.

I.	Category totals (*tq*) and cumulative category totals (*Σtq*) if coefficient that reflect hypothesis are λj 1 2 3 then
	$tq\mathbf{A} = 1\mathbf{A} + 2\mathbf{A} + 3\mathbf{A}$ $\Sigma tq\mathbf{A} = 1\mathbf{A} + 2\mathbf{A} + 3\mathbf{A}$ $tq\mathbf{B} = 1\mathbf{B} + 2\mathbf{B} + 3\mathbf{B}$ $\Sigma tq\mathbf{B} = 1\mathbf{B} + 2\mathbf{B} + 3\mathbf{B}\ \Sigma tq\mathbf{A}$ $tq\mathbf{C} = 1\mathbf{C} + 2\mathbf{C} + 3\mathbf{C}$ $\Sigma tq\mathbf{C} = 1\mathbf{C} + 2\mathbf{C} + 3\mathbf{C}\ \Sigma tq\mathbf{B}$
II.	Then find shared rank for each category: (*N* is the total number of scores in the frequency table) $rq = \Sigma tq - tq/2 + 0.5$
III.	Check shared ranks: $N(N+1)/2 = \Sigma(tq^{r}q)$
IV.	Find sample rank sums for each sample by multiplying the shared rank for each category by the number of scores in that category and adding: $R\mathbf{1} = (1_A)(rq_A)+(1_B)(rq_B)+(1_C)(rq_C)$ $R\mathbf{2} = (2_A)(rqA)+(2_B)(rq_B)+(2_C)(rq_C)$ $R\mathbf{3} = (3_A)(rq_A)+(3_B)(rq_B)+(3_C)(rq_C)$
V.	Then check if ranking carried out correctly (the total sum of ranks should be equal $N(N+1)/2$): $N(N+1)/2 = \Sigma Rj$
VI.	Compute sample rank means: $\bar{R}j = Rj/nj$ (*n is* the sample size)
VII.	Compute and evaluate key statistics *L* and *Z*: $Z = \frac{L-E(L)}{\sqrt{var(L)}}$ Where, $E(L) = \frac{1}{2}(N+1)\Sigma nj\,\lambda j$ and $\sqrt{var(L)} = \frac{1}{12}(N+1)\ (N\Sigma nj\lambda j2\text{-}(\Sigma nj\lambda j)\ (\Sigma nj\lambda j))$
VIII.	Finally, evaluate 2 by consulting table of normal distribution. For significance 2 must be equal or greater than corresponding critical value.

benefit of purchasing an unreliable car. Furthermore, the fact that the same patterns of diagnostic dyad selection were observed with the extended preamble action problem suggests that when subjects adopted the role of project manager they also valued reliability over petrol consumption. These interpretations are clearly post hoc: we have no independent a priori evidence concerning how our subjects weighted attributes of cars such as petrol consumption and mechanical reliability. A decision making perspective on this Bayesian reasoning problem however makes a number of interesting predictions which future research may well address. For one, if cost and benefit considerations motivate the selection of some attributes over others it ought to be possible to create contrasting perspectives that encourage different patterns of diagnostic dyad selection. For example, some subjects may be invited to adopt the role of a successful business executive with unlimited petrol funds who needs to be on the road a lot whereas others may be invited to adopt the role of an experienced mechanic who purchases a car for his cash-strapped offspring for whom petrol consumption may be more important. These different perspectives may encourage different patterns of data selection.

If action problems foster more Bayesian reasoning than inference problems simply because they better emphasise the cost/benefit topography of the choice behaviour, then it ought to be possible to couch inference problems in reasoning contexts which do so just as well. Future researchers might well encounter or create reasoning contexts whose underlying cost/benefit structure encourages diagnostic information selection, be the reasoning task framed as an "action" or an "inference" problem.

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Παράγοντες που επηρεάζουν την επιλογή διαγνωστικών και ψευδοδιαγνωστικών πληροφοριών

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ΠΕΡΙΛΗΨΗ

Η διαδικασία της ψευδούς διάγνωσης αναφέρεται στην τάση των ανθρώπων να προτιμούν μη χρήσιμες πληροφορίες από εξίσου διαθέσιμες πληροφορίες χρήσιμες για την ορθή διάγνωση. Οι Mynatt, Doherty και Dragan (1993) ανέφεραν ότι η συλλογιστική της ψευδοδιάγνωσης μειώνεται όταν αφορά προβλήματα στα οποία η επιλογή των πληροφοριών είχε συνέπειες για τη μελλοντική δράση του ατόμου σε αντίθεση με τα προβλήματα στα οποία δεν έχει κάποια συνέπεια. Οι Girotto, Evans & Legrenzi (1996) αρνήθηκαν ότι τέτοια προβλήματα «δράσης» ενισχύουν την καλύτερη επιλογή των πληροφοριών, επειδή υποστήριξαν ότι στη μελέτη των Mynatt και των συνεργατών του η δράση και η μη δράση ή ο συμπερασμός διέφερε ανάλογα με το πώς διατυπώθηκε η διαδικασία της απόφασης. Προβλέφθηκε ότι για τα προβλήματα δράσης θα υπάρχει μια υψηλότερη συχνότητα επιλογής κατατοπιστικών δεδομένων σε αντίθεση με όλα τα προβλήματα συμπερασμού. Επιπρόσθετα, η κυριότερη επίδραση για τα προβλήματα συμπερασμού θα συμβεί ανεξάρτητα από τη σειρά της παρουσίασης των πληροφοριών αλλά όχι για τα προβλήματα δράσης. Εξετάσαμε τον τρόπο με τον οποίο οι άνθρωποι συλλογίζονται σχετικά με τα προβλήματα δράσης και συμπερασμού λαμβάνοντας υπόψη τις κριτικές του Girotto και των συνεργατών του. Βρήκαμε ότι, ακόμη και όταν η παρουσίαση και η προβολή των πληροφοριών εξισώνονται και στα δύο είδη των προβλημάτων, η επιλογή των χρήσιμων για τη διάγνωση πληροφοριών ήταν πιο πιθανή για τα προβλήματα δράσης παρά για τα προβλήματα συμπερασμού.

Λέξεις-κλειδιά: Ψευδοδιάγνωση, Προβλήματα δράσης, Προβλήματα συμπερασμού, Διαγνωστικές πληροφορίες.

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