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Conditional Reasoning: The Claim That People Have a Special Sensitivity to Deontic Regulations is Mistaken

Several theoretical proposals over the last decade have held that human inference making is governed by content-dependent processes, and that content-general processes are rare

or absent. Cheng and Holyoak (1985), for example, claimed that reasoning typically uses pragmatic reasoning schemas, which are inductively acquired clusters of abstract rules that are highly generalized and defined with respect to classes of goals and types of relationships. Pragmatic schemas are thus a type of abstract knowledge structure induced from everyday life experience, which are context sensitive and used only when an appropriate goal and content are present. In contrast to Cheng and Holyoak's inductively acquired schemas, Cosmides (1989) proposed some rules for reasoning about social contracts that are claimed to be phylogenetically acquired Darwinian algorithms. From this perspective reasoning is governed by reasoning modules that are specific to social goals and their appropriate content. In particular, Cosmides claimed that these algorithms produce and operate on cost-benefit representations of social exchanges and contain inferential procedures that make a reasoner innately sensitive in detecting instances of cheating on social contracts. Although neither Cheng and Holyoak nor Cosmides have ruled out the possibility that there are other sorts of content-dependent schemas, the only sort for which they have developed anything specific concerns deontic conditionals that deal with social roles and regulations (e.g., for permissions or obligations). (1)

Manktelow and Over (1991) proposed that deontic conditionals convey subjective utilities, and that when people make judgments about deontic conditionals they consider these utilities. They claimed that people's deontic reasoning depends on their representation of the utilities associated with the agent of a deontic conditional statement (the party who lays down the rule) and an actor (the party whose behavior is its target); they argued that people attach different utilities to the outcomes of relevant actions they or others might perform. Hence, because people are able to distinguish clearly between social roles and associated subjective utilities in deontic contexts, they are able to make inferences concerning them.

Although these three theories differ from one another in the precise mechanisms by which they explain reasoning processes (and in the proposed developmental sources of these mechanisms), the approaches share two features. First, they place deontic conditionals in a special role, in which a centrally important mode of human reasoning is governed by inference mechanisms that are particular to the deontic domain. Second, the empirical base for each of these theories relies almost entirely on some findings with variants of a single sort of reasoning task--Wason's selection task.

Since its introduction (Wason, 1966), Wason's selection task has been the single most investigated deductive reasoning task in the psychological literature. In the standard problem, subjects are presented a rule of the form *If P then Q* and a set of cards to which the rule applies. For example, subjects are told that a set of cards each has a letter on one side and a number on the other and presented cards showing A, D, 4, and 7, respectively, together with the rule "If there is A on one side of a card then there is 4 on the other side that card." Subjects are then asked to select those cards, and only those cards, that are necessary to turn over in order to find out whether the rule is true or false. Note that the selections that would be made from the perspective of standard logic are the cards showing A and 7 (*P* and *Not Q*), because these are the only cards that could lead to a counterexample when turned over (i.e., to an instance of *P* and *not Q*), and only a

counterexample falsifies a conditional. However, fewer than 10% of adult subjects usually have selected these cards: the most common responses have been to select only the card showing A or the combination of the cards showing A and 4 (see review in Evans, Newstead, & Byrne, 1993).

Interest in the selection task has stemmed largely from findings of a *content effect*, i.e., that variants of the task are solved when presented with certain sorts of materials. Johnson-Laird, Legrenzi, and Legrenzi (1972), for example, asked their subjects to pretend that they were postal workers who had to determine which envelopes were potential violators of the rule that "If a letter is sealed, then it has a 50 lire stamp on it," and shown four envelopes (sealed, unsealed, 50 lire, less than 50 lire, respectively); similarly, Griggs and Cox (1982) asked their subjects to assume the role of a policeman who was trying to find potential violators of the rule that "If a person is drinking alcohol, then that person must be over 19 years of age," and required them to select from among four cards showing a person drinking alcohol, a person drinking coke, a person over 19, and a person under 19, respectively. The general finding with problems such as these is that a substantial majority of subjects have selected the *P* and *not Q* cards.

Although it at first appeared that the difference between the sorts of tasks that were not solved, such as the standard task, and the sorts that were successfully solved, such as the postal-rule and drinking-rule problems, was that the latter sort presented thematically realistic materials, this explanation has turned out not to be the case. Manktelow and Evans (1979), for example, reported several thematically meaningful versions that subjects failed to solve.

Interest in the pragmatic reasoning schemas theory (PRS theory) of Cheng and Holyoak (1985) has occurred in large part because the theory provided an explanation of the findings concerning content influences with the selection task: The thematically meaningful versions of the task that subjects successfully solved have been those that presented deontic conditional rules, particularly rules for permissions. According to PRS theory, those task versions elicited the *P* and *not Q* selections because their permission rules evoke a permission schema, whereas task versions without a pragmatic rule evoke no such schema. The permission schema proposed by Cheng and Holyoak consists of four production rules, as follows:

Rule 1. If the action is to be taken, then the precondition must be satisfied.

Rule 2. If the action is not to be taken, then the precondition need not be satisfied.

Rule 3. If the precondition is satisfied, then the action may be taken.

Rule 4. If the precondition is not satisfied, then the action must not be taken.

The schema leads to selection of the *P* and *not Q* cards because the antecedents of the first and fourth production rules correspond to those cards and the consequents specify necessities. The *not P* and *Q* cards are not selected because they correspond to the

antecedents of the second and third production rules, and the consequents of these two rules specify only possibilities.

Cheng and Holyoak (1985) presented several realistic-content versions of the task that had permission rules, and reported that task versions presenting a deontic permission regulation tended to be solved, particularly when a reason for the regulation was clearly understood. More recently, several investigators of children's reasoning have reported similar findings with children as young as four-years of age showing an ability to identify the *P* and *not Q* cards as potential violators of deontic rules, but failing to make such identifications when presented similar problems without deontic rules (e.g., Girotto, Gilly, Blaye, & Light, 1989; Harris & Nunez, in press). Indeed, Harris and Nunez expressed that children seem to have a special sensitivity to understanding when deontic conditionals are violated.

The most persuasive evidence presented by Cheng and Holyoak was in their Experiment 2, where they compared an abstract-content problem with a permission rule to an abstract-content problem with a nondeontic rule of the sort found in the standard version of the task; the abstract permission-rule problem led to *P* and *not Q* responses significantly more often than did the abstract non-pragmatic rule problem, indicating the possibility that it was the permission rule per se that led to task solution, rather than any possible familiarity of content.

The two problems from Experiment 2 of Cheng and Holyoak (1985) are as follows. The abstract permission-rule problem stated:

> Suppose you are an authority checking whether or not people are obeying certain regulation. The regulation all have the general form, "If one is to take action A, then one must first satisfy precondition P." In other words, in order to be permitted to do A, one must first have fulfilled prerequisite P. The cards below contain information on four people: one side of the card indicates whether or not a person has taken action A, the other indicates whether or not the same individual has fulfilled precondition P. In order to check that a certain regulation is being followed, which of the cards below would you turn over? Turn over only those that you need to check to be sure." These instructions were followed by drawings of four cards stating the four possible cases: "has taken action A," "has not taken action A," "has fulfilled precondition P," and "has not fulfilled precondition P."

The nonpragmatic-rule problem stated:

> Below are four cards. Every card has a letter on one side and a number on the other. Your task is to decide which of the cards you need to turn over in order to find out whether or no a certain rule is being followed. The rule is: "If a card has an A on one side, then it must have a 4 on the other side." Turn over only those cards that you need to check to be sure." Drawings of four

cards followed, showing four possible cases: "A," "B (i.e., not A)," "4," and "7 (i.e., not 4)."

As Jackson and Griggs (1990) noted, however, the two problems differ from one another in several ways that have nothing to do with the presence vs. absence of a permission rule. For example, the abstract permission-rule problem provided what Jackson and Griggs referred to as a checking context, i.e., instructions to assume the role of an authority checking for possible violators, whereas the nonpragmatic-rule problem presented no such context. Further, the second and fourth cards in the permission-rule problem (i.e., the not P and not Q cards) presented their negatives explicitly ("has not taken Action A," and "has not fulfilled Precondition P"), whereas the corresponding cards in the nonpragmatic-rule problem presented the negatives implicitly, but added a parenthetical comment about their negative status,i.e., "B (i.e., not A)," and "7 (i.e., not 4)." (For a more detailed discussion of several additional differences between the two problems, see Noveck & O'Brien, in press).

Jackson and Griggs also noted that although the original version of the selection task required testing the truth or falsity of a hypothetical rule, the task versions with deontic conditionals that subjects have solved have required instead identification of potential rule violators. In other words, although the original task required identification of potential falsifiers in reasoning about a conditional hypothesis, the deontic versions have required identification of potential violators in reasoning from a conditional rule.

Jackson and Griggs reported that the permission rule problem was not solved when the checking-content was removed, or when the explicit negatives were replaced with implicit negatives, or when the task requires testing the truth of a rule rather than finding violators of a rule, and they suggested that the apparent facilitation of *P* and *not Q* responses by the abstract permission-rule problem was not the result of its permission rule, but stemmed instead from the various other ways in which the two problems differed. (2)

Several recent investigations (Girotto, Mazzocho, and Cherubini, 1992; Griggs and Cox, 1993; Kroger, Cheng, and Holyoak, 1993) have argued that Jackson and Griggs were premature in dismissing the role of the permission rule, noting that Jackson and Griggs failed to show that a problem without a pragmatic rule, but containing these various other task features, led to task solution. These investigators have reported that solution seems to require that the task contain several features. First, the task needs to have a deontic rule rather than some otherwise arbitrary conditional; second, the task needs to present the negatives in the cards explicitly rather than implicitly; third, the task needs to require identification of potential violators of a rule rather than potential falsifiers of a hypothesis. The absence of any of these features is sufficient to stop subjects from solving the task. (3)

Collectively, Girotto et al., Kroger et al., and Griggs and Cox have argued for a *deontic-relevance hypothesis*. From this perspective, a problem with a permission rule can evoke the permission schema with its four production rules, whereas a problem without such a

rule has no schema that it can engage. The presence of a checking context can aid in evocation of the permission schema, although the schema might be engaged without such a context. The use of instructions to seek potentially falsifying instances leads to a failure to engage the permission schema, because the four production rules pertain only to the discovery of potential violators and not to testing the rule. The explicit negatives are required to help subjects to match the *Not Q* card onto Rule 4 of the permission schema.)

As further support for the deontic-relevance hypothesis Girotto et al. (1990), Griggs and Cox, (1993), and Kroger et al. (1993) pointed out that the error patterns differed significantly between non-permission-rule and permission-rule problems when implicit negatives have been presented. Whereas the modal erroneous response pattern on the arbitrary-rule problem has been to select the *P* and *Q* cards, it is the *P-only* selection that has occurred most frequently on the permission-rule problem. These authors argued that the *P* and *Q* response pattern occurred on the non-pragmatic problems because these problems evoke no pragmatic schema and subjects therefore rely on a more primitive matching strategy see Footnote 3). The pragmatic-rule problems, however, do evoke the permission schema; with the implicit negatives, however, the not *Q* response is suppressed because subjects fail to perceive its correspondence to Production Rule 4 of the permission schema, where the information is stated explicitly (i.e., "If the precondition is not satisfied...").

The PRS theorists have concluded that a problem will be solved when it includes the following features: a pragmatic rule that allows a pragmatic schema to be evoked, explicit negatives in the cards so that the information in the cards can be understood as deontically relevant, and possibly a checking context (to aid in understanding that the pragmatic schema should be evoked), and a search-for-violators form of the task (because the pragmatic schemas pertain only to this sort of demand and are not pertinent to the demands of tasks requiring falsification). In addition, Kroger et al. (1993, p. 633) stated that "the favorable presentation factors will be useless for facilitating performance with an arbitrary rule."

Recently, Noveck and O'Brien (in press) reported, however, that there are presentation factors that facilitate *P* and *not Q* selections both with pragmatic rules and without them. Their results were consistent with the predictions of the deontic-relevance hypothesis in that neither use of explicit negatives nor of the violator instructions led to *P* and *not Q* responses with non-pragmatic-rule problems, although these features were crucial to solution of the pragmatic-rule problems. Noveck and O'Brien found, however, that there are other task features that facilitate solution of permission-rule problems, and that these features also lead to much higher rates of solution on the non-pragmatic-rule problems when they are present. One feature concerns how the task instructions were given; for example, presenting the violator instructions as "In order to check whether the regulation has been violated, which of the cards would you turn over? Turn over those cards, and only those cards, that you need to check to be sure" led to more solutions than did "Turn over only those cards that you need in order to check that the rule is being followed."

Noveck and O'Brien found that the various task features that influence problem solution interacted in a complex way. In particular, such features as the variation in wording of instructions had an affect on the pragmatic-rule problems only when the problems were presented with explicit negatives, whereas they affected the non-pragmatic-rule problems whether the negatives were explicit or implicit. Noveck and O'Brien argued that this indicates that the deontic and non-deontic rule problems were processed differently from one another; whereas the deontic problems did not require specific instructions to search for violators ("check whether the rule is being followed"), the non-deontic problems required such specific instruction.

Noveck and O'Brien proposed that this difference reflects a difference between the two sorts of conditionals in the ways that a counterexample is understood. As Manktelow and Over (1991) noted, deontic conditionals involve roles that reflect people's intentions about actions and contingencies. For example, consider the drinking-age problem with the rule, "If a person drinks alcohol, then they must be at least 21 years of age." Finding a 16 year old drinking beer does not necessarily indicate that the drinking regulation is false, yet it indicates that someone has violated or broken the drinking rule. Hence, deontic conditionals can be violated, yet cannot be falsified. Consider, however, a scientific hypothesis such as "If an object is dropped to the surface of Mars, it will fall at a rate of 7 meters per second per second." In this case, observation of an object dropped to the surface of Mars, but falling at different accelerating velocity, does not indicate that the object is violating the proposition; rather, it would be more appropriate to say that the proposition has been falsified. Consequently, although deontic regulations and indicative natural laws both may be expressed in the form of conditionals, counterexamples to these two sorts of conditionals have different implications.

Both the reasoning-from (i.e., violator) and reasoning-about (i.e., falsifier) versions of the task require identification of potential counterexamples, i.e., of instances of *P* and *not Q*. There is no reason, however, to expect that a subject required to falsify a deontic conditional will find the request sensible, and thus may not think to find a potential counterexample; similarly, a subject required to find potential violators of an indicative conditional (such as a scientific hypothesis) may not find the request sensible, and thus may not think to find a potential counterexample. Put simply, the present work is motivated by the proposition that when the violator version of the task is presented with an indicative conditional, or when the falsifier version is presented with a deontic conditional, subjects are being required to make judgments that do not correspond to their ordinary intuitions.

Experiment 1 addresses whether people typically share the intuition described in Noveck and O'Brien that a counterexample to a deontic conditional violates that conditional and a counterexample to an indicative conditional falsifies that conditional. In Experiment 2 several falsifier versions of the task with indicative conditionals are presented; each problem makes clear that the subject is to seek information that could show the conditional false. The work is exploratory, seeking to discover whether falsifier versions of the selection task that present indicative conditionals can be constructed that subjects will solve, i.e., that will lead to selection of the *P* and *not Q* situations. In Experiment 2

the problems are presented without the usual card format, instead listing four possible situations corresponding to *P*, *not P*, *Q*, and *not Q*. This change was made so that any possible problem difficulty associated with thinking about what is on alternative sides of cards would be reduced. Experiment 3 investigates the possibility that presenting a problem with a context that makes searching for a falsifying counterexample less obvious will suppress *P* and *not Q* responses. Experiment 4 extends the sort of problems presented in Experiment 2 by presenting the information is the usual card format.

Experiment 1

The goal of the problems presented here was to investigate the hypothesis that a counterexample to a deontic conditional would be interpreted as violating that conditional, whereas a counterexample to an indicative conditional would be interpreted as falsifying that conditional. To that end, each problem presented a conditional (either deontic or indicative) together with a counterexample, and presented two response choices (one stating that the conditional had been violated, the other that the conditional had be shown false).

Method

Subjects. Fifty-six undergraduate students participated to fulfill a requirement of the introductory psychology course at Baruch College. Data for one additional participant are not included because that participant failed to follow instructions.

Tasks and Procedure. Four problems were constructed, each presenting a conditional together with its counterexample, and requiring participants to judge whether the counterexample violates or falsifies the conditional. Each subject was presented all four problems; the problems were on two pages, with one problem on each page containing a deontic conditional and the other problem an indicative conditional. The four problems were as follows. First, one of the indicative-conditional problems (The Ammonia Problem) stated:

> Some astronauts arrived on the Moon. The scientists told them that according to the laws of Newtonian physics, liquid ammonia will follow this rule:
>
> **If liquid ammonia is boiled on the surface of the Moon,**
> **then its temperature will be above 180 degrees.**
>
> The astronauts boiled a beaker of ammonia, but its temperature was less than 180 degrees.
>
> What do you think this means?

a) The beaker of ammonia was breaking the laws of Newtonian physics.
b) What the astronauts were told by the scientists about the rule was wrong.
Please choose the best answer and briefly explain why you chose that answer.

The Ammonia Problem was presented on the same page as the following deontic-conditional problem (the Grill Problem):

Some tour guides arrived at a restaurant in Gotham City. The Gotham City health inspector told them that according to the public health laws, a restaurant must follow this rule:

If a restaurant grills a hamburger,
then the temperature of the grill must be above 180 degrees.

The tour guides went into the restaurant kitchen, but found that the cook was grilling a hamburger at a temperature far less than 180 degrees.

What do you think this means?

a) The restaurant was breaking the public health laws.
b) What the tour guides were told by the health inspector about the rule was wrong.
Please choose the best answer and briefly explain why you chose that answer.

The deontic-conditional problem on the second page (the Expressway Problem) was as follows:

Some tourists arrived at the Gotham City Airport and rented a car. The car rental agent told them that according to the highway safety laws a driver must follow this rule:

If a car is driven on the Expressway,
then its speed must be kept below 65 miles per hour.

The tourists drove on the Expressway, and they kept their speed just below 65 miles per hour. They noticed that another car went past them at a much higher speed.

What do you think this means?

a) The driver of the other car was breaking the highway safety laws.
b) What the tourists were told by the car rental agent about the rule was wrong.

Please choose the best answer and briefly explain why you chose that answer.

The Expressway Problem was presented on the same page as this indicative-conditional problems (The Weight Problem):

Some astronauts arrived on the first landing on the planet Mars. The scientists told them that according to the laws of Newtonian physics, a weight will follow this rule:

If a weight is dropped to the surface of Mars,
it will fall at a rate of 9 meters per second per second.

The astronauts dropped a weight to the surface of Mars, but found that it fell at a much higher speed.

What do you think this means?

a) What the astronauts were told by the scientists about the rule was wrong.
b) The weight was breaking the laws of Newtonian physics.
Please choose the best answer and briefly explain why you chose that answer.

The task was administered individually. Subjects were informed that they were receiving a logical reasoning task and that they should give their most considered answers; they were asked to write a brief justification for each answer. The orders of the two problem pages, of the problems on each page, and of the expected response choices were the counterexamples (violating and falsifying interpretations) were counterbalanced.

Results and Discussion

Responses were scored by giving one point for each violator response, i.e., each judgment that the conditional had been violated by the counterexample, and zero points for each falsifier response. Thus, across the two problems of each type (deontic or indicative), a score = 2.00 indicates two violator responses and a score = 0.00 indicates two falsifier responses.

The mean for the deontic problems was 1.84 (i.e., 92% of responses to the deontic problems were judgments that the conditional had been violated by the counterexample), and the mean for the indicative problems was .54 (i.e., 73% of responses to the indicative problems were judgments that the conditional was false given the counterexample). A correlated t test revealed that the two means differed significantly, t (55) = 12.44, $p < .001$, thus supporting the hypothesis. Two additional t tests were computed, one comparing the observed mean for the deontic problems to what would be expected by chance alone (chance = 1.00), yielding t (55) = 7.67, $p < .001$, the other comparing the observed mean for the indicative problems to what would be expected by chance alone,

yielding t (55) = 4.24, $p < .001$. The results thus supported the expectation that a counterexample to a deontic conditional would be interpreted as violating that conditional, whereas a counterexample to an indicative conditional would be interpreted as falsifying that conditional.

Experiment 2

Given the results of Experiment 1, the following expectations concerning construction of versions of the selection task can be made: If one wants to construct a task with a deontic conditional that corresponds to ordinary intuitions about the meaning of a counterexample to a deontic conditional, the task should require identification of potential violators of the conditional; if one wants to construct a task with an indicative conditional that corresponds to ordinary intuitions about the meaning of a counterexample to an indicative conditional, the task should require identification of potential falsifying evidence for the conditional.

The goal of the present experiment was exploratory, seeking simply to construct reasoning-from task versions with indicative conditionals that clearly require identification of potentially falsifying information. The problems differ from the usual task version in that they did not show pictures of four cards; rather, they listed four situations. This change was made so that any possible difficulty stemming from requiring thinking about cards and their sides would be eliminated.

All of the problems presented indicative conditionals that were locative, that is, they had antecedents that provided conditional directions concerning someone going to some location and consequents that follow from going to that location. This locative sort of conditional was presented because locatives are among the earliest sorts of semantic categories available in language acquisition (e.g., Braine, 1976), and thus it was expected that locatives would be readily understood by adult subjects.

Method

Subjects. One-hundred-sixty-eight undergraduates participated to fulfill a requirement of the introductory psychology course at Baruch College.

Tasks and Procedure. Six reasoning-from selection-task problems were constructed, each with an indicative conditional, and each clearly requiring selection of the potentially falsifying instances. Each problem first presented a narrative providing a context for the conditional, followed by an indicative conditional, and then by the task instructions and finally a list of four possible situations, corresponding to *P*, *not-P*, *Q*, and *not-Q*.

Each subject was assigned randomly to one of the six problems, and the task was administered in small groups (between 5 and 20 participants per group). Each subject was asked to write a brief justification for their selections.

One problem, referred to as the If-Third-then-Corner-of-Main Problem, was as follows:

> Robert lives in Gotham City. He is not a very nice person. He likes to make up things that are not true, and he thinks it's funny when he tricks people. Yesterday, some tourists to Gotham City asked Robert about how to get to Gideon's Department Store. Robert told them:

If you take a left at Third Avenue, you will find
Gideon's Department Store on the corner of Main Street.

> These tourists became very upset when they found out that Robert had lied to them. Now consider the following list of four possible situations that might have happened. Put a check mark next to each situation that would have led these tourists to discovering that Robert had lied to them.
>
> 1) The tourists took a left at Third Avenue.
> 2) The tourists did not take a left at Third Avenue.
> 3) The tourists found Gideon's Department Store on the comer of Main Street.
> 4) The tourists did not find Gideon's Department Store on the comer of Main Street.

A second problem, referred to as the If-Third-and-Main-then-Gas-Station Problem, was identical to the first problem, except (a) the tourists asked for directions to a gas station rather than to Gideon's Department Store, (b) the conditional was changed to "If you go to the comer of Third Avenue and Main Street, you'll find a gas station there," (c) references to lying in the first problem were changed to references about "Robert had not told them the truth" and "what Robert told them was not true."

A third problem, referred to as the If-Siam-then-McDonalds Problem was as follows:

> Some American tourists in Bangkok, Thailand, had become tired of eating nothing but Thai food, and decided they would like to find a McDonalds. The manager of their hotel told them:
>
> **If you go to the Siam Square Mall,**
> **there is a McDonalds in the food court.**
>
> The tourists became upset when they concluded that what the manager said was wrong. Please indicate each situation below that would have led the tourists to become upset.
>
> a) The tourists went to the Siam Square Mall
> b) The tourists did not go to the Siam Square Mall
> c) The tourists found a McDonalds in the food court
> d) The tourists did not find a McDonalds in the food court

The fourth problem, referred to as the If-Siam-then-Find-McDonalds Problem, was identical to the If-Siam-then-McDonalds Problem, except that the conditional was presented as "If you go to the Siam Square Mall, you will find a McDonalds in the food court." This change was motivated to investigate a possible difference between two sorts of conditionals: One in which the consequent relies on its antecedent and one in which the consequent could be true whether or not its antecedent was true.

A fifth problem, referred to as the If-Hilton-then-Game Problem, was as follows:

> Tom had to go on a business trip to Montana and would be gone until Friday. He was disappointed because he wanted to watch the New York Knicks basketball game on television Thursday night. His boss told him not to worry because
>
> **If you stay in the Hilton Hotel, the game will be available on satellite television.**
>
> Tom was disappointed when he discovered that what his boss told him was not true.
>
> Please put a check mark next to each situation below that would have led Tom to discovering that what his boss told him was not true.

1. Tom stayed in the Hilton Hotel.
2. Tom did not stay in the Hilton Hotel.
3. The game was available on satellite television.
4. The game was not available on satellite television.

This problem was included because, although it had a locative antecedent, its consequent referred to an event that could occur at that location rather than simply to something that could be found at that location, thus providing additional variety among the problems.

A sixth problem, referred to as the If-Route-R-then-Location-L Problem, was as follows:

Peter lives in Gotham City: He is not a very nice person. He likes to make up things that are not true, and he thinks it's funny when he tricks people. Yesterday, some tourists became very upset when they found out that Peter had not told them the truth.

Now consider the following list of four possible situations that might have happened. Put a check mark next to each situation that could have led these tourists to discovering that what Peter told them was not true.

1) The tourists took Route R.
2) The tourists did not take Route R.
3) The tourists got to Location L.
4) The tourists did not get to Location L.

This problem was provided in order to present an abstract-content version of a locative-type problem.

Results and Discussion

Only two response patterns (the logically appropriate *P and not Q* pattern and the *not Q only* patterns) occurred on any problem with greater frequency than would be expected by chance. (Chance = .0625 because each of the four situations has a .50 probability of being selected, and $.50^4 = .0625$.) The proportions with which each of these two response patterns occurred are shown in Table 1. (4) Inspection of Table 1 reveals that the logically appropriate response pattern (i.e., selection of the *P* and *not Q* situations that could lead to a counterexample) was made more often than would be expected by chance on all six problems, although not equally across all problems. Tests for the significance of a difference between two independent proportions were computed, revealing that the If-Third-and-Main-then-Gas-Station problem was more likely than any other problem to elicit the *P* and *not Q*response pattern ($z = 2.53$, $p < .025$ when compared to the If-Route R-then-Location-L problem, which was the problem with the least amount of difference.) The If-Siam-then-McDonalds problem was less likely to elicit the P and not Q pattern than any other problem, except the If-Siam-then-Find McDonalds, and this latter problem was less likely to elicit the P and not Q pattern than all of the other problems except the If-Third-then-Comer-of-Main problem ($z = 2.96$, $p < .005$, when compared to the If-Third-then-Comer-of-Main problem, which was the problem with the least amount of difference that achieved statistical significance).

The only other response pattern that occurred more often than would be expected by chance alone was the selection of only the *not Q* situation, and on these problems the differences among problems were the mirror image of those for the *P* and *not Q* pattern, occurring more often on the two If-Siam problems, and least often on the If-Third-and-Main-then-Gas-Station problem and the If-Route-R-then-Location-L problem. Taken together, these two response patterns accounted for the overwhelming majority of responses, and hardly any responses of the sort found typically on the traditional selection task with an indicative conditional were made, i.e., the *P* and *Q* pattern and the *P only* pattern.

Table 2 shows the proportions with which each of the four situations were selected on the six problems, summed across all response patterns. Inspection of Table 2 reveals that subjects almost always understood that assessing the situation in which the consequent is false is required to test the possible falsity of an indicative conditional, something the previous literature has not reported.

Not all of the problems, however, led subjects to selection of the *P* situation. Inspection of their written justifications provides some insight into why some problems discouraged selection of the *P* situation. Consider first the difference between the If-Third-then-Comer-of-Main problem (on which selection of *P* was far from universal) and the If-Third-and-Main-then-Gas-Station problem (on which selection of *P* almost always occurred). Written justifications on the Comer-of-Main problem indicated that many

subjects thought that the tourists might get to the comer of Third and Main by an alternative route, and this would be sufficient to establish that the conditional is false upon the discovery that its consequent is false, and would still be false if the tourists took the route (via Third Avenue) recommended. Similarly, the two Siam-and-McDonalds problems apparently discouraged selection of the P situation for the same sort of reason: The tourists could discover that there is no MacDonalds at the food court without actually going to Siam Square, and this falsity of the consequent would hold if they had followed the manager's advice.

Tables 1 and 2

In summary, the vast majority of subjects ignored the not P and the Q situations and selected from the *P* and *not Q* situations. These findings reveal a far greater appreciation of what falsifies a conditional than previous investigations have suggested.

Experiment 3

The problems presented here had two goals. One was to present an indicative conditional that went beyond the sorts of locative directions presented in the problems presented in Experiment 1. This was accomplished by constructing a problem in which the conditional refers to an event and a financial outcome. The second goal was to provide a problem in which the context of the falsity judgment might possibly lead subjects away from a strictly logical search for a counterexample, and towards a strategy that would seek an explanation for the context.

Method

Subjects. Sixty-two undergraduate participated to fulfill a requirement of the introductory psychology course at Baruch College.

Tasks and Procedure. The procedures were identical to those of Experiment 2. Three newly constructed problems were presented. One problem, If-Taxi-then-More-Than-$20 Problem

> Robert lives in Gotham City. He is not a very nice person. He likes to make up things that are not true, and he thinks it's funny when he tricks people. Yesterday, some tourists to Gotham City asked Robert about how to get to the airport. Robert told them:
>
> **If you take a taxicab to the airport, it will cost more than $20.**
>
> These tourists became very upset when they found out that Robert had lied to them. Now consider the following list of four possible situations that

might have happened. Put a check mark next to each situation that would have led these tourists to discovering that Robert had lied to them.

1) The tourists took a taxicab to the airport.
2) The tourists did not take a taxicab to the airport.
3) The cost was less than $20.
4) The cost was more than $ 20.

If-Taxi-then-Less-Than-$20 Problem

This problem is same as the If-Taxi- then-More-Than-S20 Problem, except that i.e., the conditional "If you take a taxicab to the airport, it will cost more than $20" is modified to "If you take a taxicab to the airport, it will cost less than $20." This modification was made to investigate the possibility that searching for a counterexample could be suppressed by a context that makes such a search inappropriate.

Results and Discussion

The proportions with which those response patterns made more often than would be expected by chance alone are shown in Table 3. Inspection of Table 3 reveals that responses to the If-Taxi-then-Less -Than-$20 problem were quite similar to the problems in Experiment 2 in that only the *P* and *not Q* and the *not Q* response patterns occurred more often than would be expected by chance alone. Neither of these two response patterns occurred more than rarely on the If-Taxi-then-More-Than-S20 problem, which led instead to three different response patterns: *P only*, *not P only*, and *not P and not Q*; none of these patterns were typical on any of the other problems in Experiments 2 and 3. The If-Taxi-then-Less-Than-$20 was significantly more likely to elicit the *P* and *not Q* response pattern than was the If-Taxi-then-More-Than-$20, $z = 4.70$, $p < .00$ I, and more likely to elicit the *not Q only* pattern, $z = 3.69$, $p < .001$. Differences between the two problems for the *P only*, and the *not P* and *not Q* patterns failed to achieve statistical significance, but they did differ significantly on the *not P only* pattern, $z = 3.03$, $p < .005$.

The proportions with which each of the four situations were selected on the two problems, summed across all response patterns are shown in Table 4. Although almost all selections on the If-Taxi-then-Less-Than-$20 problems were of the *P* and *not Q* situations, revealing an appreciation of the need to find a counterexample, the modal response to the If-Taxi-then-More-Than-$20 problem was selection of the not P situation. Inspection of written justifications indicates that this selection was made from consideration of what might have upset the tourists, and most subjects assumed that they became upset because they did not follow the advice, believing that to do so would be too expensive, only to discover that they should have taken a taxi. This indicates that subjects did not understand their task as being a search for potentially falsifying information, but rather to find what would have upset the tourists. Clearly, if subjects are to make the logically appropriate responses, they must understand clearly that this is what they are expected to do.

Tables 3 and 4

Experiment 4

The problems here investigate any possible effects of presenting cards in the traditional style with four cards, rather than presenting a list of situations as was done in Experiments 2 and 3.

Method

Subjects. One-hundred-fifty-three undergraduate students participated to fulfill a requirement of the introductory psychology course at Baruch College.

Tasks and Procedure. Six problems were constructed. One problem was identical to the If-Third-and-Main-then-Gas-Station Problem of Experiment 2 except that the list of four situations was replaced by four cards, and subjects were instructed to "circle each card that might reveal that what Peter told them was not true." The four cards showed "The tourists went to the comer of Third Avenue and Main Street," "The tourists did not go to the comer of Third Avenue and Main Street," "The tourists found a gas station there," "The tourists did not find a gas station there." The other five problems are shown in Table 5. The procedures were the same as in Experiments 2 and 3.

Table 5

Results and Discussion

The proportions with which those response patterns that were made more often than would be expected by chance alone are shown in Table 6. Inspection of Table 6 reveals that on all six problems the *P* and *not Q* response pattern occurred more often than would be expected by chance alone. Tests for the significance of a difference between two independent proportions revealed no differences among the problems for this pattern. The presentation of the situations as information written on the sides of cards thus did not appreciably influence performance in relation to the lists of situations presented in Experiments 2 and 3.

Only three other response patterns occurred more often than would be expected by chance alone: the *not Q only* pattern on the If-Million-Dollars-then-Sell problem, the *P only* pattern on the If-One-ounce-then-Six-Months problem and the *not P* and *not Q* pattern on the If-Right-then-Deep problem. None of these response patterns occurred as often as the *P* and *not Q* pattern.

Tables 6 and 7

Table 7 shows the proportion with which each situation was selected on each of the six problems, summed across response patterns. Inspection of Table 7 shows that both the *P* and the *not Q* selections were made much more often than the *not P* and the *Q* selections. Taken together, the results shown in Tables 6 and 7 show that across all six problems subjects understood that seeking a counterexample is the appropriate way to falsify the indicative conditional.

General Discussion

Until now no falsifier version of the selection task had been reported on which subjects make the logically appropriate selections of *P* and *not Q*, although many violator versions with deontic conditionals have elicited such responses. This had led many theorists to claim that people have some special mental processes for reasoning about deontic regulations. The present results clearly show that construction of a falsifier version of the task with an indicative conditional that subjects are able to solve is possible. The claims of earlier researchers that people have a special sensitivity to deontic regulations is thus brought into serious doubt. The present results indicate that earlier findings must have relied on some specific task features that had discouraged the logically appropriate responses and that college undergraduates are able to seek falsifying evidence when the need for such is made clear to them.

Because deontic conditionals per se do not take truth assignments, they are outside the scope of propositional reasoning (given that propositions by definition take on truth values), and requiring falsification of a deontic conditional does not correspond to ordinary psychological intuitions about such regulations. Indicative claims, however, are within the scope of propositional reasoning, and requiring falsification of an indicative conditional does correspond to ordinary psychological intuitions about conditional propositions. In brief, it takes a regulation to be violated and it takes a proposition to be falsified. When psychological researchers conflate the demands of these two sorts of conditionals, subjects will not demonstrate their awareness of what constitutes a counterexample. Such mismatches between task demands and types of conditionals have led an entire area of cognitive research to come to an erroneous conclusion about a central feature of human deductive reasoning.

Why have previous researchers failed to find subjects making *P* and *not Q* responses on indicative-conditional falsifier versions of the task, as was found in the Experiments reported here? The present research does not provide a definitive explanation, and further research is required to answer this question. However, a reasonable supposition is that unlike the problems presented here, previously reported problems have not been clear in their instructions to subjects about what they were being required to do, i.e., to search for potentially falsifying evidence. Typically, subjects are asked merely to turn over those cards that could test whether or not a rule is true. This sort of instruction can discourage the logically appropriate responses for two reasons: First, the problems present an indicative conditional as though it were a rule, and it cannot reasonably be considered a

rule, but is rather an indicative description. Second, the wording ("whether or not the rule is true") fails to signal that the task actually requires finding whether the conditional is false. It may well be the case that when presented with a deontic regulation and the instruction to discover whether the rule is being obeyed that subjects understand that they are looking for potential violators. Such an interpretation of the task probably is encouraged by presentation of a checking context (e.g., "Assume that you are a policeman..."), for it is not the usual role of an authority checking for compliance to a rule to find those individuals who are not violating the rule. (Policemen issue tickets to rule violators, but do not issue credits to rule followers.) It may not similarly be the case that someone seeking to find out whether an indicative claim is true will proceed from the assumption that discovering falsity is the goal.

Deontic and indicative conditionals of the sort discussed here are not the only sorts of conditionals that might require special consideration concerning how a counterexample is interpreted, i.e., whether the counterexample is taken as falsifying or as violating its conditional. Consider the class of conditional promises, for example, "If you loan me $200, I'll pay you back next Tuesday." This conditional is not deontic, in the sense of a regulation described earlier; there is no modal ("must") as in a deontic regulation: such a promise is intentional, but not deontic. Given that it is intentional, however, it is not purely indicative either. In such a case, is the counterexample falsifying or violating? Suppose the counterexample occurs, and you loan me $200 but I fail to pay you back on Tuesday. Clearly I have broken my promise, that is, I have violated the conditional promise. Note however, that this violation shows that my initial promise was a lie. Future research may well find that there are classes of conditionals for which falsification instructions and violation instructions are equally appropriate. On the sorts of tasks that one finds in the literature to date, however, confusing falsifier and violator versions of the task can only lead to false assessments of some basic human deductive processes.

References

Braine, M.D.S. (1976). Children's first word combinations. **Monographs of the Society for Research in Child Development**, 41, No. 1.

Cheng, P.W.& Holyoak, K. (1985). Pragmatic reasoning schemas. **Cognitive Psychology**, 17, 391-416.

Cosmides, L. (1989). The logic of social exchange: has natural selection shaped how humans reason? Studies with Wason selection task. **Cognition**, 31, 187-276.

Evans, J. St. B. T. (1984). Heuristic and analytic process in reasoning. **British Journal of Psychology**, 75, 451-468.

Evans, J.St.B.T., Newstead, S.E., & Byrne, R.M.J. (1993). **Human reasoning: The psychology of deduction**. Hove, UK: Erlbaum.

Girotto, V., Gilly, M., Blaye, A., & Light, P.H. (1989). Children's performance on the selection task: Plausibility and familiarity. **British Journal of Psychology**, 80, 79-95.

Girotto, V., Mazzocco, A., & Cherubini, P. (1992). Pragmatic judgment of relevance in reasoning: A reply to Jackson and Griggs. **The Quarterly Journal of Experimental Psychology**, 45A, 547-574.

Griggs, R.A. (1989). To see or not to see: That is the selection task. **Quarterly Journal of Experimental Psychology**, 41A, 517-529.

Griggs, R. A. & Cox, J. R, (1993). Permission schemas and the selection task. **The Quarterly Journal of Experimental Psychology**, 46A. 637-651.

Harris, P.L. & Nunez, M. (in press). Understanding of permission rules by preschool children. **Child Development**.

Jackson, S. L. & Griggs, R. A. (1990). The elusive pragmatic reasoning schema effect. **The Quarterly Journal of Experimental Psychology**, 42A (2), 353-373.

Johnson-Laird, P. N., Legrenzi, P. & Legrenzi, M. (1972). Reasoning and a sense of reality. **British Journal of Psychology**, 63, 395-400.

Kroger, J. K., Cheng P. W., & Holyoak, K. J. (1993). Evoking the permission schema: The impact of explicit negations and a violation-checking context. **The Quarterly Journal of Experimental Psychology**, 46A, 615-635.

Manktelow, K. I., & Evans, J. St. B. T. (1979). Facilitation of reasoning by realism: Effect of non-effect? **British Journal of Psychology**, 70, 477-488.

Manktelow, K. I. & Over, D. E. (1991). Social roles and utilities in reasoning with deontic conditionals. **Cognition**, 39, 85-105.

Noveck, I. A. & O'Brien, D. P. (in press). To what extent do pragmatic reasoning schemas affect performance on Wason's selection task?. **The Quarterly Journal of Experimental psychology**.

Wason, P. C, (1966). Reasoning. In B. M. Foss (Ed.), **New Horizons in Psychology**. Harmondsworth: Penguin.

Footnotes

1. "Deontic" refers to statements concerning regulations (either judicial or moral) delineating obligations or permissions; "indiCative" refers to statements concerning matters of fact.

2. Jackson and Griggs (1990) accounted for their results in terms of Evans's two stage theory (Evans, 1984). According to Jackson and Griggs, the presence of explicit negatives, (e.g., "has not taken action A" and "has not fulfilled precondition P," in the permission rule problem is important during a heuristic stage where they would focus attention so that subjects would find all four cads relevant to the rule; the implicit negatives would cause subjects to disregard the Not P and Not Q cards because they are not named in the rule. Then, during an analytic processing stage, the presence of a checking-context would trigger subjects to look for violators of the rule, whereas the absence of the checking-context would not alert the subjects to look for violators, because they would not be sure what the rule is asking them to do. Moreover, they claimed that when the checking-context and the explicit negatives are removed from the abstract permission rule problem, subjects become prey to matching bias. Matching bias initially was proposed by Evans and Lynch (1973). According to this, when subjects are presented with abstract problems, they become thoroughly confused and tend to choose the values that are named in the rule, (e.g., P and Q cards). Jackson and Griggs thus concluded that evoking the permission schema is not the real reason for the facilitation on the permission rule problem; rather, extraneous task features such as the checking-context and the explicit negatives are responsible for the facilitation.

3. Griggs (1989) reported a non-pragmatic-rule violator problem that often leads to the P and not Q response pattern. For some reason this problem is rarely acknowledged in discussion by PRS theory advocates.

4. Table 1 indicates which response patterns occurred more often than would be expected by chance alone.

Table 1

Proportions of the commonly occurring response pattern for the problems of Experiment 2

	Response Patterns		
Problems	P, ~Q	~Q	Other
If-Third-then-Comer-of-Main (n = 39)	.41***	.33***	.26
If-Third-and-Main-then-Gas-Station (n = 25)	.80***	.08	.12
If-Siam-then-McDonalds (n = 24)	.17*	.58***	.25
If-Siam-then-Find-McDonalds (n = 22)	.23**	.73***	.05
If-Hilton-then-Game (n = 29)	.45***	.24***	.31
If-Route-R-then-Location-L (n = 29)	.59***	.07	.34

Note: P, Not Q indicates selection of the P and the not-Q situations; Not-Q indicates selection of the Not-Q situation; * indicates a response pattern that occurred more often than would be expected by chance, $p < .05$; ** indicates a response pattern that occurred more often than would be expected by chance, $p < .01$; *** indicates a response pattern that occurred more often than would be expected by chance, $p < .001$.

Table 2

Proportions with which the P, not-P, Q and not-Q *situations were selected in Experiment 2*

	Situations Selected			
Problems	P	~P	Q	~Q
If-Third-then-Comer-of-Main (n = 39)	.59	.08	.15	.90
If-Third-and-Main-then-Gas-Station (n = 25)	.92	.04	.04	.92
If-Siam-then-McDonalds (n = 24)	.25	.13	.13	.79
If-Siam-then-Find-McDonalds (n = 22)	.27	.00	.00	.95
If-Hilton-then-Game (n = 29)	.55	.21	.07	.83
If-Route-R-then-Location-L (n = 29)	.83	.10	.17	.69

Note: The notation is the same as in Table 1.

Table 3

Proportions of commonly occurring response patterns for the problems of Experiment 3

	Response Patterns					
Problems	P, ~Q	~Q	P	~P	~P,~Q	Other
If-Taxi-then-Less-Than-$20 (n = 27)	.56***	.33***	.04	.00	.00	.07
If-Taxi-then-More-Than-$20 (n = 35)	.04	.00	.21**	.29***	.17*	.29

Note: The notation is the same as in Table 1.

Table 4

Proportions with which the P, not-P, Q and not-Q situations were selected in Experiment 3

	Situations Selected			
Problems	P	~P	Q	~Q
If-Taxi-then-Less-Than $20 (n = 27)	.67	.00	.07	.89
If-Taxi-then-More-Than-$20 (n = 35)	.54	.67	.25	.38

Note: The notation is the same as in Table 1.

Table 5

Problems presented in Experiment 4.

If-Gideons-then-Free

> Bob and Carol wanted to buy a new sofa, and had just enough money to buy one they saw advertised at Gideon's Department Store. They were worried that they did not have enough money to pay the delivery charge. Carol's sister, Anne, told them not to worry because
>
> **If you buy a sofa at Gideon's**
> **Department Store, they will deliver it for free.**
>
> Bob and carol were disappointed when they discovered that what Anne told them was wrong.
>
> Below are pictures of four cards. One side of each card shows the name of a store, and the other side shows that store's policy for furniture delivery.
>
> Please circle the card or cards that could **show that what Anne said is wrong**. (The four cards show "Gideon's Department Store," "Wellstone's Department Store," "Furniture deliveries are free," "furniture deliveries are not free. There is a $25 charge.")

If-One-Ounce-then-Six-Months.

> Al Mulligan was elected governor of Gotham State after promising to get tough against drug users. He promised that after he became governor:
>
> **Anyone found in possession of more than one ounce of marijuana will spend at least 6 months in jail.**
>
> His promise was a lie.
>
> Below are pictures of four cards, each containing information about a person while Mulligan was governor. One side of each card shows whether or not a person was found in possession of more than one ounce of marijuana. The other side shows whether or not that same person spent at least 6 months in jail.
>
> Circle each card that could show that **Governor Mulligan's promise was a lie**.
>
> (The four cards show "This person was found in possession of more than one ounce of marijuana," "This person was not found in possession of marijuana," "This person spent at least 6 months in jail," "This person did not spend any time in jail.")

If-Right-then-Deep

Captain Hazleton was bringing a large oil tanker into the harbor at a new oil shipment center. He wanted to be particularly careful because this was his first trip into this harbor. After reading the navigational charts he decided:

If we stay to the right of the red marker, the water will be deep enough.

It turned out that he was wrong about this.

Below are pictures of four cards. One side of each card shows whether or not Captain Hazelton's oil tanker stayed to the right of the red marker, and the other side shows whether the water was deep enough.

Please circle each card that could show that what Captain Hazleton said was wrong. (The four cards show "The oil tanker stayed to the right of the red marker," "The oil tanker did not stay to the right of the red marker," "The water was deep enough," "The water was not deep enough.")

If-Rolf-then-Beat-Eric

Dagvar was the chief of Danish tribe in the 12th century. He was very ambitious and wanted to challenge an even more powerful chief, Eric Thorkold. Dagvar told his warriors that although we might not be able to beat Eric Thorkold by ourselves:

If we join forces with my cousin, Roll, we can beat Eric Thorkold.

Unfortunately for Dagvar, he was wrong.

Below are pictures of four cards. One side of each card shows whether or not Dagvar and Roif joined their forces, and the other side shows whether or not they beat Eric Thorkold.

Please circle each card that could show that what Dagvar said was wrong.

(The four cards show "Dagvar and Roif joined forces," "Dagvar and Rolf did not join forces," "They beat Eric Thorkold," "They did not beat Eric Thorkold.")

If-Million-Dollars-then-Sell

Donald Tramp was an important land developer who wanted to build a new casino. Before he could build the casino he wanted, however, he needed to buy a small plot of land owned by Mrs. Bortofski. Donald Tramp told his business partners not to worry because

If I offer Mrs. Bortofski a million dollars,
then she will sell the land.

Donald Tramp was wrong about this.

Below are pictures of four cards. One side of each card shows whether or not Mrs. Bortofski was offered a million dollars, and the other side shows whether or not she sold the land.

Circle each card that could show that what Donald Tramp said was wrong.

(The four cards show "Donald Tramp offered Mrs. Bortofski a million dollars," "Donald Tramp did not offer Mrs. Bortofski a million dollars," "Mrs. Bortofski sold the land," "Mrs. Bortofski did not sell the land.")

Table 6

Proportions of the response patterns for the problem in Experiment 4

Response Patterns

Problems	P, ~Q	~Q	P	~P,~Q	Other
If-Third-and-Main-then-Gas-Station (n = 28)	.68***	.14	.07	.00	.11
If-Gideon's-then-Free (n = 21)	.52***	.14	.05	.10	.19
If-One-Ounce-then-Six-Months (n = 26)	.46***	.15	.19**	.04	.15
If-Right-then-Deep (n = 23)	.48***	.13	.04	.17*	.17
If-Rolf-then-Beat-Eric (n = 34)	.47***	.09	.03	.12	.29
If-Million-Dollars-then-Sell (n = 21)	.52***	.24***	.10	.00	.14

Note: The notation is the same as in Table 1.

Table 7

Proportions with which the P, not-P, Q and not-Q *situations were selected in Experiment 4*

Situations Selected				
Problems	P	~P	Q	~Q
If-Third-and-Main-then-Gas-Station (n = 28)	.82	.04	.11	.86
If-Gideon' s-then-Free (n = 21)	.67	.19	.14	.81
If-One-Ounce-then-Six-Months (n = 26)	.73	.12	.15	.65
If-Right-then-Deep (n = 23)	.61	.26	.09	.78
If-Roll-then-Beat-Eric (n = 34)	.62	.24	.26	.68
If-Million-Dollars-then-Sell (n = 21)	.71	.05	.10	.76

Note: The notation is the same as in Table 1.