

Reasoning

Comparisons to "Gold Standards"

(not general models of reasoning, such as problem solving etc.)

Reasoning:

Reasoning & Logic

psychological question-

relationship to logic

Boole 1854 "An investigation into the laws of thought"

(mistake? or a deeper take on this)

Some definitions:

Deductive Reasoning

rules of inference:
(permit valid deductions)

$p \rightarrow q$ modus ponens
 p
 q

$p \rightarrow q$ modus tollens
 $\sim q$
 $\sim p$

Inductive reasoning (two versions)

abductive reasoning (focus of next chapter)

$a \rightarrow b$
 b
 a

inductive reasoning as concept formation

bird1 flies
bird2 flies
.....

all birds fly

inductive reasoning of natural kinds vs. Bruner et al., etc.

Conditional Reasoning

Rips & Marcus 1977

e.g., modus tollens

$p \rightarrow q$	57% always
$\frac{\sim q}{\sim p}$	39% sometimes
	4% never

$p \rightarrow q$	23% always
$\frac{q}{p}$	77% sometimes
	0% never

conditionals as biconditionals

$p \rightarrow q$	denial of the antecedent
$\frac{\sim p}{\sim q}$	

$p \rightarrow q$	affirmation of the consequent
$\frac{q}{p}$	

failure to apply modus tollens

Wason selection task:

letter + number:
vowel \rightarrow even number ?

E K 4 7

Conditionals in Context

Permission Interpretations

Probabilistic Interpretations

Reasoning from First Principles vs. Knowledge Based Reasoning

Reasoning about Quantifiers

Categorical Syllogisms

2 premises \Rightarrow conclusion
each has categorical subject and predicate

e.g.,

all A's are B's some A's are B's

all B's are C's some B's are C's

all A's are C's some A's are C's

Explanations:

the atmosphere effect: Woodworth & Sells 1935

1. negative premise \rightarrow negative conclusion

no A's are B's

all B's are C's

no A's are C's

2. particular premise \rightarrow particular conclusion

all A's are B's

some B's are C's

some A's are C's

* content effect (believability)

but people are accurate on valid syllogisms

* failure to accept logical task

* failure to discriminate information in premises

from information retrieved from memory

* forgetting premises

Johnson-Laird: Mental Models

1. construct model of first premise
2. add info in second to model of first,
taking into account various ways it can be done
3. frame a conclusion, if any, that holds in all the models

Predictions of Theory-

1. difficulty depends on number of models
2. figural effects
 - fifo working memory
 - easier to state conclusion in same order
 - A-B B-C easiest
 - B-A C-B hold second, reprocess first
-> C-A

 - A-B C-B harder-
 - B-A B-C need to convert premises

Inductive Reasoning and Hypothesis Testing

Bruner Goodnow Austin (1956) artificial concepts with distinct features

Wason 1960, 1968 rule induction for a sequence
confirming vs. disconfirming evidence
confirmation bias

implications