

Processes of Attention and Control

- 1:45 Syllogistic reasoning with generic premises
Sunny Khemlani, Sarah-Jane Leslie, Sam Glucksberg
- 2:07 Opponent process control in linked, dynamical agents
Ronnie Ward, Robert Ward
- 2:29 A computational model of the visual oddity task
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- 2:51 Counting sheep is a good way to get sleep, but the occasional aardvark will wake you up: How a salient event improves performance
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Syllogistic reasoning with generic premises

Sunny Khemlani

Sarah-Jane Leslie

Sam Glucksberg

Kangaroos are polymorphic
Polymorphic individuals have gene Gamma-64
What follows?

**Kangaroos have gene Gamma-64
(94% of responses)**

Kangaroos are polymorphic
Polymorphic individuals have gene Gamma-64
What follows?

**Kangaroos have gene Gamma-64
(INVALID)**

What are generic assertions?

Generics are claims about generalizations that lack explicit quantifiers, such as “some”, “many”, “most”, “all”, e.g.

Ducks lay eggs

Cows go “moo”

Cars have radios

Deer ticks carry Lyme disease

Some general properties of generics

1. Make claims about kinds rather than individuals
2. Important for category-wide inferences
3. Convey information that is broad in scope, often essential, e.g., reproductive modes
4. Used frequently in discourse
 - very young (4yo) to adult
5. Not marked → universally, no “gen” marker

Generics are not universals

- Consider:
 - Mosquitoes carry malaria (90%)
 - Ducks lay eggs (95%)
- People should **not** agree to:
 - *All* mosquitoes carry malaria
 - *All* ducks lay eggs

The overgeneralization effect

- Consider:
 - Mosquitoes carry malaria (90%)
 - Ducks lay eggs (95%)
- People should **not** agree to:
 - *All* mosquitoes carry malaria (9%)
 - *All* ducks lay eggs (55%)
- People tend to agree with “all ducks lay eggs”
(Khemplani, Leslie, Glucksberg, & Fernandez, 2007)
- Ducks lay eggs: a *characteristic* generic

Syllogistic reasoning

- *All artists are beekeepers*
All beekeepers are chemists
What follows?
- Most Ss (~90%): **All artists are chemists**
- Logically **valid** irrespective of content
 - Truth of the statement doesn't matter

Validity and truth are orthogonal

- *All dogs are cows*

All cows are marsupials

So, all dogs are marsupials [valid, but false conclusion]

- *All dogs are mammals*

Some mammals are vertebrates

So, all dogs are vertebrates [invalid, but true conclusion]

Invalid conclusions from generic premises

- All WNV carriers are in bad health
Mosquitoes carry the WNV
So, mosquitoes are in bad health
- Ducks lay eggs
All egg-layers are female
So, ducks are female

Invalid conclusions from generic premises

- All WNV carriers are in bad health
Mosquitoes carry the WNV
So, [all] mosquitoes are in bad health
- Ducks lay eggs
All egg-layers are female
So, [all] ducks are female
- If at least one premise is generic, universal and generic conclusions are **invalid**
- Normatively, people should respond that “nothing follows” for such syllogisms

An overgeneralization error?

- *Xs are Ys*
Ys are Zs
What follows?
- Overgeneralization: all ducks lay eggs → ducks lay eggs (Khemlani et al., 2007)
- Syllogistic reasoning: ducks lay eggs → all ducks lay eggs
- If people produce analogy of overgeneralization effect, they should erroneously conclude that **Xs are Zs**
- The conservative, normative interpretation should yield null conclusions, e.g., “nothing validly follows”

Syllogistic reasoning task

- Problems: two premises and a prompt – *what follows?*
- Nonsense content, e.g.,
 - *All comets are orthovolatile*
 - Some orthovolatile materials contain pollutants*
- Each syllogistic premise appeared in existential (*some*), universal (*all*), and generic (*no quantifier*) form
- Conclusions were coded as existential, universal, generic, or null (e.g., “nothing follows”)

Results: 1st premise (*Some A-B*)

1 st premise: Some A-B	<i>Responses:</i>			
	<i>Some A-C</i>	<i>All A-C</i>	<i>A-C</i>	<i>Null</i>
2 nd premise: <i>Some B-C</i>	76	0	6	18
<i>All B-C</i>	94	3	3	0
<i>B-C</i>	94	0	6	0

- People were reluctant to draw null conclusions
- Produced existential 76% of the time when 2nd premise was existential, 94% of the time when 2nd premise was universal (Mann-Whitney, $z = 1.99$, $p < .05$)
- Same responses for generic 2nd premises

Results: 1st premise (*All A-B*)

1 st premise: All A-B	<i>Responses:</i>			
	<i>Some A-C</i>	<i>All A-C</i>	<i>A-C</i>	<i>Null</i>
2 nd premise: <i>Some B-C</i>	59	3	22	16
<i>All B-C</i>	0	71	29	0
<i>B-C</i>	5	46	41	8

- Incorrectly drew existential conclusions when 2nd premise was existential **59%** of the time
- Correctly drew universal conclusions **71%** of the time when 2nd premise was universal (generic conclusions **29%** of the time)
(Mann-Whitney, $z = 2.19$, $p < .05$)
- When second premise was generic, equal proportions of universal and generic conclusions
(Mann-Whitney, $z = .46$, $p < .64$)

Results: 1st premise (A-B)

1 st premise: A-B	<i>Responses:</i>			
	<i>Some A-C</i>	<i>All A-C</i>	<i>A-C</i>	<i>Null</i>
2 nd premise: <i>Some B-C</i>	58	0	23	16
<i>All B-C</i>	3	11	83	0
<i>B-C</i>	3	3	94	8

- Conservative interpretation of generic first premise should be null
- Instead, Ss treat generic premises as universals
- Generic and universal conclusions are **erroneous**

The overgeneralization **error**

- We're cool with:

Kangaroos are polymorphic

Polymorphic individuals have gene Gamma-64

Kangaroos have gene Gamma-64 (94%)

- What about:

Lions have manes

Maned animals are male

Therefore lions are male

What have we learned?

Humans are overgeneralizers

Overgeneralizers are irrational

Therefore, humans are irrational

(Oops! That's invalid!)

How about, humans can sometimes be irrational.

Pernicious overgeneralization

- Not quantificational, e.g., grad students are nerdy
- Tend to be overgeneralized, e.g., *All* grad students....
- Resist negative counterexamples, e.g., MBA students aren't nerdy
- And so we can (and often do) commit the overgeneralization error when we infer:
 - Grad students are nerdy
 - Sunny is a grad student
 - Therefore, Sunny is nerdy
- Note: the students I've TAed for don't believe this is an error
- Generic semantics can potentially give rise to racial and ethnic stereotyping

Future work

- Look at other Aristotelian syllogistic “moods” and “figures”
- Role of generics in stereotyping
- Content effects
 - Semantic modulation in generic syllogisms
 - Differences between...
 - Majority generics: shoes have laces
 - Striking generics: mosquitoes carry malaria
 - Characteristic generics: ducks lay eggs
 - Definitional generics: bachelors are unmarried males
- Computational model of generic syllogistic performance

Thank you for listening!

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Participants and materials

- 19 Ps, no background in logic or CS, online study

- 2 of 4 Aristotelian “moods”:

All A are B (affirmative universal)

Some A are B (affirmative existential)

No A are B (negative universal)

Some A are not B (negative existential)

- 2 generic moods:

A are B (affirmative generic)

A are not B (negative generic)

- 1 of 4 Aristotelian figures:

A-B B-A A-B B-A

B-C C-B C-B B-C

Are nonsense generics “definitional”?

- Perhaps an utterance like “comets are orthovolatile” is construed as a definition
- “Bachelors are unmarried males”
- Predicating an adjective does not allow for definitions: “kangaroos are polymorphic”
- Clearly non-definitional verbs:
 - “Xs cause Y”
 - “Xs live in Y”
 - “Xs have Y”

What about an “atmosphere effect”?

- Atmosphere effect: Ps will produce generic response when given generic premises, universal response for universal premises, etc.
- Data contradict this:
 - **Ps produce generic responses when no premise was generic**
 - Ps produce less generic responses for U-G problems than G-U problems [atmosphere effect would predict roughly equivalent proportions of responses]
 - Primacy effects should not hold
 - Ps produce reliably fewer existential responses for E-E than for E-U and E-G

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