

Introduction

How do training sequence and variability interact to influence learning?

Variability: Two broad patterns are tied to variability in learning

- 1) Similarity of training materials supports faster learning, but results in weaker generalizations [1]
- 2) Diversity of training materials slows initial learning, but results in stronger generalizations [2]

Sequence: Depending on a learner's level of expertise, variability and similarity will be used in different ways at different points in training and influence different aspects of learning [3,4]

Genter's Structure Mapping Theory [5,6]

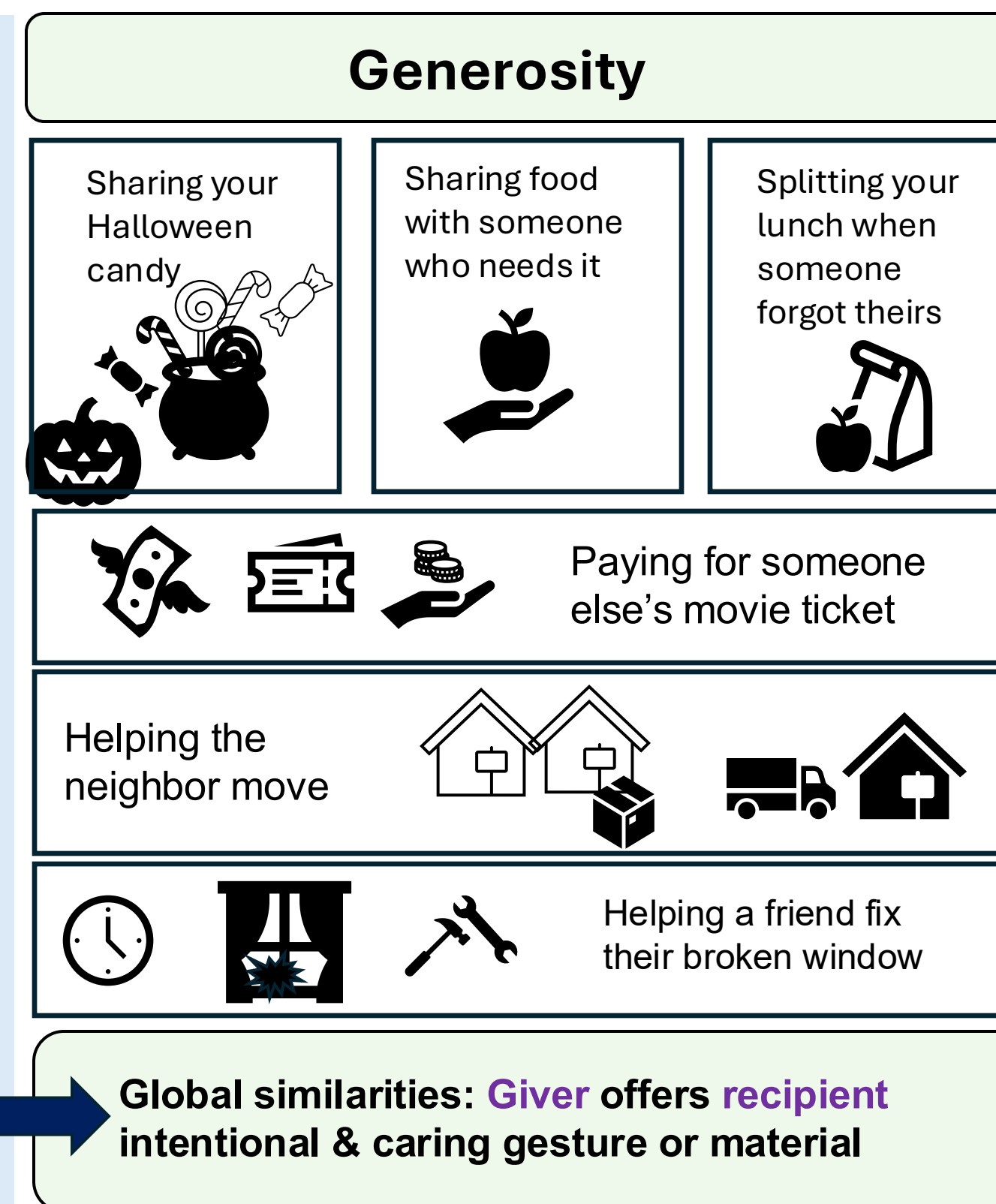
Sequential comparisons wherein learners map features from one domain onto the features of another domain.

Abstraction:

- Roles/relationships between features and across domains
- Highlights structural similarities and differences

Generalization:

- Global systematicity can be discerned across distinct domains



Methods & Materials

Participants learned **novel abstract concepts** in an **exemplar learning paradigm** [7]. Learning measured via **generalization ratings**

Materials & Design:

28 unlexicalized abstract concepts. E.g., *The tendency to give up trying to talk about an experience because people are unable to relate to it.*

Training: For each concept, participants read sets of 6 exemplar sentences, one at a time, self-paced

Situational scenarios (i.e., contexts) for exemplar sentences were manipulated in 4 training conditions (within participants, concepts counterbalanced across conditions):

- All (6) diverse scenarios (**DD**)
 - All (6) similar scenarios (**SS**)
 - First half (3) similar, second half (3) diverse (**SD**)
 - First half (3) diverse, second half (3) similar (**DS**)
- Conceptual replication of Lakhzoum et al., 2024*

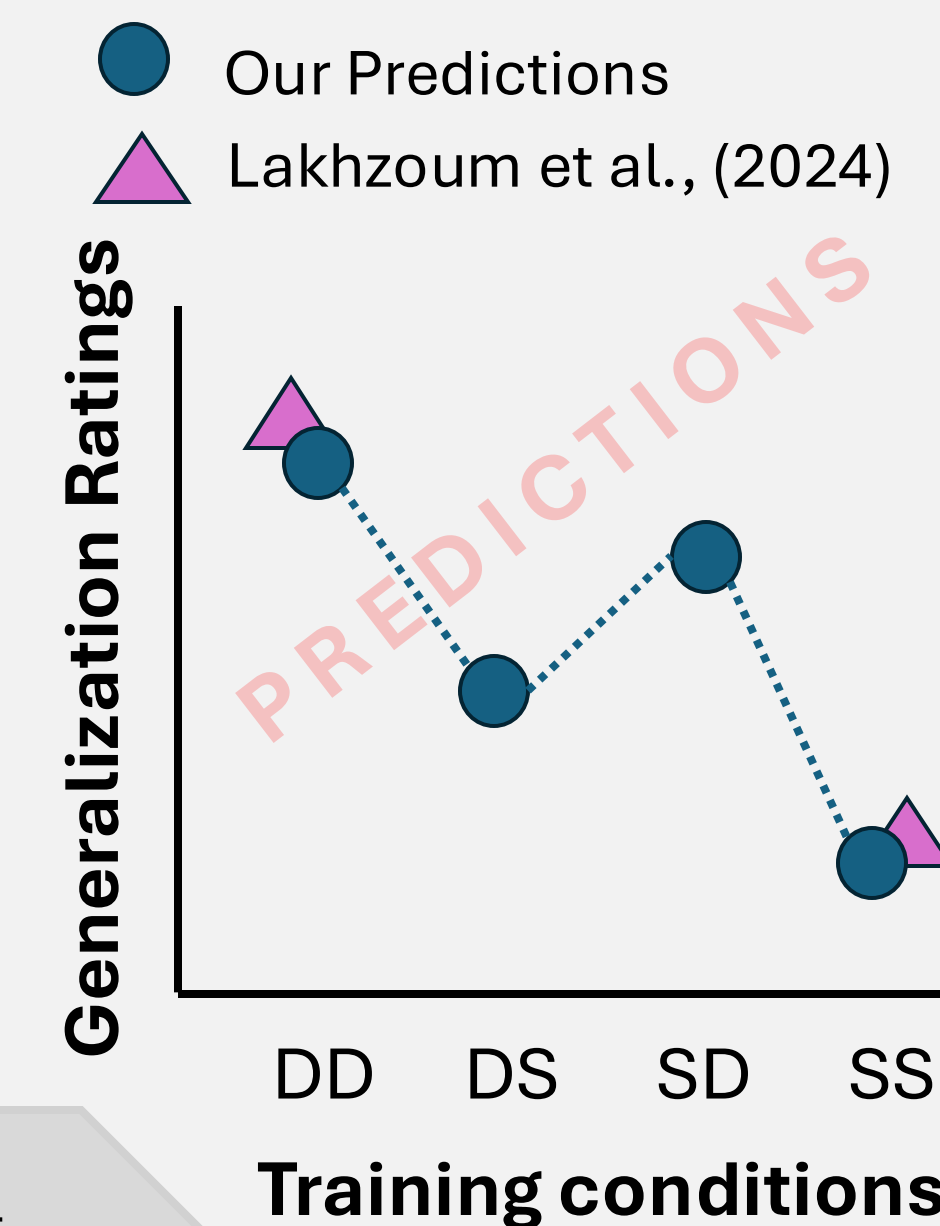
Test: For each concept, after reading the training sentences participants rated (from 1-7) two new sentences on "how well the following sentences represent the concept" exemplified in the training sentences

- **Generalization** of the concept to a new scenario: *For five years, she wrote monthly to the select board about her neighborhood police but never got a response, so she finally gave up, realizing they didn't care.*
- **Recognition** of the concept in an old scenario (control): *He stopped explaining the advantages of veganism when his cousin giggled at the very idea.*

Participants: 252 UConn undergrads

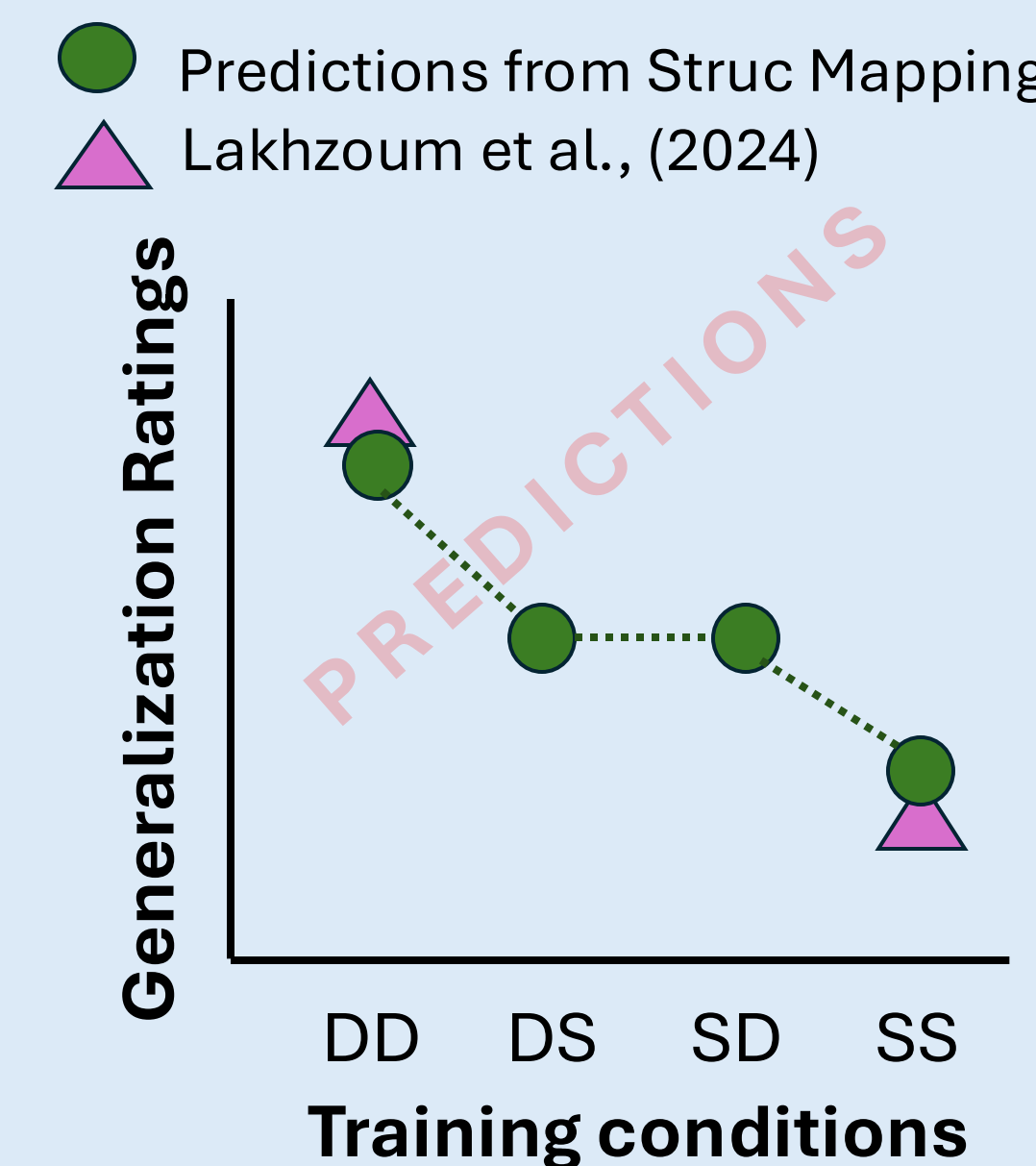
Predictions

1. **All-diverse (DD) training will produce better generalization than All-similar (SS)**, replicating Lakhzoum et al.
2. **Similar-to-Diverse (SD) and Diverse-to-Similar (DS) training will produce lower generalization than All-Diverse (DD)** because these conditions have half the number of diverse exemplars.
3. **Similar-to-Diverse (SD) training will produce better generalization than Diverse-to-Similar (DS) training** because (S) exemplars will provide stronger conceptual foundations upon which they can better-utilize the variability in (D) exemplars, akin to *progressive alignment* see [8].



Alternative Predictions (based on Structure Mapping)

1. All-Diverse (DD) training will yield the most generalization due to the number of comparisons made between each diverse exemplar.
2. All-Similar (SS) training will yield the least generalization, due to the minor comparisons made between each exemplar.
3. Similar-to-Diverse (SD) and Diverse-to-Similar (DS) will fall between DD & SS, and will not differ because adults, as more "expert" learners, do not require initial surface similarity for successful generalization.



Crunel (pseudoword): *The tendency to give up trying to talk about an experience because people are unable to relate to it.*

Intended concept – definition is **not** provided

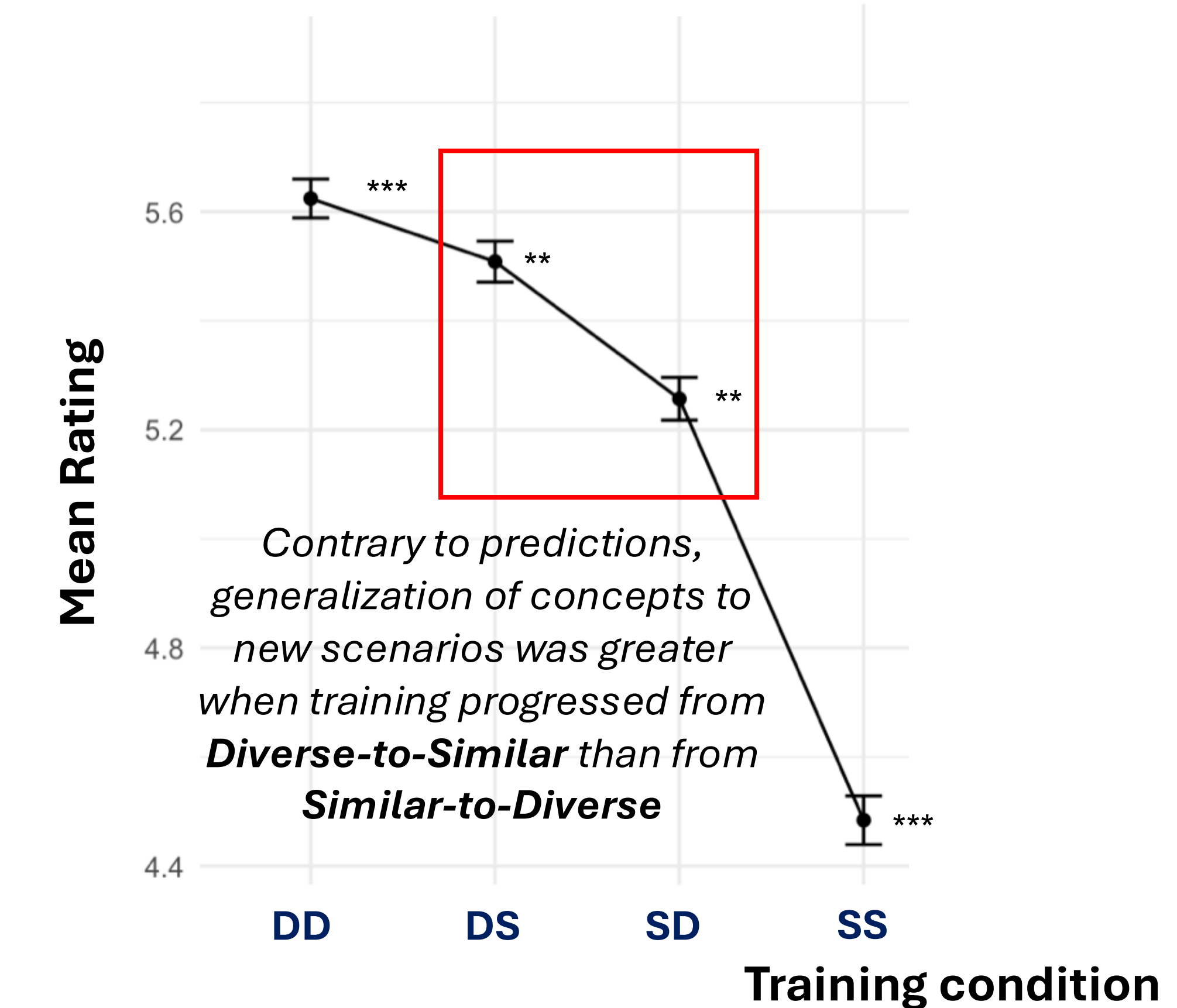
Situational Scenario

Exemplar sentences

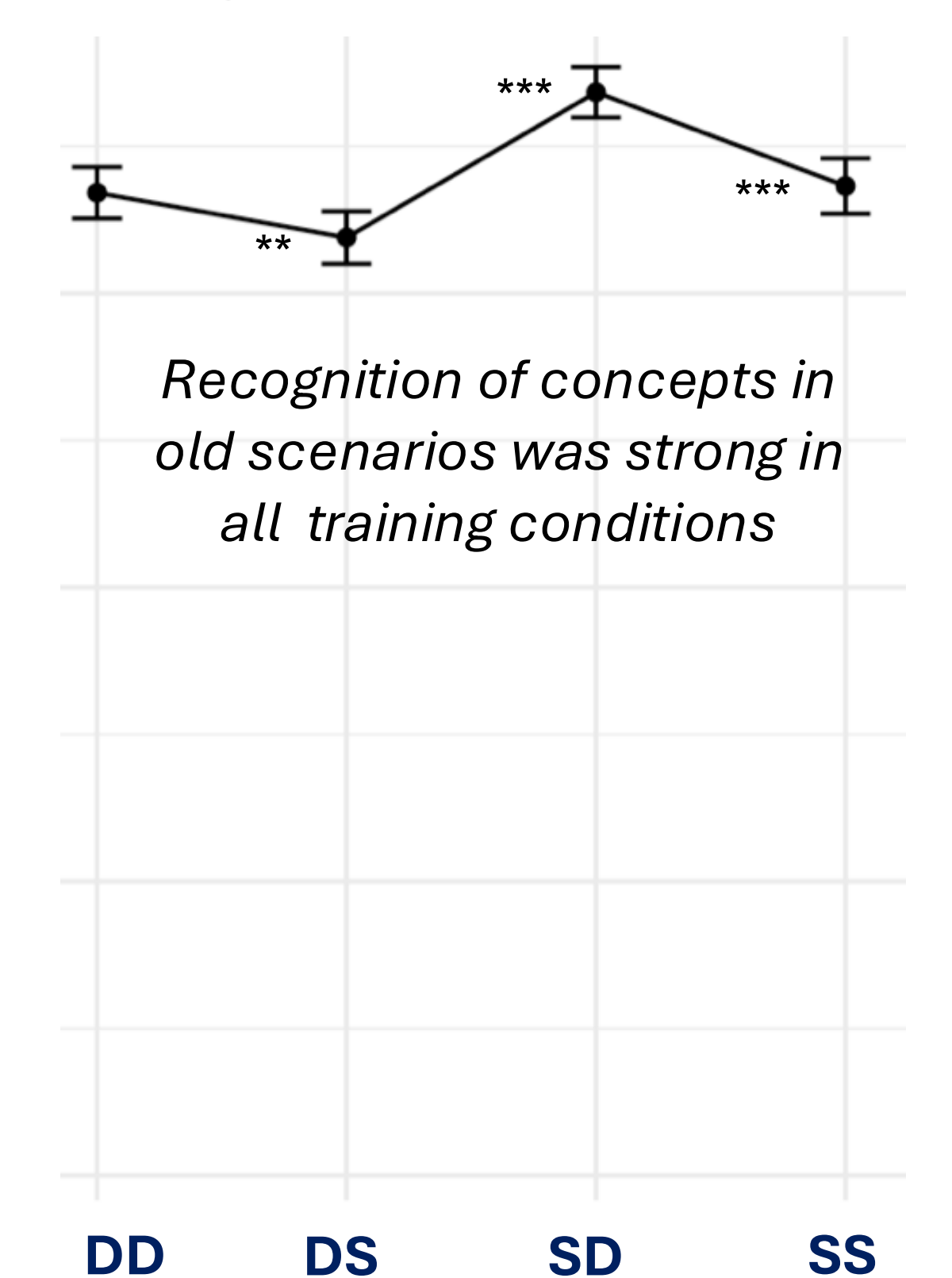
<i>Refraining from giving heath advice to unreceptive listeners.</i>	When her friend rolled his eyes, she stopped trying to convince him to try yoga.
<i>Refraining from giving heath advice to unreceptive listeners.</i>	After her father brushed off the suggestion that a chiropractor might help his back pain, she didn't bother telling him about her positive experience.
<i>Refraining from giving heath advice to unreceptive listeners.</i>	He stopped trying to convince his brother to try acupuncture for his shoulder pain since it was clear his brother didn't want to hear it.
<i>Not sharing achievements because listener is bored.</i>	She stopped telling her friends about her graduate studies because they always seemed to drift off in the middle of it.
<i>Interlocutor has a lack of interest in hearing about your culture.</i>	Although they asked about his religious holiday, he stopped explaining it because they clearly weren't listening.
<i>Having an interest no one else shares.</i>	He tried to teach his friends how to play dungeons and dragons but gave up when he noticed their eyes glazing over.

Results

Generalization Test



Recognition Test (Control)



Discussion

Structure Mapping Theory (extension)

We propose an extension of **Structure Mapping Theory** to explain these unexpected results:

Graded significance: The significance of an exemplar is determined by position in the training sequence. The first exemplar holds the greatest weight, with each subsequent exemplar weighted progressively less.

- **Understanding why DS > SD:** In SD, similar exemplars come early and so are weighted heavily, leading to an overly narrow concept that later diverse exemplars do not have enough influence to broaden. In DS, early diverse exemplars set the appropriate scope from the start; and later, similar exemplars are not influential enough to narrow it.
- **Example:** Given the following training sequences, **with graded significance**, training A (DS) will result in better recognition of the *heron* as a *bird* compared to training B (SD)

