

The Effects of Sleep on Category Structure Knowledge



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on session 2 may fall below chance, suggesting prioritization of core structure

knowledge for RING SLEEP.

interesting, awesome, and a bit tedious. Finally, I would like to thank the Center for Undergraduate Research Funding at Penn for funding this research. Without any of these contributors, this work would not have come to fruition.



Subjects recruited using Amazon Mechanical Turk (USA)

	Ring	Mod	total
Sleep Group	n = 20	n = 20	40
Wake Group	n = 20	n = 20	40
total	40	40	80

Sequence of tasks

Session one (statistical exposure task + feature association task)

12 hours pass (awake or sleep)

Session two (feature association task + explicit accuracy task)

Pay: \$2 base rate session one + \$2 base rate session two +

\$6 * dPrime score = up to \$10

Session One	Earliest/Latest Start Time	Earliest/Lastest Submit Time
(available ~ 5:00 to 9:00 PT) no sleep condition	04:47 to 08:13 PT	05:14 to 09:49 PT
(available from ~ 17:00 to 21:00 PT) sleep condition	16:37 to 21:48 PT	
Session Two		
(available from ~ 4:00 to 9:00 PT) sleep condition	05:14 to 09:05 PT	
(available from ~ 16:00 to 21:00 PT) no sleep condition	16:14 to 19:16 PT	
*pacific time = EST + 3 hours		



*Brief exposure to stimuli (Observation Phase)

1. Statistical Exposure Task

- ~ 25 mins & 550 trials
- shows statistical co-occurrences of
- features based on assigned category structure ==== implicit learning task
- Familiarizes subject with the task: learning to identify a "new species" of bugs based on their visual features
- Subjects receive score of 0 or 1 on each trial (accuracy = 1)
- Button response
 - Right arrow = identical to previous image
 - Left arrow = not identical

2. Feature Two-Alternative Forced Choice Task (2afc)

- ~ 5 mins & 24 trials
- Tests ability to recognize statistical co-occurrences of features previously learned in exposure task

Trial 1

8 core accuracy and 16 mod accuracy trials

Two exemplars are shown (each with six features): One of the exemplars structures is consistent with the previously learned structure, while the other is not.



3. Explicit Structure Task

<5 mins & "11 choose 3" visual feats measured as 3 "explicit accuracy" scores considered the "core" features



Looking at Data

How do we test differences in accuracy based on category structure?

- 1. Statistical Exposure Task
- D-Prime: measures individual's signal detection
- Standard tool for assessing noise to signal ratio
- 2. Feature Two-Alternative Forced Choice Task (2afc)
- Session one core accuracy, mod accuracy
- Session two core acc, mod acc

3. Explicit Structure Task





Select the better example of Unknown Species #1.

Trial 2...

24



Results: 2afc analysis



For the ring conditions, **RING SLEEP** core knowledge is preserved while mod structure accuracy decreased. This pattern is only observable in the **RING SLEEP** condition, not in **RING NO SLEEP**. For mod conditions, **MOD SLEEP** core knowledge may be better preserved than in **MOD NO SLEEP** condition.

Conclusion: category structures with clustering of features are more readily learned than structures that lack clustering, but Sleep may prioritize learning of core structural knowledge over peripheral features in more challenging structures to learn.

