BACKGROUND
When exposed to recurring sequences of events in our environment, there are various types of structural relationships we can potentially acquire and exploit, even without explicit knowledge or effort:

- 1st order regularities - require learning associations between adjacent events
- 2nd order (and higher) regularities - require learning associations spanning multiple events

Studies using implicit motor sequencing tasks have found less learning for 2nd than 1st order regularities (i.e., Howard et al., 2004; Remillard, 2008), suggesting that learning adjacent regularities may be the ‘default mode’ of implicit associative learning.

In contrast, comparisons across studies using the Triplets Learning Task (TLT) suggest that young adults may be equally sensitive to 1st and 2nd order regularities (Howard, Dennis & Kelley, 2008).

However, factors other than just level of structure varied across studies:

- No studies using a non-motor sequencing task have manipulated level of structure while holding all other experimental factors constant.

RESULTS: IMPLICIT SEQUENCE LEARNING

Mean Accuracy

1st Order, HP Triplets  1st Order, LP Triplets
2nd Order, HP Triplets  2nd Order, LP Triplets

1st Order: HP and LP triplets rated as occurring equally often
2nd Order: p < 0.05

Chi square analysis revealed 3 participants who showed marginal evidence of recognition in 1st Order version of TLT.

Learning results remain the same when these participants are removed from the analysis.

GOALS
- To investigate how level of structure influences the implicit acquisition of sequential regularities in a non-motor based, perceptual task.

METHOD

TRIPLETS LEARNING TASK (TLT)
- Stimuli appear at 1 of 4 locations that fill in red, then green in discrete, three-event sequences or ‘triplets’.
- Observe red cue events and respond only to the third, green target.
- One of the cues probabilistically predicts the green target.
- Level of structure
  - 1st order: 2nd cue predicts target location
  - 2nd order: 1st cue predicts target location
- Results in 16 triplets occurring with High Probability (HP) and 48 occurring with Low Probability (LP).

THE CURRENT EXPERIMENT
- TLT (Triplets Learning Task) adapted from Howard et al., 2008.
- Each participant learned both 1st and 2nd order patterns, but on different days, with the order counterbalanced;
  - 6 training epochs on each day of either 1st or 2nd order regularity
  - 250 trials per epoch (1500 trials total per day)
- Feedback (accuracy and RT) provided after each block, guiding participants to 92% accuracy.
- For both levels of structure, HP triplets occurred on 80% of trials, while LP triplets occurred on 20% of trials.

PARTICIPANTS
- 26 young adults ages 18-23 years (M = 19.5 years)

ASSESSING IMPLICIT SEQUENCE LEARNING
- Compare Response Time (RT) and Accuracy (ACC) for the triplets that occurred with HP vs. LP.
- Sequence learning revealed by increasing HP/LP separation with practice.
- Data collapsed across days.

RESULTS: IMPLICIT SEQUENCE LEARNING

Mean Frequency Ratings

1st Order: HP and LP triplets rated as occurring equally often
2nd Order: p < 0.05

Chi square analysis revealed 3 participants who showed marginal evidence of recognition in 1st Order version of TLT.

Learning results remain the same when these participants are removed from the analysis.

SUMMARY & DISCUSSION

THE TRIPLETS LEARNING TASK & IMPLICIT LEARNING
- Consistent with implicit learning seen in motor sequencing tasks, learning on a perceptual (TLT) task was affected by level of structure.
- Participants readily acquired both adjacent (1st order) and non-adjacent (2nd order) regularities.
- Participants learned significantly more from 1st order than 2nd order regularities.
- Participants demonstrated learning in both RT and Accuracy measures without gaining explicit knowledge.

IMPLICATIONS
- Young adults acquire adjacent regularities more easily than non-adjacent regularities, despite the fact that an increasing number of real world situations (due to interruptions and distractions) require associating items separated by space and/or time.

FUTURE DIRECTIONS
- Examine whether the ability to acquire adjacent and non-adjacent regularities is differentially affected by age.
- Repeat study in older adults.
- Previous research with the TLT found that compared with younger adults who appear to use both cues in responding to the target, older adults rely predominately on the second cue during the TLT (Howard et al., 2008), suggesting age differences might be greater for 2nd order than 1st order regularities.
- Examine the effects of presentation order (i.e., day) on learning.