Two faces of anxiety: Difference in predictive processing

Memory and Language Lab

Karolina JANACSEK[a,c], Ádám TAKÁCS[a], Andrea KÓBOR[b], Dezső NÉMETH[a,c]

[a] Institute of Psychology, Eötvös Loránd University, Budapest, Hungary
[b] Brain Imaging Centre, Research Centre for Natural Sciences, Hungarian Academy of Sciences, Budapest, Hungary
[c] MTA-ELTE NAP-B Brain, Memory and Language Lab, Institute of Cognitive Neuroscience and Psychology, Research Centre for Natural Sciences, Hungarian Academy of Sciences, Budapest, Hungary
e-mail: janacsek.karolina@ppk.elte.hu, web: www.nemethlab.com

AIM & BACKGROUND

Trait anxiety represents increased likelihood to experience threat across various situations

Attentional Control Theory: **attenuated efficiency** but **intact effectiveness** (accuracy)

Implicit learning → acquisition of predictable patterns

To compare high (HTA) and low trait anxiety (LTA) in predictive processing

METHODS

Screening (*N* = 180) → **upper** (HTA, *n* = 33) & **lower quintiles** (LTA, *n* = 40) of **STAI Trait** (*n* = 73)

Tasks:
Predictive processing: Alternating Serial Reaction Time (ASRT) task

Attention and control: Attention Network Test (ANT)

Updating: Counting Span, Corsi Blocks, Digit Span

RESULTS

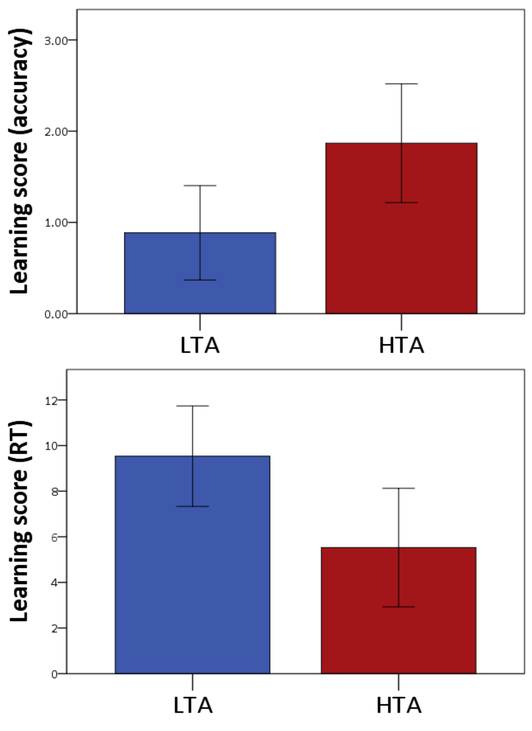


Figure 1: Learning score measure in accuracy and reaction time for LTA and HTA groups.

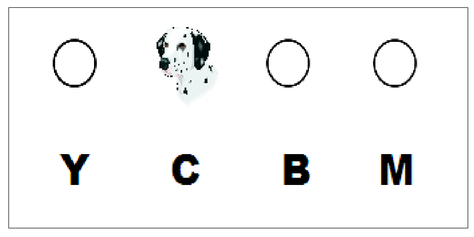
	LTA	HTA
	Mean (SD)	
Age (years)	21.4 (2.9)	21.6 (2.7)
Education (years)	14.8 (1.9)	15.2 (2.6)
Gender ratio (women/men)	8/32	4/29
STAI trait	**29.9 (3.1)**	**59.48 (5.9)**
STAI state	**31.63 (9.0)**	**46.7 (13.0)**
Alerting RT	53.975 (30.570)	51.409 (25.834)
Orienting RT	35.100 (23.043)	26.939 (20.277)
Conflict RT	87.275 (26.124)	97.045 (18.962)
Alerting Accuracy	**-0.016 (0.030)**	**0.002 (0.040)**
Orienting Accuracy	0.009 (0.036)	0.013 (0.031)
Conflict Accuracy	0.056 (0.050)	0.064 (0.145)
Counting Span	3.7 (.8)	3.7 (.7)
Corsi Blocks	5.2 (.8)	5.3 (1.0)
Digit Span	6.2 (1.1)	6.4 (1.1)

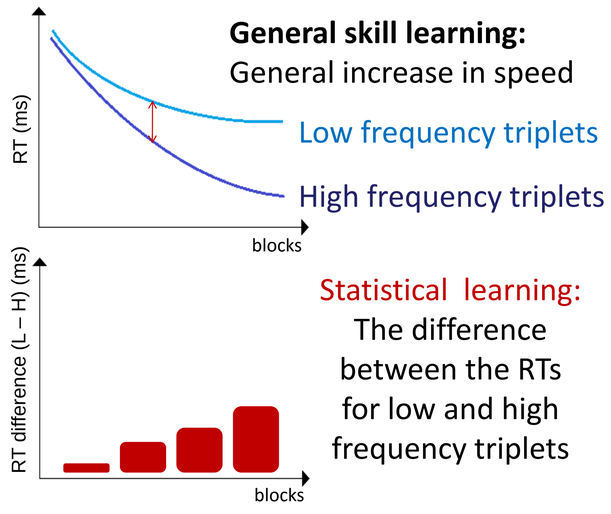
Table 1: Measurements in the two groups: questionnaires, behavioral, and demographic data. Significant ($p < .05$) differences are bold faced.

ANOVA for **accuracy** in ASRT with TRIPLET (2: high vs. low frequency) and EPOCH (1–4) as within-subjects factors, and GROUP (LTA vs. HTA) as a between-subjects factor:
The TRIPLET*GROUP interaction was significant ($F(1, 71) = 5.897$, $p = .018$, $\eta_p^2 = .077$), revealing group differences in sequence-specific learning with greater learning score in the HTA group compared to the LTA group.

Same ANOVA for **RTs:**
The TRIPLET*GROUP interaction was significant ($F(1, 71) = 5.779$, $p = .019$, $\eta_p^2 = .075$) suggesting group differences in sequence-specific learning with greater learning score in the LTA group compared to the HTA group.

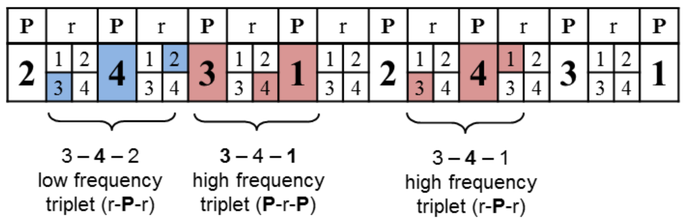
ASRT





General skill learning:
General increase in speed

Statistical learning:
The difference between the RTs for low and high frequency triplets



Sequence elements alternate with **random** ones

	Structure: 3 – r – 1	Structure: r – 4 – r
High frequency triplets (62.5 % of all trials)	3 – 4 – 1 (50%)	3 – 4 – 1 (12.5%)
Low frequency triplets (37.5 % of all trials)	never occurring (always high)	3 – 4 – 2 (12.5%) 3 – 4 – 3 (12.5%) 3 – 4 – 4 (12.5%)

Figure 2: Task structure.

CONCLUSION

- Difference between ASRT measures indicates *different processes behind accuracy and response time in predictive processing*.
- No significant correlation between RT and accuracy learning scores:
  - no speed-accuracy trade-off
- Attentional Control Theory:
  - **Attenuated efficiency** (learning score in RT)
  - **Enhanced effectiveness** (learning score in accuracy)

REFERENCE
Eysenck, M. W., Derakshan, N., Santos, R., & Calvo, M. G. (2007). Anxiety and cognitive performance: attentional control theory. *Emotion, 7*(2), 336–53. http://doi.org/10.1037/1528-3542.7.2.336

This research was supported by KTIA NAP 13-2-2015-0002 (DN), and Janos Bolyai Research Fellowship of the Hungarian Academy of Sciences (KJ).