

The role of executive functions in emotion regulation

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Introduction

➤ Emotion regulation (ER) is the processes and strategies that are adopted to influence the experience and expression of emotions (Gross, 2015). The 2 most popular strategies are cognitive reappraisal and expressive suppression.

➤ Are there cognitive processes in emotion regulation?

Yes, The implementation of ER strategies are characterized by cognitive processes, i.e.,

1. Attentional deployment.
2. Cognitive change,
3. Response modulation

Executive functions:

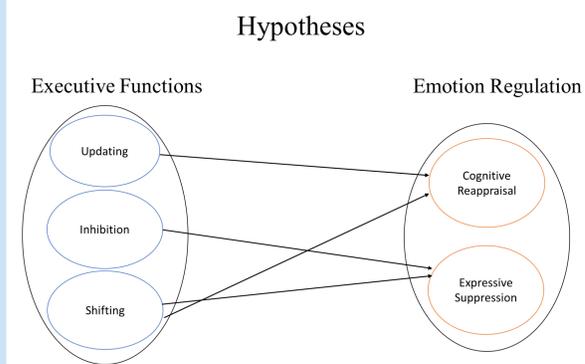
Unity-diversity framework (Miyake et al., 2000): 3 executive functions.

Updating: The ability to monitor information in working memory and as well replacing irrelevant information with newer content.

Inhibition: The deliberate attempt to override dominant or prepotent responses.

Shifting: The ability to shift back and forth between multiple tasks and mental sets.

Hypotheses

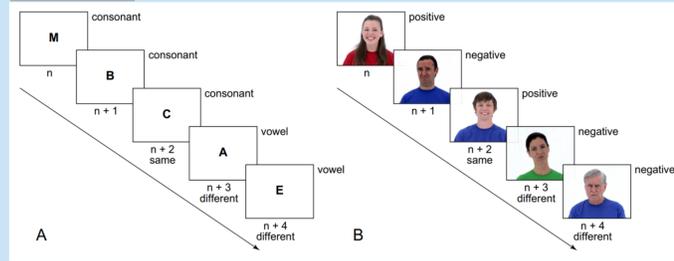


Method

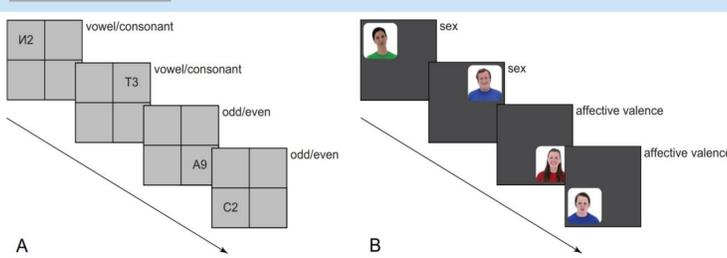
Participants:

- 79 participants were recruited
- Tasks: n-back, letter-number and Stroop tasks for EF, then ER task to assess ER
- Materials: Neutral and negative pictures from IAPS, Facial electromyography (EMG) electrodes, Heart rate sensor, Electrodermal activity (EDA) sensor.

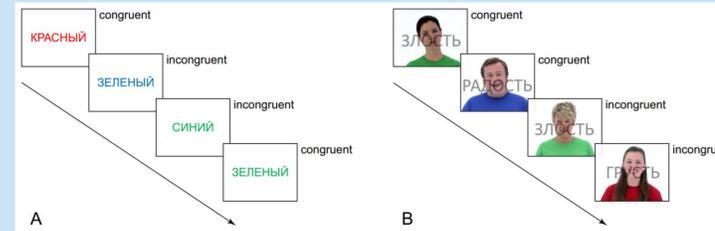
Updating



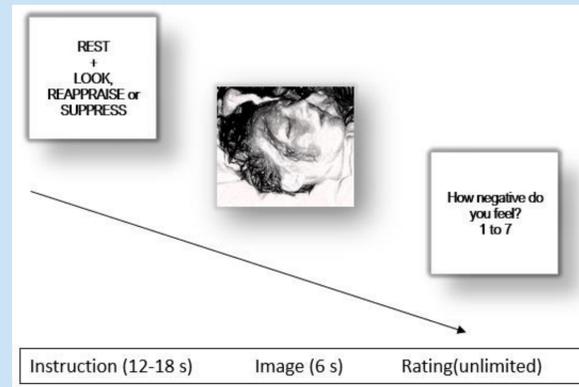
Shifting



Inhibition



ER task

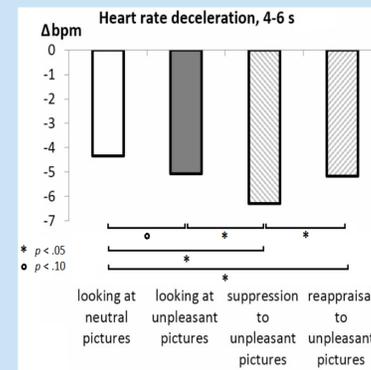
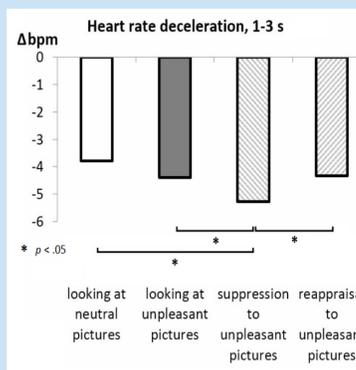
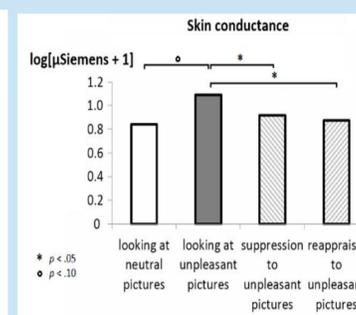
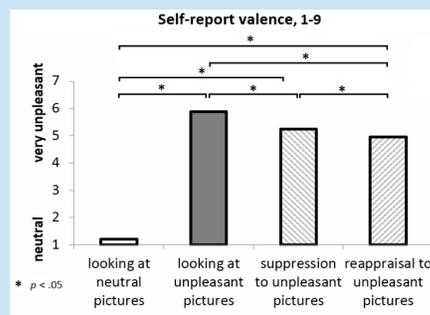
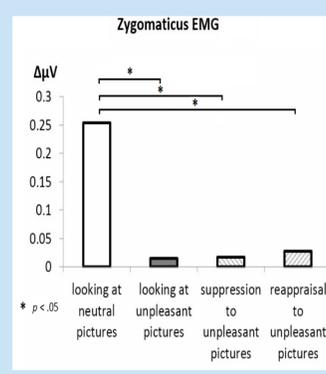
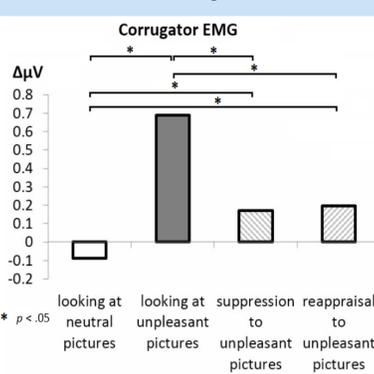


Results

Means and standard deviations for the EF measures

Executive functions	Non-affective (SD)	Affective (SD)
Updating ACC	0.641 (0.169)	0.679 (0.156)
Updating RT	1.153 (0.185)	1.318 (0.193)
Inhibition: Congruent RT	0.724 (0.154)	0.967 (0.176)
Inhibition: Incongruent RT	0.919 (0.319)	1.152 (0.264)
Inhibition cost	0.194 (0.222)	0.184 (0.239)
Shifting: Congruent RT	0.816 (0.139)	0.898 (0.161)
Shifting: Incongruent RT	1.244 (0.293)	1.377 (0.285)
Shifting cost	0.427 (0.214)	0.479 (0.199)

Results of emotion regulation measures



Results

EF	EDA		Zygomaticus EMG		Corrugator EMG		HR 1 to 3 sec		HR 4 to 6 sec		Ratings		ERQ	
	SUPP	REAP	SUPP	REAP	SUPP	REAP	SUPP	REAP	SUPP	REAP	SUPP	REAP	SUPP	REAP
Updating RT	-.044	.112	-.145	.006	-.171	-.141	-.077	-.249*	-.058	-.183	-.177	-.087	-.015	-.062
Updating ACC	.129	-.023	.024	.162	.066	.008	.019	.105	.067	.126	-.069	.005	.01	.041
Emotional Updating RT	.075	.084	-.155	.017	-.109	-.111	.032	-.16	.029	-.08	-.064	-.087	-.034	.026
Emotional Updating ACC	-.047	-.004	-.042	.061	.092	.013	-.008	.135	.011	.134	.068	.016	.079	.014
Inhibition Rate	-.144	-.102	.254	-.008	-.002	.14	-.129	.046	.087	.132	.186	.055	.246*	.141
Emotional Inhibition Rate	-.159	-.067	.212†	.025	-.194†	.007	-.108	.162	.155	.261*	.128	-.147	.264*	.085
Shifting Rate	-.106	-.179	.141	-.05	-.044	.009	-.036	-.015	.116	.073	.142	-.005	.084	-.082
Emotional Shifting Rate	-.055	-.147	.196†	.052	.008	-.094	-.108	-.098	-.019	-.06	.168	.078	.098	.139

Note ACC=accuracy, RT= response time, SUPP=suppression, REAP=reappraisal †, p<.1, *, p<.05

➤ Greater speed of updating was associated with greater change in HR deceleration using reappraisal strategy (.249).

➤ Inhibition was associated with greater frequent use of suppression (.246, .264).

➤ Emotional inhibition rate was also related to higher change in HR using reappraisal strategy(.261).

Discussion

➤ Updating was related to reappraisal measured with HR deceleration. This finding is novel and extends the growing body of research examining how updating relates to reappraisal.

➤ Again, we found that cost of inhibition was related to frequency of the use of suppression as predicted.

➤ Although typical patterns of emotional responding were observed in most of the physiological respondings, the ER strategies did not correlate with the EF measures.

References

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- Miyake, A., Friedman, N. P., Emerson, M. J., Witzki, A. H., Howerter, A., & Wager, T. D. (2000). The unity and diversity of executive functions and their contributions to complex "frontal lobe" tasks: A latent variable analysis. *Cognitive psychology*, 41(1), 49-100.

Acknowledgement

This study was supported by the HSE Basic Research Program and the Russian Academic Excellence Project '5-100' and used the HSE Synchronous Eye-tracking, Brain Signal Recording and Non-Invasive Brain Stimulation System

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