Impact of Emotional Arousal and Stimulus Processing on Inhibitory Control: Insights from Virtual Reality

Manon Sáez-Gillet, Francisco Nieto-Escámez

1 Dept. Psychology, University of Almeria, Almeria, 04120, Spain (manonsaez@yahoo.com)
2 Research Center for Wellbeing and Social Inclusion, University of Almeria, Almeria, 04120, Spain (pnieto@ual.es)

INTRODUCTION

Pessoa's Dual-Competence Framework (2009):

Inhibitory control is influenced by emotional arousal, with **highly arousing** stimuli potentially impairing response inhibition due to increased cognitive resource allocation toward stimulus **processing**.

AIMS

Identify which **emotional contexts** have the most impact on inhibition

To analyse the **differences** between the two versions of the Go/No-Go tasks

To test the **influence of virtual reality** on task performance.

H1 More errors in blocks whose No-Go stimuli are **frightening**

H2 Go/No-Go tasks with **explicit processing** have worse performance.

H3 The group **exposed to virtual reality** will perform worse in the blocks where the stimuli are derived from video games

METHOD

Table 1. Arrangement of groups

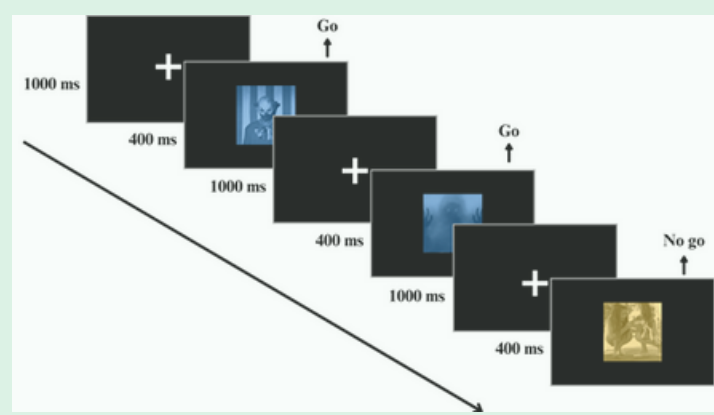|		Virtual Reality		Total
		Without exposure	With exposure	
Go/No-Go version	Explicit	16	16	32
	Implicit	16	16	32
Total		32	32	64

Participants were **randomly assigned** to VR exposure or non-exposure conditions and to two variations of the Go/No-Go task:

- Explicit processing
- Implicit processing

Figure 1. Example sequence of the implicit version

RESULTS

Statistically significant differences between the two **Go/No-Go task versions**

Table 2. Estimates and pairwise contrasts in error rates

Block	Go/No-Go version	M	SD	F	gl	p	η_p^2
NMS_1/ YMS	Explicit	.09	.01	23.70	1	.001	.28
	Implicit	.04	.01				
NMS_2 / YNMS	Explicit	.08	.01	23.15	1	.001	.28
	Implicit	.03	.01				
MS_1 / BMS	Explicit	.10	.01	30.55	1	.001	.34
	Implicit	.04	.01				
MS_2 / BNMS	Explicit	.10	.01	18.03	1	.001	.23
	Implicit	.06	.01				
NMS_VR/ YNM_VR	Explicit	.11	.01	16.43	1	.001	.22
	Implicit	.05	.01				
MS_VR/ BM_VR	Explicit	.12	.01	60.26	1	.001	.50
	Implicit	.04	.01				

More error rates

↓

Explicit Go/No-Go task version

Implicit Go/No-Go task version

Blocks of **fear**

Blocks with **virtual reality** stimuli

▲ No VR exposure / Explicit version
■ No VR exposure / Implicit version
★ With VR exposure / Explicit version
● With VR exposure / Implicit version
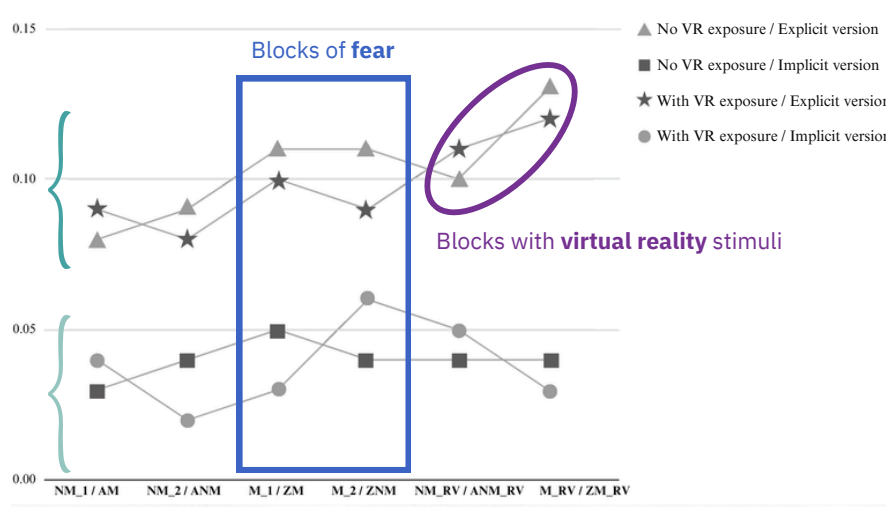
Figure 2. Frequencies of commission error rates by group

Table 3. Estimates and pairwise contrasts in response times

Block	VR	M	SD	F	gl	p	η_p^2
NM_RV / ANM_RV	With exp.	303.87	10.08	4.79	1	.03	.07
	Without exp.	272.69	10.08				
M_RV / ZM_RV	With exp.	300.41	7.92	4.32	1	.04	.07
	Without exp.	277.12	7.92				

Statistically significant differences depending on having been **exposed to virtual reality** or not

Note. **NM_1/AM**: No.-fear 1 and Yellow filter on fear; **NM_2/ANM**: No-fear 2 and Yellow filter on no-fear; **M_1/ZM**: Fear and Blue filter on fear; **M_2/ZNM**: Fear and Blue filter on no-fear; **NM_RV/ANM_RV**: No-fear on VR and Yellow filter on no-fear; **M_RV/ZM_RV**: Fear on VR and Blue filter on fear.

CONCLUSION

Fear-inducing emotional contexts make response inhibition more difficult, especially when **stimuli are intense** and **explicitly** processed.

Immersion in **virtual reality** environments affects inhibitory control by slowing **response times**.

REFERENCES

Estupiñán, S., Rebelo, F., Noriega, P., Ferreira, C., & Duarte, E. (2014). Can Virtual Reality Increase Emotional Responses (Arousal and Valence)? A Pilot Study. *Lecture notes in computer science*, 541-549. https://doi.org/10.1007/978-3-319-07626-3_51

Pessoa, L. (2009). How do emotion and motivation direct executive control? *Trends In Cognitive Sciences*, 13(4), 160-166. https://doi.org/10.1016/j.tics.2009.01.006