NEVERMIND: EMOTION REGULATION IN A BIOFEEDBACK VIDEO GAME

a Radboud University Nijmegen Behavioural Science Institute · b USC School of Cinematic Arts · c Flying Mollusk · d Trimbos instituut

Adam Lobel[a], Marientina Gotsis[b], Erin Reynolds[c], Michael Annetta[c], Rutger C.M.E. Engels[a,d], & Isabela Granic[a]

INTRODUCTION

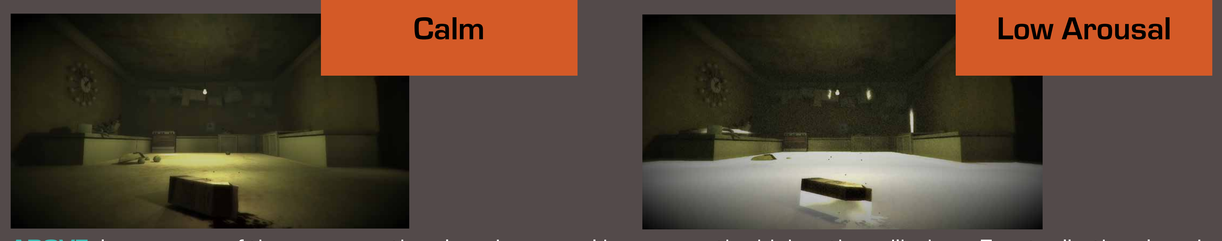
Biofeedback video games hold the promise of being able to train emotion regulation skills.[1] In such games, changes in a player's physiological state trigger the game's systems to alter the gamespace, tailoring gameplay to each player's experience. As emotional states are inherently linked to physiological states[2,3], these games can allow players to monitor their physiological arousal, and can reward the healthy down-regulation of negative physiological arousal.

Nevermind is a horror-themed biofeedback video game with these unique features. **In this study, we investigated whether players' real-world emotion regulation skills would be related to their ability to down-regulate negative arousal in-game.**

THE GAME

Premise: Players are recruited as a Neuroprober — a therapist of the future who explores the subconscious minds of PTSD patients. Players must solve puzzles to uncover memories lost in their clients' subconscious, memories which reveal the true cause of their trauma.

Biofeedback: Players must remain calm in the face of horrific situations. Heightened arousal makes the gamespace become hostile, increasing the game's difficulty. Emotion regulation is therefore paramount.



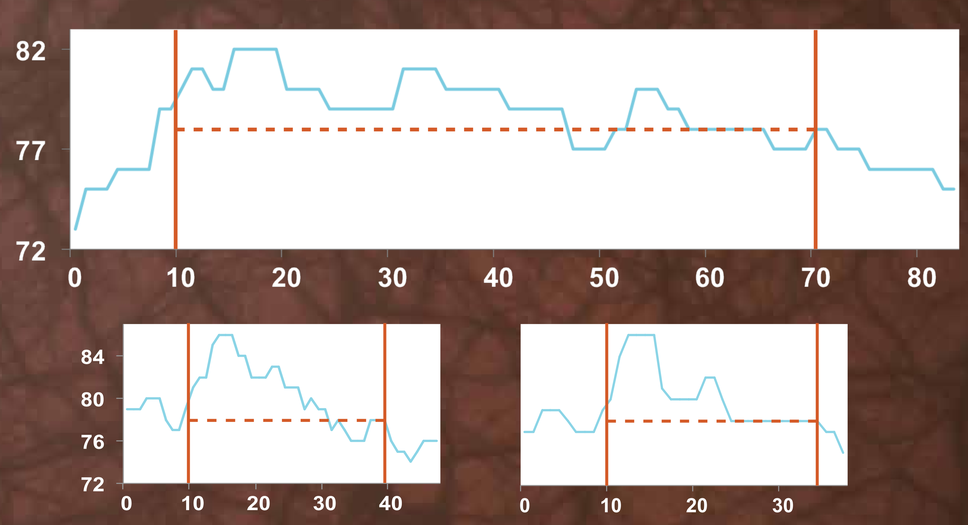
ABOVE: In one area of the game, as the player's arousal increases, the higher the milk rises. Eventually, the player's character can drown, forcing him to restart the challenge. However, returning to a relaxed state makes the milk subside.

METHOD

Emotion regulation questionnaire

Nevermind with heart rate monitor

- *Nevermind* recorded heart rate during play.
- Base heart rate was measured in-game for two minutes before players were free to play.
- After play, periods of heightened negative arousal were identified as periods where a player's heart rate exceeded 5% of their base heart rate for a period of 5+ seconds.
- For each of these periods, a record was kept for the amount of time a player needed to return to their base rate for 5+ seconds.
- The average of this value was computed for all participants (*In-game down-regulation*). This was correlated with real-world emotion regulation strategies.



Above. Heart rate in BPM (——) segmented to reflect periods of heightened arousal (same participant). For each participant the mean duration of these periods was calculated = *In-game down-regulation*.

RESULTS

Correlations: *In-game down-regulation* and real-world emotion regulation strategies.

SIS	*SES*	*ACT*	*ACC*	*REAP*	*WIT*	*RUM*	*SUP*
r=-.208 p=.216	r = .180 p = .287	r = -.100 p = .556	r = -.219 p = .192	**r=-.330 p=.046**	r=-.017 p=.921	r=-.039 p=.819	r=-.264 p=.114

Note: $n = 47$ (age = 18—24) *SIS* = seek instrumental social support; *SES* = seek emotional social support; *ACT* = seek active resolution; *ACC* = acceptance; *REAP* = reappraise; *WIT* = withdrawal; *RUM* = rumination; *SUP* = suppression

DISCUSSION

The more time players needed to return to a calm state after negative physiological arousal, the less likely they were to resolve emotional conflicts through reappraisals.

This indicates that deficiencies in emotion regulation skills may transfer from the real-world to in-game experiences when playing *Nevermind*. This lends promise for the use of *Nevermind* (and future biofeedback video games that reward the healthy down-regulation of negative affective arousal) as a means for people to bolster emotion regulation.

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Digital Copy of poster with notes available here.

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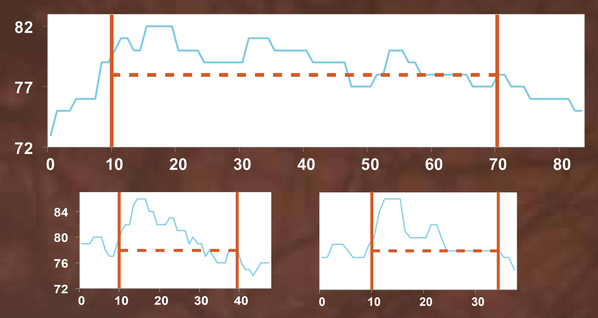
METHOD



Left. Heart rate in BPM (——) segmented to reflect periods of heightened arousal (same participant). For each participant the mean duration of these periods was calculated = ***In-game down-regulation***.

- *Nevermind* recorded heart rate during play.
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STATS & SCALES

	Male	*Female*
Sex	***n*** **= 38**	***n*** **= 9**
	M	***SD***
Age (years)	**19.95**	**2.2**
In-game down-regulation (seconds)	**64.99**	**49.36**
Seeking Instrumental Social Support†	**2.77**	**0.55**
Seking Emotional Social Support†	**2.26**	**0.9**
Active Coping†	**3.08**	**0.47**
Acceptance†	**2.94**	**0.61**
Reappraisal††	**4.57**	**1.14**
Withdrawal (Behavioral Disengagement) †	**1.75**	**0.59**
Rumination†††	**2.21**	**0.61**
Suppression††	**4.04**	**1.29**

†. Sub-scales taken from the COPE Inventory. Carver, C. S., Scheier, M. F., & Weintraub, J. K. (1989). Assessing coping strategies: A theoretically based approach. *Journal of Personality and Social Psychology*, 56, 267- 283.

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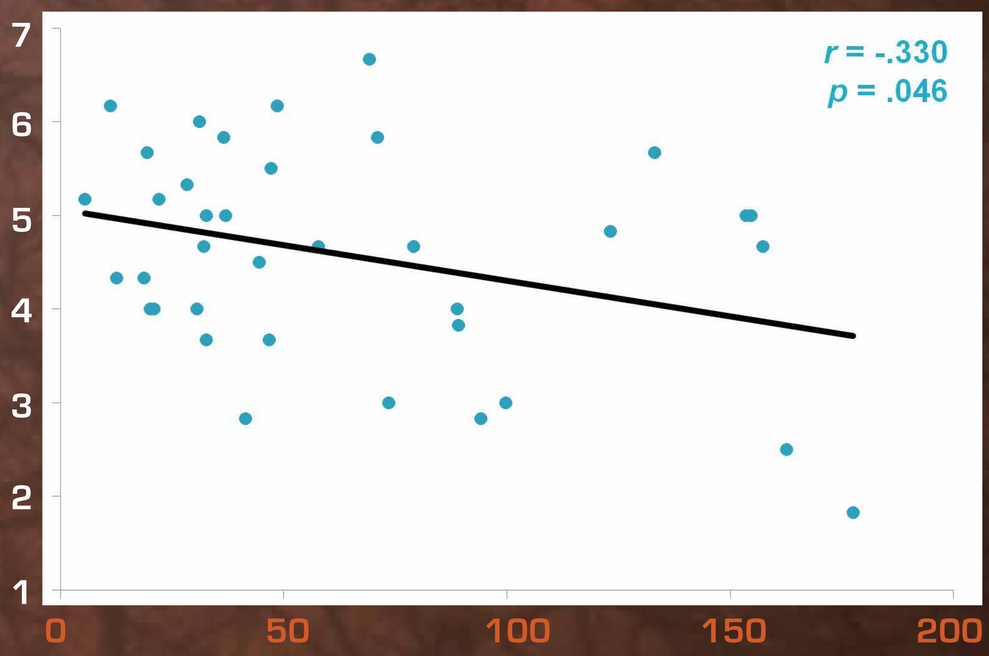
†††. Rumination Response Scale (RRS) Treynor, W., Gonzalez, R., & Nolen-Hoeksema, S. (2003) Rumination reconsidered: A psychometric analysis. *Cognitive Therapy and Research*, *27*, 247-259.

RESULTS



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Nevermind is available on Steam Early Access