University of Victoria | Graduate Studies

Notice of the Final Oral Examination for the Degree of Doctor of Philosophy

of

DUSTIN VAN GERVEN

MSc (University of Victoria, 2012)
BA (Vancouver Island University, 2010)

"The Effects of Acute Stress on Spatial Navigation in Men and Women"

Department of Psychology

Friday, December 16, 2016
10:00AM
David Turpin Building
Room A144

Supervisory Committee:
Dr. Ronald Skelton, Department of Psychology, University of Victoria (Supervisor)
Dr. Adam Krawitz, Department of Psychology, UVic (Member)
Dr. Tony Robertson, Department of Psychology (Member)
Dr. W. Jake Jacobs, Department of Psychology, University of Arizona (Outside Member)

External Examiner:
Dr. Sonia Lupien, Department of Psychiatry, University of Montreal

Chair of Oral Examination:
Dr. Susan Tasker, Department of Educational Psychology & Leadership Studies, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies

Abstract

Stress is known to impair spatial navigation in rats and declarative memory in rats and humans, but the effects on spatial navigation in humans are unclear. At least four models have been proposed to account for the cognitive effects of stress, based on the two different physiological stress response systems (the sympathetic-adrenal-medullary (SAM) and the hypothalamic-pituitary-adrenal (HPA) systems) and the effects of these responses on the hippocampus and (sometimes) other subcortical structures. In this dissertation, I examined the effects of an acute (experimental) stressor on human spatial navigation in three variations of virtual Morris water mazes designed to dissociate between hippocampus-dependent (allocentric) and hippocampus-independent (egocentric) forms of navigation. Results were considered in the light of all 4 models. Experiment 1 used a dual-strategy Morris water maze to test whether acute stress influences navigational strategy selection and whether this effect is mediated by the activation of the HPA or the SAM system. Surprisingly, stress increased hippocampus-based strategy selection, and did so in the presence of SAM but not HPA activation. Experiment 2 used new dual-strategy and place mazes to examine the effects of acute stress on both strategy selection and allocentric navigational performance. It also attempted to contrast the effects of stress at a short delay, which would favour mediation by the SAM system, and a longer, 20 minute delay, which would favour mediation by the HPA system. Contrary to expectations, results revealed no effect of stress when tested immediately and sex-dependent impairments of performance (in females) and allocentric strategy selection (in males) at the delay. Experiment 3 used the same mazes as Experiment 2, plus a new cue maze to examine the effects of acute stress on strategy selection and both allocentric and egocentric navigational performance after a 20 minute delay. Results confirmed that stress reduces allocentric strategy selection and impairs allocentric performance, but also has sex-dependent effects on egocentric performance: in females, stress enhanced navigation (as expected) but in males, stress impaired it. None of the 4 models provided a good explanation for these results, suggesting that current accounts of the cognitive effects of stress may be inadequate.