Dr Daniel Bor

Senior Lecturer

Department of Psychology

Queen Mary University of London

London E1 4NS
www.qmul.ac.uk
d.bor@qmul.ac.uk
Tel: 07805821253

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Dear Council for Medical Sciences at the Jagiellonian University

Re: PhD Thesis evaluation for Justyna Hobot

The science of consciousness is a hotly debated field, which has grown both theoretically and empirically over the last two decades. One of the most active current questions is whether regions in the prefrontal cortex are necessary for consciousness, or whether posterior (occipital and parietal) areas are sufficient to generate conscious content.

In this PhD thesis, Justyna has attempted to provide important answers to this main question. Although functional neuroimaging is a powerful tool, it is largely correlational, and therefore can't establish whether a given region is necessary for a given function. Therefore, Justyna used transcranial magnetic stimulation (TMS), which can transiently disrupt a brain region's functioning, to investigate the brain regions necessary for various components of visual awareness.

In her first main chapter, she outlines how TMS is used, and the various methodological pitfalls that exist. She largely concludes that TMS is more powerful in combination with neuroimaging, and by using a range of both TMS-site and behavioural controls. This is an important conclusion, that I wish many more TMS researchers would take on board.

Her second paper chapter uses a type of TMS that can disrupt function for minutes, to investigate a part of the anterior prefrontal cortex, regularly linked to metacognition, which is a particularly robust way of researching consciousness. The paper was highly justified given the existing literature, which has conflicting results. Her own results did change various indices of awareness, although in ways that didn't neatly fit with previous research. This is in no way a criticism of this work, more a limitation of both the field and the technique, perhaps.

Her final experimental chapter used another TMS technique to generate finger twitches and she then explored how that might impact on various features of visual awareness. There were intriguing TMS effects again, although again at odds with much of the literature. Both the experimental studies were rigorously and carefully designed and analysed. Furthermore, the writing throughout the published papers was of a very high quality and thoroughly cites other research and ideas. My only very slight suggestion for future consideration is that I would have liked a little more of the caution over the TMS approach

from the first paper chapter to filter through to the other two papers, and especially the conclusions at the end.

In conclusion, this is an exceptional PhD thesis encompassing a strong range of high quality empirical and methodological research, which Justyna should feel very proud of.

Specifically:

1) This thesis demonstrates the candidates general theoretical knowledge in the discipline.
2) This thesis presents a clear ability to conduct independent research.
3) The subject matter is an original solution in the application of scientific theory and results.

In addition, I recommend that this thesis be awarded a distinction. The non-empirical chapter (first published paper) in the thesis particularly is a very strong piece of work, giving much needed clarity and guidance to the field, in order to conduct rigorous TMS research in the future. Furthermore, it's clear that a lot of work has gone into both experimental chapters/papers, both in collecting data, as well as the analysis of results. Both papers showed great professionalism and rigour, and a highly comprehensive discussion of their meaning.

Yours sincerely,

Daniel Bor, Ph.D.