The influence of central nervous system depressant (CNS-D) drugs on driving performance and cognitive functions and recovery of cognitive functions following hospital treated deliberate self-poisoning (DSP) with CNS-D drugs.

Stewart Oxley

Bachelor of Business, Bachelor of Psychology (Honours)

Submitted to the School of Psychology at the University of Newcastle in partial fulfilment of the requirements for the degree of Doctorate in Clinical and Health Psychology

September, 2014
I hereby declare that the work submitted in this thesis is the result of original research and has not been submitted for a university degree or other similar qualification to any other University or Institution.

Stewart Oxley

September 2014
I hereby certify that the work embodied in this thesis has been done in collaboration with other researchers, or carried out in other institutions. I have included as part of this thesis a statement clearly outlining the extent of collaboration, with whom and under what auspices.

I hereby certify that the work in this thesis has been done in collaboration with the following researchers and carried out at Calvary Mater Newcastle Hospital and the University of Newcastle. My collaborators included:

Tharaka L. Dassanayake (MBBS, MPhil, PhD)1,6, Gregory Carter (FRANZCP, PhD)4,5, Ian Whyte (FRACP, FRCP (Edin), FAACT, FACMT)2,5, Alison Jones (MD, FRACP)3,5,7,8, 9, Gavin Cooper (B Mathematics, B Computer Science)1, Patricia T. Michie (PhD, FASSA)1,4.

1. School of Psychology, The University of Newcastle, NSW, Australia
2. Discipline of Clinical Pharmacology, School of Medicine and Public Health, Faculty of Health, The University of Newcastle, NSW, Australia
3. Graduate School of Medicine, University of Wollongong, NSW, Australia
4. Centre for Translational Neuroscience and Mental Health Research, University of Newcastle, NSW, Australia
5. Department of Clinical Toxicology and Pharmacology, Calvary Mater Newcastle, NSW, Australia
6. Department of Physiology, Faculty of Medicine, University of Peradeniya, Sri Lanka
7. Exec Dean Faculty of Science, Medicine and Health University of Wollongong
8. Researcher - Illawarra Health and Medical Research Institute
9. Conjoint professor, School of Medicine and Public Health, University of Newcastle

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Synopsis

Background

Hospital treated deliberate self-poisoning (DSP) has become a major concern for developed countries as 90% of all deliberate self-harm is DSP (Carroll, Metcalfe, & Gunnell, 2014). A major concern for hospital treated DSP is the capacity of individuals to perform daily activities, such as driving, after being medically discharged. One study found that, at discharge, individuals admitted to hospital for DSP with central nervous system non-depressant (CNS-ND) drugs outperformed those admitted for DSP with CNS-D drugs across several neuropsychological measures (Dassanayake, Michie, et al., 2012). A self-controlled case series that linked the New South Wales (NSW) Roads and Traffic Authority CrashLink database and the NSW Admitted Patient Data Collection from 2001–2008 found that patients were at increased risk of motor vehicle accident (MVA) within 3-days, 7-days, and up to 1-month after ingestion of CNS-D drugs (Dassanayake, Jones, et al., 2012). Based on this evidence the authors were concerned that patients medically fit for discharge were still suffering cognitive and psychomotor impairments no longer attributable to pharmacological properties.

At present the experimental literature reviewed in this thesis suggests that single and multiple therapeutic doses of central nervous system depressant (CNS) drugs (benzodiazepines, z-drug, antidepressants, opioids, and antipsychotics) have the capacity to impair simulated or actual driving ability in both healthy volunteers and patients diagnosed with various psychiatric disorders (e.g., anxiety; van Laar, Volkerts, & van Willigenburg, 1992). Evidence of a dose-response relationship suggests that supratherapeutic doses of CNS-D drugs can result in greater impairment. Examination of the epidemiological literature, again reviewed in this thesis, into the influence of CNS-D drugs on risk of motor vehicle accident (MVA) found that receiving or dispensing a prescription of CNS-D drugs up to 1-month prior increased the risk of MVA. Again a dose-response relationship suggests increasing the dose of CNS-D drugs increases the risk of MVA (Chang et al., 2012).
Despite evidence suggesting that patients discharged from hospital after DSP with CNS-D drugs have impaired cognitive and psychomotor function, no longitudinal cohort study has been conducted to support this claim. However, other factors could account for extended risk of MVA (4-weeks). These factors include, personality (Schwebel, Severson, Ball, & Rizzo, 2006), insight (Anstey, Wood, Lord, & Walker, 2005), vocational, financial, and/or interpersonal concerns (Selzer, 1969).

Methodology

This thesis reports a longitudinal cohort study that included patients admitted to hospital for DSP with CNS-ND or CNS-D drugs. Both groups provided self-assessment information of their cognitive and driving capabilities and performed neuropsychological tests that examined cognitive flexibility, cognitive efficiency, working memory, visual attention and visuomotor skills, the capacity to inhibit responses, and decision-making at discharge, day-7 and day-28 after discharge. The aims of the present study was to: compare the neurocognitive impairment (difference in means) at baseline (at discharge from hospital) for CNS-D and CNS-ND ingestion groups; compare the recovery of neurocognitive function (difference in means over time) over three time points (discharge, day-7, and day-28), in both CNS-D and CNS-ND groups; and to develop explanatory models for the recovery of neurocognitive function over time.

Results

This study replicated Dassanayake, Michie, et al. (2012), finding that the CNS-ND drug group had significantly faster completion times at discharge than the CND-S drug group for the primary measure of cognitive flexibility (Trail-Making Test B [TMT-B]). CNS-D and CNS-ND groups did not significantly differ across cognitive efficiency, visual attention and visuomotor skills test, working memory, inhibition, and decision-making. TMT-B completion times by the CNS-ND group remained stable over time (day-7 and -28) while completion times of the CNS-D group significantly improved at each time point. Compared to discharge, the both CNS-ND and CNS-D group showed significant improvement in visual attention and visuomotor skills test, and inhibition.
The CNS-D showed significant improvement in cognitive efficiency and working memory. Finally, more pre-DSP covariates were significant in the first month after discharge. Pre-DSP covariates included: a psychiatric diagnosis of schizophrenia, schizoaffective disorder, or bipolar disorder; atypical antipsychotic medication; age; and intelligence.

**Conclusion**

The limited explanatory power of post-DSP variables could be explained by the lack of fidelity of information collected post-DSP. Additionally, there were concerns that ‘the right’ information was not collected, for example whether individuals were accessing psychological support in the month after discharge as such support has been shown to improve cognitive functions (Brewin & Smart, 2005). Based on the results from the present study, future research should examine whether personality and/or driving style (Poó, Taubman-Ben-Ari, Ledesma, & Díaz-Lázaro, 2013), using a measure such as the Multidimensional Driving Style Inventory (Taubman-Ben-Ari, Mikulincer, & Gillath, 2004), influences risk of MVA. Further research should also examine insight (self-awareness) using visual analogue scales that target specific behaviour related to driving and require individuals to consider the level of support that they may need to complete a task, such as driving (Toglia & Kirk, 2000).

**Implications**

The present study had several limitations related to data collection measures (e.g., personality, driving style, psychotherapy, and social support) and assessment protocol (e.g., self-assessment at each time point). Even still, this research has found supporting evidence (Dassanayake, Michie, et al., 2012) that DSP with CNS-D drugs impairs performance after the patient has been deemed medically fit to be discharged. Given this, medical professionals may need to reconsider discharge protocols and the information provided to patients about their capacity to perform daily activities, such as driving, and their period of risk to themselves and the community.
Thesis Structure

According to the instructions for the Clinical and Health Doctorate thesis as set out by the University, School of Psychology, the thesis has been structured as follows:

Thesis Abstract

Chapter 1 - Extended Literature Review

Chapter 2 – Journal article for submission to Journal of Clinical Psychopharmacology

Chapter 3 – Extended Discussion

Appendices:

1. Glossary

2. Supplementary data

3. Instruments (questionnaires and measures)

4 Ethics Variation

5. Offsite Assessment form

6. Staff Information Sheet

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