Ketamine and schizophrenic speech: more difference than originally reported

Citation for published version (APA):

Covington, M. A., Riedel, W. J., Brown, C., He, C., Morris, E., Weinstein, S., Semple, J., & Brown, J. (2009). Ketamine and schizophrenic speech: more difference than originally reported. *Journal of Psychopharmacology*, 23(1), 111-112. <https://doi.org/10.1177/0269881108091590>

Document status and date:

Published: 01/01/2009

DOI:

[10.1177/0269881108091590](https://doi.org/10.1177/0269881108091590)

Document Version:

Publisher's PDF, also known as Version of record

Document license:

Taverne

Please check the document version of this publication:

- A submitted manuscript is the version of the article upon submission and before peer-review. There can be important differences between the submitted version and the official published version of record. People interested in the research are advised to contact the author for the final version of the publication, or visit the DOI to the publisher's website.
- The final author version and the galley proof are versions of the publication after peer review.
- The final published version features the final layout of the paper including the volume, issue and page numbers.

[Link to publication](#)

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal.

If the publication is distributed under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license above, please follow below link for the End User Agreement:

www.umlib.nl/taverne-license

Take down policy

If you believe that this document breaches copyright please contact us at:

repository@maastrichtuniversity.nl

providing details and we will investigate your claim.

Ketamine and schizophrenic speech: more difference than originally reported

Journal of Psychopharmacology
23(1) (2009) 111–112
© 2009 British Association
for Psychopharmacology
ISSN 0269-8811
SAGE Publications Ltd,
Los Angeles, London,
New Delhi and Singapore
10.1177/0269881108091590

MA Covington CASPR, Artificial Intelligence Center, University of Georgia, Athens, GA, USA.

WJ Riedel Department of Neuropsychology and Psychopharmacology, Faculty of Psychology, University of Maastricht, The Netherlands.

C Brown CASPR, Artificial Intelligence Center, University of Georgia, Athens, GA, USA; H5, San Francisco, CA, USA.

C He CASPR, Artificial Intelligence Center, University of Georgia, Athens, GA, USA.

E Morris CASPR, Artificial Intelligence Center, University of Georgia, Athens, GA, USA.

S Weinstein Department of Psychiatry, University of British Columbia, Vancouver, BC, Canada.

J Semple CASPR, Artificial Intelligence Center, University of Georgia, Athens, GA, USA; GlaxoSmithKline Research & Development Ltd., Addenbrooke's Hospital, Cambridge, UK.

J Brown GlaxoSmithKline Research & Development Ltd., Addenbrooke's Hospital, Cambridge, UK.

In an earlier article (Covington, *et al.*, 2007), we reported a subsignificant difference in idea density in the speech of healthy volunteers given subanaesthetic doses of ketamine, compared with placebo, and no such difference in a group of schizophrenia patients compared with matched healthy controls (neither group given ketamine). More accurate measurement of idea density with new software shows a much more definite difference between ketamine-influenced speech and schizophrenic speech.

As detailed in the original article, data came from nine volunteers who were given, in random order, placebo or low-dose ketamine (0.40 mg/kg spread over 10 min followed by 0.21 mg/kg/h for 90 min), and from matched populations of 11 schizophrenia patients and 12 controls. Experiments were approved by the ethics committees of the respective universities.

Subjects were asked to describe pictures from the Thematic Apperception Test (Murray, 1971). The idea density (proposition density) of their transcribed speech was measured. In the reanalysis, we used CPIDR-3 (Brown, *et al.*, 2007a, program version 3.2.2694; see Covington, 2007, and Brown, *et al.*, 2007b). Like the software used in the original article, CPIDR-3 counts parts of speech that express predication (verbs, adjectives, adverbs, prepositions and conjunctions). However, CPIDR-3 skips hesitation forms (*umm*, *uh*, etc.) and repetitions of the immediately preceding word so that results are not thrown off by hesitant speech. (Our earlier software counted *umm* as a word though not an idea, and could count a repeated

idea-word as two ideas.) CPIDR-3 also uses an elaborate set of rules to adjust its idea counts to match, as far as possible, the standards proposed by Turner and Greene (1977). Because CPIDR-3 recognizes more of Turner and Greene's idea expressions, and because it omits hesitation forms and repetitions, all idea densities are higher with CPIDR-3 than with our original software. They are also considerably more accurate by Turner and Greene's standards.

Comparing the ketamine and placebo groups as a whole, we found a statistically significant difference in idea density. The mean $\pm$ SD idea density (in propositions per word) was 0.499 ± 0.046 with ketamine and 0.541 ± 0.018 with placebo, giving $t = 2.50$, $df = 16$, $P = 0.02$. Originally we reported 0.346 ± 0.076 and 0.373 ± 0.020 respectively, giving $t = 1.02$, $df = 16$, $P = 0.33$, which is not a statistically significant difference of means, although we did note significantly unequal variances.

The mean $\pm$ SD within-subject change in idea density, from placebo to ketamine, was -0.041 ± 0.047 , giving $t = -2.64$, $df = 8$, $P = 0.03$, which again is statistically significant. Originally we reported -0.027 ± 0.063 , $t = -1.28$, $df = 8$, $P = 0.24$. Thus, we now conclude, rather than merely suspect, that ketamine reduces idea density in speech.

There continued to be no significant difference between the schizophrenic and matched control groups. That is, we did not find lower idea density to be the characteristic of schizophrenia. Mean $\pm$ SD idea density was 0.525 ± 0.023 for the schizophrenia patients and 0.535 ± 0.033 for the controls, giving

Figure 1 Comparison of measured idea density between groups (in the case of ketamine, the same group under different conditions). Box plots show minimum, quartiles, and maximum.

$t = 0.81$, $df = 21$, $P = 0.42$. Originally we reported 0.349 ± 0.030 and 0.362 ± 0.026 , giving $t = 1.06$, $df = 21$, $P = 0.30$. If anything, more accurate analysis appears to show less difference between the schizophrenic and healthy groups than before.

Figure 1 summarizes the between-groups comparisons. These results support our original conclusion, which is that low-dose ketamine produces an impairment of speech production that is not typical of schizophrenia. More research, especially in larger and more homogeneous samples of schizophrenia patients, is warranted to determine whether the ketamine-induced speech impairments have any relation to the speech disturbances observed in schizophrenia.

Acknowledgements

This reanalysis was not externally funded. The original research was funded by a contract with GlaxoSmithKline Research & Development Ltd.

References

- Brown, C, Snodgrass, T, Covington, MA (2007a) CPIDR 3.2 (Computerized Propositional Idea Density Rater). Open-source software available from <http://www.ai.uga.edu/caspr>.
- Brown, C, Snodgrass, T, Kemper, SJ, Herman, R, Covington, MA (2007b) Automatic measurement of propositional idea density from part-of-speech tagging. *Behavior Research Methods* 40: 540–545.
- Covington, MA (2007) CPIDR 3 User Manual. Research Report 2007-03, CASPR, Artificial Intelligence Center, The University of Georgia, <http://www.ai.uga.edu/caspr>.
- Covington, MA, Riedel, WJ, Brown, C, He, C, Morris, E, Weinstein, S, *et al.* (2007) Does ketamine mimic aspects of schizophrenic speech? *J Psychopharm* 21: 338–346.
- Murray, HA (1971) Thematic Apperception Test. Cambridge, MA: Harvard University Press.
- Turner, A, Greene, E (1977) The Construction and Use of a Propositional Text Base. Technical Report No. 63, Institute for the Study of Intellectual Behavior (now Institute of Cognitive Science), University of Colorado. Available from <http://ics.colorado.edu/techpubs/pdf/77-63.pdf>, accessed 2008.