

Ketamine and schizophrenic speech: more difference than originally reported

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Ketamine and schizophrenic speech: more difference than originally reported

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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

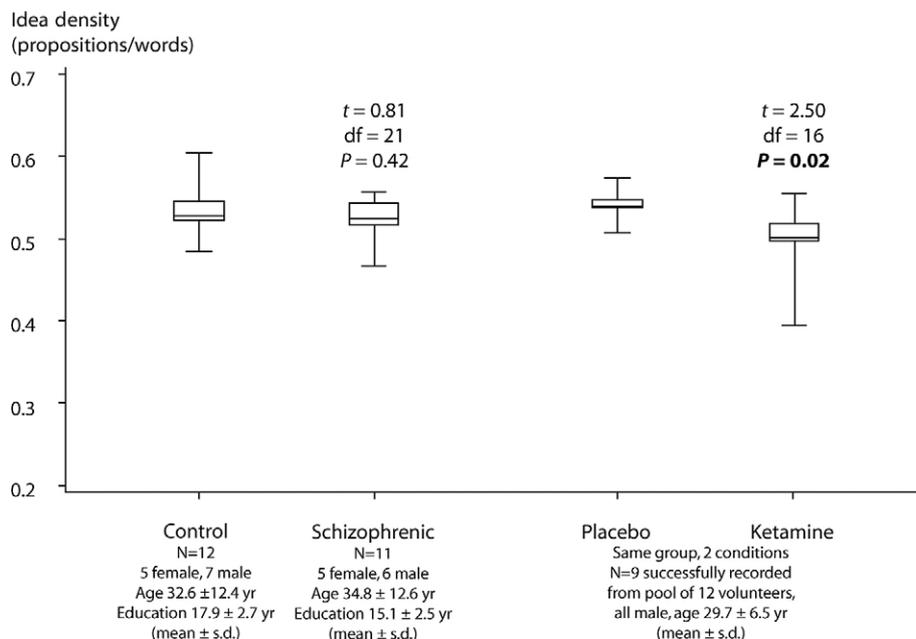


Figure 1 Comparison of measured idea density between groups (in the case of ketamine, the same group under different conditions). Box plots show minimum, quartiles, and maximum.

$t = 0.81$, $df = 21$, $P = 0.42$. 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.

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