

Effects of Ketamine on Healthy Participants and Individuals Suffering from Schizophrenia

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Abstract

The purpose of this paper is to examine a study conducted by Lahti, Weiler, Michaelidis, Parwani, and Tamminga (2001). The researchers hypothesized that drug ketamine can induce mental processes and behaviors resembling the abnormalities of schizophrenia. Their method consisted of administering a drug ketamine to healthy participants and people suffering from schizophrenia. The effect of the drug was compared to the effect of the placebo administered to these participants. It was discovered that ketamine did indeed influence the increase of some symptoms of schizophrenia. In the future, the study can be improved by stating more clearly who received ketamine and what particular dose, and who received the placebo. Also, in the future a study should be designed to determine whether ketamine has some negative long-term effects on the health of research participants.

Introduction

An anesthetic drug ketamine is an NMDA receptor antagonist. Blocking this receptor ketamine reduces the production of the neurotransmitter glutamate. Various studies have suggested that ketamine's action on the nervous system tissue can be used to shed some light on the biological mechanisms involved in schizophrenia (Carlsson and Carlsson, 1990; Javitt and Zukin, 1991; Coyle and Puttfarcken, 1993; Olney and Farber, 1995; Krystal et al., 1994; Lahti et al., 1995; Malhotra et al., 1997).

Studies on healthy volunteers and volunteers with paranoid schizophrenia have utilized dopamine agonists such as amphetamine and methylphenidate to examine the biological processes involved in this mental illness. The mentioned research indicated that a low dose of these drugs can produce worsening or even an improvement of schizophrenia symptoms (van Kammen et al., 1982). However, other research studies showed that a high dose of amphetamine can produce symptoms that resemble paranoid schizophrenia (Connell 1958; Griffith et al., 1968; Angrist and Gershon, 1970; Bell, 1973).

Studies have examined the effects of d-lysergic acid diethylamide (LSD) and psilocybin on the human experience suggesting that these drugs induce vivid hallucinations (among other mind-altering effects) which are a known component of psychosis (lost touch with reality) in schizophrenia. These drugs are structurally similar to the neurotransmitter serotonin, and they act on the 5HT₂ (serotonin) receptor agonizing it (Langs and Barr, 1968; Giannini 1994; Vollenweider et al., 1998).

Other studies have indicated that symptoms resembling schizophrenia can be induced by phencyclidine also known as PCP (Luby et al., 1998). PCP acts on the NMDA receptor antagonizing it (Anis et al., 1983). Ketamine is structurally similar to PCP, so ketamine too blocks the NMDA receptor (Kornhuber and Weller, 1995).

The purpose of my paper is to examine a study discussed in a journal article by Lahti,

Weiler, Michaelidis, Parwani, and Tamminga (2001). The hypothesis of their study is that ketamine mechanism of action on the nervous system tissue can be used to better understand the biological processes influencing the emergence of the symptoms of schizophrenia.

Method

As I decided about the topic of the paper, I went to the Long Beach City College Online Library to find the journal article. I used the *Proquest* because it was the most practical online database and it was what the librarians would use when finding journals and journal articles. After I picked the journal, I read it through several times with underlining the important sentences. Moreover, I proofread the paper for checking the grammar and asked my friend who was not majoring in Psychology if he could understand it. I also visited the writing center, where English tutors helped me polish my grammar.

In the study by Lahti and colleagues (2001) the participants were healthy individuals (recruited through newspaper advertisement of the study) and people suffering from schizophrenia (recruited from an inpatient facility). Trained professionals assessed the presence and severity of mental illness in all participants via various scales and interviews. Some participants received a ketamine injection and some participants received a placebo on two or four different days over the course of two weeks. Different doses of ketamine were utilized in the study. For 30 min after the administration of ketamine, the measurements were made to monitor to heart condition in terms of the pulse, blood pressure and the levels of oxygen in the blood. Mental condition was evaluated via a scale designed to reveal the symptoms of schizophrenia. This evaluation was administered before the injection of ketamine and 20, 90 and 180 minutes after the injection. This was a double-blind study where neither the

participants were aware about who received a placebo versus ketamine, nor the trained professionals who assessed the effects of the ketamine versus a placebo. The collected data were analyzed statistically.

Discussion

The study by Lahti and colleagues (2001) was designed to verify a hypothesis that ketamine administration can induce schizophrenia-like symptoms. This group of researchers found that all healthy volunteers experienced an increase (in comparison to their baseline measurement) in schizophrenia-like symptoms after these participants were injected with ketamine. These symptoms were short lasting (20 – 30 minutes). Similarly, volunteers suffering from schizophrenia experienced also an increase (compared to their baseline measurement) of symptoms associated with schizophrenia. These symptoms were also short-lived. While the healthy volunteers experienced illusions and perceptual delusions, the vast majority of the patients experienced a more severe form of hallucinations and delusions. Participants exposed to placebo did not experience increases in the mentioned symptoms (Lahti, 2001).

Interestingly, ketamine influenced a rise in social withdrawal and emotional blunting in the healthy participants, yet in the patients ketamine did not influence any significant rise in these symptoms. Participants exposed to the placebo did not experience an increase in any of the mentioned symptoms of schizophrenia. (Lahti, 2001).

Since ketamine is known to antagonize the NMDA receptors on glutamate-producing neurons, this study suggests that the abnormalities of the glutamate system may be a biological basis that contributes to the schizophrenia-like symptoms. This study further suggests that even though dopamine blocking medications (such as haloperidol and clozapine) are very well

known to reduce the symptoms of schizophrenia, other medications that improve the functioning of NMDA receptor may be beneficial for the patients suffering from schizophrenia (Lahti, 2001).

Future Directions

One of the limitations of the study by Lahti (2001) and colleagues was that it only recruited 18 healthy individuals and 17 patients suffering from schizophrenia. More subjects are needed so that results can be more representative of all healthy individuals and all patients with schizophrenia. A major limitation is that it was not clearly stated how many participants were exposed to the different doses of ketamine, and how many to placebo. Also, there were terms that should be defined so that readers can follow better the text. Some of these terms are “concreteness,” “loose associations,” “formed mental images,” and “bolus”.

I would conduct a study designed to replicate/repeat the same study discussed in this paper. My goal would be to obtain the same findings, since only through the replication of results we can make a progress in science. I would also design a study to test whether ketamine effects were detrimental for the participants up to 3 years after the ketamine, hypothesizing that it takes time to the nervous system to respond to the changes induced by ketamine injection.

If I were given another opportunity to write a research paper, I would first start writing it earlier than this time. Since I had some terms which I was not familiar with, it took me longer than I thought to understand the research study. Next time I should be familiar with terms and concepts upon understanding prior to writing. Also I would need to go to a writing center more than once for checking my grammar. Also, I should have submitted a draft. Then I could have

received a feedback and improved the paper.

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