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Drugs and the Music Industry: How the Neurological and Visual Effects of LSD and Psilocybin Impact Creativity and Songwriting Abilities

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Abstract

The 5-hydroxy-tryptamine 2A receptor, 5-HT2A, is a G protein-coupled receptor that belongs to a subtype of receptors known as serotonergic receptors. The 5-HT2A receptor plays a wide variety of roles that are pivotal in the optimal functionality of the brain, including mediating the neurological, visual, and auditory pathways of the central nervous system. Typical agonists of the 5-HT2A receptor include psychedelic or hallucinogenic drugs such as lysergic acid diethylamide (LSD), psilocybin, and N, N-Dimethyltryptamine (DMT). Psychedelic drugs have been a means for many artists and musicians to enhance their creativity, leading to a subgenre of music and instrumentation known as psychedelic music, or psychedelia. Typically, psychedelic music is characterized by feelings of depersonalization and derealization, and artists who've experimented with drugs such as LSD and psilocybin claim to have an expanded imagination, along with a heightened sense of creativity and mesmerism. The research presented in this study explores the overlap between music and psychedelic drugs, namely LSD and psilocybin, and how the 5-HT2A receptor engages and mediates the neurological as well as the biological effects of these substances. This study has concluded that further research is necessary to explore the possibility of activating the 5-HT2A receptors with substances that do not carry the harmful effects that drugs such as LSD and psilocybin do.

Introduction

According to Zhang & Stackman Jr. (2015), the 5-HT2A serotonergic receptor is a G protein-coupled receptor that is highly distributed throughout the central nervous system (p. 1). The 5-HT2A receptor plays a wide variety of roles that are pivotal in the optimal functionality of the brain, including mediating the neurological, visual, and auditory pathways of the central nervous system. Zhang and Stackman Jr. stated that abnormalities of the 5-HT2A receptor has been linked to neurological diseases such as schizophrenia and depression, and that hallucinogenic drugs often act as agonists of the 5-HT2A receptor (p. 1). Halberstadt (2015) stated that typical hallucinogenic agonists of the 5-HT2A receptor include lysergic acid diethylamide (LSD), psilocybin, and N, N-Dimethyltryptamine (DMT), and that these hallucinogens produce very similar subjective effects, including depersonalization and derealization, loss of self-control, and anxiety (p. 100).

Halberstadt explained that there are two different classes of classical hallucinogens: indoleamines, which include LSD and psilocybin, and phenylalkylamines, which include amphetamines and mescaline from peyote (p. 100). Halberstadt noted that although they have different chemical structures, there is evidence that serotonergic hallucinogens such as LSD and psilocybin belong to a unitary class (p. 102). Halberstadt stated that LSD and psilocybin in particular act as agonists of the 5-HT2A serotonergic receptor, with LSD in particular having a high affinity for the 5-HT2A receptor (p. 100). Halberstadt noted that the activation of the Gq-PLCß signaling pathway (Figure 1) plays a role in producing the hallucinogenic effects of these drugs, through mobilization of Ca2+ (p. 102). However, Halberstadt stated that the signaling pathways responsible for creating the effects of hallucinogens have not been conclusively identified, and that the activation of the Gq-PLCß signaling pathway is not enough to produce hallucinogenic effects on its own (p. 102).

The subjective effects that LSD and psilocybin produce have led many artists and musicians to experiment with these drugs in an attempt to enhance their creativity, ultimately leading to a subgenre of music and instrumentation known as psychedelic music, or psychedelia. Because the 5-HT2A receptor is the primary mediator in the neurological and visual pathways that psychedelic drugs such as LSD and psilocybin affect and exists in high densities in the prefrontal cortex of the brain, the hallucinogenic properties these drugs possess have the capacity to alter a psychedelic music artist's ability to hear certain instrumentation, as well as cause these artists to believe that they serve a higher purpose in the physical world while under the influence of these drugs.

How Psychedelic Drugs and Music affect 5-HT2A

Because 5-HT2A receptors are believed to alter serotonergic function located in the auditory cortex, psychedelic artists may hear certain instruments or sounds differently under the influence of LSD and psilocybin than a person who is not under the influence of these substances, sparking the artist's creativity. Barrett et al. (2018) investigated the role of 5-HT2A receptor signaling in the neural response to the time-varying tonal structure of music in a secondary analysis involving a double-blind, randomized design (p. 3941). Barrett et al. claimed that LSD and psilocybin have significant effects on the brain's perception of music, and that the 5-HT2A receptors are responsible for creating the subjective effects individuals experience (p. 3940). Barrett et al. stated that twenty-five participants received one of the following: (Pla) treatment with placebo after pretreatment with placebo (179 mg Mannitol and 1 mg Aerosil po), (LSD) treatment with LSD (100 µg po) after pretreatment with placebo (179 mg Mannitol and 1 mg Aerosil po), or (Ket + LSD) treatment with LSD (100 µg po) after pretreatment with ketanserin (40 mg po) (p. 3941). Barrett et al. found the study to suggest that LSD serves to support a deeper or more integrated experience of music (Figure 2), which could explain the wide range of emotional and cognitive effects that are encountered (p. 3946).

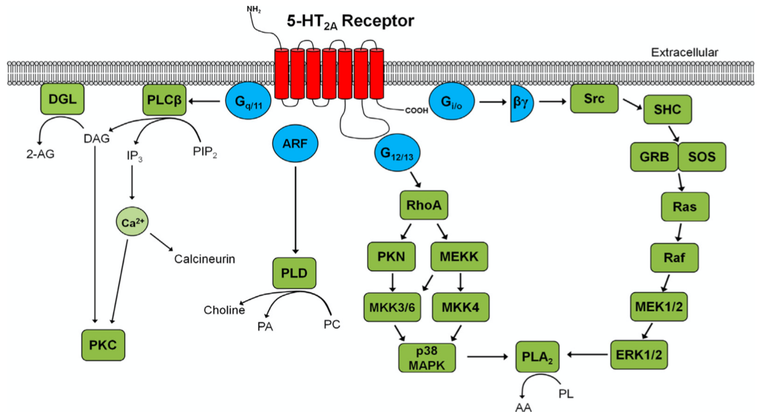

Figure 1. This figure illustrating the mechanism of the 5-HT2A receptor pathway was adapted from "Recent advances in the neuropsychopharmacology of serotonergic hallucinations," by Halberstadt, A., 2015, *Behavioral Brain Research*, *277*, 99-120.

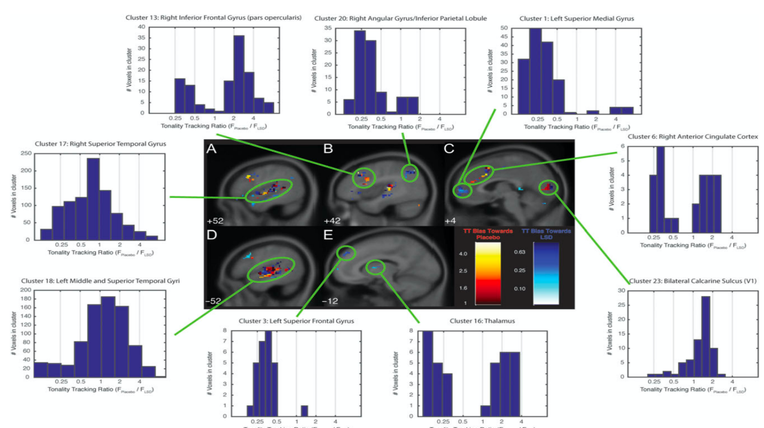

Figure 2. This figure shows which parts of the brain were responsive to the treatment that they received. The TT biases toward LSD are shown in blue, and the TT biases toward the placebo are shown in red. Adapted from "Serotonin 2A receptor signaling underlies LSD-induced alteration of the neural response to dynamic changes in music," by Barrett, F. S., Preller, K. H., Herdener, M., Janata, P., Bolstridge, M., Vollenweider, F. X., 2018, *Cerebral Cortex*, *28*(11), 3939-3950.

The Influence of Psychedelic Drugs On Creativity

Anderson et al. (2019) performed a study in order to determine whether microdosing with psychedelic drugs is related to changes in personality, mental health, and creativity (p. 731). Anderson et al. recruited participants from online forums such as Reddit as well as social media platforms such as Twitter and Facebook (p. 734). Anderson et al. indicated that the participants self-reported their microdosing behaviors and completed questionnaires concerning dysfunctional attitudes, wisdom, negative emotionality, open-mindedness, and mood, and that the participants also performed the Unusual Uses Task to assess their creativity (p. 731). Anderson et al. hypothesized that microdosing with psychedelics would lead to increased personal growth and wisdom, improved mood and mental health, and enhanced creativity (p. 733).

Anderson et al. found that microdosing with LSD and psilocybin resulted in decreased scores (based on the Dysfunctional Attitude Scale) on dysfunctional attitudes ($b = -8.69$, 95% CI [-12.48 -4.89], $z(364) = -4.49$, $p < 0.001$, $r = -0.92$) (p. 735). Anderson et al. noted that microdosing with LSD and psilocybin also resulted in higher scores (based on the Big Five Inventory 2 Model) in the wisdom category ($b = 6.61$, 95% CI [3.52 9.69], $z(367) = 4.19$, $p < 0.001$, $r = 0.88$) (p. 735). Anderson et al. found that microdosing with LSD and psilocybin also resulted in higher creativity scores, with responses being more clever ($b = 0.57$, $SE = 0.13$, $z(423) = 4.25$, $p < 0.001$, $r = 0.15$), more uncommon ($b = 0.50$, $SE = 0.15$, $z(427) = 3.42$, $p < 0.001$, $r = 0.14$), and more remote ($b = 0.74$, $SE = 0.16$, $z(425) = 4.49$, $p < 0.001$, $r = 0.20$) than without the doses (based on the Unusual Uses Task) (p. 736).

Conclusion

The 5-hydroxy-tryptamine 2A receptor, 5-HT2A, plays a wide variety of roles that promote brain consistency, with high concentrations of these receptors existing in the neurological, visual, and auditory pathways of the central nervous system. It appears that activation of these receptors tends to be highly correlated with human hallucinogenic potency, as well as agonist activity. LSD and psilocybin have been used for decades by many artists and musicians in exchange for heightened creativity, ultimately leading to a subgenre of music known as psychedelic music, or psychedelia. Music has long been a means for individuals to experience emotions; however, psychedelic drugs have since enabled individuals to heighten the emotional arousal experience within a song. Psychedelic music has been characterized by feelings of derealization and mysticism, and artists who have experimented with LSD and psilocybin claim to have an expanded imagination, along with a heightened sense of mesmerism. The research presented in this study explored the relationship between LSD and psilocybin and the engagement of the 5-HT2A receptor, and how music helps to mediate the neurological effects that are created via receptor activation. In order to recreate the heightened sense of imagination and creativity that is associated with 5-HT2A activation without the negative consequences of taking LSD and psilocybin, it may be suggested that further research explore the possibility of activating the 5-HT2A receptors with alternative substances rather than with psychedelic drugs such as LSD and psilocybin.

Works Cited

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