Novel Psychoactive Substance Discussions in the Online Webforum Lycaeum Reveal Popular and Unanticipated Drug Combinations

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Background: Novel psychoactive substances (NPS) are an emerging public health issue, with incompletely understood usage profiles and toxicities. NPS are frequently discussed in web fora and on social media.

Research Question: To provide insight into NPS usage and toxicity, we analyzed unstructured text from a long-standing high-volume online web forum (Lycaeum).

Methods: We conducted a qualitative analysis of substances, substance-substance combinations, and substances effects mentioned on Lycaeum, an online forum devoted to psychoactive substances. We extracted substances and effects using the Natural Language Toolkit in Python. We processed each post by standardizing spelling and mapping all variants of substance names to one form (lemmatization). To identify patterns in discussion we clustered posts by substances or effects mentioned. To identify clutters we used a principal components analysis of the term-term correlation matrix.

Results: We analyzed 107,802 posts on Lycaeum, extracting 806 substances and 58 effects. All posts were in English. The most commonly mentioned substances were LSD and diazepam. The most commonly mentioned classes of substances were hallucinogens and stimulants. The most commonly co-mentioned substances were LSD and MDMA, a recognized combination called "candyflipping". Two patterns emerged. First, posts tended to discuss one of two clusters of effects, "sedative-hyponotic and tactile hallucinations" or "stimulant and visual or audio hallucinations". Second, posts discussing mixing psychoactive plants and prescription medications formed two distinct clusters (silhouette coefficient 0.8, p <0.005, bootstrapping). We also found combinations with no prior discussion in the literature, including guarana and kanna (S. tortuosum) as well as chaliponga (D. cabrerana, a hallucinogenic vine) and M. tenifluora, another hallucinogenic plant.

Discussion: Lycaeum posts centered around creating two types of experiences, combining a relaxed state with tactile hallucinations or combining a stimulated state with audiovisual hallucinations. Posts also described combining psychoactive plants or prescription medications, but not mixing psychoactive plants with prescription medications. Further work is needed to relate online discussion to real-world behaviors. We also discovered discussions on novel combinations of psychoactive substances, which, inasmuch as online discussion reflects behavior in real life, may help focus biochemical and toxicologic work.