



Short communication

Salvia divinorum: Effects and use among YouTube users[☆]

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ABSTRACT

Salvia divinorum (salvia) is an intense, short-acting hallucinogenic plant gaining popularity among adolescents in the United States. There has been little scientific documentation of salvia's effects. The popular video-sharing website YouTube has received literally thousands of video-posts of people using salvia. The objective of this study was to assess the effects of salvia use through systematic observations of YouTube videos. A sample of salvia videos was obtained using the search term "salvia." The videos were further screened and only videos that captured the entire drug "trip" without video edits were included in the analyses described here ($n = 34$). Three trained research assistants independently watched the videos and rated their observations on 42 effects in 30-s intervals. Onset of symptoms was quick (often less than 30 s) and tended to dissipate within 8 min. Further, there was a relationship between salvia dose and effect duration. Since salvia's effects on humans are largely undocumented, this study provides the look at users in a non-laboratory environment (e.g. self-taped videos) exhibiting impairments and behaviors consistent with this powerful hallucinogen. Also, this study demonstrates the feasibility and shortcomings of using YouTube videos to assess emerging drugs and drug effects.

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1. Introduction

The cultivated plant *Salvia divinorum* originated in Oaxaca, Mexico where it was used for generations as an entheogenic drug (Schultes and Hofmann, 2001). Mazatec Shamans would chew the leaves to facilitate healing and visions. The reported effects of *S. divinorum* include: uncontrolled body movements, changes in visual perception, laughter, and separateness from body (Siebert, 1994). The plant was brought to the U.S. in the 1960s, but more recently gained popularity among young people in general and college students in particular (Lange et al., 2008). *S. divinorum* (usually referred to as *salvia*) users in the U.S. appear to usually smoke an extract-enhanced leaf product, instead of chewing fresh leaves as Mazatec Shamans have done. Extract-enhanced leaf concentrates the active agent, Salvinorin A, which is a potent hallucinogen (Siebert, 1994). Vaporizing Salvinorin A and inhaling it also appears to create a very fast pathway for the agent to cause effects (Siebert, 1994). Salvia's effects have quick onset—less than 1 min—and a short "trip" duration (González et al., 2006).

1.1. Salvia's effects

While research is beginning to document the extent of salvia use, there have been no published controlled human-laboratory experiments describing salvia's effects. Siebert (1994) provides a list of effects that were reported by six subjects who received doses of salvia leaves or Salvinorin A. His report, however, lacks the duration, intensity or prevalence of those experiences. We are left therefore primarily with users' self-reported accounts to help us understand the drug's effects.

Until now, there have been few documented complications or negative occurrences associated with salvia use. Based on the limited information available, neither dependence nor overdose appear to be substantial risks associated with using salvia; however the coordination, speech, and interpersonal impairments that have been reported, along with the sometimes profound hallucinogenic experiences and loss of self are the causes for concern. User accounts claim the effects to be very short lasting (5–15 min (González et al., 2006)).

YouTube is a popular international website that offers anyone the ability to freely post videos for general viewing. Currently anyone can observe people taking many illicit and legal drugs on YouTube, including marijuana, cocaine and methamphetamine. Since salvia is legal in most U.S. states and other countries, it is not too surprising that literally thousands of videos of salvia users have been posted; this provides a unique opportunity to observe people using salvia in settings of their choosing. Salvia's short effect duration means many user video-posts may actually contain

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the entire drug experience. The videos serve as a unique resource for observing the drug's effects. Therefore, this study was undertaken to document the observable effects of salvia through publicly posted videos of its use. While there are certainly salvia users who choose to use the drug less publicly and for different purposes, the "experimentation" mindset of some users appears to provoke documentation via video recordation. For others, the social aspect of the experience appears to be fulfilled in part by posting videos to YouTube. The motivations and means by which the videos are posted are left to be inferred, and clearly this represents a subset of the entire salvia using population.

2. Methods

2.1. Video samples

A sample of salvia videos was obtained using the search word "salvia" on the YouTube Internet site. Over 3000 videos were found using this strategy. Every 4th video on the list was selected, skipping instances of non-using videos and segments of television documentaries, until 100 videos were obtained. Seventy-six videos were excluded because they did not include the entire trip, leaving 24 videos that appear to be unedited. A video included an entire trip if it included unbroken video of an individual drug administration until the end of any observable effects. As the initial search yielded a majority sample of male users (19 of the 24), a second search was conducted; this time, the first 10 videos containing a female user's entire trip were selected. Therefore there were 34 videos used in the study. While they were not truly randomly selected, the videos were not selected based upon the observable effects of salvia, and therefore are adequate to test these methods' ability to document such effects.

2.2. Observation coding

Although there are no existing instruments to record direct observations of a hallucinogen's effects, there are measures of subjective effects. The Hallucinogen Rating Scale (HRS) has been previously tested for validity and reliability and we based our checklist of observable effects of salvia upon it. The HRS includes six sub-scales from 71 items: volition, somatic effects, affect, cognition, perception and intensity (Riba et al., 2001). A total of 42 items either from the HRS, or based on user accounts were adapted for our checklist.

Three coders were trained to conduct the observations. Training consisted of watching additional videos not included in the research sample and learning the definitions of the terms. Each rater coded 2–3 videos and received feedback on ratings. The observation checklist included not only those behaviors described above, but also: apparent drug dose, social context (e.g. numbers, type and gender of others in the area), administration method, place of use, user gender, apparent age, and ethnicity. In the case of multiple users, the person that smoked first was observed.

Videos were divided into 30-s intervals beginning with the first "hit" of salvia; the set of observations were coded within each interval. Any occurrence of an effect was coded as present; multiple or continuous occurrence were counted only once per 30 s interval.¹ Duration of symptoms was a sum of the 30 s intervals in which the symptom occurred. Severity of symptoms was rated on a 5-point scale. Duration of severe effects was the sum of 30 s intervals in which the symptom severity was rated "5".

Dose was measured by counting the seconds that the smoke was held and the number of hits the user took. The type of pipe used to smoke was coded as water pipe or standard pipe. Aspects of the salvia user's environment were measured as context variables: number of people present, other drug use, other salvia users, TV and/or music playing, the size of the room, and was the video shot inside versus outside.

2.3. Analyses

2.3.1. Reliability analysis. In order to examine reliability, 11 videos were coded using two raters. The checklist was assessed for reliability using the Intra Class Correlation (ICC) procedure with the two-way random option selected available in SPSS as described by Shrout and Fleiss (1979). There are no clear criteria for ICC cutpoints; however, as the reliability of the data affects the effect size detectable, higher ICC is preferred and in a small sample such as this, 0.7 and above is preferred. The ICC values for the separate items ranged from very low, below 0.2, to moderately high, 0.8. However many of the variables occurred rarely or not at all, which is a problem for any statistical procedures, ICC included (Shrout and Fleiss, 1979; Weir, 2005). This is reflected in the lower ICC values for some of the items. Therefore a percent agreement between raters was used to further assess differences due to error or

low variance. The result was an average between rater agreements of 78% (range 36–100%). Taken together, with the face validity of the observations, the reliability analysis does suggest that most items were reliably recorded.

2.3.2. Observation analysis. There were three ways that the variables were examined: (1) the duration of effects, (2) the duration of severe effects, and (3) observation of severe effects (dichotomous). The analyses were conducted using a *t*-test or a Pearson's correlation. A *t*-test was used to examine the difference in mean duration of effects by pipe type and compare number of hits and time to exhale by the experience of severe effects. Correlations were used to examine the relationship between symptom duration and the number of hits and seconds to exhale.

3. Results

The mean duration of the videos was 5.8 (SD = 1.91, range = 2.34–9.55) min with users taking an average of 1.71 (SD = .94, range = 1–5) hits while holding the smoke in their lungs for an average of 25.4 (SD = 15.03) s.

A range of 0–6 (mode = 2) other people were in the room, with nine (26%) videos including another salvia smoker. In seven (21%) videos, the user was moved, touched or otherwise interfered with in some way by others. In almost half ($n = 16$), those with the user showed concern for the user, and in 30 (88%) videos the others laughed at the user. Finally, there was a "trip director" or a person that provided instructions to the user in 24 (71%) of the videos.

Fig. 1 presents the percentage of users that presented an effect by the time from first "hit" throughout the 30-s intervals. The effects for nearly all users appear to have dissipated by about 8 min after the first "hit." Several effects were not present in any videos, these included: an expression of closeness to others, mention of childhood memories, and the user eating or drinking.

Dose and administration effects were observed. Number of "hits" was correlated with speech problems, specifically gibberish ($r = .353, p < .05$), and diction ($r = .593, p < .05$). Users that exhibited severe diction problems had, on average taken more hits ($m = 2.4$ vs 1.4, $p < .05$) than those that did not; those exhibiting severe fluency problems ($m = 2.4$ vs 1.35, $p < .05$) took more hits, and held the smoke longer ($m = 32$ s vs 21.3 s, $p < .05$) than those that did not. Finally 44% ($n = 8$) of the water pipe users had severe fluency impairments versus only 13% of the standard pipe users ($p < .05$). There were insufficient instances of salvia strength verbal descriptions to find relationships with that variable.

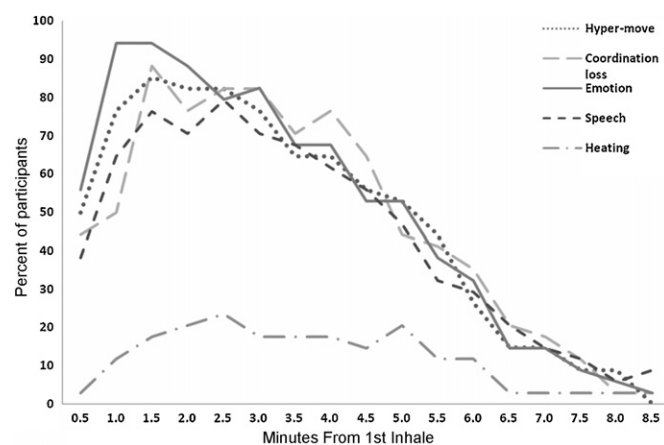


Fig. 1. Percent of users showing effect over time. Drug effects were grouped into five categories: (1) hypo-movement (e.g. slumping into a slouched position, limp hands, facial muscles slack or relaxed and falling down), (2) hyper-movement (e.g. uncontrolled laughter, restlessness, touching or rubbing the face without apparent reason or thought), (3) emotional effects included being visibly excited or afraid, (4) speech effects (unable to make sense, problems with diction, problems with fluency, inability to speak, and having problems recalling words) and finally (5) heating effects related to being hot or heated (e.g. flushed, or user makes a statement about being hot or sweating).

¹ For an example of the checklist see the supplementary materials online at doi:10.1016/j.drugalcdep.2009.11.010.

For the most part, variables such as number of people present, having a “trip leader” and being laughed-at had little relationship with observable effects. The number of people present was positively associated with instances of “shakes” ($p < .05$). A non-significant association was also found between having a trip leader and observation of the user trying to leave the room ($p = .14$). However, given the number of comparisons analyzed, even the significant finding should be viewed with skepticism and confirmed with a new and larger sample.

4. Discussion

Two main findings emerge from this research: (1) observable effects of salvia can be measured, and (2) the demonstration of the utility of YouTube videos as a resource for behavioral observation research. The dose–response relationships observed demonstrate the method’s sensitivity to capture the effects of salvia. We were not able to test extract-concentration effects due to low instances of statements by those in the videos disclosing the strengths of the salvia used. However, Wolowich et al. (2006) recently called into question the validity of the concentration claims by salvia retailers. Therefore, such an analyses may not have yielded the expected dose-relationship even with more disclosure within the videos.

There are of course shortcomings with this approach. Clearly, the videos represent a self-selected sample of salvia users and “trips.” Only those instances where a video is made and its owner felt there would be interest among viewers are placed on YouTube. Therefore instances of longer effects which do not lend themselves to uncut videos or effects that are subtle or unobservable may not be shared. There may be biases in the types of outcomes that lead some to post their videos; effects deemed humorous, for instance, may be more likely to be posted than effects that may be disconcerting. Also, the legality, duration and effects of salvia may lend itself to a broader representation of the drug’s use within the videos than other substances. So the utility of this method may be limited for some substances.

More subtle effects may be observed in laboratory studies; cognitive impairments, for instance, may require direct testing of the user. Laboratory testing may uncover effects that continue after the apparently short-term profound and passively observable effects have passed. For example González et al. (2006) observed user reports of “hangover” effects after using salvia. These reports may be indicative of lingering cognitive deficits, not likely to be articulated by users in subjective accounts. It is also possible that other effect domains are present for users who, for reasons either personal or situational, did not appear within our sample of YouTube videos.

However, it is also important to recognize that some drug effects are dependent, at least to some extent, on the setting of use. Emotional reactions, for instance may be very different for a user in

a lab versus at a party. Thus, the YouTube videos offer an opportunity to observe drug effects in the natural settings presented in these videos.

Finally, the risks associated with salvia remain mostly unknown; however, this research sheds some light on possible risk domains. Coordination loss, emotional and cognitive effects of the drug were found to be profound, yet of short duration. Thus, while the risk of injury, interpersonal conflict and property damage is possible, the window of risk seems much shorter than for most other drugs, including alcohol.

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The project was completed without a funding source.

Contributors

Drs. Lange, Reed and Clapp designed and wrote the study protocol. Dr. Lange, Mr. Daniel and Ms. Homer contributed to the literature review. With input from Drs. Lange and Reed, Mr. Daniel and Ms. Homer conducted data analysis. Dr. Lange and Mr. Daniel wrote the initial draft of the paper and all authors edited and contributed to parts of the final draft. All authors have approved the final draft.

Conflict of interest

There are no conflicts of interest with any of the authors.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at [doi:10.1016/j.drugalcdep.2009.11.010](https://doi.org/10.1016/j.drugalcdep.2009.11.010).

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