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SUBJECT EXPECTANCY AND ENVIRONMENTAL FACTORS AS DETERMINANTS OF PSYCHEDELIC FLASHBACK EXPERIENCES

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This study assessed the roles of expectancy and autonomic arousal in inducing psychedelic flashbacks under conditions of mild sensory deprivation. Subjects with and without previous flashbacks participated. During the first experimental session, subjects were given a drug which they were told would induce flashbacks, and during the second, a drug which was alleged to induce only autonomic arousal. Ephedrine sulfate (causing autonomic changes) or placebo actually was given in counterbalanced order. Subjects of both groups experienced many more psychedelic sensations when they expected flashbacks. Drug effect was nonsignificant. These findings support the view that flashbacks are not "caused" by psychedelic drugs, but by the tendency of some drug users to mislabel and selectively attend to relevant aspects of naturally occurring altered states of consciousness.

Psychedelic sensations which spontaneously recur some time after initial effects of psychedelic drugs have worn off are called *flashbacks*. The flashback phenomenon is one of the most dramatic adverse reactions linked with the major psychedelic "street drugs," including LSD, mescaline, peyote, and morning glory seeds (3, 8). Although practically nothing is known about the causes of flashbacks, published reports have contained speculations attributing them to persistent changes in the nervous system or to psychotic processes which may be triggered by psychedelic drug use (7, 20, 23). Little attention has been focused on psychological factors as possible determinants of flashbacks, perhaps due to the prevailing assumptions that: a) such experiences are uniquely associated with psychedelic drugs, and therefore b) they must be manifestations of pharmacological or physiological changes.

A review of the relevant literature yields no evidence that psychedelic drug use causes enduring changes in the nervous system or in personality (*e.g.*, 15, 21). Also, "psychedelic" experiences do not appear to differ qualitatively from altered states of consciousness (hereafter called ASCs) which can be achieved by a variety of procedures and naturally occurring circumstances not involving drug use (13, 14). Finally, flashbacks consistently are reported to occur in the same settings and circumstances which have been found to induce ASCs in the absence of previous psychedelic drug use: conditions of reduced sensory input, stress, fatigue, or extreme relaxation (3, 4, 7). Taken together, these findings raise a serious question about the assumed causal role of psychedelic drugs in the production of flashbacks. That is, the possibility is suggested that flashback experiences are due less to previous drug use than to the individual's circumstances and physical state at that particular time.

As with earlier theories about causes of flashbacks, an explanation based entirely upon environmental circumstances and physical state would have difficulty accounting for the fact that at least 85 per cent of psychedelic drug users never experienced flashbacks (14). A third factor which seems likely to affect whether a given psychedelic drug user will experience an ASC or flashback is that person's expectations in the situation.

The ASC literature provides several examples of the effectiveness of expectancy in bringing on or inhibiting these subjective states. In an isolation, but not sensory deprivation situation, Orne and Scheibe (16) found that subjects led to expect ASCs

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performed significantly more like real sensory deprivation subjects than did those without such expectations. Barber and Calverley (2) have reported that both hypnosis and brief motivational instructions enabled a majority of their subjects to experience auditory and visual hallucinations, and that these two procedures did not differ significantly in hallucination-producing effectiveness. A consistent finding of single and double blind studies of LSD effects is that some placebo control subjects experience ASC reactions as great as or greater than those of other subjects given the active drug (1, 10, 17). In one of these, Reed and Witt (17) tested two subjects together twice under double blind conditions. At the first testing, both subject A, given LSD, and subject B, given a placebo, experienced dramatic ASC reactions. When informed about the real doses of their first testing and then tested again, this time with A getting the placebo and B getting the drug, neither subject reported any ASC effects.

The present study was undertaken to assess the role of expectancy in producing or inhibiting flashbacks under mild sensory deprivation conditions in two kinds of subjects: those who had multiple psychedelic drug exposures and experienced flashbacks, and those who had similar drug histories without experiencing flashbacks. In addition, since some flashbacks reportedly occur within the context of stress or anxiety, the flashback-inducing potency of a drug which effects changes in autonomic nervous system activity (*i.e.*, physiological correlates of anxiety) was compared with that of a placebo.

METHOD

Subjects. These were 16 males who claimed to have experienced flashbacks (hereafter referred to as FB subjects) and 16 males claiming extensive psychedelic drug histories but no flashbacks (non-FB subjects). Subjects of both types were recruited through clinics and counseling agencies which primarily serve students and young "street-oriented" people around the city of Seattle, Washington. Payment of approximately $2.00/hour ($20.00 altogether/subject) was offered for participation in the pre-experiment interview and two experimental sessions. No applicant was accepted if he was less than 18 years old or had a history of psychiatric hospitalization.

The two subject type groups were matched on the basis of age, social class background (Hollingshead's Index levels I through V; 6), and psychedelic drug history. Table 1 presents group means and results of *t*-tests of their differences for these variables; none of the *t*-values approached statistical significance. Almost all subjects in both groups were in their 20s and had been brought up in middle or upper-middle class families. There was considerable variability in numbers of psychedelic drug exposures ("trips") reported by subjects in both groups; however, the two medians were comparable (152 for the FB group and 140 for the non-FB group), as were the number of subjects reporting fewer than 100 trips (six for the FB group and four for the non-FB group; $z = 0.8$, N.S.). Although the groups were not specifically matched for this, only six FB subjects and four non-FB subjects ($z = 0.8$, N.S.) reported having indulged in psychedelic drug "binges." A binge was somewhat arbitrarily defined as taking at least two drug trips/week for at least 4 weeks in a row. No effort was made to match the two groups on the basis of education because it was anticipated that the experience of flashbacks and/or the existence of personality characteristics associated with flashbacks may be predictive of poor academic achievement. However, the mean of 14.2 years of education for the non-FB group was not significantly greater than that of 13.1 for the FB group ($t = 1.6$, $df = 30$).

TABLE 1
Comparison of FB with Non-FB Groups on Matching Variables

	Age	Social Class Background	No. of Drug Trips
FB group mean	22.3	34.7	155.8
Non-FB group mean	23.4	38.4	136.6
t	0.9	0.8	0.5

Tests. The 70-item Linton and Langs Subjective Reaction to LSD Scale (10–12) was used as a self-report measure of psychedelic-type reactions during the experimental sessions, as well as for retrospective reports of previous psychedelic drug trips and flashbacks. In addition to total scale scores, scores were also computed for each of the four factors obtained by the Linton and Langs (12) factor analysis of their scale; factors A, B, C, and D contain 26, 15, 17, and 8 items, respectively. Retrospective measures of ASC reactions during each subject's typical psychedelic drug trip and typical flashback (FB subjects only) were obtained in the following way: he was asked to give the percentage of drug trips and percentage of flashbacks in which he experienced each ASC sensation on the scale; total scores and factor scores for each condition were then obtained by summing the percentages. Linton *et al.* (12) have reported that retrospective accounts of single drug experience do differ from measures taken during or immediately following the LSD reactions themselves, but the average net loss of 3.6 endorsed items out of the 70-item scale is relatively small. Moreover, the mean Linton and Langs Scale score of 30.5 obtained retrospectively in relation to the present subject's typical psychedelic drug experience falls midway between the mean scores of 25.0 recorded by Levine and Ludwig (9) and 38.8 recorded by Linton and Langs (11) for their subjects under LSD conditions; the comparability of these three scores provides some justification for the procedure used here to estimate retrospectively typical ASC reactions.

One of six brief cognitive exercises was given during each experimental hour solely for the purpose of cutting down on a possible tendency for some subjects to go to sleep. These exercises included the Word Naming, Serial Sevens, and Simple Rhyming tests used by Goldberger (5), as well as three similar tests constructed for use in the present study.

Drugs. Fifty-milligram doses of ephedrine sulfate (ephedrine) in capsule form were administered to induce changes in autonomic activity. Ephedrine effects, which normally last about 3 to 4 hours, include insomnia, nervousness, palpitation, sweating, and vertigo. Capsules containing lactose (a pharmacologically inert substance), which were given for comparison purposes, were indistinguishable in appearance from the ephedrine.

Design and procedure. In a 1-hour individual pre-experiment interview, data were obtained concerning each subject's age, education, social class background, drug history, nature of typical psychedelic drug trip, and (for FB subjects) nature of typical flashbacks.

All subjects were individually tested two times, once under each expectancy condition. Before the first session (the "expect flashback" condition) subjects were told that they would receive a drug that was expected to induce flashbacks in people who have taken LSD. In fact, half of the subjects in each subject type group received ephedrine and the other half the placebo. Before session 2 (the "not expect flashback" condition) subjects were told that they would receive a drug which does not cause flashbacks but which has some of the same side effects as the first drug, including nervousness, dizziness, and increased respiration rate. This time, half of the subjects in each of the session 1 subject type × drug type groups were given the same drug as before and the remaining subjects were given the other drug. This was, therefore, a four-dimensional factorial design, with three between-group factors (subject type, drug type, and same *vs.* different drug at second session) and one within-group factor (expectancy condition).

During the experimental sessions, the subject was seated in an easy chair behind a screen in a dimly lit room. The experimenter, who was not informed as to the subject's actual drug condition, administered the Linton and Langs Subjective Reaction Scale (hereafter referred to as the ASC scale) and cognitive exercises via a tape recorder. In session 1, the subject was administered the drug as soon as he arrived for the experiment. In the second session, the subject spent the first hour in the experimental setting without being given

the drug, so that at the end of this hour, a baseline ASC score could be obtained; following this, the subject was given his drug and the session proper began. Session 1 lasted 3 hours and, because of the baseline hour, session 2 lasted 4 hours. Cognitive exercises were given every hour on the half-hour and the ASC scale every hour on the hour. The ASC scale was scored according to the system described in Linton and Langs (11), which yielded a single baseline score and both a peak hour and a cumulative score for each of the two sessions proper. At the end of his second session, the full purpose of the experiment was explained to each subject and his cooperation enlisted in keeping this a secret until the study was completed.

RESULTS

Assessment of independent variables. Two four-factor mixed (within and between) analyses of variance were used to test the effects of subject type (FB *vs.* non-FB), drug type at first session (ephedrine *vs.* lactose), drug type at second session (same *vs.* not same at first session), and expectancy condition (expect flashback *vs.* not expect flashback).

The dependent variable used for the first analysis was cumulative minus baseline ASC score. Means and standard deviations for main factor groups used in this analysis are presented in Table 2. Table 3 summarizes the results of this analysis of variance. A highly significant expectancy condition main effect was obtained, indicating that the subjects experienced many more ASC sensations when they expected to have flashbacks than when they expected not to have flashbacks. None of the other main effects or interaction effects attained statistical significance.

The second analysis of variance used peak hour minus baseline scores to test the same effects. This difference score is not independent of the one used above, since peak scores are included in cumulative scores, but the separate analysis does provide a somewhat different view of what happened in the experimental sessions. However, the results obtained were the same as those in the first analysis, and therefore, will not be reported in detail. Again, there was a strong expectancy effect ($F = 30.91$; $p < .001$) and none of the other main or interaction effects was significant.

TABLE 3
Summary of Analysis of Variance of Cumulative Minus Baseline ASC Scores

	df	*MS*	*F*
Subject type (A)	1	221.27	3.98
Drug type at first session (B)	1	15.02	0.27
A × B	1	4.52	0.08
B × C	1	2.64	0.05
A × B × C	1	11.39	0.20
Error a	24	55.57	
Expectancy condition (D)	1	1991.39	41.30***[a]
A × D	1	54.39	1.13
B × D	1	2.64	0.05
A × B × D	1	50.77	1.05
C × D	1	0.39	0.01
A × C × D	1	2.64	0.05
B × C × D	1	1.27	0.03
A × B × C × D	1	87.89	1.82
Error b	24	48.21	

[a] *** $p < .001$.

TABLE 2
Means and Standard Deviations for Cumulative Minus Baseline ASC Scores

	Expect Flashback		Not Expect Flashback	
	Mean	Standard deviation	Mean	Standard deviation
FB subjects ($N = 16$)	20.69	7.58	7.81	6.25
Non-FB subjects ($N = 16$)	15.13	7.10	5.81	5.15
Ephedrine at session 1 ($N = 16$)	17.63	7.77	6.19	6.27
Lactose at session 1 ($N = 16$)	18.19	7.92	7.44	5.24
Same drug at session 2 ($N = 16$)	17.56	8.89	6.69	4.24
Different drug at session 2 ($N = 16$)	18.25	6.64	6.94	7.04
Total ($N = 32$)	17.91	7.85	6.81	5.81

TABLE 4
Per Cent of Subjects Reporting Specific ASC Effects under Expect Flashback Conditions

Item No.[a]	Item Description	FB Group	Non-FB Group	Item No.[a]	Item Description	FB Group	Non-FB Group
7	Lost sense of time	87.5	68.7	23	Detached, watching self	31.2	18.7
14	Body looked or felt strange	75.0	68.7	19	Illogical experiences	31.2	12.5
10	Difficulty concentrating	75.0	62.5	38	Losing reality	25.0	18.7
32b	Thoughts moving slower	81.2	56.2	43	Depersonalization	31.2	12.5
39	Mind blank at times	75.0	62.5	45	Unsure of others	25.0	18.7
46a	Dizziness or grogginess	75.0	62.5	9a	Difficult to move	18.7	18.7
3	Perceptual distortions	75.0	50.0	15	Especially happy	18.7	18.7
36	Fleeting thoughts or images	56.2	68.7	29b	Hard to talk	18.7	18.7
25	Fascinated by something	62.5	56.2	46f	Unusual odors	31.2	6.2
44	Obsessive thoughts or images	62.5	56.2	9b	Easier to move	12.5	19.7
21a	Time passing faster	62.5	50.0	18	Felt child-like	18.7	12.5
29a	Rather not talk	62.5	43.7	28	Lost control of thoughts	18.7	12.5
32a	Thoughts moving faster	68.7	31.2	29c	Increased talking	12.5	18.7
35	Judgment changes	62.5	37.5	37	Altered sense of self	18.7	12.5
42	Hallucinations or illusions	56.2	43.7	2	People look different	12.5	12.5
46b	Numbness or tingling	68.7*[b]	31.2	4	Personal disclosure	18.7	6.2
11	Increased understanding	62.5	31.2	6	Attending to childhood	12.5	12.5
17	Unusual thought topics	62.5	31.2	13	Depressed or sad	25.0*	0.0
1	Dream-like feeling	50.0	37.5	16b	Acting silly	18.7	6.2
12	New understanding	50.0	37.5	20	New powers	18.7	0.0
46k	Felt weak	43.7	43.7	24	Felt old	18.7	0.0
46m	Body felt heavier	62.5*	25.0	26	Disown body part	18.7	0.0
5	Merging into surroundings	56.2	25.0	27	Afraid or upset	12.5	6.2
21b	Time passing slower	43.7	37.5	31	New meanings	6.2	12.5
22	Things seem meaningless	62.5*	18.7	46g	Felt nauseous	12.5	6.2
30	Time seemed to stop	31.2	50.0	8a	Lost self-control	0.0	12.5
46i	Dry mouth	50.0	31.2	8b	Might lose control	6.2	6.2
46j	Ears ringing	50.0	31.2	28a	Possessed by thoughts	12.5	0.0
46l	Body felt lighter	50.0	31.2	34a	Body being controlled	12.5	0.0
46d	Hot or sweating	43.7	31.2	28b	Thoughts being controlled	6.2	0.0
46e	Unusual taste	37.5	37.5	34	Lost control of body	6.2	0.0
46h	Blurred vision	50.0	25.0	40	Afraid may go crazy	0.0	0.0
33	Angry or annoyed	37.5	25.0	41	Lost control of feelings	0.0	0.0
46c	Feel cold or chilled	25.0	31.2	41a	Possessed by feelings	0.0	0.0
16a	Feeling silly	18.7	31.2	41b	Feelings being controlled	0.0	0.0

[a] Linton and Langs (11) item no.
[b] * Percentages significantly differ by z-test ($p < .05$).

Assessment of dependent variables. The results presented above indicate that the instruction to expect flashbacks in the experimental situation was quite successful in influencing these subjects to experience increases in ASC sensations. However, this in itself does not necessarily mean that the experimentally induced experiences were comparable to naturally occurring flashbacks. In this section, ASC sensations reported during expect flashback conditions will be described and compared with retrospective measures of previous flashbacks and psychedelic drug states.

Table 4 presents descriptions of the ASC scale items, along with percentages of FB and non-FB subjects endorsing each item under expect flashback conditions; order of presentation is from most often to least often endorsed by the total subject pool. Items most frequently endorsed by the combined group include those relating to alterations in thinking, perception, and sense of time. Those least often endorsed described loss of control and dysphoric feelings. Although a higher proportion of FB subjects endorsed 50 of the 70 items, z-tests of proportion differences were statistically significant ($p < .05$) for only four

TABLE 5
Comparison of Flashback Mean ASC Scores with Expect Flashback Mean ASC Scores

Comparison Variable	Flashback Mean	Comparison Mean	*df*	*t*[a]
Peak score				
FB subjects	18.86	19.63	15	0.37
Cumulative score				
FB subjects	18.86	25.69	15	2.71**[b]
Peak score				
Non-FB subjects	18.86	13.86	30	1.63
Cumulative score				
Non-FB subjects	18.86	18.06	30	0.28

[a] *t*-Test for correlated means was used when comparison group was the FB subjects, and *t*-test for independent samples was used when the comparison group was the non-FB subjects.
[b] ** $p < .05$.

items; this does not exceed the number expected by chance.

In Table 5, the ASC mean for the previous flashbacks (FB subjects only) is compared with ASC means of the two subject type groups under expect flashback experimental conditions. The cumulative ASC mean for FB subjects was significantly greater than the ASC mean obtained for their previous flashbacks. All other differences were nonsignificant. Thus, the ranges of ASC reactions of both subject groups under expect flashback conditions were at least as great as those claimed by FB subjects for their typical previous flashbacks.

The four factors empirically identified by Linton and Langs (12) within their ASC scale were used to define and compare patterns of ASC response across the three comparison conditions: psychedelic drug states, flashback states, and expect flashback reactions. First, since there are unequal numbers of items included in these four factors, it was necessary to compute percentages of items endorsed in each factor for each subject in each comparison condition (using cumulative ASC responses for the expect flashback experimental reaction). These percentages were then used to rank the factors from highest to lowest response ratio for each subject in each condition; this manipulation yielded ASC reaction profiles characterizing subjects' experiences in three conditions. The next step in this analysis was to compare the factor ranks obtained for the different conditions. This was done by computing Freedman two-way analyses of variance (χ_r^2s) for each individual factor. The comparisons of previous flashbacks with psychedelic drug states and expect flashback reactions were necessarily restricted to FB subjects only ($N = 16$). Comparisons of expect flashback reactions with psychedelic drug states were first accomplished for each subject type group separately, but since the results were the same for all four factors, these χ_r^2s were recomputed for the combined subject pool ($N = 32$). The χ_r^2 values obtained by the above procedures are presented in Table 6. Factor A (items concerning expansiveness and decreased control over affect and distribution of attention) had significantly higher ASC profile ranks for the psychedelic drug state than for the expect flashback experimental

TABLE 6
Summary of Freedman Analyses of Variance of ASC Factor Ranks across Comparison Conditions

Factor		χ_r^2	Conditions: Comparison and direction
A	1	1.00	Psychedelic drug state ≃ flashback state[a]
	1	3.06	Flashback state ≃ expect flashback state[a]
	1	9.03**[c]	Psychedelic drug state > expect flashback state[b]
B	1	3.06	Psychedelic drug state ≃ flashback state[a]
	1	3.06	Flashback state ≃ expect flashback state[a]
	1	0.50	Psychedelic drug state ≃ expect flashback state[b]
C	1	2.25	Psychedelic drug state ≃ flashback state[a]
	1	5.06*[c]	Expect flashback state > flashback state[a]
	1	6.13*[c]	Expect flashback state > psychedelic drug state[b]
D	1	1.00	Psychedelic drug state ≃ flashback state[a]
	1	0.06	Flashback state ≃ expect flashback state[a]
	1	2.00	Psychedelic drug state ≃ expect flashback state[b]

[a] FB subjects only; $N = 16$.
[b] All subjects; $N = 32$.
[c] ** $p < .01$; * $p < .05$.

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condition. Factor C (items relating to changes in body image and generalized mental and physical inhibition) were significantly more characteristic of the expect flashback condition than of either the psychedelic drug or previous flashback states. However, nine of the 12 comparisons failed to yield statistically significant results. Hence, the patterns of ASC reactions obtained for the three comparison situations appear to be more similar than dissimilar.

DISCUSSION

The major finding concerning the independent variables studied here was that subjective experiences of identical setting and drug stimulus conditions could be altered dramatically by varying the expectancy instructions. In a setting with restricted sensory input, subjects experienced many more ASC sensations when they were told to expect flashbacks than when they were told not to expect flashbacks. Also, the ASCs experienced under positive expectancy conditions were comparable in both range and pattern to naturally occurring flashbacks.

It was not economically feasible to study order of presentation of expectancy conditions as an additional experimental factor. While the design confounded expectancy with order of sessions, there are several reasons why this is not likely to have inflated the expectancy effect obtained. First, any learning of ASC responses which may have occurred in session 1 should have led to an increase rather than a decrease in ASC scores at the second session. Even though the subjects were told not to expect flashbacks in session 2, their previous ASC experiences in session 1 may have alerted them to the possibility of experiencing them in the experimental setting, regardless of what they were instructed. A second possibly relevant aspect of session order is relative novelty of the experimental setting. Since the expect flashback session was preceded by a lengthy interview in the same room and with the same experimenter, these were not new to the subjects under either expectancy condition. However, the reduction of sensory input and the giving of pills were new in the expect flashback session, and this raises the possibility that adaptation to them during the first session may have inflated the results. The findings of previous research suggest that such adaptation effects on the dependent variable used here (ASC scale scores) were probably minimal. Zuckerman (24) has reviewed a number of session order effects on responses to sensory deprivation. A consistent finding was that in the second session with sensory deprivation, although reports of unpleasant moods tended to decrease, there was no such tendency with respect to perceptual alterations, body image changes, and feelings of unreality. As indicated in Table 4, in the present study the major reactions in the first (expect flashback) session were the perceptual and cognitive changes which do not seem vulnerable to order effect; on the other hand, the dysphoric feelings previously found to decrease over repeated sessions were hardly reported at all. Finally, two previous studies which obtained no significant increase in ASC responses after administration of a placebo and a short (1-hour) period of isolation suggest that the novelty of taking pills does not have major ASC-inducing effects (19, 25).

In retrospect, the assumed relationship between effects of ephedrine and autonomic changes that characterize these particular subjects' stress responses is questionable and certainly has not been demonstrated here. That is, there is no way of determining what reactions these subjects had to this drug and how these reactions were similar or dissimilar to the physiological components of their typical anxiety responses. In addition, autonomic changes occurring naturally as the result of being placed in the experimental situation were not controlled. Schachter and Singer (18) have reported evidence of consistent increases in subject's emotional arousal due to participation in an experiment which seems less dramatic than the present one. Therefore, even if the ephedrine did produce the appropriate autonomic changes in some cases, these may have been matched by naturally occurring autonomic changes

in subjects given lactose placebos. Although significant drug effects, if obtained, may have had some relevance, it is concluded that this experiment did not provide an adequate test of the flashback-inducing effects of emotional arousal.

One of this study's most intriguing results was the failure of the subject type variable to attain statistical significance. Even subjects with no history of flashbacks were able to experience significant ASC reactions when flashbacks were expected; also, subjects who had had flashbacks before failed to experience such ASC reactions when flashbacks were not expected. This suggests that a considerable amount of control over these ASCs is possible, even under stimulus conditions which tend to induce them. Moreover, the finding that almost all of the present subjects did experience flashback-like ASCs raises the question of just how unusual or pathological are the basic processes involved.

It is proposed that the instruction to expect flashbacks influenced the subjects to attend selectively to sensations which they had previously learned to associate with psychedelic drugs. By closely attending to whatever relevant stimuli were available due to the reduced sensory input and their particular patterns of autonomic responses (22), subjects became aware of a wide range of psychedelic sensations. On the other hand, when they were led not to expect flashbacks, they were more likely to ignore such stimuli and may actually have inhibited responses to them. This "gating out" of stimuli not relevant to external reality is a much reinforced adaptive response by which most people more or less automatically avoid or minimize the potentially disruptive effects of ASCs on waking mentations. However, if a psychedelic drug user enjoys or fears recurrent psychedelic sensations and/or is a member of a subculture which emphasizes them, it is quite possible that he will create in his own environment conditions similar to the expect flashback experimental conditions. That is, he will selectively attend to relevant aspects of naturally occurring ASCs and mislabel them flashbacks.

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