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RETROSPECTIVE ALTERATIONS OF THE LSD-25 EXPERIENCE

HARRIET B. LINTON, Ph.D.,¹ ROBERT J. LANGS, M.D. AND I. H. PAUL, Ph.D.

INTRODUCTION

Until the recent upsurge of interest in drug-induced states there were few systematic studies of altered waking states of consciousness. Lacking the means to induce an extended and controlled alteration in the state of consciousness, investigators had to rely on transient and relatively inaccessible alterations, as those accompanying falling asleep, fatigue or fever. Rapaport's pioneering self-observations of the state of falling asleep (12) did, however, lay a useful theoretical groundwork in this area. Rapaport and, later, Klein developed a classification, based on modern psychoanalytic theory, of the variables of awareness that differentiate waking states of consciousness. "... each definable as a distinctive *pattern* of experience, and each reflecting and vouchsafed by the existing balance among drive, defense, and controlling structures" (5).

Linton and Langs used this classification in their study of the effects of LSD-25 (8, 9). The drug, they found, "... produces an accentuation of thinking by means of images, alterations of self-experience, in-

cluding feelings of detached self-observation and estrangement, confusion of personal identity, the experiencing of events in terms of implied meanings, loss of boundaries between the self and the environment, drive-dominated thinking, alterations in distribution of attention cathexis, somatization, and an increase in feelings of passivity, expressed as a subjective loss of control." These effects, they felt, were best conceptualized as an alteration in state of consciousness.

Later recall of the drug experience has never been systematically studied. Such an investigation can reveal much about the workings of human memory, particularly the way people recall or reconstruct experiences that were unusual, stressful or bizarre. It is already known that recall of an extended meaningful experience is prey to a wide variety of distortion-producing factors. Leveling and sharpening (1, 6), rationalization (2, 18) and importation (11) are among the processes that have been studied in the laboratory. Psychoanalytic investigators have provided a body of persuasive clinical evidence of the effect of drives and defenses on remembering (e.g., 3, 7, 14). Only recently, however, have analysts redirected their attention to the importance of state of consciousness as a condition of remembering, and it is on this issue that the writers' research bears most directly.

Loewald (10) suggested that experiences from hypnoid or infantile states were subsequently unrecallable in the waking state. Following Breuer's theory of the "hypnoid

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state" (3), Loewald suggested that such experiences were not "absorbed" into the cognitive systems of the waking state. This formulation is similar to that of Schachtel (17), who felt that childhood amnesia may be largely due to the way such events were experienced, rather than the nature of the experiences themselves. Reiff and Scheerer (15) and Gill and Brenman (4), using hypnotic states, demonstrated persuasively that mode of experiencing can play a crucial part in forgetting. Using clinical examples, Rubinfine (16) showed that shifts in state of consciousness during psychoanalytic therapy can enable old memories to emerge.

There is, then, a growing body of opinion and evidence that state of consciousness, since it is associated with a particular mode of cognitive functioning, is a crucial variable in recall. An experience under an altered state can best be remembered if that altered state is re-entered, and waking recall of altered-state experiences is subject to limitations arising from the "structural" differences between the two states. The present paper reports an experimental effort to investigate this thesis.

The data were collected during a study of subjective reactions to LSD-25. One of the instruments used was an exhaustive 74-item questionnaire, administered periodically during the drug experience, containing a number of items dealing with perceptual, cognitive, affective and somatic effects (9). On the drug day, it was often felt that an S's total involvement in his unique and absorbing experience was restricting his report. Hoping to fill in such gaps after the drug's effects were gone, it was decided to administer a "retrospective" questionnaire the next day, asking Ss to report the effects they had experienced while under the influence of the drug the day before.

It was soon apparent that an experiment dealing with the recall, in a normal state of consciousness, of experiences that had taken place in an altered state of consciousness had been developed. Instead of merely

filling gaps, Ss made systematic modifications. Some new information was added, but most Ss dropped more items than they added, and it became clear that different Ss showed different and distinctive patterns of modification.

The retrospective questionnaires were therefore examined systematically to see what could be learned about the nature of the recall: what aspects of the drug experience were remembered or forgotten, and what individual differences could be identified. The writers were aware that this is an exercise in *post hoc* analysis, of course, and that replication is necessary. But the interesting implications of the findings, and their high order of statistical significance, make them worth reporting at this stage.

PROCEDURE

The present study is part of a larger study, the details of which have been described elsewhere (9). The method will be briefly summarized here.

Thirty adult Ss were given 100 gamma of LSD-25 orally, and twenty were given a tap-water placebo. All subjects—male professional actors who answered an advertisement in their professional newsletter—had undergone a personality assessment (used to screen out seriously disturbed applicants) which included a battery of tests, an autobiography and several intensive interviews. During the experimental day, they were subjected to a wide variety of experimental procedures, including the 74-item questionnaire which was designed both to monitor the strength of the drug effect and to study its subjective aspects. The questionnaire was given once, as a control, on the pretest day, four times during the drug day (at approximately one-half, two, five and eight hours after the drug or placebo), and once on the post-test day. The instructions for the retrospective questionnaire, given to 26 drug and 19 placebo Ss, were:

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TABLE 1
Acceptance of Items and their Degree of Stability (N = 26)

	Per Cent of Items Accepted on*			Of Items Accepted, Per Cent that are†		
	A Experi- mental Day	B Retrospec- tive Day	C Net Change	D Stable	E Dropped	F Added
Total questionnaire (74 items)	54	49	-5	68	20	12
Stable items (26 items)	69	65	-4	84	11	5
Dropped items (18 items)	53	34	-19	57	38	5
Added items (8 items)	45	57	+12	62	10	28
Dropped and added (6 items)	27	26	-1	36	33	31

* Column A: Average rate of acceptance of items on experimental day;
 Column B: Average rate of acceptance of items in retrospective report;
 Column C: Net discrepancy between A and B.

† All items accepted on either day are divided into three parts totalling 100%:
 Column D: Stable, i.e., accepted on both days;
 Column E: Dropped, i.e., accepted on experimental day only;
 Column F: Added, i.e., accepted in retrospective report only.

questions again, but this time I want you to answer in terms of your reactions yesterday, while you were under the drug. That is, for each question, tell me whether you had the reaction or not at any time during the drug day."

(This report deals with data drawn from the drug Ss except when controls on placebo are specifically cited.)

THE PHENOMENON

Our chief interest is in an item analysis of the questionnaire content: what aspects of the drug experience were remembered and forgotten, and what processes appear to be involved. But first we must determine that our findings are not merely artifacts. It must be established, by quantitative analyses, that the nature of the item did in fact make a difference, and that such factors as regression to the mean or variations in the initial acceptance of particular items do not account for the changes found.

Retrospective Alterations: Quantitative Evidence

Grossly, the retrospective reports agreed well with the drug day reports; the total scores for the two days intercorrelated .90. Thus, if the specific items of the question-

naire are ignored, it would be concluded that the drug experience was well recalled. Inspection of the content of the two reports, however, reveals a substantial amount of change.

At some time during the drug day² an average S accepted 39.9 of the 74 questionnaire items, and in retrospect he accepted 36.3 items. The mean loss of 3.6 items ($p < .01$)³ results from 1) dropping 9.1 of the items that had been accepted on the experimental day and 2) adding 5.5 new items, reactions not reported while under the drug. Furthermore, the discrepancies in the two reports were not scattered randomly over the items; rather, the items readily divided into four groups according to their pattern of retrospective changes. There were 26 relatively stable items, 18 items that were often dropped, eight that were often added, and six that showed both adding and dropping (Table 1). The remaining 16 items had no marked trend.

Table 1 shows that the four groups of

²This is based on all four questionnaire administrations. The average S accepted 30.9 items on his highest single protocol and 8.2 on his lowest one.

³All significance levels in this report are based on two-tailed tests and are derived from the *t*-test unless otherwise stated.

items differed in the extent to which they were reported initially under the drug: stable items had the highest rate of acceptance, dropped items were next, followed by added items, while those that were both added and dropped had far less drug day acceptance ($p < .01$ for each comparison).

The stable items seem to represent the more nearly universal (and perhaps stronger) effects of LSD-25, and this may contribute to their more accurate recall. Accurate recall was, in fact associated not only with the number of Ss who had reported the specific effect initially, but also with the frequency with which the item was reported (not shown in Table 1). Items reported more than twice on the drug day were rarely dropped, while items accepted less often were much more likely to drop out in recall ($p < .001$, chi-square). Yet, while items that were later dropped had less initial acceptance than stable items, those that were added in retrospect had an even *lower* rate of drug day report. If most Ss had accepted an item in the first place, to be sure, there would not be many left to add it in retrospect. This raises the question of whether "regression toward the mean" was responsible for the changes in the retrospective report. If this were so, however, items with the highest rate of acceptance would be dropped most often, and it has been shown that they are, instead, the best retained. Further, both the added and dropped groups of items were accepted by so close to half the sample on the drug day that about as many Ss were available to drop these items as to add them. While regression toward the mean may occur to some extent, it is clearly not a major factor in the modifications here observed, and it certainly cannot explain the distinction between the added and dropped groups of items.

The argument that the findings are not artifactual is bolstered by comparison with the placebo group. While placebo Ss naturally accepted far fewer items than drug Ss

on both days (8), they also showed very high consistency in their total scores on the two days ($r = .91$), and dropped more items than they added. The drug and placebo groups do not, however, either drop or add the same items most often, and the placebo group has a lower percentage of items accepted at any time that are the same on both days (47 per cent *vs.* 68 per cent for drug Ss). Further, the number of items dropped by placebo Ss was almost entirely a function of the number accepted on the experimental day (the two correlate at .92, compared with a negligible .14 for drug Ss), suggesting that regression toward the mean is a strong factor in the placebo group.

It can be seen, then, that the fate of an item in the recall of the drug Ss is apparently not a statistical artifact based on the rate of initial acceptance and, moreover, that the differences between drug and placebo groups testify to the special nature of the alterations shown by drug Ss. The content of the various aspects of the drug experiences therefore can be investigated with confidence from the standpoint of their differential fate in recall.

What Processes are Being Observed?

Before examining the content of the items a question must be raised: what psychological processes are reflected in stability, dropping and adding? If one thinks of simple remembering, the three kinds of modification correspond to accurate recalling, forgetting and confabulating. But is an S who drops an item really forgetting, is he consciously denying, or is he re-evaluating his experience? He may have said "yes" to "Do you feel that you have lost control over yourself?" But he was not asked to recall his previous response, but rather the experience itself. He may now re-interpret that experience and decide that he had not really felt that way; or he may know that he felt so at the time, but now feel that he really could have controlled

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himself. Such re-evaluation may, to be sure, implicate denial or repression, but such a response certainly reflects more than simple forgetting.

Added items may be genuine confabulations or retrospective falsification, but they may also reflect forgetting: *S* forgets that he did not in fact have that experience. The element of denial is absent in the recall, but may have operated during the drug experience itself. Here, too, re-evaluation may occur: *S* now judges that he had a certain experience although at the time he either could not recognize it or had to avoid acknowledging it.

Perhaps the best way to judge the issue is through an examination of the content of the items which are stable, dropped or added. Another basis for judgment is to compare the questionnaire responses with the experimenters' observations of *Ss*' manifest behavior; this will be done after presentation of the qualitative results.

Retrospective Alterations: Qualitative Evidence

First, the main body of data is presented: the content of the items with regard to their fate in recall. Table 2 presents the items grouped according to their stability or alteration in the retrospective report. Interpretation of these findings follows. Reports of altered physical sensations were notably stable, but distortions of the body image often dropped out (*e.g.*, *Ss* recalled somatic symptoms such as dizziness or numbness accurately, but tended to drop reports that they had felt lighter or that some part of the body had felt disconnected or strange). One basis for this difference is that somatic symptoms are easy to identify because they are in the range of the ordinary experiences of normal waking states of consciousness; changes in the body image, however, are not only less common, but their association with an altered state of consciousness may make them harder to recall; the latter changes are also more

likely to evoke anxiety. Strangeness, in itself, on the other hand, would be expected to facilitate recall and therefore does not seem to be a factor.

The criteria of resemblance to normal experience and being unlikely to evoke anxiety may be applied to the other stable items. Acting silly and talking more or less than usual are common experiences. Similarly, impaired concentration and judgment, slowed thinking, difficulty in holding onto thoughts and loss of time sense, all brought home to these *Ss* by the trouble they had in performing the experimental tasks, are not unusual or bizarre experiences. Being unsure of how others react to you is a frequent social experience.

Some of the other stable items are clarified by comments that explain what these *Ss* meant by their answers. Feeling like a child or an older person did not, in most cases, imply any feeling of changed identity, but referred rather to silly behavior, the inability to perform tasks, or feeling physically helpless, fatigued or depressed. The altered appearance of objects rarely referred to hallucinatory or meaning-laden distortions, but to color and size distortions. The new powers acquired referred, in many cases, to heightened perceptions such as more acute hearing or a sharpened sense of smell; in no case did it refer to an overtly paranoid or otherwise bizarre idea.

The most striking group of items among those that tended to drop out is that dealing with feelings of loss of control over body, thoughts and emotions. For example, of thirteen *Ss* who had once reported feeling that "some of what you have been doing is not your doing at all," ten failed to report this in retrospect. Such experiences centered around a sense of passivity which is an important aspect of other frequently dropped items (*e.g.*, the experience of "fascination" or riveting of attention, things seemingly meaningless, and the mind being an utter blank). In contrast, reports of difficulty in concentration, slowed

TABLE 2
Questionnaire Items Grouped According to their Fate in Recall
(Note: In each instance, positive answers to items are implied)

Stable Items	
3. Have objects or things about you looked different in any way?	9b.
5. Have you felt somehow as if you were melting or merging into your surroundings?	28a.
7. Have you felt occasionally that you have lost your sense of time?	34a.
10. Have you found it hard to concentrate on the tasks being given you?	40.]
16b. Have you been acting silly?	41a.
18. Have you felt like a child?	42.]
19. Have events or experiences seemed illogical or disconnected?	
20. Have you felt that under the drug you have acquired any new power or ability?	
24. Have you felt like an old person?	
29b. Have you found it hard to talk?	thin
29c. Have you been talking more than usual?	whi
30. Has it felt that time has come to a standstill or stopped now and then?	ade
32b. Have your thoughts been moving slower than usual at times?	(
35. Do you think that your judgment and ability to evaluate have been different from usual? [If S reports his judgment as impaired]	cor
36. Is it hard to hold onto thoughts, ideas, or images—do they seem to get away from you when you try to catch them?	inc
45. Are you unsure of how others are responding or reacting to you?	sor
46. Have you had any of the following physical sensations?	see
a. Dizziness or grogginess?	the
b. Numbness or tingling?	per
c. Chills or a cold feeling?	Fe
d. Felt hot or sweating?	dro
e. Funny taste in your mouth?	see
g. Felt nauseous?	ex]
i. Mouth dry or less saliva than usual?	a
j. Pressure or ringing in ears?	sel
k. Felt weak physically?	do
m. Body felt heavier?	bl
Items Often Dropped	
4. Do you find yourself talking about personal things you wouldn't usually talk about?	lir
6. Have you been thinking or talking a lot about your childhood?	m
8a. Have you felt that you have lost control over yourself?	ex
12. Have you seen new connections between certain events or experiences that you hadn't seen before?	so
14. Has your body looked or felt strange in any way? [If S reports change in body image]	
22. Have some things seemed meaningless to you?	
25. Has any particular thing fascinated you—held your attention so that you found it hard to leave it?	
23. Has it felt as if some part of your body was disconnected or somehow didn't belong to the rest of your body?	re
28b. Does it feel as if someone else were controlling your thoughts?	re
32a. Have your thoughts been moving faster than usual at times?	at
33. Have you felt angry or annoyed? [If angry or annoyed with self]	no
34. Have you felt at times that you have lost control over your body or that you might?	fc
39. Has your mind been a blank at times, so that you have had no thoughts at all?	er
41. Have you lost control over your emotions and feelings? [If in the sense of elation]	st
If so: 41a. Have they taken possession of you?	fc
41b. Does it feel as if someone else were controlling them?	w
43. Have you felt as if some of what you have been doing is really not your doing at all?	d
46. Have you had any of the following physical sensations?	w
l. Has your body felt lighter or like it was floating in space?	tl
Items Often Added	
2. Have people looked different than they usually do?	se
13. Have you felt depressed or sad?	w
15. Have you been especially happy?	h
17. Have you been thinking about things you don't usually think about?	
27. Have you been afraid or upset?	
31. Have certain objects or other things taken on meanings they never had before?	
33. Have you felt angry or annoyed? [If directed externally]	
41. Have you lost control over your emotions and feelings? [If in the sense of fear or anxiety]	

TABLE 2—*Continued*

Items Both Dropped and Added

- 9b. Have you found it easier to move than usual?
 28a. Have your thoughts taken possession of you?
 34a. Have you felt as if someone or something else has taken over control of your body?
 40. Have you been at all afraid that you might go crazy or lose your mind?
 41a. Have your emotions and feelings taken possession of you? [If with reference to fear or anxiety]
 42. Have you been seeing imaginary things?

thinking and impaired judgment, all of which are well recalled, suggest active, if inadequate, functioning.

Other dropped items refer to the loss of control of a number of other functions, including loss of control over elated affect, sometimes to the point where these feelings seem to have taken possession of *S*—thoughts moving rapidly and talking of personal matters not usually discussed. Feelings of bodily lightness were also dropped often, as was the report of having seen new connections between events or experiences. This latter usually referred to a blurring of the boundaries between the self and the environment: "Could feel the dots on the center line of the Rorschach blot on me, like I was divided by a center line—one thing the blot and I had in common, we both had a center line." Such experiences seem to represent a partial dissolution of ego boundaries.

The nine items most often added in the retrospective report fall into two groups related to affect and meaning. Reports of affect were added whether happiness, sadness, fear or anger was involved. These feelings are in the normal range of experience, and readily reported in the waking state of consciousness. Furthermore, except for anger, the recall agrees more closely with the experimenters' ratings than the drug day report. The question arises, then, why *Ss* did not report these emotions under the drug. One reason, later verbalized by several *Ss*, is that while under the drug *Ss* were trying to fight the emotion, felt helpless, would not admit it for fear that their

precarious control would be disrupted. The special case of anger also seems to reflect this. Some *Ss* changed their original report of anger-at-themselves to anger-at-the-experimenters, while others merely added the latter. *Ss* later reported that they had been very suspicious and hostile under the drug, but would not admit it at the time.⁴

The other three added items deal with changes in meaning. "Have people looked different . . . ?" elicited reports of changes in their personalities and in the impression they made, and rarely reports of physical changes. Responses to the other two items were similar. A paranoid element was often present: "His ears kept changing shape, didn't want to mention it and embarrass him—they got pointier, a devilish quality." Such material, at least some of the time, was consciously withheld. While social embarrassment or fear of the experimenter may have played a part, the evident projection of hostile feelings makes it likely that such thoughts were too dangerous to express while *S* was under the drug.

A look at the unstable items shows that they are all rather bizarre reactions, common in psychotic states, with the possible exception of finding it easy to move. In some cases, it is evident that *S* had mixed feelings toward the phenomenon: "Tossed between being overcome by thought—having this awakening and being frightened by it—and not having it and missing it. It

⁴One *S* reported two years later, for the first time, that while under the drug he had taken such a dislike to one experimenter that he planned to hide behind the door in order to kill him when he entered the room.

was exciting. Like having your cake and eating it." Over all, these were experiences that were terrifying, unusual and difficult for these Ss to pin down or describe clearly.

Observable Behavior Compared With Recall

Each time an experimenter saw an S, he rated his behavior along 18 scales (described more fully below). In some cases the aspects of behavior rated corresponded fairly well to questionnaire items. If it is assumed that the experimenters' ratings were more objective and valid than Ss' own evaluations, the former may be used as a criterion.

Thirty-four pairs of biserial correlations were obtained between experimenters' ratings and questionnaire responses (on the drug day and in retrospect). The median r was $+ .47$ (range: $+ .03$ to $+ .99$); both r s were statistically significant in 25 pairs and one was significant in all but one of the remaining pairs, showing an appreciable correspondence between Ss' responses and the objective ratings.

In sixteen comparisons the observations correlated more highly with the retrospective report than with the drug day report, suggesting that in these instances Ss' modifications represented a correction. Some of these deal with affect; *e.g.*, increases in the r between observed anxiety and the report of loss of control over fear (from $.34$ to $.71$) and between observed silliness and the subjective report of acting silly ($.13$ to $.61$). Several deal with heaviness and trouble in moving, *e.g.*, the r between observed reduction in motility and the report of difficulty in moving rose from $.27$ to $.65$. Further, the r between confused thinking, as observed, and the report that things seemed meaningless rose from $.43$ to $.73$. Overall, the items with an increase in correlation were primarily stable in recall, with a few that showed much adding.

In seven comparisons the retrospective report correlated less well with observation

than did the drug day responses, suggesting that these alterations distorted the original experience. These items generally fall into the least stable group, with both adding and dropping, and their content tends to be bizarre and psychotic-like. There were, for example, decreases in the r s between observed loss of reality contact and the report that things felt unreal ($.73$ to $.54$), between observed visual distortion and the report of seeing imaginary things ($.99$ to $.65$) and between observed anxiety and the reported fear of going crazy ($.70$ to $.34$).

A crucial difference between these two groups of items is that those whose recall agrees better with observed behavior seem more like normal experiences, while those whose recall agrees less are more alien to normal experience. This is clearest when the same observable aspect of behavior can be compared with different questionnaire items. In the examples cited above, observed anxiety shows a marked drop in its correlation with the fear of going crazy, but an equally strong increase in its correlation with the report of actual fear. These two questionnaire responses are related, but the former carries with it far more anxiety and is far more alien to normal experience than the latter.

INDIVIDUAL STYLES OF RECALL

While the group patterns of remembering the drug experience were distinctive and meaningful, there were also marked individual differences. Although the average total score on the retrospective questionnaire was significantly lower than the total on the drug day, seven Ss showed a net increase, seventeen showed the decrease and two had no change in total score. This net change is the resultant of new items added and items previously reported that were dropped; examination of individual patterns revealed three distinct ways of handling the recall of the drug experience.

Nine Ss—called here Subtractors—dropped relatively many items and added

relatively few; eight Ss—called Adders—added relatively many items and dropped relatively few; seven Ss—to be called Accurate Recallers, or Recallers for short—showed comparatively little modification of either type.⁵ Thus three groups were isolated: one who forgot or denied a substantial part of their drug experience, one who enlarged on their drug experience, and one who recalled their drug experience well with little change. If these differences are associated with differences in the reaction on the drug day and with fundamental personality differences,⁶ they can contribute to the understanding of the determinants of the recall of altered-state experiences.

Group Differences in Initial Item Acceptance

Before presenting the major differences among groups, it must be considered, as it was with the findings for the entire sample, whether there are artifacts that would cast doubt on the results. The first issue is whether the reactions of the three groups can be explained simply by differences in item acceptance under the drug, without regard to the content of their responses. Two measures are pertinent: the number of items accepted during the entire experimental day, and their frequency of acceptance across the four questionnaires. The Subtracters reported the items they accepted fewer times during the drug day, on the average, than did the other two groups ($p < .01$). But when the frequency of acceptance is held constant, we find that the Subtracters still dropped more items at each level of acceptance; for example, they dropped 54 per cent of all items they

accepted only once on the drug day, compared with 27 per cent for the other Ss ($p < .001$). It appears, then, that while effects that were reported less often on the drug day were more likely to drop out in recall (see above), and while the Subtracters had a larger proportion of such items, their marked tendency to drop items is not entirely explained by these two factors.

What about the total number of items accepted during the experimental day? Table 3 presents the same kind of data as Table 1, but separately for the three groups. It shows clear differences among groups in their rate of acceptance of items on the drug day. The Adders accepted most items ($p < .01$), the Recallers accepted the fewest ($p < .01$), and the Subtracters fell in between; this order holds not only for the total score, but, with one minor inversion, for each type of item. The best recalled items had the highest rate of initial acceptance (see Table 1), but the Ss who recalled most accurately were those who accepted the fewest items; similarly, added items had a rather low rate of acceptance, while Ss who added much accepted many items initially. Evidently, differences in Ss' rates of item acceptance do not account for their differences in recall.

Table 3 also shows that comparisons among groups of items hold up within each group. With one minor inversion, stable items were accepted most often on the drug day, followed by dropped items, with added items next and dropped-and-added items accepted least often.⁷ Thus, although the overall acceptance of items is quite different in the three groups, the relative acceptance of the four types of items is remarkably similar. Furthermore, the classification of items is the same for each group, as shown by the fact that, for each group, stable

⁵One S, who had shown extreme shifts in his four drug day protocols, had a good deal of both adding and dropping and was therefore not included in any of the three groups. Another was eliminated because he was borderline with regard to the cut-off points for both adding and dropping.

⁶The three groups do differ in personality, and those findings will be reported in a separate paper, along with comparisons of their performance in experimental tests of memory.

⁷Despite the small number of cases in each group, these comparisons all reach statistical significance with the exception of the differences between dropped and added items.

TABLE 3
*Degree of Stability of Items for Adders, Subtracters and Recallers**

	Per Cent of Items Accepted on			Of Items Accepted Per Cent that are		
	A Experimental Day	B Retrospec- tive Day	C Net Change	D Stable	E Dropped	F Added
Subtracters (<i>N</i> = 9)						
Total questionnaire	52	38	-14	60	32	8
Stable items	66	54	-12	77	20	3
Dropped items	52	24	-28	39	56	5
Added items	54	50	- 4	67	20	13
Dropped and added	30	15	-15	33	56	11
Adders (<i>N</i> = 8)						
Total questionnaire	65	68	+ 3	72	12	16
Stable items	81	82	+ 1	85	7	8
Dropped items	64	51	-13	68	25	7
Added items	53	78	+25	58	6	36
Dropped and added	36	46	+10	44	19	37
Accurate Recallers (<i>N</i> = 7)						
Total questionnaire	40	38	- 2	73	16	11
Stable items	58	57	- 1	93	4	3
Dropped items	38	25	-13	65	35	0
Added items	25	36	+11	70	0	30
Dropped and added	9	14	+ 5	11	33	56

* Note: For explanation of column headings, see Table 1.

items are the highest set in Column D, dropped items are highest in Column E, equalled or closely followed by the dropped-and-added items, and the added or the dropped-and-added items are highest in Column F.

How the Groups Differed on the Questionnaire

To facilitate the use of the questionnaire, the 74 items were grouped into 17 scales on an *a priori* basis, combining items that touch on related phenomena (for a complete description, *cf.* 9). The three groups differed in the patterns of their subjective reactions as reported on the drug day, as well as in the way they recalled them (Table 4). Differences in their retrospective reports were naturally accentuated by the basis on which the groups were formed. Nevertheless, examination of the specific areas in which these reports differ tells something about the nature of the modifications that each group introduced in recall.

Under the drug, the Adders^a reported the most marked changes: in their self-experience, in their perception of the environment, and in both inhibitory and disinhibitory effects. These effects were maintained in recall and, further, they reported more impairment of controls, both in general and over thinking and their sense of time, more somatic symptoms, and a much greater affective reaction, including suspiciousness.

The Recallers reported the least effect on the drug day, particularly less impairment of controls, disturbed time sense and thinking ability, impaired reality contact, and meaning changes. They also reported less unpleasant affect and were particularly unlikely to report the fear of going crazy. Somatic symptoms and elation were

^aThe fact that the Adders had the highest scores on all questionnaires raises the possibility that they were merely more acquiescent. This issue was considered by Linton and Langs (8), who showed that other evidence, such as the patterning of responses, indicates that mere acquiescence does not account for more than a small proportion of the total scores of high-scoring Ss.

TABLE 4
Percentage Acceptance of Questionnaire Items by the Three Groups*

Questionnaire Scale	Experimental Day			Retrospective Day			Net Change		
	Subtracters	Adders	Recallers	Subtracters	Adders	Recallers	Subtracters	Adders	Recallers
I. Thinking difficulty	71	76	57—	49—	79++	55	-22	3	-2
II. Timesense disturbance	75	77	36--	56	84++	30--	-19	7	-5
III. Inhibited, slowed down	56	78++	52	39	73++	43	-17	-5	-10
IV. Loss of control	55	59	37—	31	69++	34	-24	10	-3
V-A. Closer to environment	72	88	57	42	75+	43	-30	-13	-14
V-B. Contact loss	67	88++	32--	53	88++	29--	-14	0	-4
V-C. Ego change, self alienation	19—	48++	21	8--	41++	19	-11	-7	-3
VI. Perceptual distortion	37	54+	2--	41	65++	12--	4	11	10
VII. Less inhibited, opened up	51	66+	31—	27—	63++	28	-24	-3	-4
VIII-A. New meanings acquired	52	67+	12--	56	60	7--	4	-7	-5
VIII-B. Loss of meaning	67+	56	14--	36	59	11--	-31	3	-4
IX. Increased functioning	50	53	18	39	59	11--	-11	6	-7
X. Suspiciousness	33	41	26	21—	52++	27	-12	11	1
XI-A. Body image change	36—	77++	48	18--	69++	32	-18	-8	-16
XI-B. Somatic symptoms	55	75	68	47--	82++	68	-8	7	0
XII-A. Positive affect	67	54	57	57	81+	55	-10	27	-2
XII-B. Negative affect	49	54	33—	40	71++	36	-9	17	3
Total Questionnaire	53	66++	40--	39—	69++	37—	-14	3	-3

* Note: A plus sign following a percentage indicates that the group in question accepts more items than the other two groups combined at the .05 level (two-tailed test), a minus sign that it accepts fewer at the .05 level. Differences that reach the .01 level are indicated by ++ or --.

the only reactions they reported as often as the other Ss. Their retrospective reports were essentially unchanged.

As a group, the Subtracters were quite variable in their total scores, but showed a clear pattern of drug effects. On the drug day they reported much change in their perception of, and relation to, the environment, and little change in themselves; they also reported little inhibition or slowing down in their reactions, compared with the Adders. Their retrospective reports showed more change than those of the other groups (*cf.* Table 3; their overall proportion of stable items is 60 per cent, in contrast to 72 per cent and 73 per cent for the other groups) and the pattern of alteration is complex. They remembered even less change in themselves, less impairment of controls and thinking ability, and less disturbance of time sense. The recall

of their relationship with the environment continued to reflect the perception of new meanings in objects or events, but at the same time they remembered less loss of meaning and loss of contact; as a result, new interpretations of stimuli played a larger role in recall than in the original report.

Some Qualitative Differences in Response

The remarks Ss made helped to illuminate the different styles of remembering found in the three groups. Since the groups were formed solely on a quantitative basis, these comments can be viewed as independent data.

The most striking finding is that the Subtracters, when responding to the questionnaire under the drug, often made statements that heralded the fact that dropping was to be the fate of the items, statements

suggesting that a process of denial was already in operation. The Subtractor often included a negative in a positive response, e.g.: "No, not really, just a bit different"; "No, except for that compulsive giggling." Such comments were recorded for 34 per cent of the items that Subtractors later dropped, compared with 14 per cent of the items dropped by other Ss ($p < .01$). Similar comments appeared in their retrospective denial of items previously accepted: "Felt I couldn't control it, but I did." A noteworthy proportion of such comments were made in denying that they had lost control.

For the Adders, in contrast, many of the items they dropped seem to have represented re-interpretations of the experience, and the element of denial was not particularly apparent. Often an item was not accepted in retrospect, but the comment that had been made while accepting it under the drug was now given in accepting a different item, which sometimes thereby became an added item. A specific change shown by several Adders was that under the drug they reported being angry with themselves for their incapacity; this dropped out the next day, but they reported instead having been angry at the experimenters for asking them to do difficult tasks. Another finding is that some of the items the Adders dropped represented an acceptance of responsibility that had been denied under the drug; a drug-day acceptance of "...some of what you have been doing is not your doing at all" would be dropped in recall with "No, it was all me, I was responsible for it."

Independent Ratings of Behavior

The experimenters' ratings of the behavior of Ss on the pretest and drug days provide an assessment independent of the questionnaire and a check on the subjective findings. On the experimental day, each S was rated from six to twelve times by from four to eight different experimenters.

On each occasion, he was rated on eighteen different variables; for statistical analysis the variables with intercorrelations of .80 or more have been combined, so that there are eleven observational measures, as well as their sum which represents the overall behavioral change. The ratings made throughout the experimental day for each S were averaged in order to obtain single scores for each variable, and the resulting group differences are shown in Table 5.

Table 5 shows that the Adders (who had the greatest overall response to the drug day questionnaire) were rated by the experimenters as showing the greatest effect, both overall and in most of the specific aspects of behavior. Their mean scores were significantly higher than on the pretest day for eight of the eleven variables (Table 5, fifth column), and for four variables their scores were higher at the .10 level or better than the other groups (second column). Although their average score for depression-elation (V) does not differ from that of the other groups, the variance of their scores is twice that of either of the other groups, indicating that they were more likely to be rated at the extremes of elation or depression.

The recallers showed the least effect (again confirming the questionnaire findings), being lower than the other groups at the .10 level or better in total change and on five of the eleven variables. They increased significantly from their pretest ratings on only one variable and their total behavioral effect was not significantly higher than pretest. Because their scores for regressive behavior were lower than those of the other groups on the pretest day ($p < .05$), the Recallers appeared less regressed than the other groups under the drug, despite the increase shown in this area.

The Subtractors tended to have intermediate scores for observed behavior, and they showed significant increases over their pretest ratings on four variables, as

TABLE 5
Behavioral Ratings of the Three Groups

Behavioral Scale ¹	Drug Day Mean Score ²			Significance of Each Group's Change From Pretest		
	Subtracters	Adders	Recallers	Subtracters	Adders	Recallers
I. Regression (thought confusion, contact loss, regressive behavior, open verbalization)	1.19	2.53+	.64—	.05	.01	.05
II. Visual distortions	.39	.55(+)	.11—	.05	.01	ns
III. Inappropriate affect	.54	.75	.43	.01	.05	ns
IV. Silliness-lability	.74	1.24	.51	ns	.05	ns
V. Signs of depression (vs. elation)*	.20	.29	.67	ns	ns	ns
VI. Motility slowed (vs. fast)*	— .03	.24	.13	ns	ns	ns
VII. Withdrawn	.26	.23	.23	ns	ns	ns
VIII. Anxious behavior	.97	1.36(+)	.57—	ns	.05	ns
IX. Bodily preoccupation	.73	1.14(+)	.69	.01	.01	.10
X. Hostility	.83	.64	.33(—)	ns	.05	ns
XI. Suspiciousness	.22	.40	.09(—)	ns	.05	ns
Total Behavioral Effect (sign ignored)	7.24	10.50(+)	4.94—	.05	.01	ns

¹ All scores represent a shift from a zero-point that represents "normality." All scales are unidirectional except for those marked *, which are bipolar, with the zero-point in the middle and deviations in either direction possible.

² ++ indicates a mean higher than that of the other two groups at the .01 level, + at the .05 level, and (—) at the .10 level. Means which are lower are indicated by corresponding minus signs.

well as in the total effect. Their pretest ratings for regression and silliness were higher than those for the other groups ($p < .05$ and $p < .10$, respectively), so that their drug day scores for these variables, while intermediate to the other two groups, actually represent a smaller increase than occurred in either of the other two groups.

The differences in the experimenters' ratings of the observable behavior of the three groups, then, resemble the differences in drug reaction found through Ss' questionnaire responses. Since the division into Adders, Subtracters and Recallers was based on the questionnaire, it is of special value to have behavioral confirmation of the drug-day differences from a source independent of the questionnaire.

DISCUSSION AND CONCLUSIONS

In this paper, the writers have focused on the question of what processes underlie

the modifications that appear in the recall, in the normal waking state, of experiences that occurred in the altered state of consciousness produced by LSD-25. If the retrospective questionnaire had originally been designed to study the recall process in detail, an attempt would have been made to inquire about discrepancies. Future replication must include this, but here these modifications will be discussed on the basis of available findings.

The aspects of the drug reaction that were best recalled represented those experiences that were most concrete, easily identified and likely to have occurred in normal states of consciousness. Included were experiences which posed little threat and would seldom lead to anxiety or defensive operations except where there was some idiosyncratic reaction.

The subjective aspects of the drug experience that were most poorly recalled included feelings of extreme passivity and

actual loss of control, and experiences that seem to reflect a weakening of ego boundaries and a loss of the sense of self. Many of these experiences are alien to the mental organization of the waking state and may for that very reason have been inaccessible to the person at the time of recall. In addition, these same experiences probably represent serious threats to the person. They may have been experienced under the drug because of a weakening of ego defenses and forgotten or repressed with the re-establishment of these defenses the next day. On the drug day many of these items were answered quite gaily, with a cheerful abdication of responsibility, ("I couldn't care less!") or reported with the qualification that "this isn't really me." Thus, even under the drug, the work of denial and disavowal were manifest, and the subsequent "forgetting" could represent the continuation of these processes into the following day. Over all, a process akin to secondary revision of the dream may have occurred in recall, the archaic experiences being clothed in more logical and reality-oriented garments by the waking ego.

Thus, both the differences in the mental organization of the two states of consciousness and the alterations in defensive operations help to account for reinterpretations made in recall. The experience most often reinterpreted was that of loss of control. One S, for example, reported a loss of emotional control under the drug; the next day, he remembered clearly that he had laughed excessively, but stated that he had not really lost control, or that he could have controlled himself if he had cared to. This reinterpretation entails a shift from being passively overwhelmed to being in active control, and it occurred often.

Those reactions which appeared for the first time in recall center around one major concern: the maintenance of controls, or the threat of losing control under the drug. Ss reported the conscious withholding of dis-

turbing affective reactions and paranoid fantasies on the drug day, and the experimenters' observations provided evidence that many of these unreported experiences had actually occurred. In recalling such feelings and ideas, Ss expressed fears that verbalizing them during the drug experience might have led to loss of control, such as aggressive outbursts or "going crazy." The projection of harmful intentions onto the experimenters can be seen as a defense against recognizing one's own rage, which might otherwise have endangered these controls. The restoration of normal controls on the following day probably made it possible to express such feelings for the first time. The outcome is confabulation of a specific type.

Other evidence indicates that adding often did "fill in the gaps" by recovering experiences that were not reported initially because of the difficulties in concentrating and communicating with the experimenter so common under LSD-25.

The three styles of recalling the drug experience found in this study represent meaningful individual differences not only in the recall of the experience, but in the manner of responding to the drug itself. Accurate recall of the experience was found in Ss who experienced a relatively weak reaction to the drug in all respects. Ss who dropped a substantial portion of their drug experience in recall stated under LSD-25 that they experienced little change in themselves but much change in the environment. The material they dropped in retrospect tended to be limited to the changes in the self, further exaggerating this discrepancy. Ss who added to their drug experience were strongly affected by the drug, experiencing many changes both in themselves and in the environment; they tended, in recall, to enlarge on the impairment experienced. Over all, however, even though the individual's style of recall is a major determinant in how much he adds, drops or recalls accurately, the kinds of drug effects

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most likely to be added, dropped or accurately recalled were generally the same for all three groups.

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