

# Time Perception of Patients with Depression : A Review

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### Abstract:

The past literature of time perception studies on depression is reviewed. Confusion of terminologies is recognized. Contradictory results were found in each concept of time perception, particularly in time estimation, time production, and time reproduction. Relatively good agreement was obtained in the studies of time orientation (the depressive tend to orient to the past), time extension (their future extension tends to be shortened and past extension to be prolonged) and time awareness (the depressive tended to feel time passing slowly). Detailed information was, however, difficult to obtain because of methodological difficulties — lack of explicit symptom definitions and diagnostic criteria, lack of control subjects, lack of follow-up studies, and lack of comparison of each time perception test with each clinical element.

**key words:** depression, time perception.

She looks for night, and then she longs for morrow,  
And both she thinks too long with her remaining:  
Short time seems long in sorrow's sharp sustaining:  
Though woe be heavy, yet it seldom sleeps;  
And they that watch see time how slow it creeps.

—W. Shakespeare, "Rape of Lucrece"

"Time stands still" when one is depressed whilst "time flies" when manic. Although this phenomenon is familiar to clinicians, there has been only a little experimental work to support.

It is intended in this review to clarify terminologies of time perception and to summarise studies on the perception of time by depressives. It will also be intended to cast light on certain methodological difficulties encountered in carrying out time perception studies and to suggest possible solutions.

### *Terminology*

One of the methodological difficulties in the study of time perception is terminology. Wallace and Rabin (1960) cited a variety of nomenclature including time estimation, temporal experience, time sense, and time perception. One word often has more than one meaning; for example "time experience" means in its narrower sense the subjective feeling of the passage of time, but in its wider sense it includes any aspect referred to below. The same phenomena are given many different descriptions and subjected to various psychological investigations.

Time estimation is here defined as a test in which a subject is given a measured sequence of two short (usually clicking) sounds and then required to guess the time span without the help of external cues. He may over- or underestimate the interval. This is equivalent to Mezey and Cohen's (1961) "interval estimation", Dilling and Rabin's (1967) "measure of time perception", Lehman's (1967) and Elsass et al.'s (1979) "verbal estimate", and Wyrick and Wyrick's (1977) "time interval estimation".

A time production test is simply a request for a subject to count a certain length of time (usually 15 or 30 seconds) without the help of external cues (Mezey and Cohen, 1961; Melges and Fougereuse, 1966; Lehman, 1967). This is equivalent to Lehman's (1967) "time estimation production", Edelstein's (1974) "subjective time estimation", and Elsass et al.'s (1979) "operative estimation".

In a time reproduction test, a subject is required to imitate by tapping a regular beating sound (as of a metronome) after it has stopped (Mezey and Cohen, 1961; Lehman, 1967; Elsass et al., 1979). This is equivalent to Lehman's (1967) "time estimation reproduction".

The concept of time orientation attempts to define a subject's occupation with past, present, or future events. The subject is requested to tell a story without stimuli (Leshan, 1952) or using TAT cards (Dilling and Rabin, 1967), or after being given introductory phrases (Story Root Test) (Kastenbaum, 1965), or having been asked whether "Tomorrow is further away than yesterday" to which, if the answer is the affirmative, the subject is considered to be past oriented (Lehman, 1967). This concept has been given a variety of names, "time perspective" by Albers (1965) and Dilling and Rabin (1967), and "past (or future) conceptualization" by Kastenbaum (1965).

If a subject is either past or future "oriented", the extent to which he is oriented in a direction of time is called time extention.

The time awareness test (Lehman, 1967) attempts to measure the "subjective judgement of the passage of time" (Solomon, 1950) usually by asking either simply "How does time pass — slowly or quickly?", or using a set of graded multiple questions — very slowly, slowly, neutral, quickly, or very quickly.

A generic term to cover the above mentioned terms should be, in the present author's opinion, "time perception", since it has been adopted as a heading in the Index Medicus. "Time experience" and "time judgement" (Lehman, 1967; Pfaff, 1968) are also used as a generic term, but they may well be mistaken as words connoting time estimation.

*Time perception of depressive patients*

Depression is a field where the experience of time has long interested clinicians. As long ago as 1932 Lewis advocated that time had two quite separate meanings one being "world time" (objective physical time, clock time, calendar time), which was an arbitrary standard, and the other "psychological time" (personal time, experiential time) which was time that one lived in. In his experiment psychological time was altered in depressives but world time was not. His experiment attempted to clarify patients' ability to estimate a variety of time intervals. Unfortunately, he did not define what he meant by depression nor did he give experimental details such as actual length of the time intervals given to his patients and whether the intervals were "filled" or "blank".

Similarly Straus (1947) pointed out that the contrast between the cosmic objective order of time and individual personal time reached maximum discordance in depressive psychoses. He did not, however, offer any experimental evidence.

It was not until the 1950s when experimental data on this subject became available. Wallace and Rabin (1960) pointed out that research data were contradictory though it could be said that schizophrenics were more inaccurate in estimating time intervals than normals, while depression had not been much studied.

One of the early surveys of depressed subjects in which objective assays were employed was that of Mezey and Cohen (1961). Twenty-one patients with affective disorder were examined shortly after each hospital admission and again after recovery so that each patient became his own control. All were asked firstly to count 30 seconds without the use of a watch (time production test). They over-counted when depressed but improved after recovery though not to a statistically significant degree. The same tendency was found in the time reproduction test in which the subjects were asked to listen to a sequence of pips and then asked to tap at the same rate after the pips were discontinued. A third test was an estimation of a 3 second interval, where a tendency to accuracy when depressed but to overestimation after recovery was found. On the other hand no difference was found when the time span was as long as 12 to 30 minutes. As regards the subjective experience of the passage of time, the patients felt time passed slowly when depressed and neither slowly or quickly when recovered. These findings were open to further discussion because all but the last results were without any statistical significance.

Dilling and Rabin (1967) examined whether depressives looked into the future or the past and also their extension of future perspective. They completed tests on a total of 20 depressed patients and 20 normals. Firstly, ten common life events were read out to the subjects. Following this they were asked to say how old they might be when the event might happen to them (future extension). Secondly four TAT (Thematic Apperception Test) cards were shown and the subjects were requested to make up stories freely (time orientation). The depressives turned out to have shorter future extension and to orient themselves more to the past. The investigators added a time estimation test of a 14 minute interval. The depressed group showed less accuracy compared to normals, but no difference of the means of two groups was found.

Melges and Fougousse (1966), trying to correlate affective elements with capability to produce a certain length of time, studied 20 depressive patients — 10 psychotic, 10 neurotic (definition not given) — and other mentally ill patients. A Mood Adjective Check List (MACL) was applied together with a time production test (where the subjects were requested to count 30 seconds without the help of a watch). There was a tendency for aggression, anxiety and depression (on the MACL) to be correlated with an underestimation of the 30 second interval. With a shorter time production test, less consistency was found to be in relation to the three MACL elements mentioned above.

Clinically after the acute phase of depression, the subjects tended to show more accurate and consistent time production. No significant difference emerged between neurotic and psychotic depressives.

The aim of Lehman's (1967) study was similar to those already mentioned. Fourteen depressives and some other psychotic patients together with 20 normals were given a time production test of 15 seconds. The depressives tended, though without statistical significance, to underestimate more than the normals. A time reproduction test of 15 seconds showed that the depressives were more likely (but again without statistical significance) to overestimate time. In a time estimation test of 20 to 60 minutes, which Lehman called the verbal estimate, the depressives especially, but to lesser degree the normals also, underestimated time. In a time awareness test the depressive patients (unlike other groups) felt that time passed slowly. He also found that the depressives were oriented to the past more than the normals.

A unique method of time perception test was established by Bech and his co-workers (1975). A film was projected onto the windscreen of a mock car so that the subject, "driving", had the impression of a test course. The subjects were then required to guess a time interval of 3 minutes. There were no statistically significant differences either between the groups (i. e. endogenous, reactive, non-psychotic, organic, and control) or within the groups (i. e. before and after recovery). However both endogenous and non-endogenous depressive groups *felt* time passing slowly, significantly correlated with the scores of depressive mood, work and interest, and psychic anxiety on Hamilton's Rating Scale for Depression but not with other items (including retardation). His conclusion was, therefore, that "when a depressed patient tells us that 'he is very sad and unhappy', and when he tells that 'time passes by very slowly', he is trying to communicate the same or similar experience — in two different frames of reference", whereas his ability to estimate time is intact.

A criticism of Bech's study from a methodological viewpoint was made by Wyrick and Wyrick (1977), who found that only when a relatively long time span was presented did the depressives overestimate it. Other research findings do not always confirm this as will be discussed later. In addition the depressives were proved, in Wyrick and Wyrick's study, to be most occupied with past events, to focus on more distant past events and more imminent future events, and to feel time passing slowly.

#### *Disagreement of studies on time perception of depressive patients*

It will be seen from Table 1 that there have been contradictory findings about the depressives' time estimation, including overestimation, underestimation, no change and increased inaccuracy. This contradiction can not be attributed to any difference in the length of time spans because from Table 1 it can be seen that there is no relationship between long/short time spans and over-/underestimation.

Table 1 Time perception tests used in the past studies on depression

Author	Year	Time estimation	Time production	Time reproduction	Time orientation	Time extension	Time awareness
Lewis	1932	→short span →long span (? length of span)	NOT DONE	NOT DONE	NOT DONE	NOT DONE	NOT DONE
Straus	1947	→12 to 30 min	NOT DONE	NOT DONE	NOT DONE	NOT DONE	NOT DONE
Mezey et al.	1961	3 sec→ when depr. but ↑ after recovery	↑ 30 sec improved after recovery	↑ improved after recovery	NOT DONE	NOT DONE	↓ improved after recovery
Melges et al.	1966	NOT DONE	↓ 30 sec (& less accurate) improved after recovery	NOT DONE	NOT DONE	NOT DONE	NOT DONE
Dilling et al.	1967	→14 min (less accurate) ↑ 31 min	NOT DONE	NOT DONE	to past	↓ future	NOT DONE
Lehman	1967	↓ 20 to 60 min (but also ↓ of control group)	↓ 15 sec	↑ 15 sec	to past	NOT DONE	↓
Bojanovský et al.	1973	↓ 1/2 & 2 min	NOT DONE	NOT DONE	NOT DONE	NOT DONE	NOT DONE
Edelstein	1974	↑ 30 to 90 sec. improved after recovery	↑ 60 sec improved after recovery	NOT DONE	NOT DONE	NOT DONE	NOT DONE
Bech	1975	→3 min	NOT DONE	NOT DONE	NOT DONE	NOT DONE	↓ related to mood but not to retardation
Wyrick et al.	1977	→5, 10, 20, 80 sec ↑ 160 sec, 4 min ↑ 15, 30 min	NOT DONE	NOT DONE	to past	↓ future ↑ past	↓
Elsass et al.	1979	→10 sec	→120 sec	→10 sec	NOT DONE	NOT DONE	NOT DONE

N.B. Time estimation  
 ↑ overestimation  
 → no change  
 ↓ underestimation  
 Time production  
 ↑ longer counting  
 ↓ shorter counting  
 Time reproduction  
 ↑ overestimation (slow tapping)  
 ↓ shorter extension  
 ↑ longer extension  
 Time awareness  
 ↓ subjects feel time passing slowly

A point of importance which has been nevertheless ignored is whether the time interval in question is blank or filled with some activities. As Wallace and Rabin (1960) pointed out, the relationship between time estimation and this filled/unfilled condition has not yet been thoroughly studied. It can reasonably be presumed that in previous studies a relatively short interval was blank and that long intervals were filled. Nevertheless, most authors do not make this clear.

Again, in a time production test, reports in two different directions appear. Mezey and Cohen (1961) suggested a tendency for the depressives to produce a time longer than 30 seconds. But two other researchers (Melges and Fougerousse, 1966; Lehman, 1967) showed shorter time production.

In a time reproduction test, overestimation, i. e. tapping more slowly than the pace given, was found to be consistent in two studies on depression (Mezey and Cohen, 1961; Lehman, 1967).

In a time orientation test, depressives were shown to be mainly past oriented. Future extension is shortened and past extension prolonged in depressive patients. However, orientation in the same direction was found in schizophrenic patients (Dilling and Rabin, 1967; Lehman, 1967).

As far as time awareness test is concerned, researchers agree with the clinical impression that time goes slowly for depressives. Nevertheless, personal experience suggests the feeling that the passage of time largely depends on the situation. It will be, therefore, essential to adopt graded situation-dependent questionnaire. Of clinical interest is a study of Bech (1975) who found that the subjective feeling of slowing of time passage was related to depressive mood but not to psychomotor retardation and that there was no diagnostic specificity particularly between psychotic and neurotic depression.

#### ***Methodology of time perception study of depressive patients***

It seems that disagreement of the previous studies arises from methodological defects (Table 2).

The first methodological issue is comparison between the control and subjects in follow-up. As far as clinical studies on depression are concerned, control samples (not necessarily matched) were examined in only four papers; follow-up of the samples after recovery in only three. Therefore it is open to discussion whether a significant finding, if it arises, is specific to depression or non-specifically related to mental ill health in general, whether a specific element of time perception has a bond with a specific psychiatric symptom or syndrome regardless of diagnosis, or whether it is related to the depressive condition so that a positive finding will disappear after recovery, or whether it is related to constitutional personality factors, and so remains even after recovery.

Table 2 Methodology of the past studies on time perception of depressives

Authors	Year	Sample	Diagnostic criteria	Control	Follow-up
Lewis	1932	depressives (?number)	NO	?	?
Straus	1947	depressives (?number)	NO	?	?
Mezey et al.	1961	21 affective disorder	NO	NO	YES
Melges et al.	1966	20 depressives (10 psychotics + 10 neurotics)	NO	NO	YES
Dilling et al.	1967	20 depressives	NO	YES	NO
Lehman	1967	14 depressives	NO	YES	NO
Bojanovsky et al.	1973	15 endogenous + 16 neurotic depressives	NO	NO	YES
Edelstein	1974	10 depressives	NO	NO	YES
Bech	1975	52 depressives	NO	YES	YES
Wyrick et al.	1977	30 depressives	NO	NO	NO
Elsass et al.	1979	41 manic depressives	YES	YES	NO

N. B. Follow-up YES Patients were re-examined after recovery.

NO Patients were not re-examined after recovery.

The other important issue in methodology is the influence of drugs on time perception. Lehman (1967), giving sodium amytal, dextro-amphetamine, or psilocybin to normal volunteers, suggested that no change occurred after administration of these drugs with regard to time estimation and time awareness. The exception was sodium amytal which seemed to prolong time production and time reproduction. Neither Lehman nor Wallace and Rabin mentioned the effect of antidepressants. Research is required in this area.

Also influential on time perception tests is the time of a day when they are administered. Pfaff (1968), testing normal subjects in the morning and in the afternoon, demonstrated that time production was shorter and time estimation was overestimated in the afternoon.

Finally, virtually none of the studies quoted made their diagnostic criteria explicit thereby making the interpretation of their results difficult. The reliability of clinical diagnosis has been of recent interest in psychiatry. A belief that the American criteria for the diagnosis of schizophrenia is broader than British has been postulated by Kendell (1971). Kreitman et al. (1961) also suggest that diagnostic reliability is not satisfactorily high even within one country. Recognition of the confusion of different classification in psychiatry (Stengel, 1960) has recently resulted in attempts at integration such as the ICD9 (World Health Organization, 1978). Those attempts have not, however, been totally successful. It is hoped to adopt an explicit diagnostic criteria in future studies.

To recapitulate, it can be said that there has been little agreement between the research findings on time perception of depressive patients because of several reasons — different terminology, different tests adopted for the same or a similar concept, lack of definition of symptoms, syndromes, and diagnoses, lack of comparison with normal controls, lack of follow-up studies, and lack of comparison of each element of time perception. In order to overcome these drawbacks, it will be recommended to select patients from variety of subcategories of depression using an explicit diagnostic criteria such as Present State Examination and its computer system Catego (Wing et al., 1974), to study matching non-psychiatric controls, and to administer different time perception tests frequently throughout the experimental period so that comparison within and between groups can be possible.



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## 総説：うつ病患者の時間認識

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うつ病時における時間認識のこれまでの研究の検討を行った。その結果次の諸点が明らかとなった。

1) 用語上の不統一があり、そのため同一または類似の時間認識機能に異なった多種の名称が与えられ、さらにひとつの名称が研究者によってさまざまな意味が賦与されている。従ってこの総説では各概念の定義と最も適当と思われる呼称を選択した。

2) Time estimation, time production 及び time reproduction についてはこれまでの研究は相違した結果を示している。

3) 比較的に一致した結論は time orientation (うつ病者はより過去指向も示す), time extension (うつ

病者においては future extension はより短く, past extension はより長い) 及び time awareness (うつ病者は主観的に時間の流れをより遅く感じる) について得られた。

4) しかしながら詳細についてはいまだに不明な点が多く、これは研究の方法論上の欠陥に起因する可能性があると思われる。すなわち、明瞭な症状規定、診断基準を欠く、対照群を採用していない、追跡調査が行われていない、各時間認識検査と各臨床要素との詳細な比較が行われていない、などの点である。これらの方法論上の欠陥を是正した上での研究が望まれる。