

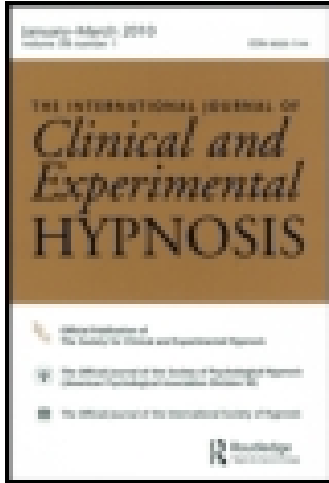
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HYPNOSIS AND THE PERCEPTION OF TIME¹

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Abstract: Ss who were administered the Harvard Group Scale of Hypnotic Susceptibility, Form A of Shor and E. Orne (1962) underestimated the duration of the "hypnotic interval" by 41%. The same Ss underestimated a nonhypnotic interval of the same length by only 14%. This temporal foreshortening of the hypnotic interval, replicated on several different samples (combined, $N = 435$) confirms informal observation that people underestimate the length of time they have been hypnotized. Contrary to prediction, however, there was no relation between the amount of underestimation and hypnotic responsiveness. Discussion focused on possible reasons why significant underestimation of the interval was not accompanied by the expected (negative) correlation of hypnotic responsiveness and temporal foreshortening.

Perception of time and distortions of time by hypnotized persons is a domain of inquiry that has been rather neglected during the recent renaissance of interest in hypnotic phenomena. In the decade from 1968 to 1978, the present authors have found only five papers that contribute original research to this area of inquiry³ (Johnson, 1976; Krauss, Katzell, & Krauss, 1974; Zimbardo, Marshall, & Maslach, 1971; Zimbardo, Marshall, White, & Maslach, 1973; Zimbardo, Maslach, & Marshall, 1972). The relative dearth of such research is somewhat surprising, since historically, there have been some fairly extravagant claims about the power of hypnosis to alter the time sense—everything from judging the passage of real time with uncanny accuracy (Bramwell, 1921), to experiencing a few seconds of real time as much longer than it actually was. The latter procedure presumably provides a sort of temporal fulcrum, whereby mentally rehearsing the violin (say) for a few seconds can be levered into benefits comparable to several hours of real time practiced (Cooper & Erickson, 1954).

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³There has been work in hypnotic age regression, but this constitutes rather a special case of time perception and alterations therein. As this article was going into press, the present authors found a study by Tebecis and Provins (1974) that should be noted in this context. Those authors found that hypnotized Ss underestimate temporal durations by about 40%, which is an outcome quite consistent with the findings reported in the present investigation.

Typically, the investigations presuming to support these rather dramatic claims are not well controlled, employ dependent variables of dubious objectivity, and are largely unsupported by more controlled investigations (e.g., Barber & Calverley, 1964; Edmonston & Erbeck, 1967). Nevertheless, there are more modern experiments which indicate that a hypnotic S's perception of time can be accelerated or slowed by appropriate suggestions (e.g., Krauss et al., 1974; Weitzenhoffer, 1964; Zimbardo et al., 1971, 1972, 1973). Even these more critical studies have not gone entirely unchallenged (Johnson, 1976).

The number of claims made about the hypnotic perception of time are matched only by the various procedures used to demonstrate the presumed effects. These procedures can conveniently be grouped as follows:

1. The Ss are given suggestions that they will perform a specific behavior at a specified time in the future (Bramwell, 1921).
2. The Ss are given suggestions to estimate when a predefined temporal duration is completed (e.g., signal when a minute has passed) (Mason, 1960; Stalnaker & Richardson, 1930).
3. The Ss are given suggestions to complete an hallucinated activity, the time to completion being compared to the real time such an activity would require (Welch, 1936).
4. Suggestions are given for Ss to take whatever time they need to learn or perform an hallucinated task, and given a real time interval that is far too brief for the actual performance of the hallucinated task (Cooper, 1952; Cooper & Erickson, 1954; Cooper & Tuthill, 1952; Edmonston & Erbeck, 1967).
5. Suggestions are given to Ss for time to speed up or slow down, so that a minute seems like a second, or a second like a minute (Barber & Calverley, 1964; Cooper & Erickson, 1950; Erickson & Erickson, 1958; Johnson, 1976; Krauss et al., 1974; Weitzenhoffer, 1964; Zimbardo et al., 1972, 1973).

In most, but not all of the above cases, Ss seemed to experience time in accordance with suggestions—i.e., either accurately estimating a predefined interval, or distorting time in a manner implicitly or explicitly conveyed by the suggestion. For example, Ss who were told they would have “ample time” to perform some hallucinated activity tended to perceive the actual time allotted as far longer than it actually was, thereby permitting them enough “subjective time” to accomplish the mental task at hand.

Noteworthy by its absence from the above list of research approaches to the hypnotic perception of time is a simple retrospective estimate of the amount of time that a person has been hypnotized. This is a curious omission, because it has been our experience that Ss frequently underestimate the amount of time they have been hypnotized. Such underesti-

mations seem to occur even in group administered scales of hypnotic susceptibility. It should be pointed out, however, that nowhere during the typical group induction is there any hint that time will be foreshortened in this manner, so that such temporal distortion, if substantiated in formal inquiry, is unsuggested. Such unsuggested effects on the perception of time would contrast with the studies cited above, where the perception of time is at least implicitly at issue in the initial suggestions.

In sum, the present authors predict that in the experiments to follow Ss will underestimate the amount of time taken by the hypnotic proceedings. In addition, however, we also hypothesize that there will be a negative correlation between estimates of temporal duration and Ss' hypnotic susceptibility, such that the higher the hypnotizability, the shorter the perceived duration of the hypnotic induction and suggestions (the hypnotic interval). The basis for this latter prediction requires further comment.

Basically, the prediction follows from a combination of the present authors' previous work and Ornstein's (1969) theory of perceived time. Ornstein argues that the perception of time depends upon the amount of information processed (and stored) during the real time interval in question: the less information processed per unit of time, the shorter the interval seems to be.

Invoking a variety of his own and others' research, Ornstein (1969) provides at least some support for this notion. For example, psychotomimetic drugs such as LSD "tend to produce excitation and accelerate the time sense, whereas tranquilizing drugs have the reverse effects [Doob, 1971, p. 284]." Presumably, the former drugs increase and the latter drugs decrease the amount of information processed per unit of time. Sensory deprivation, with its low information load, tends to produce underestimations in the judged interval (Doob, 1971, p. 117).

This information processing notion of elapsed time accounts, according to Ornstein (1969), for the old adage that, "a watched pot never boils." He argues as follows:

Expectancy is a situation which leads to increased sensitivity to stimuli, that as we continually 'watch' the pot, that we are more vigilant than usual. An increase in vigilance should result in a greater amount of awareness of input, and consequently a lengthening of duration experience [p. 112].

The present authors would like to suggest that the deeply hypnotized S is, figuratively speaking, a "non-watcher of the pot," in the sense that he or she is absorbed in the moment-to-moment events of hypnosis, to the exclusion of things past and future. Indeed, part of what absorption means is a total immersion in the present moment, without consideration for, or distraction by, past events or future possibilities. Recent work in

our laboratory (Bowers & Brennehan, 1976) has strongly suggested that adopting an anticipatory or listening posture *vis-à-vis* auditory information is precisely what a good hypnotic *S* does *not* do when processing information hypnotically. And indeed, the preamble to the group scale used in our work cautions *Ss* to satisfy their curiosity about hypnosis by committing themselves totally to the hypnotic proceedings, rather than by splitting themselves into participant on one hand, and observer of their participation on the other. Such a listening or anticipatory orientation helps reduce the degree of absorption and consequently, the depth of hypnosis (see also recent absorptive accounts of hypnosis by Bowers, 1976, Pp. 118-122; Spanos & Barber, 1974).

If high hypnotizable *Ss* are indeed more absorbed in the induction and suggestions of the hypnotic scale than less hypnotizable *Ss*, then they should also process less information than low susceptible *Ss* during this time interval. At least this seems to follow from Ornstein's (1969) "watched pot" metaphor. In processing less information during the period of hypnotic induction and subsequent suggestions, high susceptible *Ss* should experience the hypnotic interval as shorter than their low susceptible counterpart *Ss*.

EXPERIMENT I

Method

The senior author solicited volunteers from six undergraduate psychology courses to participate in a group hypnotic induction. The *Ss* from a particular class were later seen together, so that there were six different group administrations of the Harvard Group Scale of Hypnotic Susceptibility, Form A (HGSHS:A) of Shor and E. Orne (1962). After a preamble of approximately 15 minutes (as per instructions), the hypnotic induction began by having each *S* focus attention on a "target"—some arbitrary spot on his or her hand. At this point in the proceedings, *E* activated a stopwatch, which ran until just after the completion of the posthypnotic response item of HGSHS:A. The watch was then stopped, and *E* addressed the group as follows:

Okay, before opening your booklets, and without looking at your watch (or the clock)⁴, I want each of you to write down in the upper right-hand corner of the booklet the amount of time in minutes that you feel has gone by since you began staring at the target on your hand. Don't think too long about your answer, since I am interested in your subjective experience of time, not in an attempt to provide an objectively accurate estimate of the time that has actually passed. Okay, write down your

⁴*Ss* in some of the groups had earlier been asked to put their watches in their pockets. They had done so as part of a series of tasks (take off your left shoe, hand your pencil to your neighbor) demonstrating *nonhypnotic* compliance to instructions. For these *Ss*, then, watches were not readily available for scrutiny.

response in minutes in the upper right-hand corner of your response booklet.

The Ss were then asked to complete the scale.

RESULTS

Table 1 lists the means and standard deviations of HGSHS:A scores for each of the six groups. Table 2 presents the actual time elapsed for each of five⁵ group sessions, the mean estimated time elapsed, and the statistical comparison of the actual and estimated times. It is clearly the case that Ss regularly and substantially underestimated the amount of time that transpired between induction onset and termination of HGSHS:A suggestions, thereby confirming informal observation.

TABLE 1
AVERAGE HGSHS:A SCORES AND STANDARD DEVIATIONS FOR THE SIX GROUPS OF Ss

<i>N</i>	Mean HGSHS:A Score	<i>S.D.</i>
43	7.21	3.1
21	6.71	3.1
45	6.22	3.1
38	6.37	2.7
235	7.31	2.7
53	6.89	3.0

TABLE 2
ACTUAL AND MEAN ESTIMATED TIME ELAPSED FOR EACH OF FIVE GROUP SESSIONS

<i>N</i>	Actual Time Elapsed (min.)	Mean Estimated Time Elapsed (min.)	<i>S.D.</i>	<i>t</i>
43	27.6	14.35	8.9	9.77**
21	26.9	20.76	13.3	2.10*
45	29.4	16.07	7.7	11.59**
38	28.7	17.68	9.6	7.08**
235	26.8	15.82	9.3	18.04**

* $p < .05$.

** $p < .001$.

Table 3 presents the correlations between hypnotic ability (as measured on the 12-point HGSHS:A) and the time estimation data. As can be seen, five out of six of the correlations are in the predicted negative direction, but only one of these correlations is significantly different from zero, and that barely so. Only a charitable view of these results could regard them as supporting the hypothesized relationship between hypnotic susceptibility and the perceived duration of the hypnotic interval.

⁵The "real time" interval was mistakenly not recorded for one of the groups, so the results of only five of the groups is presented in Table 2.

TABLE 3
CORRELATIONS BETWEEN HGSHS:A SCORE AND TIME ESTIMATION DATA

<i>N</i>	<i>r</i>
43	-.27
21	-.21
45	-.17
39	-.18
235	.06
53	-.27*

* $p < .05$.

EXPERIMENT 2

There are two potential problems with the above study that require consideration. One issue is that the degree of Ss' underestimation of the hypnotic interval is compared to a real-time baseline. This fact makes it unclear whether Ss typically underestimate time by almost half, or whether there is something special about the hypnotic procedure that leads Ss to underestimate time to the extent found.

The remaining problem is not as important, since the second hypothesis was not well supported. Notice, however, that if the predicted negative correlation between hypnotic susceptibility and temporal underestimation had been found, it would have been a somewhat ambiguous finding. For it would not have been clear whether the correlation achieved was due to hypnotic susceptibility *qua* trait, or to the fact of being hypnotized to whatever extent permitted by one's hypnotic ability.

The second experiment was planned to obviate both these interpretive difficulties. The strategy involved seeing a subset of Ss from the largest of the six previously run groups in a nonhypnotic context, and to have them retrospectively estimate an interval of real time equal in length to the previously judged hypnotic interval. The prediction was that Ss would not underestimate the temporal duration by nearly as much as they had on the earlier occasion, and that hypnotic susceptibility would *not* correlate significantly with the estimate of elapsed time.

Method

The senior author lectured to a group of 118 Ss drawn from the largest of the six groups seen earlier for HGSHS:A administration. The topic under discussion was hypnosis, and the talk proceeded for about 15 minutes, i.e., the same amount of time previously taken to proceed from the beginning of HGSHS:A session to the point where each S began staring at his or her target. At this juncture, E interrupted the lecture, drew an arbitrary but simple design on the blackboard, and asked members of

the class to reproduce the design on a blank sheet of paper earlier prepared for that purpose. No explanation for this request was offered, and the lecture was resumed after a brief interval sufficient for Ss to draw the design. About 27 minutes later (a period of time equal in length to that previously taken by the induction and suggestions of HGSHS:A), E again interrupted the lecture and addressed the class as follows:

Please retrieve the paper on which you drew your design a while back. Now what I want you to do is to write down in minutes the amount of time you feel has gone by since I asked you to draw the design. . . . Don't think too long about your answer, since I am interested in your subjective experience of time, not in an attempt to provide an objectively accurate estimate of time that has actually passed. Okay, write down your response in minutes in the upper right-hand corner of your sheet of paper.

RESULTS

The actual time interval from the drawing of the design to the estimation of time was 27 minutes and 15 seconds (inadvertently 30 seconds longer than the hypnotic interval had been). The mean estimated time was 23.50 minutes (*S.D.* = 10.00), which is significantly less ($t = 4.07$; $p < .01$) than the real time interval in question. So, even in a nonhypnotic context, Ss underestimated the amount of time that had passed.

In order to compare the estimates of duration for the hypnotic and nonhypnotic contexts, we first re-analyzed the time estimates for the hypnotic interval made by the subset of 118 Ss. The average amount of perceived time by these Ss was 15.77 minutes (*S.D.* = 8.61), which was almost exactly the same as the comparable figure for the entire group of 235 Ss who originally received HGSHS:A. More to the point, however, the 118 Ss underestimated the hypnotic interval by much more than they did the comparable period of time in a nonhypnotic context (difference = 7.73 minutes, $t = 6.85$, *d.f.* = 117; $p < .001$). The Ss underestimated the hypnotic interval by 41%, whereas they underestimated the nonhypnotic interval by only 14%. Thus, the data confirmed that the degree to which hypnotized Ss underestimate the duration of the hypnotic interval is not simply typical, but has something to do with the fact of being administered a hypnotic procedure.

Although the underestimation of the hypnotic interval is clearly confirmed by even this more conservative comparison, the data from this subsample of Ss still revealed no relation between hypnotic ability and the estimate of "hypnotic time" ($r = .00$), between hypnotic ability and the estimate of "nonhypnotic time" ($r = .01$), or even between the two different estimates of time in the hypnotic and nonhypnotic contexts ($r = .14$). It was hoped that there would be a significant negative correlation

between hypnotic ability and the perception of "hypnotic time," and no relation between hypnotic ability and the perception of time during the lecture on hypnosis. Had that pattern of data emerged, it would have meant that the distortions in the perception of time were a function of hypnotic depth per se, not of hypnotizability alone.

The correlation of .14 between estimates of the hypnotic interval and its comparable lecture equivalent could mean that retrospective estimates of durations of approximately 25 minutes are highly unreliable, or it could mean that the hypnotic induction is effective in disordering Ss' time sense. Without two estimates of "nonhypnotic time" by the same Ss, no decision can be made between these two possibilities. Notice, however, that if this low correlation reflects unreliability of the time estimation measure, the correlations between this measure and hypnotic susceptibility could not possibly be high. If this were indeed the case, a more reliable measure of time estimation might conceivably support the hypothesized negative correlation between hypnotic ability and the degree to which the hypnotic interval is underestimated. On the other hand, suppose the present time estimation measure is reliable. The low correlation of .14 between the two estimates of time then implies a real effect of hypnosis on Ss' time sense. In either case, it is clear that the results of the present study cannot be the final word about the effect of hypnosis on perceived time.

DISCUSSION

The results of the two experiments confirm the informal observation that Ss undergoing hypnosis substantially underestimate the duration of the hypnotic interval, and that the degree of underestimation considerably exceeds the amount of temporal foreshortening these Ss ordinarily manifest in a nonhypnotic context. On the other hand, the theoretical expectancy that the magnitude of the underestimation effect would correlate negatively with hypnotic ability was supported hardly at all. How are we to understand this pattern of data?

Recall Ornstein's (1969) hypothesis that the perception of time is a function of the amount of information processed and stored during a given real-time interval. Surely one characteristic of the typical hypnotic induction is that it is relatively low in the amount of information conveyed per unit of time. In part, this state of affairs is due to the slow rate of speech ordinarily employed; in part, it is due to the high rate of repetition and redundancy in the hypnotic patter. This relatively low amount of information processed by Ss exposed to a typical hypnotic induction may thus be the prime reason for their very considerable underestimation of the hypnotic interval. If this is indeed the case, the results of this study are more important to a theory of perceived time than to an understanding of hypnosis.

There is, however, another possibility. Ornstein's (1969) notion that the perception of time depends directly upon the amount of information stored during the interval to be judged is by no means unassailable. It does not, for example, account for the common experience that time seems to fly when one is busy having a good time. Doob (1971), in his superb review of the literature on the perception of time, is critical of Ornstein's tendency to oversimplify and overgeneralize his conclusions (see Doob, 1971, especially Pp. 127-129). For instance, regarding the "watched pot" metaphor, Doob (1971) has this to say: "I may be aware of input during the agonizing interval but . . . I have little to observe; hence other factors [i.e., factors besides the amount of information stored while waiting for the pot to boil] must certainly be invoked to explain the phenomenon [p. 128]."

Perhaps one such factor affecting the perception of time is the kind of attention paid to the events of the interval in question. It has become increasingly clear that a legitimate distinction can be made between active-directed and passive-receptive forms of attention (Deikman, 1971; Reyher, 1977). It is the latter form of attention—an uncritical receptivity to incoming information—that seems to characterize hypnotic Ss. Moreover, recent research from our laboratory (Bowers & Breneman, 1977) has strongly suggested that such passivity of attention can be achieved equally well by high and low hypnotizable Ss. This somewhat surprising finding implies that attentional passivity may be a necessary but not a sufficient condition for hypnotic suggestibility. That is, a high hypnotizable S will perhaps demonstrate suggestibility only when attending passively to suggestions; a low susceptible S will not do so even when passively oriented *vis-à-vis* the suggestions.

If this conjecture is correct, it might go a long way toward explaining the fact that low as well as high hypnotizable Ss underestimate the hypnotic interval, and that there is no correlation between hypnotic ability and the perceived duration of this interval. For it is possible that the administration of HGSHS:A creates a passive-receptive orientation in almost all the participants. This attentional passivity may in turn engender underestimation of the hypnotic interval in most Ss, while at the same time permitting individual differences in hypnotic responsiveness to emerge. If it is attentional passivity and not hypnotic ability that is important for the perception of time, then a measure of hypnotic responsiveness such as HGSHS:A simply would not correlate with the estimations of time.

Still, it is difficult to ignore the fact that five out of six correlations between hypnotic ability and the temporal estimates of the hypnotic interval were in the predicted negative direction, even though the magnitude of the relationships was low, and statistically significant in only one group of Ss. It is certainly the case that HGSHS:A is a very convenient

device for the selection of Ss, but it is by no means as valid an index of a person's hypnotic ability as an individually administered scale, particularly one that includes suggestions requiring considerable distortion in perception and memory (see, e.g., Hilgard, 1977, Pp. 156-162; Ruch, Morgan, & Hilgard, 1974). The correlation of HGSHS:A with other individually administered scales tends to be lower (about .60) than the correlations among the individually administered scales (upwards of .80) (see Bowers, 1976, p. 66 for a summary of these findings). It is therefore possible that an individually administered scale, such as the Stanford Hypnotic Susceptibility Scale, Form C (SHSS:C) of Weitzenhoffer and Hilgard (1962) might well show higher correlations with time estimations of the hypnotic interval than were obtained with the group-administered scale in the present study. This possibility is currently under investigation.

There is another prospect that will be explored. Conceivably, underestimations in the duration of the hypnotic interval are related to the degree of posthypnotic amnesia engendered in S.⁶ To the extent that S cannot remember the events transpiring during the hypnotic interval, the interval in question may be experienced as much shorter than it actually was. Indeed, if a relationship is forthcoming between SHSS:C score and temporal underestimation of the hypnotic interval, it may be mediated in part by the degree of posthypnotic amnesia. Notice, however, that such amnesia could not account for the *generalized* reduction in the perceived duration of the hypnotic interval reported by low as well as high hypnotizable Ss. For it is simply the case that low hypnotizable Ss seldom display any posthypnotic amnesia at all.

Clearly, in any future study of hypnosis and time estimation, one ought to be alert for the possibility that underestimations of the hypnotic interval may have two separable components: a generalized component attributable to the hypnotic procedure per se, and a specific component due to S's responsivity to particular hypnotic suggestions, especially posthypnotic amnesia. It is evident that there is considerable research left to do in this relatively unworked domain of inquiry.

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⁶We would like to thank Dr. Richard St. Jean for calling our attention to this possibility.

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Hypnose und Zeitwahrnehmung

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Abstrakt: Vpn., die am Harvard-Gruppenmaszstab für Hypnoseempfindlichkeit, Form A (Shor & E. Orne, 1962) gemessen wurden, unterschätzten die Zeitdauer des "hypnotischen Intervalls" um 41%. Die gleichen Vpn. unterschätzten ein nicht-hypnotisches Intervall von derselben Länge um nur 14%. Diese temporäre Verkürzung des hypnotischen Intervalls, das an mehreren unterschiedlichen Mustern repliziert wurde (N zusammengefasst = 435), bestätigt die nicht formelle Beobachtung, dass Menschen die Zeitdauer ihres Hypnotisiertseins unterschätzen. Jedoch bestand im Gegensatz zur Voraussage keine Beziehung zwischen dem Unterschätzungsbetrag und der hypnotischen Reaktion. Die Diskussion beleuchtet die möglichen Gründe, warum eine bedeutende Unterschätzung des Intervalls nicht von einer erwarteten (negativen) Korrelation zwischen hypnotischer Reaktion und temporärer Verkürzung begleitet war.

L'hypnose et la perception du temps

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Résumé: Les Ss soumis au *Harvard Group Scale of Hypnotic Susceptibility, Form A* (Shor et E. Orne, 1962) ont sous-estimé de 41% la durée de "l'intervalle hypnotique." Les mêmes Ss ont sous-estimé de 14% seulement un intervalle non-hypnotique de même durée. Cette tendance à raccourcir l'intervalle hypnotique, observée dans plusieurs échantillons différents (somme des N : 435), confirme les données empiriques selon lesquelles les gens sous-estiment la période de temps pendant laquelle ils ont été hypnotisés. Cependant, contrairement aux prédictions, il n'y avait pas de rapport entre le taux de sous-estimation et la susceptibilité hypnotique. La discussion porte sur les raisons possibles pour lesquelles la sous-estimation significative de l'intervalle ne s'accompagne pas de la corrélation attendue (négative) entre la susceptibilité hypnotique et le taux de sous-évaluation.

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Resumen: Los Ss sometidos al *Harvard Group Scale of Hypnotic Susceptibility, Form A* (Shor y E. Orne, 1962) se han equivocado de cerca el 41% en cuanto a la duración del "intervalo hipnótica." Los mismos Ss se han equivocado de sólo el 14% en cuanto a la duración del intervalo no-hipnótico de la misma largueza. Esta tendencia a acortar el intervalo hipnótico, observada en varios ejemplos (suma de los N = 435) confirma los datos

científicos que muchas personas normalmente acortan el tiempo que se encuentran bajo hipnosis. Pero, contrario a las previsiones, no hay relación entre el total de acortamiento y la susceptibilidad hipnótica. La discusión trata de explicar el hecho de que este acortamiento significativo del intervalo hipnótico no está acompañado de la respectiva correlación (negativa) entre la susceptibilidad hipnótica y el total de la subestimación del intervalo.