Initiation, Modification, and Inhibition of Motor Reactions through indirect Suggestion Approaches

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In contrast to studies on hypnotic suggestibility, there are only a few works dealing with the phenomenon of suggestibility examined independently of hypnosis. The research reported in this chapter explores the influence of a non-hypnotic suggestion procedure on motor processes. Thirteen indirect suggestion-test items were carried out by a sample of 108 students of education under three experimental conditions. As suggestion, different body exercises - to be performed under muscular relaxation or tension - were used. Specific effects were attributed to the neutral exercises regarding the initiation, modification, or inhibition of motion. The subjects were told, e.g., that they might fall backwards if they relaxed their body and pressed their hand continuously against their chest while standing upright. In the first of the experimental conditions it was pointed out explicity to the subjects that they could react in a certain way, as described above. In the second condition, further information was added to the instruction of condition one. With each test item the subjects were also explicitly told that the indicated reaction might not occur. Under the third condition the subjects were not explicitly informed of the possible consequences of the bodily exercises they were to perform. The results showed a significant difference only between condition 3 and the other two conditions. This indicates that the frequency and intensity of the reactions are significantly lower when there is no explicitly suggested direction of movement. The research furnishes clues concerning the construction of a suggestibility scale. Finally, different influencing factors will be discussed which might be responsible for the motor reactions.

Suggestibility has been researched using various types of behavior. Among these, apart from perception and memory, motor processes have predominated. In testing hypnotizability as well as suggestibility (when researched independently of hypnosis), a number of

motor procedures have been employed, e.g.. the body sway test, and the arm lowering or arm-levitation tests (see Aveling & Hargreaves, 1921; Barber, 1979; Eysenck & Furneaux, 1945; Hilgard, 1965; Hull, 1933; Stukat, 1958; Weitzenhoffer, 1989).

The attempt to influence motor processes through suggestive techniques is based traditionally on a direct mode of communication. During the test, the experimenter literally repeats what is expected of the subject. The monotonous tone of voice preferred in these experiments is very similar to routine hypnotic procedure. As an example, the instructions of the body sway test are reported below (cited, following one of the best known works on suggestibility independent from the context of hypnosis): *"Go on standing straight. Listen to me. Whatever I say, you should do nothing, just stand still and listen to me. Imagine you are falling forwards. Don't make any other efforts, don't do anything, just imagine you are falling forwards. Now you are falling forwards, you are falling forwards more and more, more and more you are falling forwards. You are falling forwards all the time ... These suggestions are monotonously repeated for 45 sec"* (Stukat, 1958, p. 40).

There are, however, some particular problems with such so-called "waking suggestibility" research. One of the major difficulties with this type of research is the need to find an adequate justification for the experimental task. Unlike the hypnotic situation (where the persuasive attempts of the experimenter are part of the context itself), under non-hypnotic conditions, where the actual intentions of the experimenter are not usually revealed, special explanations are necessary.

Binet (1900) drew attention to the possibility that the response of a subject in a suggestiblity test can be altered by the allusion that the test might have something to do with hypnosis or suggestion. He, as well as Seashore (1895), concluded that in order to avoid the uncovering of experimenter's real intention indirect procedures should be used in researching suggestibility in a non-hypnotic situation. Accordingly, they developed a series of indirect suggestion procedures. These procedures (a number of which is used up to the present day) were almost exclusively designed to influence sensory processes, e.g. the heat illusion test (Seashore, 1895), or the progressive lines-, and weights-test (Binet, 1900). In order to disguise the intention of influencing, an indirect suggestion was used which pretended to alter the nature of the given situation - e.g. the simulation of switching on specific stimulus-generators.

The fact that motor processes can be influenced by indirect suggestion techniques is probably not well known. Here, there are two basic types of procedures:

(a) The first category is analogous to the classic indirect sensory procedures of testing suggestibility. Indirect means that a "vehicle", e.g. a device, is installed between experimenter and subject which - apart from the verbal component - becomes an important carrier of the suggestive contents. However, the technical device merely serves as a credible explanation of the motor processes supposedly taking place. It was probably Estabrooks (1929) who was the first to introduce indirect vehicles to influence motor processes. He - and later Stukat (1958) - demonstrated that the oscillation of

the Chevreul Pendulum (then regarded as a classic direct suggestion procedure) can as well be triggered using an electro-magnet, apparently working under the pendulum. We ourselves showed experimentally that the same type of motor response (e.g. body-swaying, arm movements) can be induced by means of both direct and indirect suggestion techniques (Gheorghiu, 1971; Gheorghiu, Gehm, Hehl & Vaitl, 1989; Gheorghiu, Meiu, Onofrei & Timofte, 1966).

(b) A second type of suggestion technique uses the person's own motor apparatus as a suggestion vehicle. Here, subjects are asked to produce a certain motor reaction. At the same time, they are given a communication suggesting another motor behavior, as a consequence of the first one might occur. For instance: When standing upright in a relaxed manner, they might fall backward when exerting a continuous pressure on their own chest with their hand.

A number of experiments with this indirect suggestion approach has shown that various motor reactions can be initiated, modified or inhibited (Gheorghiu & Hoeme, 1987; Gheorghiu, 1991; Huebner, 1994). A major advantage of these indirect techniques - especially when compared with the techniques based on faked technical devices - is their relative economy. They neither require lavish equipment nor demand much time. Also, a large number of items with different degrees of difficulty can be employed.

Out of the different questions which might be asked in connection with suggestion techniques based on non-apparative indirect motor procedures, the following problems can be highlighted:

1. A weakness of direct, as well as indirect, suggestion methods lies in the fact that subjects are offered no plausible explanation for reactions being incongruous with the suggested behavior.

There is only a limited capacity for a permissive approach to compensate for such a shortcoming. Experimental techniques, like an ambiguous pattern of speech, vague wordings, use of metaphors, and other linguistic "reality constructions", are after all supposed to serve as subtle suggestive hints to the finally desired effect. Actually, the possibility for the subject to react differently is only suggested implicitly. Therefore , in the case in which the subject is informed that alternative reactions might occur, it still remains to be tested if he becomes less reactive to the suggestion.

In the present work, we wanted to test the effects of suggestions with and without mentioning alternative responses to the subject. In particular, we were interested in the possibility of influencing motor responses, when (together with the description of the reaction) it is also mentioned that the reaction might not take place. It was hypothesized that under these conditions the number of reactions would be fewer of than under conditions where only the expected reaction is described (without mention the possibility not to react at all).

2. Direct and indirect suggestion procedures both communicate explicitly which reaction the subject might show. This introduces certain disadvantages into the experimental situation. Explicit reference to the expected behavior might trigger discomfort on

the part of the subject. In relation to psychological tests it is rather unusual to tell the subject how to react. It is possible that by mentioning the intended response one runs the risk that the real intention of the experiment might become obvious. The allocation of implicit suggestions serves to restrict this risk.

This chapter examines one of the manifestations of implicit suggestive directedness, namely insinuation which is akin to suggestive questioning. Here, we wanted to test to what extent motor processes can be influenced by implicit suggestion. Also, we wished to explore how this type of influence differs from the effects of explicit suggestion. The effects of implicit suggestion were hypothesized to be weaker than those of explicit suggestion.

3. By means of suggestion a motor process can be initiated, modified or inhibited. Concerning these three types of motor response it is of interest to know whether differences in reaction tendencies will appear when indirect induction techniques are employed.

4. Very few standardized test batteries - with the exception of scales of hypnotizability - are available for the measurement of suggestibility in the motor area. The usefulness of such procedures has been stressed by several authors (Gheorghiu, 1989; Gudjonsson, 1992; Hilgard 1991; Kirsch, 1997). Such measurement techniques would allow better examination of (a) suggestibility independent of hypnosis, (b) and the relationship between hypnotic and non-hypnotic suggestibility. Our intention was to verify whether it is possible to construct such a suggestibility scale without technical devices. The results of a couple of previous experiments provide some clues (Gheorghiu, Cuntz, Goetz & Zimmer, 1991, Huebner, 1994).

Methods

Test Items

The test items are based on the preliminary data obtained by Gheorghiu et al. (1991). Thirteen items were selected which showed a corrected item-test-correlation of at least .30.

Each of the 13 tasks consists of 2 trials, dubbed "phase A" and "phase B". In phase A, subjects were instructed to perform a neutral motor movement. (For example, the description of item M 3: *Lift both arms to the height of your shoulders, then move them downwards quite slowly.*) Immediately after this neutral exercise followed a question which alluded to a certain type of movement in a seemingly "offhand" manner. (*Did you notice a tendency for your dominant arm to move slower than the other arm?*). This question suggested implicitly the expected reaction to be performed in phase B. In phase B, the subject was instructed to repeat the movement of phase A, with some changes: here, the subject was instructed either to relax the corresponding muscles or to place them under tension. (*Before you move your arms down again, please place your dominant arm under strong tension.*) In the experimental conditions (1 and 2) to follow, changes in the movements of phase A were attributed to these exercises of relaxation or tension by way of seemingly plausible explanations. (*It may be possible that the heavy tension in the arm leads to a slower downward movement than in the other arm.*) This was to prepare the subject for the intended reactions. For a brief description of test items see appendix A.

In order to increase the plausibility of the whole experimental setting (and - consequently - the inclination of the subject to react), a series of 12 dummies was also employed (see Appendix B). During the experiment, the dummy items were used between the test-items; they always followed a test item, with the exception of the last test item. The main characteristic of the dummies was that the change of the movement in phase B - for psycho-physiological reasons - almost always actually occurred. Therefore, with the dummies, it was possible to omit the expected reactions. As a consequence, the impression of a more direct type of response on the part of the subject would have been reduced. Moreover, the dummies served to make the experiment more attractive and instructive for the subject, and to increase the attention of the subject, as the motor effects these tasks were often surprising (see McGuire, 1969). Reactions to the dummies were not analyzed, since the main reason for their use was to increase credibility and plausibility of the suggestive procedures themselves.

Experimental Conditions

Three experimental conditions were designed to test our hypotheses. Phase A was the same for all three conditions; conditions differed only with respect to phase B.

For Condition 1, in the instructions of phase B a possible direction of behavior was explicitly mentioned. The indicated reaction followed from the "logic" of the exercises of relaxation and tension during phase B. The "suggestive prediction" of a behavioral change always followed an "if-then"-format. The inference that the reaction might not take place could be drawn at an implicit level.

In Condition 2, phase B instruction for Condition 1 was supplemented by mentioning explicitly that the change of response in phase B might not take place. (e.g., for item 3, initiation of a movement, phase B: "We will now repeat the exercise. Prior to the exercise, please try to relax the muscles of your chest and legs. Now, the following could happen: If your muscles are well relaxed, it is possible that you will no longer be able to keep your balance; when you press your hand against your chest you might fall backwards. There is also a possibility that you will remain standing upright.")

The order of suggestions for a change and for no change in movements of phase A was balanced. For one half of the test-items, the suggested direction of movement was mentioned first; for the other half, it was mentioned first that no change in movement might take place. In both cases, however, there was only an argument in favor of the intended response. The alternative was only introduced as one of two possibilities.

In Condition 3, phase B instructions for the exercises of relaxation or tension were similar to Conditions 1 and 2. Unlike the two former conditions, a direction of the intended reaction in phase B was not explicitly mentioned. Condition 3 was implemented to check the possible influence of the suggestive interrogation after phase A and

Table 1: Experimental phases under the three treatment conditions

	phase A		phase B	
	Instruction Phase A	Interrogation after Phase A	Instruction Phase B	Interrogation after Phase B
Condition 1	equal for all conditions	equal for all conditions	explicit mentioning of intended reaction(no reference to non-reaction)	equal for all conditions
Condition 2			explicit mentioning of intended reaction and non-reaction	
Condition 3			not mentioning any reaction	

the exercises themselves on the behavior of cues resulting from the subject. An overview of the differences between the three experimental conditions is given in Table 1. For each condition, there were 36 subjects, equally balanced for gender.

Type of Suggestion

There were three types of Items, 5 Items of the type that could be labelled 'initiation'; 5 Items of the type, modification; 3 Items of the type, blocking. During the items of the type initiation, a not existing motion should be started, during the items of the type modification a certain motion should be changed, and during the type blocking a certain motion should be stopped.

Procedure

It was explained to the subjects that they were participating in an experiment designed to investigate the effects of exercises of relaxation and tension on motor processes. Prior to the experimental trials an example much like exercises of Jacobson's progressive relaxation technique (Jacobson, 1929) was used to introduce subjects to the phase A / phase B - setup. However, examples with relaxation as well as tension were used. The tension arose from a request to tense certain muscles. Here, it was also explained to the subjects that with some of the tasks, their attention would be drawn to certain effects of these exercises, in order to make it easier for them to observe their own behavior to make accurate self-ratings of reaction tendencies. Also, they were instructed that after each phase a measurement of pulse rate would be necessary. (These data were exclusively collected for reasons of increased credibility and were not subjected to analysis.) Following these instructions the experimental task items were applied. The duration of each individual task was about 1-3 minutes. After completion of the experimental trials, the subjects were asked to give some personal data like handedness, or if they feel pain at present. The total experiment lasted 40-50 minutes per subject.

Dependent Variables

Three types of dependent variables were measured:

1. Recordings of behavior: Subsequent to each trial, the intensity of the motor response was rated and recorded by the experimenter. Here, the following category system was employed: 0 = no change in reaction, 1 = weak change, 2 = moderate change, 3 = strong change (each in direction of the intended response).

2. Self-ratings: After each phase A and phase B, subjects were asked to rate the strength of their inclination to show a certain type of response on a 5-point-scale. In order to make these two measures directly comparable, both self-ratings and recordings of behavior were transformed to a range of values between 0 and 1 by dividing each measure with its own maximum value.

3. Self-ratings at the end of the experiment: Subjects rated on a 5-point-scale their overall inclination to respond to the experimental tasks (reflected or spontaneous), how exhausting they had found the experimental tasks (responses ranging from not at all to very strong), whether they got new insights during the experiment, and whether anything distracted them during the experimental tasks (with the alternative responses (a) noise, (b) tiredness, (c) explanations how to react); these data were only of subsidiary importance, and, hence, were only partly analyzed.

Subjects / Experimenters

A total of 54 male and 54 female subjects participated in the experiment (all education students) with a mean age of 22.8 yrs. They were randomly assigned to one out of two experimenters, and one of the three experimental conditions. The experiments were carried out in a quiet room at the University of Giessen. Only experimenter and subject were present. Experimenters were one junior , and one senior psychology student (the latter, one of the co-authors of this article, C.G.).

Results

Analysis of Variance

Because we had 5 items belonging to the type-initiation, 5 to the type-modification, and only 3 to the type-blocking we summed up the items in phase A, as well as phase B. This was done for the behavior recordings and self-ratings. With the resulting data three way ANOVAs were performed for the behavior recordings as well as self-ratings with experimental condition (CON) being a between-subjects factor, and type of suggestion

Table 2: *Results of the analyses of variance for behavior recording and self-ratings*

	behavior recordings				self-ratings			
effect	F	df_1	df_2	p	F	df_1	df_2	p
Condition (1,2,3)	5.92	2	104	< .01	.02	2	104	ns
Phase (A, B)	354.66	1	105	< .001	346.36	1	105	< .001
Type (initiation, modification and blocking)	53.00	2	104	< .001	267.31	2	104	< .001
Condition x Phase	12.49	2	105	< .001	4.30	2	105	< .05
Condition x Type	.94	4	208	ns	.32	4	208	ns
Phase x Type	30.71	2	104	< .001	27.83	2	104	< .01
Condition x Phase x Type	.22	4	208	ns	.64	4	208	ns

Condition: exp. cond. 1, cond 2., cond. 3 as described above, *Phase:* phase A= the reaction of the subject before the explicit or implicit suggestion; phase B = the reaction of the subject after the explicit or implicit suggestion; *Type:* the three types: modification, initiation and blocking.

(initiation, modification, blocking, as well as phase of experiment (phase A and B), respectively, being within-subjects factors. The results of these ANOVAs are reported in Table 2.

Concerning the phase factor, it can be seen in Table 2 that there is a strong effect on the behavioral recordings ($F(1,105)=354.66$; $p<0.001$) as well as on the self-ratings ($F(1,105)=346.36$; $p<0.001$). Figures 1a and 1b show the summed up scores for the 13 items. It can be seen from these figures that in phase B values were significantly higher than in phase A. This holds for behavioral recordings as well as for self-ratings.

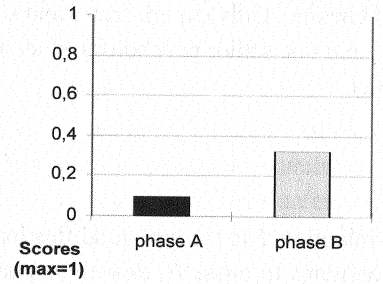

Figure 1a*: Behavior recordings (sum of all 13 items, Cond. 1 - 3)*

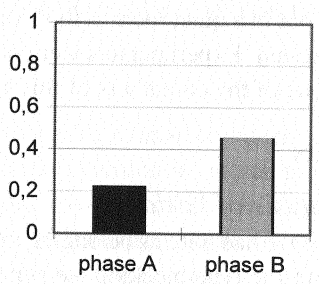

Figure 1b*: Self-ratings (sum of all 13 items, Cond. 1 - 3)*

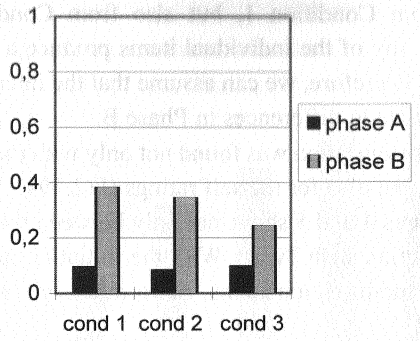

Figure 2*: Interaction of Phase by Condition (behavior recordings)*

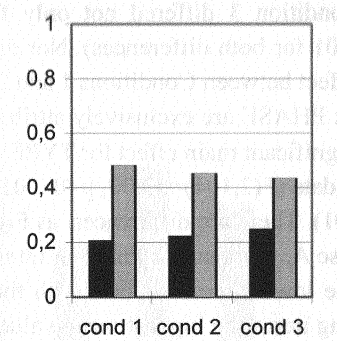

Figure 3*: Interaction of Phase by Con dition (self-ratings)*

The condition factor showed a main effect for behavioral recordings ($F(2,104)=5.92$; $p<0.01$). For the self-ratings, however, the condition factor proved to be insignificant. Figure 2 and 3 show the summed scores of the 13 items, split by condition and phase.

For the behavioral recordings, there was also a significant interaction CON x PHASE ($F(2,105)=12.49$; $p<0.001$).

With the observation data there was also a significant interaction CON x PHASE ($F(2,105)=12.49$; $p<0.001$); this interaction can only be attributed to differences between the conditions in Phase B. Two further analyses of variance (one for Phase A and one for Phase B) with the factor CON (using the summed value of all items) showed a strong main effect only in Phase B ($F(2,105)=10.71$; $p<0.001$). In contrast to this, in Phase A there was no significant difference between conditions. For Phase B a Tukey Test was performed which showed that Conditions 1 and 2 do not differ significantly,

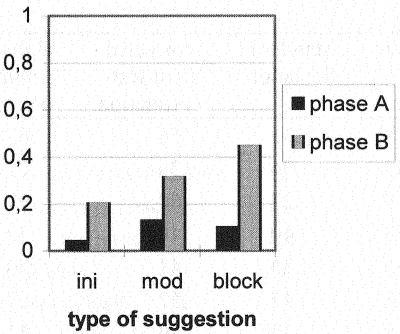

Figure 4*: Interaction of the Type of suggestion (ini = initiation; mod = modification; block = blocking) by Phase (A,B) (behavior recordings)*

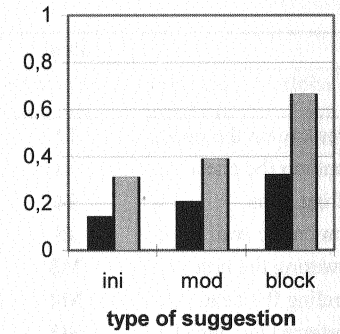

Figure 5*: Interaction of the Type of suggestion (ini = initiation; mod = modification; block = blocking) by Phase (A,B) (self-ratingsS)*

but Condition 3 differed not only from Condition 1, but also from Condition 2 ($p<0.001$ for both differences). Nor did any of the individual items produce a significant effect between Conditions 1 and 2. Therefore, we can assume that the interactions CON x PHASE are exclusively attributable to differences in Phase B.

A significant main effect for TYPE of suggestion was found not only with the observation data ($F(2,104)=53.00$; $p<0.001$), but also for the self ratings ($F(2,104)=267.31$; $p<0.001$). There are differences, as Figures 4 and 5 show, not only between the values of Phase A, but also for Phase in interaction with Types. With the initiation items we find the lowest mean values, with the modification items, more mid-, and with the blocking items the highest mean values.

Scale Analysis

The next analytical step was to make item analyses in order to construct a reduced scale which can be employed in future research.

For this analysis we used the recordings of behavior of Condition 1 and 2. Although there is no significant mean difference between Condition 1 and 2, we showed - by a multi sample analysis and a structural equation model (LISREL) supposing one factor - a significant difference between the structure of items between the two groups. ($Chi2=89.18$; $df=55$; $p<0.001$). It could be shown - by assuming the same weights - that the model of Condition 1 can be accepted ($Chi2=38.90$; $df=27$; $p=0.065$) while the model of Condition 2 must be refused ($Chi2=45.07$; $df=27$; $p<0.05$).

Since in Condition 2 the internal consistency was comparatively low (Cronbach's $a=0.56$) and there were only 3 remaining items, here we only present the data for Condition 1. This seemed to be most useful to provide a basis for a test of suggestibility in the motor field. Since in Condition 1 no attempts were made to counteract or reduce possible suggestive effects, the preconditions for arousal of suggestibility seemed best

Table 3: *Scale analyses of the behavior recordings (Cond. 1)*

	item	mean	standard deviation	corrected item-test-correlation	alpha if item deleted
1 pressure on the neck	**I2**	.28	.36	.56	.67
2 hand on the chest	**I3**	.35	.34	.30	.71
3 lifting arms	**I4**	.19	.27	.60	.67
4 arm on the wall	**I5**	.43	.40	.40	.70
5 lowering the arm	**M3**	.30	.32	.41	.70
6 circling the head	**M4**	.43	.47	.52	.67
7 preferred leg ahead	**M5**	.68	.45	.30	.72
8 leaning on wall	**B3**	.56	.34	.30	.71

Cronbach's alpha = .72

mean of scale = 3.19 ($x_{min}=0$, $x_{max}=8$)
variance = 3.02
standard deviation = 1.74

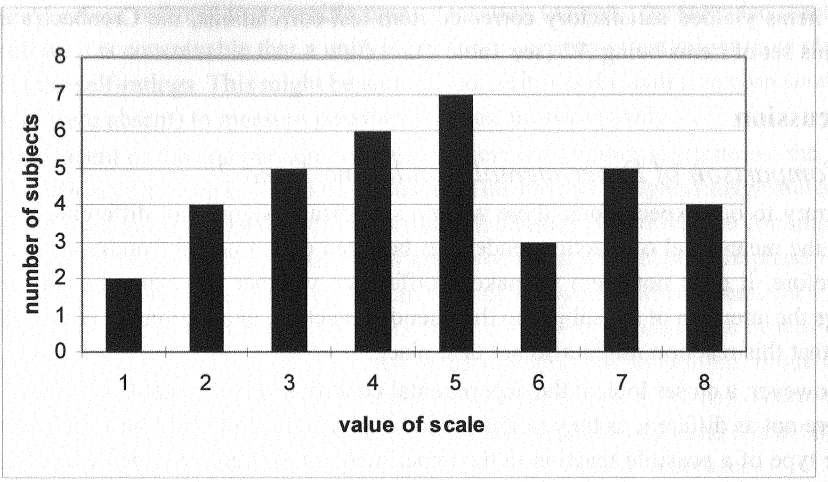

Figure 6*: Scores of the dichitomized recordings of the 8-item scale in Cond. 1 mean = 4.69; std.dev. = 2.06; median = 5.0)*

in Condition 1 (the between-subjects variance should be largest here). Therefore we only present the data of condition 1. For the behavior recordings of Condition 1, a total of 8 items had corrected item-test- correlations of .3 and above. For this set of items, an alpha of .72 was obtained. Table 3 shows the results of this analysis.

Figure 6 shows the frequency distribution of the scale values. Prior to summation, the raw item results were dichotomized as follows: values of 0 and 1 were set to 0, and values of 2 and 3 were set to 1. The distribution of these summed scores follows closely a normal distribution (for Kolmogoroff-Smirnov Test (test statistic = .104)).

The self-ratings of Condition 1 were also submitted to scale analysis. Here, a total

Table 4: *Scale analyses of the self ratings (Cond. 1)*

	type	mean	standard deviation	corrected item-test-correlation	alpha if item deleted
1 sitting with stretched legs	**I1**	.19	.34	.40	.69
2 pressure on the neck	**I2**	.28	.30	.42	.69
3 hand on the chest	**I3**	.41	.36	.39	.70
4 lifting arms	**I4**	.22	.28	.67	.64
5 arm on the wall	**I5**	.49	.33	.50	.67
6 circling the head	**M4**	.37	.38	.24	.74
7 leaning on wall	**B3**	.77	.30	.47	.68

Cronbach's alpha = .72

mean of scale = 2.72 ($x_{min}=0$, $x_{max}=7$)
variance = 1.96
standard deviation = 1.40

of 7 items yielded satisfactory corrected item-test-correlations, the Cronbach's alpha for this set of items being .72 (see Table 4).

Discussion

Comparison of Experimental Conditions 1 and 2

Contrary to our expectations, there was no statistically significant difference concerning the mean level of reaction tendencies between experimental Conditions 1 and 2. Therefore, it does not seem to make a difference whether the experimenter merely draws the attention of the subject to the intended reaction, or additionally points out the fact that this reaction might also not take place.

However, a closer look at the experimental conditions reveals that Conditions 1 and 2 were not as different as they might appear at first sight: In Condition 1, only a particular type of a possible reaction to the experimental task items was described. However, the permissive character of the instruction was an implicit hint to the subject that the described reaction might not take place. The instructions for Condition 2 simply made explicit the possibility of not reacting. In Condition 2 (as well as in Condition 1) no special reasons for a non-reaction were provided. In both conditions, subjects were given only a reason for why the specific reaction might in fact happen. A plausible explanation for a possible non-reaction was not given, because such an explanation might operate as a suggestion not to react and thus could counteract the intended suggested reaction. Hence, in both conditions subjects were given a rationale for reactions, not for non-reactions.

Comparisons of Condition 3 and Conditions 1 and 2

Statistically significant differences in the mean level of reactions only appeared between the behavioral recordings of Condition 3 and Conditions 1 and 2. Therefore, if an explicit description of the intended reactions is omitted before the second trial of the individual tasks (phase B), the number and intensity of suggestive behaviors is reduced significantly. The weaker influence of the implicit suggestions (Condition 3), in comparison with explicit suggestions (Conditions 1 and 2), arises partly from the fact that for Condition 3, there is a statistically significant phase A - phase B difference (for behavioral recordings) only for 7 out of 13 items. By contrast, in Conditions 1 and 2 these differences proved to be significant for 11 out of the 13 items.

Results are strongly in accord with studies in persuasion research which have shown repeatedly that explicit messages are more effective than types of communications based on implicit allusions (see O'Keefe, 1990). The fact that in all three experimental conditions practically no differences for the self-ratings were found (explicit and implicit suggestive cues seemed to be equally effective on the level of self-perception) might have to do with the specific measurement techniques that were employed by us. In order to be able to compare all the subjective aspects of the motor reaction in all three conditions, leading questions were introduced for each item in both phases (A and B).

These questions referred to a specific type of reaction (namely, the intended reaction). Therefore, it is conceivable that a unifying leading-question-effect might have characterized the self-ratings. This might be anticipated, as it was difficult (the corresponding anchors were absent) to measure possible changes, introspectively.

Independent of the comparison between explicit and implicit suggestions, the latter type of influence as such is still to be discussed. The effects of implicit suggestions cannot be reduced to the suggestive allusions made in phase A. The influence coming from the demand characteristics of phase B has also to be taken into account. In phase B, the subjects were not directed to a particular type of reaction. Nevertheless, they were required to repeat the phase A-movements under conditions of relaxation or tension. It might have been implicitly communicated to the subjects that "something" might change (what this might be, nevertheless remained unclear for the subjects). Therefore, it can be hypothesized that there is a summation of the suggestive demand characteristics of the treatment of the phases A and B, and subject's preceding inferences.

Scale construction

The behavioral recordings as well as the self-ratings of Condition 1 seem most useful for scale construction. Here, we were able to construct a reduced scale which had reasonable reliability and item-test-correlations.

However, these sets of items cannot be interpreted as final psychometric scales. There are still some problems of the current sets of items which have to be checked in further research. For instance, there must be an improvement of the recording of behavior and the valence of the responses. Since a three-stage arrangement of weak, mean, strong (see dependent variable) is not always possible, the question arises, if a bimodal or nominal measurement (reacted, not reacted) would not be better.

Possible Factors influencing the Induction of the Motor Reaction

The discussion in the literature from time to time on suggestion-dependent "ideomotor" reactions exclusively refers to their manifestation in the context of hypnosis. The issue of whether these reactions should be viewed as non-voluntary in character is a central one for the whole area. Apart from the topic of "ideomotor" reactions, the arguments have also a lot to do with controversial approaches to hypnosis itself (for overview, see Kirsch & Lynn, 1997). However, we feel that fruitful discussion stand focus on relevant approaches to cognition and social psychological theories which offer valuable hints for the explanation of suggestion phenomena in a non-hypnotic context. The whole debate nevertheless runs the risk of placing too much emphasis on the paradigm of "voluntariness/involuntariness", thereby neglecting other relevant topics. One of these topics refers to the factors of influences rendering a reaction in accordance with the suggestions possible in the first place.

With regard to the results presented, the following factors of influence should be taken into consideration (see also Gheorghiu & Kruse, 1991; Gheorghiu, 1993).

(a) Situational ambiguity and uncertainty. Subjects are typically confronted with experimental tasks that are new and unfamiliar to them. Because of this, they can hardly be interpreted and classified in terms of the common tasks. Additionally, subjects commit themselves to a quick reaction. Therefore, they are surprised and have only a limited amount of time to develop reaction strategies (either consciously or unconsciously). The post-hoc self-rating task is also charged with situational ambiguity. When judging his or her own behavior, it is not so easy for the subject to give an adequate estimation based on the behavioral changes that actually happened. The task of self-rating is not independent of situational ambiguity.

It is also conceivable that offering two possibilities to react (Condition 2) instead of just one produces an increase of uncertainty and instability. Therefore, a decision in favor of the alternative appearing more plausible might be expected to be more probable. The importance of conditions of ambiguity in connection with instability for evoking suggestion-dependent reactions has been noticed very early (Binet, 1900; Coffin, 1941; Sherif, 1935). However, later research has neglected their significance. They play a facilitative role in suggestive situations, and allow suggestions to break through.

(b) Plausibility of the test situation. In traditional research on motor suggestibility (based on direct suggestions) the plausibility factor only played a minor role. With the introduction of indirect techniques (producing an "as if"-situation), plausibility of manipulations grew increasingly important. In the process of deception, as Irle (1979) points out, we are always interested in a minimization of the veridicality of a situation and a maximization of the subjective certainty. The objective of an experiment on deception is therefore to maximize the certainty of the subject.

In the work presented here, several manipulations served such a purpose: (1) The introductory explanations about the experimental objectives pointed to the effects of relaxation and tension on motor processes. This statement was communicated in a self-explaining manner (requiring no further explanation). (2) The subsequent completion of a short exercise of relaxation or tension before phase B of each task (item). Here, the subjects attention had been drawn to potential changes in behavior brought about by these exercises. The circular causal constructions introduced here (" ... if you are relaxed pretty well ... it might happen that ...") were meant to convince the subject that the behavioral changes were actually caused by him- or herself. (3) The use of two phases. Behavioral changes were only expected in phase B, because phase A lacked the necessary experimental preconditions. (4) The use of dummies, that made up about the half of the set of tasks. And (5) the physiological measurements (pulse). The intention of these manipulations was to construct a context, where the experimental tasks acquired the status of a "matter of course" (with nuances that stemmed from the differences between experimental conditions).

The conviction provided by the explanations allegedly given to subjects allowed better understanding of the experiment, but this effect could only have been partial. After all, it was based on pseudo-facts, and (either explicitly or implicitly) there was

always the option to "react differently". From the comments of the subjects on completion of the experiment, it was obvious that none of the subjects connected the study with suggestion research. Nevertheless, 30.5 % (Condition 1) and 39 % (Condition 2) of the subjects stated that the directions of the experimenter about possible behavioral changes during the individual tasks disturbed them to an intermediate or even high degree. In Condition 3, only 8.4 % of the subjects made such a statement.

When placed in the context of persuasion research, our experiment can be interpreted best in terms of the "elaboration-likelihood-model" (Petty & Cacioppo, 1986). The type of influencing process investigated by the current experiment can be viewed as a "peripheral route". Such a process is based on simple and unconscious heuristics (i.e., when physical exercises are performed, there will be an influence on the corresponding muscles), since the necessary preconditions for a more elaborate type of cognitive processing (corresponding to a "central route") are missing. A "higher" type of motivation on the part of the subjects cannot be assumed. Of special note, there has been no intrinsic motivation in the experiment, and the results were of no direct interest to the subjects themselves. Moreover, subjects were in no way dependent on the experimenters.

(c) The compliance component. The results of the experiment are determined by compliance effects at several levels. First, there are general demand characteristics (as described by Orne, 1962) which seem to have influenced the self-ratings of the current experiment. Additionally, there have possibly been some specific demand characteristics (defined after Lewin, 1926), since every type of experimental tasks incites experimental participants to do something. Finally, the appellative nature of speech (Buehler, 1934) being transmitted by the verbal instructions might also have favored affirmative tendencies on part of some subjects.

Specific motor responses triggered by indirect techniques are hard to detect. Rather, for reasons of the situational ambiguity, the plausible context, the specific social psychological conditions, and the available suggestive cues, the subjects seem to develop a readiness to react that is described best in terms of Kirsch's (1990) response expectancy. In the experimental context a type of "logic of the matter" seems to arise, triggering hypothesis-guided behavior. In suggestibility research this basic form of a "top down"-effect was first described in Binets concept of "leading ideas" (l'idee directrice). There, Binet (1900) described an autosuggestive process manifesting itself through apparently valid observations and conclusions, which finally produced (short- and longterm) changes in behavior. (Binet's conclusions were based on results of experiments employing indirect suggestion techniques, like "progressive lines and weights"). It is this kind of ("false") attributions caused by the "leading idea" which is accentuated through the above described indirect motor techniques. In this way, more reflective cognitive mechanisms and the option to "react differently" are excluded. Still, there is the question why this does not happen more often. To find an answer here is quite difficult, because non-suggestive behavior is not necessarily accompanied by rational insight (Gheorghiu, 1981). Some subjects show themselves surprised when they find

out that "nothing happens".

Our final cautionary note is that, if the current approach results in valid and reliable psychometric procedures, it will be necessary to test the relationships of these procedures with other non-hypnotic and hypnotic measures of suggestibility.

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Appendix A: Brief description of testitems for a motor reaction

	Phase A task	Phase B task	Interrogation after Phases A and B	Explanations for Phase B about intended reactions
I1	Please sit upright on your chair and relax.	Stretch your legs and relax as good as possible.	Did you notice a tendency of your head to move backwards?	Should you be relaxed well enough it is possible that your head moves backwards.
I2	Please stand up and press both hands against your neck.	Before you start pressing again, tense your whole body.	Did you notice an inclination to fall forwards?	Maybe your muscles are not capable to keep balance if they are tensed. Should you fall forwards, you will make a step forwards instinctively.
I3	Please stand upright and press your hand against your chest.	Now relax as good as possible, and start again to exert a pressure on your chest.	Did you notice an inclination to fall backwards?	If your body is relaxed well the exerted pressure can cause a falling backwards. A step backwards can prevent you from falling.
I4	Hold both arms diagonally in front of your chest and lift your left arm quite slowly.	Please tense your arms strongly, and then lift the left arm again.	Did you notice a tendency to lift the right arm as well?	Please, note if you experience an involuntary tendency to lift you right arm as well, caused by tension in your arms.
I5	Lean against the wall with your right arm, and step aside at my signal.	This time, please, press your right arm and your whole body heavily against the wall (by this form of pressure with the whole body a Kohnstamm-effect is not caused)	Did you notice a tendency to lift your right arm?	If the pressure is strong enough, it is possible that the arm lifts by itself as if it would equalize the pressure.
M1	Swing your arms back and forth in front of your body.	This time, please move your arms jerkily.	Did you notice a tendency to move your head as well?	Please note if your head tends to follow this movement involuntarily, because some people have a tendency to follow jerky movements with the eyes.
M2	Hold your hands in front of your chest and press your hands against each other.	Hold your non-dominant hand like before but make a fist with it. Press again.	Did you notice a tendency for your dominant hand to push aside the other hand?	Because your dominant hand exerts more power when a fist, it is possible, that you could cause the other hand to slide aside.
M3	Lift both arms to the height of your shoulders, then move them downwards real slowly.	Before you move your arms down again, please put your dominant arm under strong tension.	Did you notice a tendency for your non-dominant arm to move quicker than the other arm?	It may be possible that the heavy tension in the arm leads to a slower downward movement than the other arm.
M4	Please move your head in a circle real slowly. Stop the movement and continue upon my signal.	Let's now repeat the circular movement of your head. However, during the break we will perform a relaxation exercise.	Did you notice a tendency to move your head in the opposite direction after the break?	For reasons of compensation it is possible that after relaxation the direction of the circular movement changes spontaneously.
M5	Make a step forwards and pull the other leg behind the first one. Now once again.	Now repeat the same exercise. However, before the second step, please, put the one leg which you used first under strong tension.	Did you notice a tendency to use the other leg for the second step?	Please, note if you feel a tendency to use the other leg for the second step. The first one might feel stiff, because of the strong tension.

(I = Initiation; M = Modification; B = Blocking)

	Phase A task	Phase B task	Interrogation after Phases A and B	Explanations for Phase B about intended reactions
B1	Fold your hands with your palms upwards and press the fingers against each other as hard as possible. Then try whether it is possible for you to pull your hands apart.	Now fold your hands again at the same way, put them under strong tension, and stiffen your fingers.	Did you notice a feeling that your fingers can hardly be pulled apart or cannot at all be pulled apart?	Please note if your hands can not be pulled apart. The strong tension could prevent your hands from being parted.
B2	Sit down, close your eyes and relax as good as possible. Breath calm and relaxed. Soon, I will give you a sign to open your eyes.	Close your eyes again. Now, turn your eyeballs inwards and upwards, towards your root of nose. Hold this setting and try to find out whether your eyes can now be opened.	Did you notice a tendency that it is hardly possible for you to open your eyes?	The so-called convergence of eyes can make the eyelids inert. For this reason it could be impossible to open the eyes during this exercise. Hold this setting and try to open your eyes.
B3	Lean against the wall with your shoulders. Close your eyes and try to move up without using your arms.	Try this time to put your whole body under strong tension.	Did you notice that you could not move up?	The tension can lead to a self-blocking of the body position. Consequently, it might prevent your body to move up.

(I = Initiation; M = Modification; B = Blocking)

1 With the dummies no explanations were given because the reactions were triggered by physiological cases. The intended reaction is only mentioned in the interrogation after phase A + B.

2 Relaxation causes the perception that the weight has actually increased.

3 Item is based on the "reversal effect" (Gheorghiu, 1997).

4 Item is based on the Kohnstamm effect (Kohnstamm, 1915).

Appendix B: Brief description of the dummy-items[1] (D1 - D12 = Dummies)

	Phase A task	Phase B task	Interrogation after Phases A and B
D1	Stretch out your arms and start to mark squares in the air with both hands.	We will now repeat this exercise, but this time you will gradually increase your speed while marking squares.	Did you notice a tendency to mark circles?
D2	Lift this weight (50 g) with your hand under heavy tension and let it come down immediately afterwards.	Now relax your right hand and lift the weight once again. [2]	How heavy did the weight feel? Please, mark on a scale ranking from 1 to 5.
D3	Stretch out your arms and start marking circles with both arms.	Please try now to mark the circles in a clockwise manner and gradually increase your speed..	Did you notice a tendency to change the direction of the circles?[3]
D4	Stretch out your right arm and put your left hand around the right one. Now press the hands against each other (5 sec.)	Press your hands against each other in the same manner for 1 minute. Then, relax them again.[4]	Did you notice a tendency of your right hand to move upwards?
D5	Stretch your legs and let only your heels touch the ground.	Keep sitting like that and try to relax your leg very well.	Did you notice a tendency of your feet to fall outwards?
D6	Same as D3 with circle movement of legs.		
D7	Lift your right arm and let it sink slowly. Put your left hand around the right one. Now let the right arm come down quite slowly.	Now let your right arm sink once again. As it comes to the height of your shoulder press your upper right arm briefly with your left hand.	Did you have the impression that your right arm stopped briefly when being moved downwards?
D8	Shortly, I will pretend to hit your chest. Please allow yourself to fall backwards and catch yourself with one leg. – Hit -	Now I will pretend to pull you forwards. Please react in the same way. – Pull -	Which foot did you use to make the step?
D9	Fold your hands and notice which thumb is lying on top.	Now fold your hands again the way that your other thumb will be lying on top.	Does it feel strange?
D10	Stand upright and make a step aside. Then pull the other leg behind. Repeat it once more.	Repeat the first step. Relax the leg with which you made the first step. Now make another step aside.	Did you notice a tendency to use the other leg for the second step?
D11	Sit down and fold your legs and allow the upper leg to hang down in a relaxed way. Now hit the upper leg with the edge of your hand right below the knee.	Now fold your legs once again and put the upper leg under strong tension. Hit the leg at the same place but a bit stronger than the first time.	Did you notice a tendency of the upper leg to move forwards in a reflex-like manner?
D12	Sit down and stretch your legs and arms. Now mark circles with arms and legs.	Now try to circle your legs inwards and your arms outwards.	Did you notice a tendency for your legs to circle in the same direction as your arms?