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From Measurement to Interpretation of Change in Psychopathology

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Summary. The experimental literature on changes in verbal self-report, psychophysiological reactions and overt motor behavior under stress or therapy is reviewed. The concordance of changes across the systems is generally low, their order difficult to predict. The correlation of changes is interpreted to depend—besides crucial methodological issues—on the preparedness of the subject to test and to modify his propositions defining in which situations he might experience certain somato-visceral reactions and emit certain overt motor acts successfully.

Key words: Interaction of behavior – Psychophysiology and cognition – Behavior therapy.

It is my task in this symposium[1] to discuss some problems concerning the measurement and interpretation of change in the treatment of nonpsychotic disorders. I shall concentrate on those groups of patients that can be characterized by an excess in frequency and/or intensity of a narrow class of behavior deemed symptomatic. If it is considered avoidance behavior the patients are usually called neurotics; if it is considered approach behavior most of them are called addicts. No other groups from the same category of the ICD system have received as much attention. Whenever there is a choice of examples I shall cite more recent, including unpublished, studies from German laboratories, because they are likely to be less well known than those from Britain or the United States.

Especially with regard to anxiety it has become common practice to differentiate three broadly defined response systems: overt motor behavior, somato-visceral activity, and verbal self-reports. When evaluating therapeutic interventions one therefore tries to collect information from all three systems, whether one considers them functionally equivalent or not. Strangely enough, in research with addicts one seems to be interested only in overt behavior. It is most unusual that verbal self-reports about craving, or psychophysiological reactions to the symptom-related stimuli, are collected in the same venture.

[1] Paper presented as last contribution to the symposium "The Measurement of Changes in Psychopathology and Behavioral Disorders" (Chairman: Detlev Ploog). VI. World Congress of Psychiatry, Honolulu, Hawaii, 1977. See also the preceding papers by Wieck, v. Cramon, Emrich and Eilert, Heimann, Schulz et al.

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Most of what will be discussed in the following deals with the relationship between these three systems. This relationship seems to me to be of utmost importance, as the most striking difference between schools of therapy, aside from their jargon, can be seen in the priority they set in attempting to change one or another of the systems. Most psychotherapists aim at cognitive appraisals of subjective experience; drug therapies and relaxation techniques aim at influencing somato-visceral activities; and some behavior therapists proceed as if nothing existed except overt motor acts.

I had hoped to be able to present you with a summary table of quantitative results from about 40 articles dealing with behavior-therapeutic enterprises and more than 90 articles dealing with stress and other experimental conditions that have provided information about changes in at least two of the systems. Unfortunately, I found myself unable to accomplish this task. Not because I was too scrupulous to mix obsessive-compulsives with undergraduates afraid of spiders, but because most publications did not allow a judgment as to whether the distribution of scores satisfied the minimal conditions for significant correlations. Let me mention four problems which can be considered to bias most of the empirical data to an unknown degree, mainly in the direction of accepting the null-hypotheses of no relationship between the systems.

(1) You cannot expect change-scores from different response systems to correlate if the scores from only one of them deviate significantly from what might be considered a baseline. But this is the state of affairs in nearly three quarters of the publications. Changes in different systems can be compared only when the measures are about equal in reliability, variance, and average deviation from the norm (Chapman and Chapman, 1973).

(2) Most publications reporting psychophysiological data report a decrease in heart rate and/or skin conductance, but less than half of them had a control group or control condition which would allow one to judge whether this decrease might be more than mere habituation or adaptation to the test situation.

(3) Just as people differ in how they spend their leisure time—and no single measure such as number of hours spent playing chess or watching TV could be considered representative—there are reliable idiosyncratic response patterns in the psychophysiological reactions to stress. In measuring just one response such as heart rate the arousal reactions of many subjects might pass unnoticed. Knobloch (1976) found, that depending on the criterion, 15 to 30% of her 60 subjects gave highly significant evidence for Individual Specific Response patterns in the autonomic system. Applying the same methodology to a variety of verbal self-report scales about subjective experience under different stress conditions, approximately the same proportion of subjects was found to have significant Individual Specific Response patterns in this more cognitive response system. Half the subjects with idiosyncratic response patterns in the somato-visceral system also showed idiosyncratic response patterns in the verbal self-report system. In agreement with this study Engel-Sittenfeld and Engel (1977) found 40% of the variance in the psychophysiological reactions of insomniacs to various sorts of stress to be accounted for by the interaction of subject and psychophysiological variable. These Individual Specific Response patterns were more pronounced in women than in men.

(4) It has become common practice in research to ignore the basic fact of life that time-point *t* can never be independent of *t-1*. The properties being measured may have changed. To illustrate this it might be worth mentioning that Fahrenberg et al. (1977) found not a single self-report or performance measure such as tapping or simple arithmetic that yielded similar intercorrelations on consecutive days. Apparently you cannot loose your virginity day after day.

But there is a nice example of how one can take advantage of this heterogeneity in covariances to demonstrate changes in the quality of what occurs in a time series. Revenstorff (1976) correlated the number of cigarettes reported smoked at 13 points in time to compare the course of effect from six therapeutic and three control conditions. For aversion therapy, for instance, there was a slight but steady decrease in the number of cigarettes smoked as well as in correlations with the baseline. As therapy proceeded, the rank order of the subjects changed in respect to the criterion used. For self-control training the decrease in both curves is more rapid and much more pronounced. The same is true for placebo pills. The number of cigarettes smoked after treatment seems to depend not so much on how much the subject smoked before, but on how he reacted to the intervention. The reverse is true for nondirective therapy. While there is about the same decrease in number of cigarettes smoked and in correlations with the baseline as long as the subjects are in treatment, in contrast to the other methods the original rank-order is reestablished shortly after treatment. The influence of the therapy comes and goes with the nondirective maneuvers. Applying an autoregressive model Revenstorff (1976) was thus able to show when and where a specific method of treatment added something qualitatively different from what was observed before.

I hope these arguments and data help you to understand why I am reluctant to present any average correlations from the published data. Only very rarely does one find correlations from measures that supposedly tap different systems and that account for more than 10% of the variance. This is also true for correlations within subjects across time, when corrected for a monotonic decrease in activation due to adaptation (Fahrenberg et al., 1977). It might well be that the three systems act in concert to a much higher degree than is revealed in these figures. But I am afraid there is not much basis for such optimism. Different measures within either the autonomic or the behavioral system, presumably representing the same dimension, only rarely generate correlations higher than those between the systems. Thus, unless proved otherwise, it might be more realistic to give the different response classes independent conceptual status and safer to treat them in their own right rather than assume them to be glued together by nature or some underlying disorder (Bem, 1972).

How can such surprisingly low correlations between changes in different systems be reconciled with the fact that about three quarters of the publications reporting therapeutic changes in the average scores of overt behavior or verbal self-report also document corresponding changes in the other system? For comparisons with psychophysiological measures the proportion is somewhat lower, but still more than half the reports show averages going in the same direction. The answer is that there must be large individual differences in the

order and rate of the corresponding changes across systems. As Schroeder and Rich (1976) summarize their findings:

"The initial variable in unraveling the fear response appeared to be idiosyncratic to the individual subjects. Some subjects initially showed more cognitive changes, others more behavioral changes and still others more autonomic changes" (p. 198).

Thus it is possible, as suggested by Hodgson and Rachman (1974), that the longer the interval between pre- and posttest, the greater the chance other systems have to catch up, and the higher the concordance between one's measures.

What do we know about the 'normal' sequence of events? Common sense psychology usually takes behavior to be the consequence of subjective intentions and feelings. Freud realized the lack of correspondence between verbal reports and overt behavior, and he was ingenious enough to invent the unconscious to preserve this traditional view. Most experimental psychologists tried it the other way around. Considering most overt behavior and physiological reactions to be under the direct control of external stimuli, the only variables in need of explanation were the individual's reports of internal states. Today we have an abundance of studies on cognitive dissonance and attribution theory that show how individuals infer their internal states—at least when internal cues are weak and ambiguous—from their own overt behavior, and the external circumstances under which the behavior occured, just as an outside observer would do (Nisbett and Wilson, 1977).

But what if the order is reversed? In the treatment of speech-anxious subjects, for instance, Tunner et al. (1975) found for both systematic desensitization and self-control training a significant improvement in the electrodermal responses around the fourth in-vivo test after 12 sessions of therapy, following an improvement in objective behavior indices around the third in-vivo test after 9 sessions. These results followed improvement in subjective self-reports after the first three sessions. The results are by no means exotic. I found exactly the same number of studies—six—with autonomic changes coming before and after changes in subjective reports.

How can either learning or attribution theory account for such an order of events? They can't. They could explain synchrony as coeffect, assuming overlapping functional properties of the same stimuli. They might even explain changes in overt behavior to follow changes in self-report with reference to some hypothetical drive toward consistency: if you think of your self as free of anxiety you might behave accordingly. But I did not find any theory that would allow for physiological reactions trailing behind.

Such results, as well as the distressingly large number of patients showing all signs of anxiety without any identifiable prompts, or showing persistent avoidance behavior after all physiological and self-report indications have disappeared, lead more and more behavior therapists to believe that cognitive processes play a prominent role in the initiation, acquisition, and retention of responses. All too often much more speculation is needed to link physiological and motor responses through peripheral mechanisms to external stimuli than to conceptualize these, as the subject's appraisal of his ability to successfully engage in certain behavior. Such appraisals might be thought of as propositions—not necessarily linguistic

ones—defining the subject's relation to his world (Lang, 1977). Many studies have shown that in-vivo training is usually more effective than symbolically based experiences in changing pathological reactions, and that verbal persuasion, the manipulation of outcome, or false physiological feedback have at best limited and short-lived success. The most effective way to change a patient's self-appraisal or propositions is clearly under the guidance of real life (Bandura, 1977).

I would like to propose that overt behavior, physiological reactions, and self-reports will change and influence each other only to the extent that the subject is prepared to test his propositions defining whether and when he might successfully emit certain responses in a given environment. Furthermore, only to the extent that the propositions tested do not merely assert certain features of the objects in his environment, but define also the likelihood of overt behavior and somato-visceral reactions of the subject himself, can one expect new experience to effect more than just responses from the cognitive system. This latter assumption is primarily based on the repeated finding that the higher the concordance between heart rate and self-report during desensitization, the greater the therapeutic success. Ferstl (1977) found a corresponding relationship in the treatment of obese patients. He compared patients who lost at least 10% of their overweight and regained not more than 20% of it within two years after treatment, with less successfully treated patients. Those who profited most from treatment had significantly higher correlations between verbal reports of hunger and a measure combining time elapsed since the last meal and calory intake at that meal. Again, the higher the correspondence between self-report and physiological state, the higher the rate of success.

It might not be unreasonable to assume, forgetting at the moment the possible influence of external demands, that the amount of concordance between the systems is not a matter of heredity but of self-awareness and preparedness to adjust one's self-appraisals to one's own physiological and behavioral responses. This is exactly what we earlier called the testing of propositions that certain motor acts will be emitted or physiological reactions experienced in a given environment. We know from many experiments that such an awareness can be learned and that it is a prerequisite for self-control. We are still far away from understanding what it means to 'test propositions' and how the neural centers of the brain organize what appear as interactions between the systems. But the increasing preparedness to accept empirical data whether they fit an established theory or not, together with the increasing number of methodologically sophisticated longitudinal studies, allow at least for some hope that we might come closer to understanding what occurs when we see people change.

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