

The measurement of subjective symptoms

by Lennart Sjöberg, PhD¹

Is it possible to measure subjective experience? The answer depends, of course, on how measurement is conceived and what requirements are made for accepting a certain procedure as an example of measurement.

Scepticism about the measurement of subjective experience has several roots, some of which are historical and philosophical. In psychology behaviorism was long a predominant school of thought. Orthodox behaviorists argued that mental life could not be studied scientifically and that psychology should be restricted to the study of overt behavior. This attitude is no longer common. The study of perception and other subjective phenomena such as thought and decision making have long been accepted as scientifically respectable fields of psychology. When it comes to measurement, however, additional obstacles enter the picture. Can you measure something which is not physically present, such as a mental state, and how can you go about it? Early discussions of measurement assumed that measurement required that "objects" could be combined in a way which could be interpreted as addition. A much more comprehensive and profound analysis was presented by Suppes & Zinnes (19), who argued that measurement is the establishment of an isomorphic relationship between empirical and mathematical systems. The operation of addition need not be interpreted empirically. Other operations can be interpreted instead. The "objects" to be measured need not exist physically; they can just as well be mental states. It is true that the physical existence of a unit of measurement may simplify certain types of inference, but not necessarily. [For a detailed discussion of current operational procedures in psychology, see Sjöberg (12)].

Thus mental life can be studied, and even measured, and many investigations have shown that the study of mental life is a meaningful and fruitful endeavor on the part of the psychologist.

Some concrete examples follow.

Measurement of mood

In my earlier work I was concerned with the evaluation of drugs. We found that traditional psychomotor tests were fairly insensitive to drug effects, while mood ratings were often quite sensitive and gave reasonable results. However, even cursory perusal of the literature on the measurement of mood demonstrated the need for simplifying and clarifying what the dimensions of mood actually are. Earlier work, such as that of Nowlis (6) and Cattell (2), had apparently shown that mood should be measured on a large number of scales (10–15) and that there were no bipolar mood dimensions. The mood dimensions suggested by Nowlis and Cattell were partly confusing and only partly overlapping. Especially the lack of bipolar dimensions was puzzling. For example one would expect a person who says that he is happy to reject the statement that he is at the same time sad. Happiness and sadness would in Nowlis's work typically end up as different factors which were approximately orthogonal in relation to each other. This placement would mean that one can be happy and sad at the same time! Although this statement may have some poetic and suggestive value, it seemed to us to be fairly unreasonable.

The literature revealed that certain methodological errors had been committed by earlier researchers. The sample sizes had often been small and, more important, the response scale that had been used by most workers in the Nowlis tradition did not have an established order of the response categories. Detailed studies of the regression plots showed that the insertion of a "don't know" category had been done in an arbitrary and unjustified manner.

Finally, use had been made routinely of the common factor model, although accumulating experience on the analysis of subjective rating data had suggested that other models, in which correlations were interpreted as distances rather than as scalar products, may be more suitable.

With the use of a more appropriate factor model and response scale and a large sample of subjects, the mood space could be reduced to basically two dimensions. This work has been summarized by Sjöberg et al (16, 17). These two dimensions are measured by three scales, as shown in figure 1.

¹ Department of Psychology, University of Göteborg, Box 14158, S-400 20 Göteborg, Sweden.

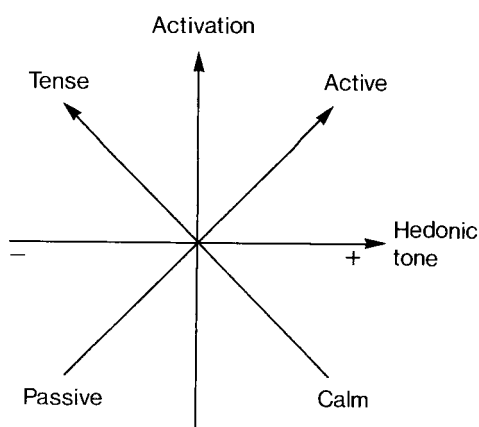


Figure 1. Mood and dimensions and scales according to Sjöberg et al (15).

The first dimension is hedonic tone, which ranges from sadness to happiness. The second dimension has been termed activation and ranges from passive and calm states to active and tense states. It is basically measured by two different scales, possibly because the Swedish language is not rich in words which describe activation without, at the same time, being loaded on the hedonic factor. One of the activation scales goes from tense to calm states and the other from active to passive states as shown in the figure. Other workers have subsequently or at the same time, and independently of us, confirmed similar mood structures.

The mood scale has since been used in a large number of studies. I would like to mention specifically validation studies on drugs (20) and alcohol effects (8). The scale has also been used for measuring the variation in mood as related to personality and sex (15), mood and expectations (18), and the interaction of emotional and cognitive processes. In a doctoral dissertation (1) Blomkvist also introduced the idea of using the scale for both state and trait mood ratings with interesting results. In using the scale for trait ratings, subjects are asked to rate their typical rather than temporary mood. Further studies of mood, expectation, and coping in stressful situations are in progress, as well as a project in which mood ratings are used to study the effects of industrial solvents.

The mood questionnaire consists of 71 adjectives which are grouped into six different scales, three of which are the basic mood scales. The reliability of these scales is about 0.8. The questionnaire takes about 5 min to administer. Some norm data are available. Repeated administration of the scale does not seem to give rise to systematic level changes but rather results in changes that are in line with what is to be expected according to the specific circumstances of the study.

Persson & Sjöberg (7) also described the development of scales of physical symptoms specially selected for their relevance in the study of industrial solvents. A scale was constructed for the measurement of physical symptoms, and the symptom dimensions were related to mood scales. There were considerable correlations between subjective mood and physical symptoms. These correlations were particularly interesting because psychological factors such as expectations had earlier been shown to have relatively modest effects on moods. The experience of bodily processes is a field that has been much neglected in psychology in spite of William James's well-known theory of emotion. I feel that this is a line of work that merits further investigation, because it is of obvious potential relevance to practical medical problems. Persson recently presented a study on galvanism which is an example of this line of work (9).

Alternatives to subjective scales and a critical discussion of reports on mental phenomena

Traditionally there have been several competing approaches to the measurement of mental states, particularly in the field of emotion. These include psychophysiological measurements of emotion, observation of overt behavior, and more indirect techniques such as projective tests. Psychophysiological indicators are coarse and do not allow finer differentiation of emotional states. Overt behavior is even more difficult to interpret because people do not express only emotion in their behavior, but are mainly concerned with various types of instrumental striving (10), the goals of which may be quite covert. The more indirect approaches, as exemplified by the use of projective tests, give results which are in my view even more difficult to interpret, and they are certainly subject to much controversy in the psychometric literature. The reliability of projective tests is notoriously low, and their predictive validity is doubtful. This situation does not mean that they cannot be used, but certainly that their basis of justification is considerably more shaky than that of the scaling of subjective symptoms. (These critical remarks on projective tests do not necessarily apply to the use of projective tests for other clinical purposes.)

Some of the traditional critical comments on the measurement of subjective states will now be commented upon. The behavioristic tradition argued that mental states cannot be studied scientifically. In a recent paper Nisbett & Wilson (5) argued that people cannot make valid reports of mental processes. This paper has been widely discussed, and there seems to be considerable agreement that their critical attitude was overstated. For example Ericsson & Simon (3) argued that at least some types of cognitive processes can be assumed to be reflected in verbal reports; and the bulk of work in which subjective scales have been

used with success, in the sense that results have been reasonable and fruitful, testifies to the same somewhat optimistic conclusion. Another line of criticism takes its support from the feeling which raters often have that their ratings are arbitrary or even highly arbitrary. It may be true that in a concrete rating situation it is due to chance whether one picks a certain response category or a neighboring one, but this does not preclude the use of subjective scales. All measurement is inevitably attended by errors. Psychologists have developed an error theory which can be used to analyze the extent to which their scales are affected by error. The use of several scales measuring the same concept is the basic trick whereby one can reduce the influence of error; in principle one can in this way reach respectable levels of reliability. (It may be noted that many physiological measures which appear to have more scientific respectability turn out, when analyzed with the same strict criteria as psychological procedures for measurement, to be equally prone to error or even more so.)

Finally it must be admitted that biasing factors can enter into subjective ratings. This is particularly true if the ratings are done under circumstances in which tactical considerations enter in a forceful manner, for example, in various applied industrial settings. To this criticism one can only answer that methods are available for estimating the size of bias factors and for minimizing their influence. Furthermore, the fruitfulness and reasonableness of results testify that bias cannot be of predominant importance.

Mood, action, and life-style

Although psychologists long argued that psychology is the study of behavior, there have been remarkably few attempts to live up to this principle. What behavior do people actually carry out, and how is it experienced in real life?

Two studies have been reported (10) in which samples of real life actions were taken on a random

basis by means of a time sampling procedure. It was found that behavior was mostly instrumental and that it was carried out in positive and neutral mood states. There were remarkably few negative moods reported.

It is well known that various coping mechanisms may be used for producing positive mood states and that such mood states are favorable for the efficient regulation of action. It has even been reported that normal people, as compared to depressed patients, have a more distorted self image in the sense that they believe that their social environment regards them in a more positive way than it actually does. Distorted beliefs may therefore serve a positive psychological purpose [see the reports of Sjöberg (11) and Sjöberg & Biel (14)].

In the past behavioral toxicology has been mostly concerned with perceptual and motor skills and acute mood effects. However it is probable that long-term exposure to toxic agents in the work environment carries with it other effects associated with style and quality of life. For example, toxic agents could make people more passive and foster a passive life-style and a lower quality of life. This possibility is at present being investigated in a study on the effects of certain industrial solvents.

Relating subjective and objective phenomena

Many students of mental life have tried to relate mental life to various objective and physiological phenomena. This, of course, was the goal of classical and modern psychophysics, in attempts to study how physical stimulus dimensions affect corresponding subjective experiences.

When it comes to explaining mental phenomena, however, one is wise to keep as close as possible to these phenomena. It has repeatedly been found, for example, in studies on attitudes, that "distant" factors such as personality variables and physiological fea-

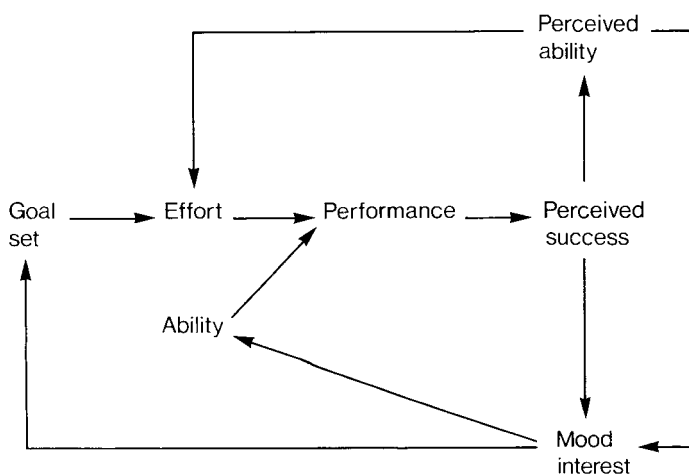


Figure 2. Suggested model of short-term feedback effects of performance.

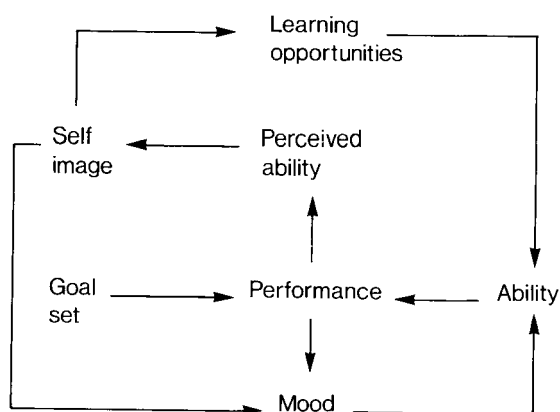


Figure 3. Suggested model of long-term feedback effects of performance.

tures have little relation to subjective ratings. However, if these ratings are related to various components in the belief and value structures, it is quite easy to find the major determinants. For example behavioral intentions have been found to be highly predictable from specific behavior-oriented beliefs and values.

As for performance, psychologists have neglected motivation and emotion. (Somewhat surprisingly, this circumstance is still true in modern cognitive psychology.) Mental tests have been developed and used for more than half a century, but no satisfactory means of analyzing the interplay between motivational and cognitive processes in problem solving has emerged. A study on the interplay between effort, performance, and interest (13) in the area of high school education has been reported. Because interest is an example of a positive mood, one may perhaps speculate a little and generalize from these results to positive mood in a general sense rather than as the specific emotion of interest (see figure 2).

In the model in figure 2, which is based on correlational data, it is assumed that perceived ability ("I can" sensation) affects effort which in turn improves performance. Success leads to a positive mood state and to a strengthening of the goal set; the result in turn further stimulates effort in the task. Intellectual ability, of course, also contributes to performance and may be increased by certain mood states, as suggested in the model.

In the long run, perceived ability contributes to self-confidence, and a positive self image enhances mood, strengthens the goal set, and contributes to further learning, and thus improves ability (figure 3).

Models such as these can be investigated by means of recently developed statistical methods for analyzing causal flow schemes in correlation data, most notably

the LISREL (4) model. Such work is now being done in Göteborg.

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