THE MEANING OF THE TERM 'PRACTICE'

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A question which often confronts a student interested in the learning process, is concerned with the meaning of the term 'practice' in the literature of psychology. Should this word be taken to mean repetition with or without observable improvement of the function, or does it connote something more than this, repetition with observable gain in quantity or quality of the product as a result? Or does the term refer not primarily to any fact of behavior, but to the conscious processes which accompany repetition?

The problem is not necessarily a futile one. It is important, first, in view of the need for definition of any term used in science. To determine the reliability of our terms is surely as important as to determine the reliability of our averages or measures of variability. A word should be no less exact than a coefficient of correlation. The word practice is certainly as essential (at least for some schools of psychology) as the terms subconscious, levels of attention, redintegration, transfer, apperception, innervation, imitation, libido. Our understanding of many of the important psychological discussions may be dependent, moreover, upon our concept of the term. If we use the word practice to refer to an experiment on transfer of training, it is necessary that we observe whether mere repetition or repetition accompanied by improvement takes place, not only in the test, but in the training series. Discussions concerning the effect of practice on ability to see through an illusion, on suggestibility, on ability to differentiate tones, to grasp small visual details, are more or less meaningful as the term is taken in one or another sense. In the field of individual differences, it is of greatest importance that we distinguish between repetition

and its usual results. We can present no general theories concerning the influence of practice on, let us say, correlation between tests, until we decide whether practice may have no observable effect, or always has some observable effect upon individual scores.

In order to discover the meaning of the term, one turns first to the text-books in common use, and then to the original reports concerned with the 'effects of practice,' 'practice curves,' etc. The quotations which follow are taken as samples of possible view-points. They are not inclusive—on the contrary a random selection has been made from the works of accessible representative authors.

The indexes of the text-books of James, Sanford, Angell, Pillsbury, Bagley, Calkins and Breese do not contain the word 'practice.' These authors instead discuss learning, habit formation or training.

But in Meyer's translation of Ebbinghaus¹ there is a definition:

The word practice refers to a number of different phenomena having this in common, that they occur when the same mental function is frequently repeated, either in immediate succession or with moderately long intermissions. To a large extent, practice is identical with the selective and supplementing functions of the mind which are discussed above. But certain effects included in the term practice cannot be understood thus and must be regarded as the signs of a fundamental law of the mind.

Practice, therefore, is a general term referring to the wonderful adaptation of mind to the external world for the purpose of self-preservation. By association and reproduction, mind adapts itself to frequently recurring events and anticipates them. By practice, it adapts itself to those events which occur with particular frequency and which are of particular importance. These events are through practice comprehended more delicately, more quickly and more inclusively. They are responded to in a manner tested as the most fitting and the most prompt, and yet requiring only a minimum of mental energy, of which more than a limited amount is at no time available. Without having to neglect the ordinary and as

¹ 'Psychology—An Elementary Text Book,' by Hermann Ebbinghaus; translated and edited by Max Meyer, 99 f., 101 f.

such important, mind has energy left to devote to that which is new, unusual, surprising.

Ebbinghaus refers evidently to the usual effects of repetition. Whether repetition, if fairly frequent, will always produce these phenomena, he does not say. We have no way of knowing what would be Ebbinghaus's comment upon an observation of a repetition with no apparent effects. The results described, he apparently assumes to be universal.

Kulpe¹ also makes repetition and improvement identical. Practice seems to be an active force, unknown but with measurable results.

We shall not mean by practice a special psychical capacity, or even a new mental act, but merely a number of processes, not very exactly known, whose effect is to facilitate an operation which has been frequently repeated.

Practice and Fatigue—We mean by these terms processes which are ordinarily alike dependent upon the number of observations, but which exert diametrically opposite influences upon sensitivity and sensible discrimination. To practice is due a steady increase in delicacy of perception and readiness of judgment, to fatigue a steady decrease in both. The words are so familiar and intelligible that it is unnecessary to define them. . . . Practice expresses itself psychologically (1) in an increase of attentional concentration, with all its accompanying advantages, and (2) in an increased capacity of reproduction.

Titchener's² definition is in terms of consciousness. We are not sure whether this consciousness is achieved as a result of repetition or whether (as seems more probable) it is the consciousness that accompanies repetition with desire to improve.

Practice is an integrative, as distinguished from a discursive consciousness; the focal processes are few in number, extremely clear, and protected by the negative effect of the determination against interference from casual associations. The effects of practice, if we take that phrase in its widest sense, are manifold. Thus it was found in experiments upon the discrimination of lifted weights

¹ Kulpe, 'Outlines of Psychology,' 7, 42 f.

² Titchener, 'A Text Book of Psychology,' 538 f.

that the influence of practice shows itself in no less than five different ways. It makes the observers physically stronger—and a change in physical strength may in this case mean a change in the absolute impression of the stimuli; it makes the lifting more uniform; it raises the level of attention; it increases the likelihood of judgment by absolute impression; and it may shift the observers' standard of comparison so that a difference of stimuli which finds expression in 'heavier' or 'lighter' at one stage of the experiment may be recorded in the words, 'much heavier,' 'clearly lighter,' at a later state. All these effects are closely related; but their number and variety prove that the general statement of the text 'practice favors discrimination' covers a large number of coöperating factors.

The practiced consciousness is characterized on the functional side by a maximum degree and constant direction of attention, with minimum effort (secondary passive attention), ease of discrimination (delicacy of perception) and a high degree of capacity for reproduction, implying great readiness and confidence of judgment.

The meaning of the phrase 'effects of practice' is not quite clear in view of the definition given in the first sentence. Is the increase in physical strength, the more uniform lifting of the weights, due to this peculiar kind of consciousness *per se*—or must there be repetition of the process of lifting weights, accompanied by an integrative consciousness? Is a repetition which includes measurable improvement in the discrimination ability essential for an improvement in level of attention? Would a person who reached a limit beyond which no further improvement was observable still be practicing? Such a subject might have an integrative consciousness. But none of the observable 'effects of practice' would appear. Granted that from Titchener's point of view the integrative consciousness is essential for practice, how many more factors, if any, must we add? Is the practiced consciousness the result of the mere existence of the practicing consciousness, or of the exercise of this consciousness, or of this exercise with "visible effect upon the external world?"

In Myers's Text Book¹ there is no definition of practice but excerpts will give the meaning.

¹ Myers, 'Text Book of Experimental Psychology,' 1, 61; 2, 292, 180.

It is not difficult to devise experiments which shall test the degree of practice in speed and accuracy of movement. [Experiments suggested.] By such means the effects of increasing practice, fatigue and the extent of retention of practice can be qualitatively determined.

When Myers speaks of 'degree of practice,' 'extent of retention of practice,' he evidently refers not to mere repetition (for degree of repetition, extent of retention of repetition are meaningless) but to repetition, plus some observable effects—to repetition accompanied by improvement.

Other references are less clear. Speaking of what occurs as a result of repetition of an illusion, he says: "Many, at least, of these illusions tend to disappear with continued practice, even though the subject remain ignorant throughout of the nature of the illusion. In the Müller-Lyer illusion, it has been shown that these effects of practice only occur when the exposure of the figure is prolonged. During momentary exposure the subject has no opportunity of learning to disregard the end lines and to limit his attention to the horizontal line, the length of which is being estimated." Is the repetition of the momentary exposure practice? Not in Myers's other use of the term. The phrase 'effects of practice' seems awkward, if the word means the same as it did in the phrase 'extent of retention of practice.' The simplest meaning in the second quotation would seem to be mere repetition.

In a discussion of mental work and practice we find these statements: "Along with increasing fatigue goes increasing practice"; and, farther down the page, "The influence of practice is not evident at the early stages of experience." In one sense repetition plus its effects is evidently meant. In the second we must substitute repetition.

Wundt¹ implies that practice and improvement with repetition are not identical, since this improvement is the universal 'result' of practice. Then is practice mere repetition? If so, how can we believe that it has this 'universal result'?

¹ Wundt, 'Outlines of Psychology' (translation by Judd), 233.

These physical concomitants are the effects which practice produces on all organs, especially on the organs of the nervous system. As a universal result of practice we observe a facilitation of action which renders a repetition of the process easier. To be sure we do not know any details in regard to the changes which are effected in the structure of the nervous elements through practice, but we can represent them to ourselves through very natural analogies with mechanical processes, such, for example, as the reduction of friction resulting from the rubbing of two surfaces against each other.

Whitley¹ speaks frequently of effects of practice and changes with practice. Her real concept of the word seems, however, to be improvement by repetition. She refers to the lifted weight test: "After a certain date, too, each subject was told what the real weight was, in the hope of facilitating practice by this means." And, in her conclusion: "On the whole higher mental functions are sooner susceptible to practice than are sensory functions, the more so again if they are novel."

Wells² uses the word in both senses, though his meaning is fairly clear. He says: "We have then, finally (1) a difference in the individual's (resp. functions) fundamental plasticity, i.e., ability to profit by practice; (2) a difference in the actual amount of practice experienced; and (3) constitutional factors, independent of plasticity, in the nervous system." Here "ability to profit by repetition" is obviously meant. "Amount of practice experienced" probably refers to amount of repetition of the process. Whether these repetitions must be accompanied by improvement, Wells does not state. Yet the distinction would seem to be an important one. Does repetition after observable gain has ceased, have any influence on individual differences?

Again, we find: "A far-reaching sex-difference in susceptibility to practice seems, so far as concerns the functions covered by these experiments, quite improbable." Does he

¹ Whitley, 'An Empirical Study of Certain Tests for Individual Differences,' 115, 138.

² Wells, 'The Relation of Practice to Individual Differences,' *Amer. J. of Psychol.*, 25.

mean susceptibility to repetition? Then susceptibility would only be a very poor word for opportunity. What Wells does mean is susceptibility to improvement, through repetition. Such a usage differs from the one quoted in the last paragraph.

Hollingworth¹ says: "By final capacity is here meant a degree of ability which, having been attained as the result of constant practice, remains practically unchanged by further practice during, say, 100 later trials."

But in another article we find: "With practice, then, the average correlations of all tests become positive and the coefficients become greater the longer the practice is continued."

If we take practice in the first sense in which it is used—the second quoted statement is indeed a remarkable one. Repetition of tests, necessitating, perhaps, no change in the individual scores (see first quotation) would, nevertheless, increase correlations between the tests.

Book² avoids the difficulty by referring usually to 'phenomena influencing learning,' 'learning curves,' etc. His mention, however, of 'stages of practice' implies a wider meaning given to the word than mere repetition.

Besides this use of the term practice to designate indiscriminately mere repetition or repetition with improvement, and its use to mean a certain kind of conscious process assumed to accompany the repetition of an act, we have a third and much more definite meaning attributed to 'practice.'

The following quotations are taken from Whipple.³

The consensus of opinion is that at least in comparison with many other mental activities the discrimination of lifted weights is but little affected by practice.

This practice effect is, however, rapidly lost, being reduced very definitely within eight days and completely lost within a month. (Esthesiometric Index.)

¹ Hollingworth, 'Individual Differences Before, After and During Practice,' *PSYCHOL. REV.*, 1914.

Hollingworth, 'Correlation of Abilities as Affected by Practice,' *J. of Educ. Psychol.*, 1912.

² Book, 'The Psychology of Skill.'

³ Whipple, 'Manual of Mental and Physical Tests,' 228, 255, 273, 601, 470.

Practice has a curiously small effect upon the range of attention when once the period of preliminary habituation to the arrangement of apparatus and method is passed.

¹ Practice has very little effect upon the suggestibility of S's; at least Binet found that, when twelve older children (16 years) repeated the test by the first method five times in immediate succession, there was no alteration in the average number of times that suggestions appeared.

Practice increases the speed of computation, even when the test demands the exercise of associative connections in which S has already had extended school-training.

Evidently Whipple means by practice pure repetition, since he uses the term in cases where no improvement is apparent.

Yerkes¹ speaks of a law of temporal distribution of practice. "Brief intervals of practice,—repetition for memorizing are more valuable than long-continued practice." This reference is again to the process of repeating—not to its psychical accompaniments or visible effects.

Thorndike² differentiates improvement and practice. A number of quotations are needed to suggest his meaning.

Education and applied psychology generally consider mental functions, especially under the concept of efficiency, as improving or deteriorating. They then should describe a function as a number N of amounts ($a, b, c \dots n$) each of some one thing—quality, characteristics or feature, which varies only in amount or degree.

The scale by which the amount or degree of one of these component features of a mental function is measured is very often a graded series of external products, or features of products produced by the function's activity. . . .

Any intelligible statement about a function's efficiency is then, as a rule, a statement defined as vague, precise or rough, about some score or combination of scores.

He heads a chapter, 'The improvement of mental functions by practice,' and, in the opening paragraph—

This chapter and the six which follow are to present the facts

¹ Yerkes, 'Introduction to Psychology,' 308 f.

² Thorndike, 'Educational Psychology,' 2, 83 f.

known and problems pending concerning the amount and limits of improvement of mental functions with practice, the rate of improvement, and any changes in it as practice proceeds, the factors which constitute the improvement, the circumstances which condition it, and the effect which the improvement of any one mental function has upon others.

Had Thorndike said—in the last phrase—‘the practice of any one mental function’—who could have been sure what he meant?

Another quotation presents the differentiation even more clearly. In speaking of the fact that most men remain far below their limit of efficiency, Thorndike says:

First, hardly any functions have ever been practiced in the course of the scientific study of mental functions, which did not improve. . . .

Second, there are striking cases of individuals who have had enormously long practice, as taken in the course of schools or trades, and who have kept at the same level of efficiency for a long time, but who, under more favorable conditions, make notable advances.

Culler¹ similarly speaks of ‘ability to profit by practice,’ ‘susceptibility to improvement by practice,’ ‘practice effect,’ ‘errors committed in practice,’ etc. Bair² seems to mean mere repetition when he speaks of “continuing for twenty, thirty, and forty practices in one order before the other one was practiced,” or “by practicing a particular reaction, or series of reactions, until the new order becomes automatic,” or “the time required from day to day is constantly reduced by practice until the physiological limit is reached.”

Bryan and Harter³ use the word in this same meaning. They say: “A fact which seems to be highly significant is that years of daily practice in receiving at ordinary rates will not bring a man to his own maximum ability to receive. That daily practice in receiving will not insure improvement,”

¹ Culler, ‘Interference and Adaptability.’

² Bair, ‘The Practice Curve,’ 37, 38, 39.

³ Bryan and Harter, ‘Studies in the Physiology and Psychology of the Telegraphic Language.’

etc. They speak of stages of progress where others might refer to stages of practice.

We find then, at least four fairly distinguishable meanings. Practice may mean (1) phenomena or processes which occur in the individual when an act is repeated, (2) it may refer to a certain kind of consciousness, (3) it may mean the act of repeating when repetition is accompanied by gain in efficiency, or (4) it may mean mere repetition whether or not accompanied by improvement. That it is difficult to decide which meaning an author has in mind is evident, not only from the statements with contradictory usages quoted here, but from the fact that it is very easy to disagree with the present writer's interpretation of an author's meaning.

Which of these different meanings shall the student of practice adopt? Shall he define practice in terms of consciousness, or of external events? Shall its effects be emphasized or the activity itself? What do words like practice curve, practice limit, practice level, susceptibility to practice, effects of practice, facilitating practice, stages of practice, practiceability, extent of retention of practice, degree of practice, mean? In a concrete case, how can one determine whether an individual is or is not practicing? Must we observe merely whether he repeats an act, whether he improves, whether certain processes accompany the repetition, or, perhaps, whether his consciousness is or is not integrative?

A few suggestions might be offered. The difficulties involved in distinguishing between the consciousness of the beginner and of the expert are obvious. A given individual is often unable to tell whether he is practicing or playing the piano. When the object of our description is a turtle perfecting the learning of a maze, opportunities for discussion and reconstructed definition are endless.

It seems better simply to stand aside and observe as much of the activity of the individual as it is possible to see and the product of his performance. Then we may say that the expert is or is not practicing as we take repetition or repetition with gain as our standard. If we choose repetition with measurable improvement, it still involves us in diffi-

culties. Suppose we had used some other method of scoring, a different measure of 'product produced per unit of time.' What seemed a level, might then appear to be an ascent. Suppose we had tested two 'experts' after years in which neither had had 'practice.' The one who had made the most repetitions—though these repetitions showed no gain at the time, might be shown to have retained the process better. If, moreover, we take the word improvement to mean immediate, observable change in score, we must not only dismiss the expert's work from our discussion, but exclude also such work as that of Bryan and Harter's subjects who repeated the work of receiving, but who for a long time made no apparent improvement, or of Book's typewriting subjects who were likewise on an improvement level. Because anything but immediate improvement is difficult to measure and likely to prove ambiguous, and because if we confine ourselves to the meaning—immediate gain, we must exclude so many activities called both commonly and in scientific literature, studies of practice, it seems best to abandon improvement as a necessary criterion of practice.

If we take the word in its widest sense—it means mere repetition of any process or exercise of any function. Then responding to one's name is practice in such a reaction, putting on one's shoe is practice in that process, the grocer who has footed up bills for thirty years is still practicing, the expert typist and the expert color-namer are practicing, whether or not they experience any measurable effects of this practice. The use of the word in this sense enables one to include under the subject practice—such activities as those of Whipple's subjects who repeated tests of visual apprehension without, in his opinion, appreciable gain, of Hollingworth's subjects who continued repeating tests after an improvement limit had apparently been reached, of individuals working at one level of efficiency for a long time with, however, subsequent gain, as was the case in the experiments of Book, Bryan and Harter, and others. Such a usage also avoids theoretical difficulties implied in other ways of employing the term. We do not assume any invariable effects

of practice or influence of practice. We have before us the observable event—some one repeating something. Then, we may inquire, what is the effect of this repetition on the product produced, on the person himself, or on his similarity to or difference from other individuals.

This definition would seem to make necessary a departure from the customary phrases built upon the word practice. If practice is to mean mere repetition then we can no longer talk of stages or degrees of practice, of susceptibility to practice, of practiceability, of facilitating practice,—or even perhaps of such time-honored concepts as practice curves, practice limits or practice levels. We may easily substitute stages of learning or improvement for stages of practice, susceptibility to improvement by practice or ability to learn by practice for the second and third phrase. We may talk of facilitating learning or improvement. It is more difficult and perhaps unnecessary to give up practice curve. Yet a practice curve in the sense of a curve representing repetitions would only be, if repetitions were evenly distributed, a straight line. The phrases 'learning curve' or 'curve of improvement' (stating as they do just what the curve is intended to represent), are perhaps preferable. For practice limit and practice level again we might use limit of improvement or learning.