

Evaluation Techniques Based on Measurement

In an experiment one measures observable variables in a controlled environment, and that measurement becomes a numerical description. Measurement can be defined as a process of assigning symbols to varying magnitudes of these given properties according to a set of rules. Developing exact devices of measurement is a requirement of all of the sciences.

20-1 The measurement process is a tool which is used to observe the amount of something.

- A. True
- B. False (A)

20-2 In psychology as well as in physics and chemistry, it is necessary to develop exact devices of measurement.

- A. True
- B. False (A)

20-3 Measurement is numerical description.

- A. True
- B. False (A)

20-4 There is no particular rule or criterion for assigning symbols.

- A. True
- B. False (B)

Let us now consider some of the simple measures of responses commonly used in Psychology: (the memory device is **A RED FLAP**).

- A. Accuracy measured in terms of distance from a given point. (e.g., Bulls Eye in target practice)
- R. Rate: the amount of something per unit of time. (e.g., a child does 5 addition problems in 4 minutes)
- E. Errors (e.g., the more proficient you are at a task, the fewer errors you make)
- D. Duration of a response: the time between the beginning of a response and its termination (e.g., a person's proficiency at parking a car could be measured by the time required to perform such a task)
- F. Frequency of response (e.g., the more frequent the bar press, the better the learning)
- L. Latency of a response: the time between the onset of the stimulus and the subject's initiation of the response. (e.g., reaction time)
- A. Amplitude: amount of or force of the response (e.g., amount of salivation)
- P. Percentage of correct responses or the percentage of time that the appropriate response occurs. Many behaviors are such that this measurement is easily used, e.g., percentage of time a child is out of his classroom seat, percentage of time thumb sucking, percentage of time a student's head is on the desk.

One can add to this list:

One: Saving score (How many trials does one save in relearning a task by recall, reconstruction, reproduction, or recognition?).

Two: Percentage and Rate Compared - In many cases only one response may follow a stimulus, but in others many responses occur.

Three: Rating scales (e.g., rating the quality of a given response).

Four: Trials to criterion (e.g., how many trials it takes to produce a perfect performance).

Five: Trials to extinction or termination of behavior after stopping the procedure (e.g., how many trials it takes to get rid of a behavior).

20-5 Measurements of behavior might include:

- A. frequency of response
  - B. rate of response
  - C. trials to criterion
  - D. techniques
  - E. saving score
- (A,B,C,E)

20-6 Measurement of behavior might include:

- A. response latency
  - B. response duration
  - C. amount of response
  - D. amplitude of response
  - E. errors
- (A,B,C,D,E)

20-7 In measuring performance, we define the time from the onset of the stimulus to the onset of the response as the:

- A. interval period
  - B. initial period
  - C. Latency
  - D. time out
- (C)

20-8 The time between the stimulus and response is

- A. Latency
  - B. magnitude
  - C. reflex arc
  - D. response
- (A)

20-9 During learning, the amplitude of a response should:

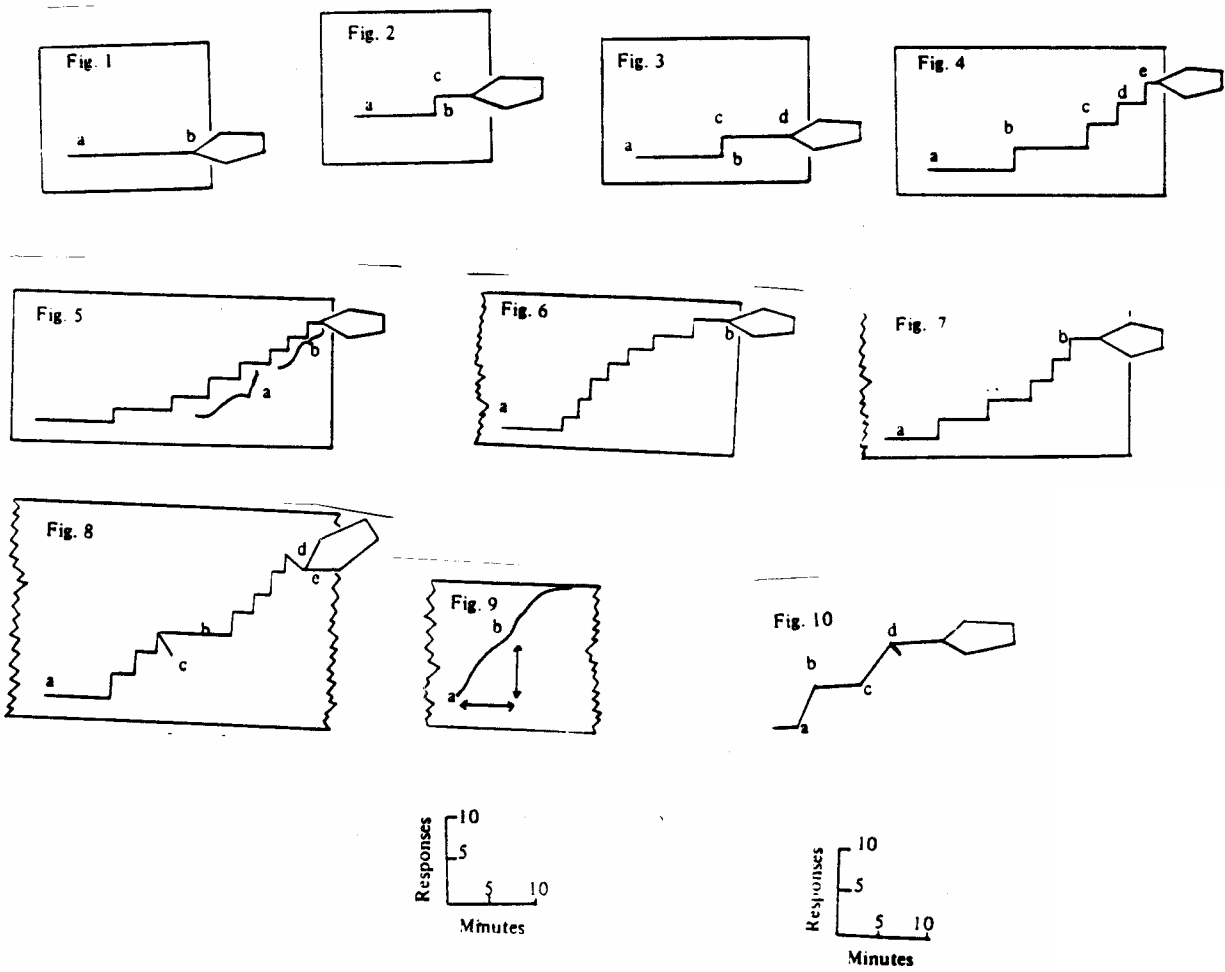
- A. decrease
  - B. increase
  - C. first decrease and then increase
  - D. first increase and then decrease
- (B)

- 20-10 Reaction time provides us with an example of psychological research on latency being applied to everyday affairs. In which of the following is reaction time being measured?
- A. a doctor testing for the mere presence of the knee jerk reflex
  - B. a motor vehicle official measuring how long an applicant takes to push a brake pedal after a light flashes
  - C. an Army officer measuring the rate at which a recruit can run a two mile course.
  - D. all of the above (B)
- 20-11 Which of the following is not a response measure listed in the text?
- A. rate
  - B. latency
  - C. amplitude
  - D. money spent (D)

#### RATE AND CUMULATIVE RECORD

One of the response measures presented in the previous unit will be discussed in detail. Stages exist when rate is used as a response measure. Advantages of rate as a means of learning will be elaborated on later.

- 20-12 Figure 1: A broad strip of paper is unwinding from a roll. The end of the strip is moving slowly and steadily toward the left. A pen held against the paper in a fixed position, has drawn a line beginning at \_\_\_\_\_ and ending at \_\_\_\_\_. (A,B)
- 20-13 Figure 2: The slow movement of the paper under the fixed pen has drawn the horizontal line from \_\_\_\_\_ to \_\_\_\_\_. At "b" the pen suddenly moved a short distance upward to \_\_\_\_\_. (A,B,C)
- 20-14 Figure 3: the paper has moved a short distance beyond the position shown in Figure 2. The fixed pen has drawn a second horizontal line from \_\_\_\_\_ to \_\_\_\_\_. (C,D)
- 20-15 Figure 3: the pen has been in the four positions, a,b,c,d. It occupied position \_\_\_\_\_ first and \_\_\_\_\_ last. (A,D)
- 20-16 Figure 3: The time which elapsed between c and d was \_\_\_\_\_ than the time which elapsed between a and b. (SHORTER)
- 20-17 In recording the responses made by an organism the pen moves upward and draws a short vertical line each time a response is made. In Figure 4, an experiment began when the pen was at a. The first response was made at \_\_\_\_\_. (B)
- 20-18 Figure 4: three responses were made fairly quickly, and at a steady rate at, \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_. (C,D,E)



- 20-19 Figure 5: the three responses recorded at "a" were emitted \_\_\_\_\_ rapidly than the three at "b".  
(LESS)
- 20-20 The more rapid the responding, the \_\_\_\_\_ the pause between responses.  
(SHORTER)
- 20-21 The higher the rate of responding, the \_\_\_\_\_ the horizontal line drawn by the pen between successive responses.  
(SHORTER)
- 20-22 Figure 5: the more rapid the responding, the \_\_\_\_\_ the slope of the step like line.  
(HIGHER)
- 20-23 Rate of responding is shown by the \_\_\_\_\_ of the step-like line.  
(SLOPE)
- 20-24 Figure 6: Responding begins at a relatively high rate at "a". The time between successive responses becomes progressively \_\_\_\_\_.  
(SLOWER)

- 20-25 Figure 6: the slope of the first part of the curve drawn by the pen beginning at "a" is relatively \_\_\_\_\_. (STEEP)
- 20-26 Figure 7: the rate increases fairly steadily from a low value near \_\_\_\_\_ to a high value near \_\_\_\_\_. (A,B)
- 20-27 An increase in rate is called positive acceleration. Positive acceleration is shown in Figure \_\_\_\_\_. (6 or 7)
- 20-28 Negative acceleration refers to a(n)\_\_\_\_\_ in rate. (DECREASE)
- 20-29 Negative acceleration is shown in Figure \_\_\_\_\_. (6 or 7)
- 20-30 To record other events which occur while an animal is responding, the pen swings quickly "to the southeast" and back again. In Figure 8 the pen has just drawn a line from \_\_\_\_\_ to \_\_\_\_\_. The point of the pen will immediately return to is \_\_\_\_\_. (D,E,D)
- 20-31 Figure 8: The short mark ("hatch" or "pip") at \_\_\_\_\_ was made by the same movement of the pen as shown at "d-e". (C)
- 20-32 The "southeast" mark or hatch is often used to indicate that a response has been reinforced (rewarded). In Figure 8, reinforced responses were recorded by the vertical marks at \_\_\_\_\_ and \_\_\_\_\_. (C,D)
- 20-33 Figure 10: a response was reinforced at \_\_\_\_\_. (D)
- 20-34 In practice, the vertical mark made by a single response is too small to be easily identified. However, we can still use the \_\_\_\_\_ of the curve at any point as a valid indicator of rate of responding. (SLOPE)
- 20-35 Figure 10: the rate was highest between \_\_\_\_\_ and \_\_\_\_\_; zero and between \_\_\_\_\_ and \_\_\_\_\_, and of an intermediate value between \_\_\_\_\_ and \_\_\_\_\_. (a-b; b-c; c-d)
- 20-36 When the steps are so small that we cannot count responses, we can still determine the number of responses between two points on the record by using a scale. In figure 9, the scale at the right tells us that responses occur approximately \_\_\_\_\_ minutes apart. (5)
- 20-37 If the paper moves very slowly, we may not be able to measure accurately the time between two responses, but we can still determine the time elapsing between two chosen points. In figure 9 the scale at the right tells us that responses at a and b in the cumulative record at the left occurred approximately \_\_\_\_\_ minutes apart. (5)
- 20-38 Figure 10: after completing about 5 responses, between a and b, the animal paused for a short period, \_\_\_\_\_ to \_\_\_\_\_ and then emitted about \_\_\_\_\_ responses between c and d. (B,C,5)
- 20-39 When a cumulative curve is used to record animal behavior the slope indicates \_\_\_\_\_. (RATE)

- 20-40 "Rate of responding" means number of responses per unit time. In a cumulative record, number of responses can be determined from the distance traversed by the pen in a \_\_\_\_\_ direction. (VERTICAL)
- 20-41 In a cumulative record, time is indicated by the distance traversed by the pen in a \_\_\_\_\_ direction. (HORIZONTAL)

1 Skinner, B.F., Cumulative Record 1959, p. 178-182, Appleton-Century Crofts