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MINIMALLY EFFECTIVE INTERPOLATED STIMULI IN WEIGHT DISCRIMINATION

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HUMAN ENGINEERING LABORATORIES

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ABSTRACT

The question of minimally effective weights was investigated by using an interpolated anchor paradigm. The weight series of 100 to 300 g, at 50-g-step intervals, was shown to be significantly affected by an interpolated anchor of 0.5 g, thus demonstrating a reduction in the region of ineffectiveness. The results were discussed in terms of procedural artifacts in the weight-judging methods reported in previous literature.

Minimally effective interpolated stimuli in weight discrimination

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The question of minimally effective weights was investigated by using an interpolated anchor paradigm. The weight series of 100 to 300 g, at 50-g-step intervals, was shown to be significantly affected by an interpolated anchor of 0.5 g, thus demonstrating a reduction in the region of ineffectiveness. The results were discussed in terms of procedural artifacts in the weight-judging methods reported in previous literature.

Minimally effective stimulation has been a concern of psychologists since the beginning of psychophysics. In the words of Black and Bevan (1960): "From the inception of psychophysics, it has been held that the absolute threshold provides the limiting criterion in the identification of the stimulus-correlates of the several magnitudes of sensory experience [p. 262]."

Pratt (1933) investigated the question of how small a stimulus would cause the upward displacement of an indifference point when interpolated in a psychophysical series of weights. He was able to show that a 15-g stimulus used as an interpolated anchor between a standard of 100 g and variable weights of 92, 100, and 108 g produced a larger number of heavy judgments than when the anchor was not used.

Helson (1947) continued this investigation by using a 5.0-g stimulus, interpolated in a weight series varying from 200 g to 400 g in 50-g steps. This light anchor produced an upward displacement of the indifference point. However, when a 0.5-g anchor was used, there was no resultant shift in judgments. It would thus seem that some value of an interpolated stimulus would cease to be considered relevant to a S when making psychophysical judgments about weight. From prior experimentation, this value would be between 5.0 g and 0.5 g.

When subliminal research is considered, an inconsistency develops. Black and Bevan (1960) showed that interpolated subliminal stimulation, in the form of an electric shock, decidely influenced the perceived intensity of other electric shock. Even though this research was specifically concerned with electric shock, it is an intensity dimension and has relevance. Black and Bevan concluded that the traditional assumption of the absolute threshold being the lower limiting value for a psychophysical scale is no longer valid. They have also shown that an organism can incorporate subliminal as well as supraliminal stimulation in the formation of internal referents that underlie judgments.

It is possible that the potential inconsistency in weight discrimination can be viewed as a procedural artifact. Helson (1964) has postulated that a light anchor, when considered in relationship to the series members and the hand itself, would be practically zero. It is Helson's suggestion concerning the weight of the hand in the active method that has led to this experiment.

Since the active method of weight discrimination was used to obtain the previous data, there is the possibility that the weight of the S's hand obscured the effect of the 0.5-g anchor. In other words, the S is required to exert a given amount of effort to lift his arm. The additional amount of movement required to lift the anchor is negligible when compared to the amount necessary to move the arm. Thus, this stimulation would have no effect on the indifference-point determination. By changing the method of discrimination to the passive method, it may be possible to eliminate the artifact of arm weight in the procedure.

METHOD

Subjects

The Ss were 24 male U.S. Army enlisted personnel, either commencing or terminating individual training at the U.S. Army Ordnance School, Aberdeen Proving Ground, Maryland.

Apparatus and Procedure

The stimuli consisted of brown glass medicine bottles that were filled with mercury to make a series of weights from 100 to 300 g, at 50-g-step intervals. A 700-g anchor was made from the same material as the series members, while a 5.0-g and a 0.5-g anchor were made of cardboard with the same surface area as the bottom of the bottles. The series stimuli were presented by the method of single stimuli in five random orders for each anchor determination. Two practice trials were given at the start of the experiment. Each S served in all five conditions of the experiment. The five conditions were as follows: (1) weight series alone, (2) series plus 700-g anchor, (3) series plus 5.0-g anchor, (4) series plus 0.5-g anchor, and (5) series plus simulated weight lift. The order of presentation of these conditions was counterbalanced across the Ss. A 1-min rest period was given between each condition.

For Conditions 1-4, the S was asked to place his arm, palm up, through the opening in a screen. An area was marked on the palm to insure that the weights were placed in the same area. The Ss were instructed not to move their hands nor to lift the weights in any manner. In Condition 5, the S was asked to stand in front of a screen and to lift each series member by the active method. Between each series member, the S was told to simulate the lifting of a weight.

Each S was told to judge the stimuli by an absolute rating scale, whose categories consisted of very very heavy, very heavy, heavy, slightly heavy, medium, slightly light, light, very light, very very light. The Ss were allowed to add such categories on the two extremities of the scale as extremely heavy or extremely light.

RESULTS

The S's responses were transformed into numerical values varying from 1 to 9, and the more extreme judgments were assigned either a 1 or a 9 as their score. Analyses of variance with all within main effects of conditions and stimuli were performed on these scale values (Butler, Kamlet, & Monty, 1969).

Figure 1 shows the judgmental curves for the five conditions. An overall analysis of variance showed a significant conditions effect [$F(4,576) = 99.39$, $p < .01$], a significant stimulus effect [$F(4,576) = 438.83$, $p < .01$], and a significant Stimulus by Conditions interaction [$F(16,576) = 17.64$, $p < .01$]. These results represent typical psychophysical results with an interpolated anchor.

Additional analyses of pairs of curves of particular importance to the problem indicate that the 5.0 and 0.5 groups are both significantly different from the control, with $F(1,216) = 40.85$, $p < .01$ and $F(1,216) = 16.05$, $p < .01$,

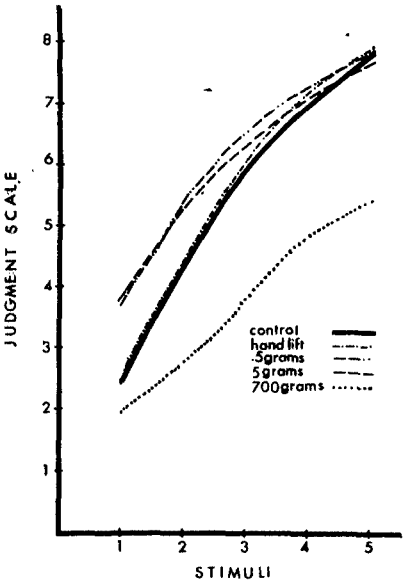

Fig. 1. Judgmental curves for anchor conditions and control for the stimulus series.

respectively. However, the pair-wise comparisons of 5.0 vs 0.5 and of hand vs control were not significant.

DISCUSSION

These results have shown that when the passive method of weight lifting is used, a 0.5-g anchor produces a significant shift in judgments. However, the question of the procedural artifact of the hand in the active method has not been completely answered, since the hand-lift group did not produce a significant shift in judgments. Interviews with the Ss at the termination of the experiment produced several possible interpretations of these results. Five of the Ss reported that they simulated the lifting of a heavy weight instead of just lifting the hand. The majority of the Ss reported that they did not take the hand-lift portion of the experiment seriously. It is difficult to assess the contributions of these two factors on the hand-lift condition.

These results do not rule out the procedural-artifact hypothesis but do show that a ligher anchor than was previously thought causes a shift in judgments. Thus, the region where a stimulus ceases to have an effect has been lowered.

In classical weight-discrimination research, both tactile and kinesthetic sensitivities are involved since the S is required to both grasp and lift. In the method employed in this study, only tactile sensitivity is utilized. Consequently, it would not be expected that the 0.5-g weight would act as an effective anchor in this situation.

There are other factors besides judgmental method that could affect the ineffective region. The stimulus series that is employed as well as the physical properties of a given stimulus might be important variables. This problem is one that deserves further experimentation. The delineation of the conditions that determine the region of ineffectiveness would be a further step toward the prediction of psychophysical data.

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