RESEARCH ON THE SIZE OF THE PROJECTED AFTER-IMAGE(I). PART I. ON THE METHOD OF MEASUREMENT.

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PART I. ON THE METHOD OF MEASUREMENT.

by

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1. PROBLEM

It seems there are four schools in the history of researches about the size of the projected after-image.

(1) The classical interest about the size of after-image was in the variation of size according to the distance from subject to the projection ground. The size of after-image is proportional to the distance from subject to the projection ground. This proportion was clearly formulated by E. Emmert (1981). Therefore, it is called "Emmert's law".

(2) E. R. Jaensch treated this phenomenon in his typology. In his theory, he placed the after-image between perception and representation (Vorstellung)[3].

(3) K. Koffka[1] (1923) and A. Noll[2] (1926) studied these phenomena under the stimulus of Jaensch.

(4) E. G. Boring[4] (1940) asserted that the Emmert's law and size constancy were able to be derived from the same equation. Recently, F. A. Young [5,6] (1950, 1951) criticized Boring's interpretation of Emmert's law.

In this paper, I want to consider about the method in measuring the size of after-image.

In the first place, we must consider the main trend of research in the history of the method of measurement.

Jaensch noted the deviation of judgement of the size from the Emmert's law. For him, it was the important index to find eidetic youth, as well as eidetic type whether the size of after-image coincide with the Emmert's law or not. Next, Koffka point out the difficulties to measure the size accurately, and Noll showed the measured size of after-image was varied by the method used. I think that their assertion was not only pointing out the technical difficulties to measure the size after-image, but also was objecting to the Jaensch's theory that the deviation from this law is based on the types of subjects and showed the intention to explain it by their "field theory". But I have not heard any methodological discussion of anti-gestalt theory by Jaensch school in Marburg. Afterwards, Norris, O. O. [9] (1934), Helson, H. [10] (1936), and Young, F. A. [7] (1948) found that the variation of the size coincide also with the Emmert's law through more accurate measurement.

The method to measure the size of projected after-image and the coincide with Emmert's law are mutually related to each other ultimately. Therefore, the method to measure is most important in problem.

II. EXPERIMENTS

The purpose of the experiments in this report is offer a new method in measuring the size of after-image.

When one intends to test the coincidence with Emmert's law, most authors have used the method to measure the size of after-image according to the variation of distance from subjects to projection ground (or screen). But now I will point out the unsatisfactory features at that method.

I want to offer another method to measure; that is, I do not measure the size of after-image directly, but measure the length of distance from subjects to projection ground indirectly, when the size of after-image coincides with the Emmert's law.

The former is involved in Series A, and the later in Seris B.

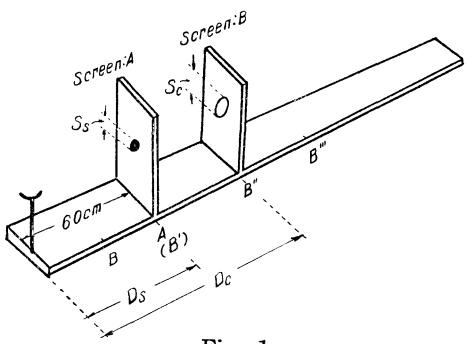

Fig. 1

(Series A) In Fig. 1 and 2, Screen A on which the standard stimuli (Ss) of 5cm diameter's circle is pasted on the point A (distance Ds from subject is 60cm), and the Ss is presented for 20 seconds. After the period of presentation, Screen A is put away, and Screen B is placed on the point B, B', B'', B''', etc. Distance Dc from subject to point B, B', B'', B''', etc. are respectively 30cm, 120cm, 180cm, etc.. Subject's after-image is projected on the Screen B. Therefore, Bc/Bs is 1/2, 2, 3, etc., one is constant. Now we measure the Sc directly.

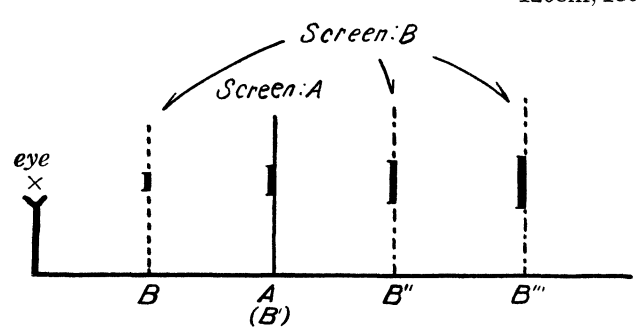

Fig. 2

Such direct method in measurement is classical, and there have been several ways in this method. It seems to me, Noll's methods are more refined, and Young's method is the most refined. This method is called "the type of outline method" by Young.

I used the compass to measure as a typical one in the type of outline method.

(Series B) On the contrary, I hold the ratio of the sizes of after-image Sc/Ss as constant. First, Screen A on which the standard stimulus (Ss) of 5cm diameter's circle is pasted, is placed upon the point A (the distance Ds from subjects is 60cm in the same was Series A, and presented for 20

seconds. Then Screen A is put away. The Screen B on which comparative stimuli (Sc) of 2.5cm, 5cm, 10cm, etc. diameter's circle are drawn, is placed on the front of the points B, B′, B″, B‴, etc. and is slided to the opposite direction. Next the Screen B which is based on the far place over the point B, B′, B″, B‴, etc. is slided to the side of subjects.

The Subjects is given the instruction, "Please sign to me Yes', when you see the size of after-image become the same as the size of circle drawn on the Screen B", and the Screen B is stopped when the subjects say "Yes". Next, the experimenter measure the length of distance (Dc) from subjects to the Sc Screen B.

(Results and Discussion) The results of the above experiments are shown in Table 1 and 2. We measured 20 times on each distance in a dark room.

Table 1
Result of Series A

Dc \ Ss	A M	A σ	B M	B σ	C M	C σ	D M	D σ	Average M	Average σ_a	Sc/Ss
30 cm	2.7	.38	2.8	.46	2.7	.51	2.4	.48	2.7	.47 (17.40)	0.58
120	10.6	.49	9.6	.51	9.4	.53	9.5	.56	9.8	.52 (5.30)	1,97
180	15.5	.53	15.0	.61	14.8	.50	15.2	.57	15.2	.55 (3.16)	3.04

Table 2
Result of Series B

Dc \ Ss	A M	A σ	B M	B σ	C M	C σ	D M	D σ	Average M	Average σ_b	Dc/Ds
30 cm	31.5	1.1	29.3	1.1	30.4	0.9	31.7	1.0	30.7	1.1 (3.58)	0.51
120	119.7	1.1	120.0	2.2	119.1	1.0	118.9	1.3	119.4	1.4 (1.17)	1.99
180	181.4	1.9	179.2	3.2	177.2	1.2	178.5	1.3	179 0	1.9 (1.61)	2.98

The degree of coincidence in Emmert's law is indicated by the ratios of Dc/Ds or Sc/Ss. In other words, the nearer the values of them are to 1/2, 1/3, etc. the more the Emmert's law would be affirmed.

According to the Table 1, we can see the values of the ratio in Series B are nearly equal to the value of ratio in Series A. But when we compare the Coefficient of variation σ_a/M and σ_b/M we can see σ_a/M is larger than σ_b/M. Therefore our method is more exact than the classical method.

The above researches teach us the fact that the method in measurement is important in the experimental research of the size of after-image.

Next, I can point out that the small variation in the size of after-image depend on the large variation in the length of distance from subjects to projection ground. And I can say, our method of measurement is preferable to others for the precise one minute research about the size of after-image.

SUMMARY

In this report, I offered a new method to measure the size of after-image. According to the author's judgment, our method is superior to classical methods in accuracy, that is, σ_a/M is larger than σ_b/M

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RÉSUMÉ

Dans cet article, j'ai présenté une nouvelle méthode de mesurer la grandeur de l'image consécutive. Je crois que cette méthode est plus précise que les méthodes acceptées jusqu'à présent.