FUNCTION OF THE GROUND AS "FRAMEWORK" IN THE PERCEPTION OF SIZE (II) —IN THE CASE OF IRREGULAR FIGURE OR GROUND—

FUNCTION OF THE GROUND AS "FRAME-WORK" IN THE PERCEPTION OF SIZE (II)

——IN THE CASE OF IRREGULAR FIGURE OR GROUND——

by

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(I) PROBLEM

The perception of a figure depends upon the ground and the ground plays the role of frame-work to support and determine the perception of the figure. For example, we see the same square as shown in the following figures of Koffka (2), as either a square or a diamond according to the different directions of frame-work.

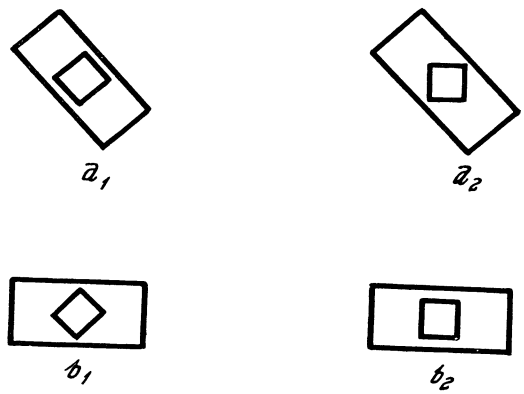


Fig. 1

But can such a relation as shown in Koffka's examples generally be found between any figure and any frame-work whatever? In other words, the question is as follows:

(A) Can any figure be seen differently owing to the influence of frame-work in the identical way as in Koffka's examples?

(B) With the frame-work of any kind, can a figure be seen differently according to the influence of frame-work in the identical way as in Koffka's?

On these questions Koffka did not carry out any experiment, but he induced the general theory on frame-work from the examples of squares only.

Previously, through their experiment, Y. Ohwaki and T. Onizawa (4) ascertained that, using the various figures of different regular shape, the apparent size of the figure varied according to whether there is frame-work or no.

Now we wanted to use the figures of various irregular shapes as stimulus figures for the study of the above-mentioned question (A). And in (B) we used various irregular frame-works.

(2) EXPERIMENT

Consequently our experiment is divided into two parts (and three ex-

perimental series) as follows:

(A) Frame-work : regular
Figure : irregular (the first series)

(B) Frame-work : irregular
(i) Figure : regular (the second series)
(ii) Figure : irregular (the third series)

(A) The first series of experiment.

In this series stimulus figures used are of nonsense, irregular and asymmetrical shape. Through them we intended to examine how the ground as frame-work acts upon the recognition of their sizes.

Experimental apparatus:

As shown in the Figure 2, we have used a large desk, the surface of which is covered with gray paper. In the middle of the surface, we put a screen to divide the surface into two parts. On the one side of the surface a standard figure is presented and the other side of it, comparative figures are scattered at random. Those figures are illuminated by twe lights hung down from the ceiling, to which it is about 70 cm distant from the surface of the desk, and those throw light on the whole surface of the desk without any shadow.

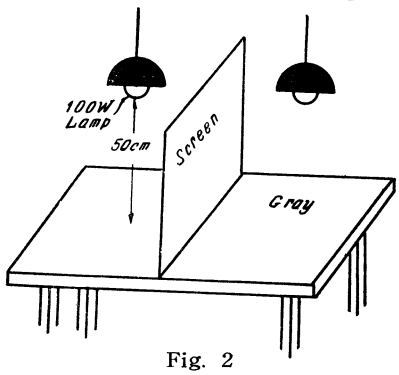


Fig. 2

When the stimulus figures are presented, subjects observe them while standing. The range of clear vision is about 50cm.

Stimulus figures:

We used six kinds of cut-off figures of white paper as standard figures, which were mounted on a gray card 5.4cm×7.3cm. The shapes of the figures are shown in Fig. 3. Each standard figure has four different sizes: 4, 8. 11 and 15mm in height.

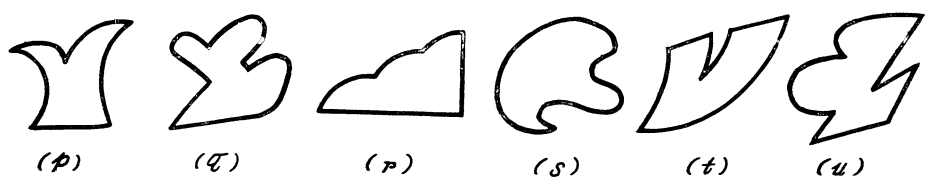


Fig. 3

Comparative figures are divided into two kinds.

(1) The first kind of them are cut-off figures of white paper mounted on a gray card that is the same size as is used for the standard card.

(2) The second kind of them are cut-off figures of white paper themselves, namely, they are not mounted on a card. These figures are presented at

random on a sheet of gray paper stuck on the whole surface of the desk. On this occasion, differing from that of the comparative figures of the first kind, a subject can hardly perceive the contour of the paper when he looks at these figures. Therefore we may regard the figures of this kind as the comparative figures without frame-work.

These comaprative figures of two kinds have six different shapes as well as in the case of the standard figures and each figure has 10 different size: 2, 3, 5, 7, 9, 10, 12, 14, 16 and 17mm in height.

Procedure and method of experiment:

On the one side of the surface of the desk divided into two parts, experimenter presents one of the standard figures to a subject for two seconds, and let the subject who is standing by the desk look at the size of the figure. Then experimenter put the subject to select the figure of the same size as the standard figure from the comparative figures which have already been scattered on the other side of the desk surface. The time for this selection could be free but experimenter limited it to five seconds or so. Experimenter changed the distribution of the comparative figures at every recognition test, because experimenter intended to keep the subject from remembering the position of the comparative figures of each size, that is, to remove the influence of the distribution of figures as much as possible. And we also changed the order of presentation of the comparative figures on each experiment day according to the distinction whether with frame-work or no. Table I shows the order of the presentation.

Table 1

Exp. Day / Order	I	II	III	IV
1	with	without	with	without
2	without	with	without	with

Likewise, we changed the order of presentation of the standard figure on each experiment day according to the difference of its shape and size. Table 2 shows the order according to the difference of the shape and Table 3 shows the order according to that of the size.

Table 2

Small letters show the kind of figures (see Fig. 2).

Order / Exp. day	1	2	3	4	5	6
I	r	t	q	p	u	s
II	t	q	u	s	p	r
III	s	u	p	t	r	q
IV	u	p	r	q	s	t

Instruction:

"Now I present a figure here. Look at it intensively, for afterward you will be asked to select a figure of the same size as this figure from the

Table 3

Fig. / Order / Exp. day	p				q				r				s				t				u			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
I	4	8	11	15	8	11	15	4	11	8	4	15	8	4	11	15	15	11	4	8	15	11	8	4
II	15	4	8	11	4	11	8	15	15	8	4	11	11	4	15	8	4	15	8	11	8	15	4	11
III	8	15	11	4	11	15	8	4	4	8	15	11	15	8	11	4	8	11	4	15	11	8	15	4
IV	11	4	8	15	15	4	11	8	8	4	15	11	4	11	15	8	11	15	4	8	4	15	11	8

distributed figures of various size. The exposition-time of the figure is two seconds. Further, select the figure of the same size within five seconds."

Subjects:

Subjects are T. Aoki, Y. Horiuchi, S. Iwawaki, and A. Tamura, all of them being students of psychology. The experiment was carried out for four days on each subject.

Place of experiment: The second dark room of our laboratory was used.

Result of this experiment and consideration:

(1) When the figure is irregular the quantity of recognition error, according to whethere there is frame-work or no, is shown in Table 4.

Table 4

Difference of the total of quantity of recognition error between the case with frame-work and without one of each subj.

Sub. / Fr-w	A		H		I		T	
	with	without	with	without	with	without	with	without
Total	106	119	106	110	114	142	103	135
Difference	13		4		28		32	
%	12.2		3.7		24.5		31.0	

For the brevity of comparison, the quantity of error in the recognition of size of the figure of irregular shape according to whether there is frame-work or no is shown in the following Table 5. This is the results of experiment by Ohwaki & Onizawa (4). The size of the recognition figure used there is the same as we used here, therefore, the results of the two

Table 5

Results of experiment by Ohwaki & Onizawa.

Sub. / Fr-w	A		B		C		D	
	with	without	with	without	with	without	with	without
Total	90	109	87	102	85	99	82	95
Difference	19		15		14		13	
%	21.1		14.9		16.4		15.8	

experiment can be compared directly.

Comparing the result shown in Table 5 with the one in Table 4, the percentage of the difference in the case of the former is much the same in all the subjects each other. While in the case of the latter, there are great individual differences between them. For example, in the result of Subj. H. there is almost no difference between the recognition test whether with frame-work or without one. On the contrary, there is a difference between the two cases in the result of Subj. I. and T. In other words, owing to the use of irregular figure the influence of the frame-work becomes very little in one case or far greater in the other.

(2) The tendencies of over- and under-estimation in the recognition of size of each figure are shown in Table 6.

Table 6

Fr-w. \ Fig. / Tendency		p	q	r	s	t	u	Total
with	over-estimation	43	30	53	36	38	44	244
	under-estimation	23	36	17	46	31	32	185
without	over-estimation	46	47	58	21	43	37	252
	under-estimation	36	44	27	60	36	51	254

As shown in Table 6, the tendencies of over- and under-estimation in recognition of size are different for each figure and there is no general tendency through them. But in the total of the error in the recognition test with frame-work we can find clearly that the tendency of over-estimation is more strong than in the other, but in that of the case without frame-work, there is, in general, hardly any difference between them.

Next, we shall analyse the tendencies of each figure.

(i) There is such a figure that tends to be over-estimated more in the recognition test with frame-work and to be under-estimated more in the test without frame-work. Such is Fig. (u).

(ii) There is such a figure that tends to be under-estimated more in the case with frame-work and to be over-estimated more in the other case. Such is Fig. (q).

(iii) There are such figures that always show the tendency of over-estimation in both the cases of the recognition test. Such are Fig. (p), (r) and (t).

(iv) There is such a figure that always shows the tendency of under-estimation in the recognition test whether there is frame-work or no. Such is Fig. (s).

Though there are four different types in the tendencies of the figures used here, we can see that there is in general increase of the tendency of under-estimation in the recognition test without frame-work. Because in the case (iii), the quantity of under-estimation in the test without frame-work is larger than that in the test with frame-work, though the quantity of under-estimation is always smaller than that of over-estimation whether frame-work is there or not, and also in the case (iv), the quantity of under-

estimation in the test without frame-work is by far the larger than that with frame-work.

(3) The difference of the quantity of recognition error according to the kind of figures.

The result is shown in Table 7.

Table 7

Exp. day / Fig	I	II	III	IV	Total
p	37	38	34	39	148
q	45	37	39	36	157
r	40	38	40	38	156
s	41	48	34	40	163
t	39	37	36	36	148
u	42	51	36	35	164

As one can see in this table, the quantity of recognition error is the largest of all in the case of Fig. (s) and (u). On the contrary, it is comparatively small in the case of Fig. (p) and (t), and next comes Fig. (r). From these results we know that the quantity of recognition error is larger in the case of the figures of complicated shape than of the simpler one, presumably for the difficulty involved in recognition of the former. On the other hand, the quantity of recognition error is smaller in the case of the figures of comparatively simple shape like Fig. (p), (t) and (r) than in other cases. These figures consist of many straight lined parts and such parts may have served as the standard to measure the size of the figures presented here. Generally, in such figures as can be replaced with the geometrical figures that are familiar to subjects in their every day life, the quantity of recognition error is respectively small. That is, Fig. (t) may be seen as an inverted triangle, Fig. (r) is as a right-angle triangle, and Fig. (p) is as a rectangle.

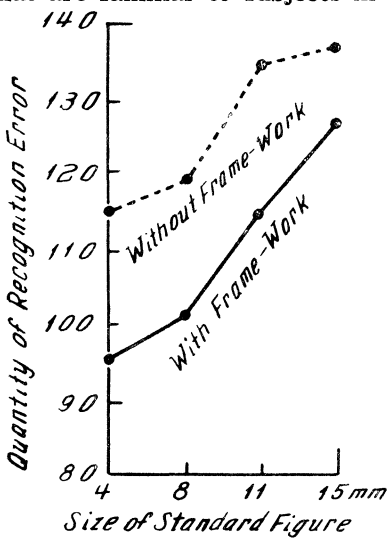


Fig. 4

(4) The difference of the quantity of recognition error, according to the size of the standard figures.

As shown in Fig. 4, the quantity of recognition error tends to increase in company with the increase of the size of the standard figure. The tendency is seen in the case with frame-work as well as without one, but it is always larger in the latter case than in the former.

In the introspections the subjects say that in the case of a smaller figure, though it is of complicated shape, its complexity hardly makes the recognition

of the figure difficult, because the figure is seen as a group or a mass, while in the case of a larger figure the larger the figure, the clearer becomes the characteristics of it, and the more difficult the recognition of it, since the complexity of a figure is felt more intensively in such a figure. And also the subjects continue to report that especially in the case without frame-work the recognition of a figure seems to be more difficult owing to the lack of the standard for recognition as frame-work. We suppose that the above-mentioned phenomena in the results of experiment may be explained by these description of subjects.

Next, how the size of the standard figure has an effect upon the tendencies of over- and under-estimation of the figure?

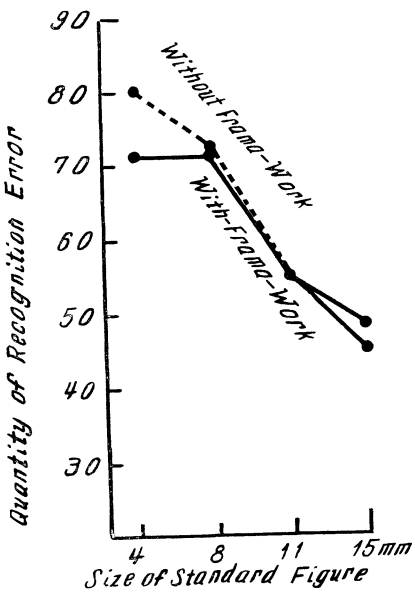


Fig. 5 Over-estimation

In the case of tendency of over-estimation, the quantities of recognition error decrease gradually with the increase of the size of the standard figure almost regardless of the presence of frame-work. On the result of the test with frame-work we assume that the figure is seen rather smaller, though a larger figure is presented, because the contour of the figure goes nearer to the frame-work, and consequently the quantities of the over-estimation decrease. On the other hand, as for that of the test without frame-work we imagine that on this occasion, the operative power of the contour of a figure, instead of the restriction of the frame-work, works inwards, therefore, the figure is not seen larger than it is. Because the figure, when it is irregular, tends to be seen by us not as irregular shape, but as regular one, i. e., as the most stable shape as possible. On the contrary, in the case of a smaller figure it seems that owing to this smallness of the figure itself, the complexity of various shape of the figure is felt for us not so clearly as influences on the recognition of the figures, and it is perceived as a whole and consequently it tends to be over-estimated more in this occasion than in the other.

On the tendency of under-estimation, as shown in Fig. 6, the quantities of the recognition error increase rapidly with the increase of the size of the standard figure. This increase may be in the same way as stated in the case of over-estimation, based upon the function of the frame-work or that of the contour of the figure. Then, in comparison between the results of the test with and without frame-work, the tendency of under-estimation is always larger in the latter than in the former. Therefore, we imagine that as well as in the case of over-estimation this fact is based upon the strength

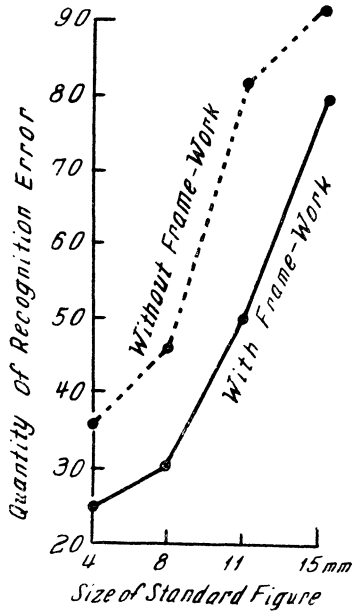


Fig. 6 Under-estimation

of the operative power of organization, in the figure, directed inwards and the tending to fix the figure itself.

(5) How the tendencies of over- and under-estimation vary according to the difference of experiment day?

As shown in the figure, with the process of the experiment in general, the tendency of over-estimation increases, while that of under-estimation decreases. From this fact we understand that in the case of the figure of irregular shape, the quantity of over-estimation becomes more and more increased with the advance of the localization of a figure as the result of practice. This result is the one opposite to that in the case of the figure of regular shape.

Summary of experiment in this series:

When we compare the recognition error of our irregular figures with that of the regular figures(4), which are both

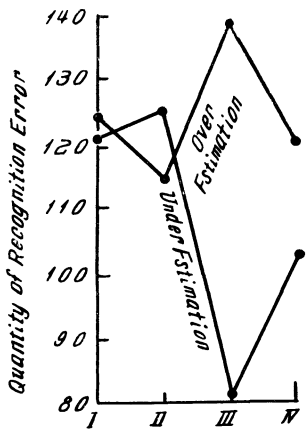


Fig. 7 Total

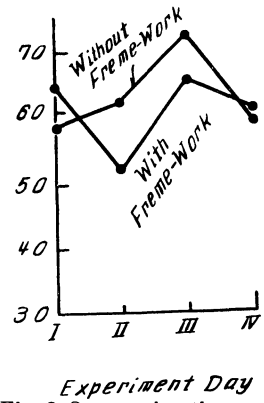


Fig. 8 Over-estimation

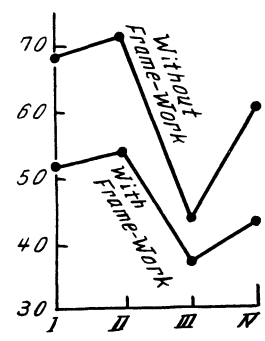


Fig. 9 Under-estimation

the results of the recognition test with regular frame-work, the percentage of the difference of the quantity of error between in the case with frame-work and without one is not so different in every subject each other in the latter. While in the former there is a considerable difference in the results of each subject, that is, some of them are little and some of them are fairly great.

Next, the size of a figure tends to be under-estimated more in the

recognition test with frame-work, while in that test without frame-work it tends to be over-estimated. On the contrary in the case of a figure of irregular one the size of a figure tends to be over-estimated more in that test with frame-work. The figure of irregular shape is more unstable and incoherent to look on than that of regular one, so that the figure seems to tend to settle into good shape in our perception of it. On this occasion it seems that in the case with frame-work the tendency of over-estimation becomes to be increased, especially in the case of a smaller figure, because the operative power of the contour of a figure works to the frame-work to fix the figure itself in relation to the frame-work, while in the case without frame-work the tendency of under-estimation becomes somewhat larger, because the operative power of the contour of a figure directs inwards to fix the figure itself for the lack of the relation to frame-work.

In other words, in the case of a figure of regular shape that fixes itself whether with frame-work or no, one directs his attention, in the perception of a figure, to the frame-work surrounded it, so that the dynamic relation to the frame-work becomes powerful.

While in the case of the figure of irregular shape, one turns one's attention, in the perception of a figure, more particularly to the figure itself than to the frame-work, so that the perception of a figure is hardly affected by the function of frame-work, though it was used together, and is free from the restriction of frame-work in the same way as in the case of the perception of the figure of regular shape without frame-work, then the tendency of over-estimation will increase as a necessary consequence. In the case of this figure without frame-work, however, the above-stated explanation is not enough to apply here but it will be consistent with this case, if we consider that the function of frame-work to fix a figure does not, even in the case where the figure of irregular shape was used, disappear but remains more than in the case of the test without frame-work, though the function becomes very little.

(B) The second series of experiment

In this series of experiment, the figures of regular shape are used as recognition figures and the card of irregular shape, on which the figure are stuck, are used as frame-work. With these materials we intend to examine how such a frame-work acts upon the recognition of the size of the figure of regular shape.

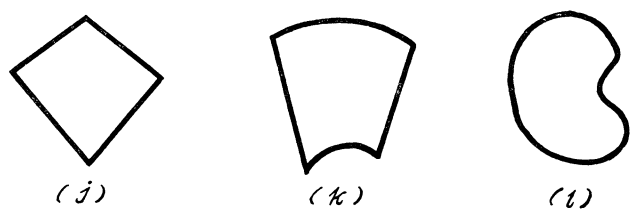


Fig. 10

Three kinds of the frame-work of irregular shape used here are shown in Figure 10.

The size of these are much the same as that of a rectangle used in the first series (5.4cm×7.3cm).

[Experiment I]

Here we use frame-work of j-type which consists of all straighe lines.

Experimental apparatus:

It is the same as was used in the firet series.

Stimulus figures:

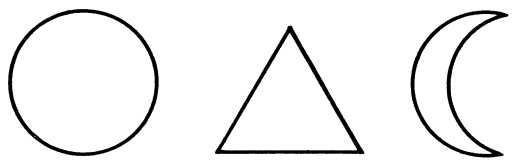


Fig. 11

Stimulus figures used here are of regular shape of three kinds as shown in Fig. 11.

In each figure its standard is fixed in order to make the size of the figure much the same.

The standard figure are those that the above three kinds of cut-off figures of white paper are stuck on the gray card of shape (j) and each kind of them has four different size as same as in the first series.

Comparative figures also consist of two kinds as in the first series.

(1) The figure that is mounted on the card of shape (j).

(2) The figure itself that is cut off.

Each figure has ten different size as in the first series, too.

Procedure and method of experiment:

The experiment was carried out about the same as in the first series with the exception of the difference of the order of presentation of the standard figure that was shown in Table 8 and 9.

Table 8
Order of presentation of each shape of figures

Exp \ Order	1	2	3
I	○	△	☾
II	△	☾	○
III	☾	○	△
IV	○	☾	△

Table 9
Order of presentation of each size of figures.

Exp. day \ Fig. Order	○				△				☾			
	1	2	3	4	1	2	3	4	1	2	3	4
I	4	15	11	8	15	11	8	4	8	15	4	11
II	4	15	8	11	8	11	4	15	11	8	15	4
III	15	11	4	8	15	8	11	4	4	11	8	15
IV	11	15	8	4	4	15	11	8	15	4	8	11

The order of presentation of the comparative figure does not differ.

Instruction and the place of experiment are not different from that of the first series, too.

Subjects:

Subjects are T. Aoki, G. Ohuchi and T. Kihara, K. Maruyama and S. Ohwaki,

all of them being students of psychology, and Prof. Y. Ohwaki. Except Prof. Ohwaki, all subjects do not know about the intention of the experiment.

Result of this experiment and consideration;

(1) The total of the sum of recognition error on each subject is as follows.

Table 10

Sub. / Fr-w / Fig.	A		O		K		M		S		Y	
	with	without	with	without	with	without	with	without	with	without	with	without
○	18	17	21	20	16	22	16	17	20	24	20	22
△	19	20	19	20	20	20	17	19	19	18	23	23
☾	18	18	19	16	21	25	16	20	18	18	25	21
Total	55	55	59	56	57	67	49	56	57	60	68	66
Difference	0		3		10		7		3		2	
%	0		5.0		17.5		14.3		5.3		2.9	

Here, we are able to find two types. In subjects A, O, S and Y, there is almost no difference between the recognition error in with- and without-frame work. On the contrary, in subjects K and M, there is much errors in recognition of figure without frame-work than in that of with frame-work.

(2) The tendencies of over- and under-estimation in the recognition of the size of each figure are as Table 12.

Table 11

Fr. W.	with	without
Total Sum	345	360

Table 12

Fig. \ Fr-w. / Tendency		○	△	☾	Total
with	over-estimation	79	65	89	233
	under-estimation	87	110	86	283
without	over-estimation	112	96	100	308
	under-estimation	70	84	76	230

As shown in Table 12, in the recognition test without frame-work, every figure tends to be over-estimated more than under-estimated. While in the case with frame-work each figure shows a different tendency, though there is common tendency of under-estimation as a whole, in recognition test, that is, the figure of a circle tends to be over-estimated pretty more and a crescent has both the tendency without difference.

It seems that in the case with the irregular frame-work, the figure does not always tend to be under-estimated more, different from the recognition test with frame-work of regular shape, but often tends to be over-estimated owing to the influence of the irregularity of the shape of frame-work.

(3) The difference of the quantity of recognition error according to the kind of the figure is shown in Table 13.

In the triangle, the recognition error is the most of all and is the least

Table 13

Fig. \ Exp. day	I	II	III	IV	Total
○	60	58	62	54	234
△	63	62	58	54	237
☾	56	66	58	55	235

in the circle. From this fact we can imagine that the circle is influenced only a little by the function of frame-work in its recognitions, though the frame-work of irregular shape is used. In every figure, the recognition error decreases with the process of the experiment and at the last day of experiment, each of them shows just the same quantity of error.

In the appearence, the crescent seems to be the most unstable one and next comes a triangle, because a triangle has a stable bottom. Therefore it seems that the quantity of recognition error is smaller in the latter than the former. Nevertheless, in the result of experiment there is no difference between them.

[Experiment II]

In this experiment we use frame-work of k-type which consists of the contour of straight and curved line. The other factors, that is, experimental apparatus, stimulus figures, procedure and method, instruction, subjects and place of experiment, are the same as in the first experiment. This experiment was carried out on the middle of Feb. in 1952.

Result of this experiment and consideration:

(1) On the total of the sum of recognition error, we has the result as Table 14 and 15: Generally the quantity of recognition error is smaller in the case with frame-work than without it. The result of Subj. K and Y show this tendency clearly. But there is no great difference each other in general.

Table 14

Fig. \ Sub. / Pr-w.	A		O		K		M		S		Y	
	with	without	with	without	with	without	with	without	with	without	with	without
○	16	18	16	18	16	25	16	17	18	22	17	23
△	16	17	16	16	20	32	17	18	18	19	17	26
☾	17	16	17	16	19	22	19	20	21	22	21	26
Total	49	51	49	50	55	79	52	55	57	63	55	75
Difference	2		1		24		3		6		20	
%	4.0		2.0		43.6		5.7		10.5		36.4	

Table 15

Fr-w.	with	without
Total Sum	317	373

(2) The comparison of the tendencies of over-

estimation and under-estimation in the recognition error of each figure between the recognition test with frame-work and no is as Table 16.

Table 16

Fr-w. \ Tenden-cy \ Fig.		○	△	☾	Total
with	over-estimation	46	48	35	129
	under-estimation	53	56	79	188
with-out	over-estimation	70	89	60	219
	under-estimation	63	39	61	163

As one can see in Table 16, the recognition of figures with frame-work tends to be under-estimated and that of figures without frame-work to be over-estimated.

In the recognition of a circle and a triangle with frame-work, there is no great difference between the tendencies of over- and under-estimation in the recognition error, but of a crescent it is much more under-estimated than over-estimated. We assume that the superior tendency of under-estimation depends upon the function which the operative power of the frame-work acts more strongly on the width of the figure than the height of it owing to the long and slender shape of a crescent.

(3) Differences of the quantities of recognition error according to the kind of the figures.

The Table 17 shows the relationship between the shape of figures and the quantities of recognition error.

Table 17

Exp. day \ Fig.	I	II	III	IV	Total
○	56	59	56	53	224
△	55	62	58	60	235
☾	61	59	59	59	238

As one can see in Table 17, the quantities of recognition error of a crescent is the most of all, that is, a crescent is most influenced by the frame-work of irregular shape. The least recognition error has the circle. The reason about it, we have treated in the Experiment I.

[Experiment III]

In this experiment we use frame-work of *l*-type which consists of the contour of all curved lines. The other factors are the same as in the first experiment of this series.

Result of this experiment and consideration:

(1) On the total of the sum of recognition error, we had the result as follows:

Table 18

Sub. / Fr-w. / Fig.	A		O		K		M		S		Y	
	with	with-out	with	with-out	with	with-out	with	with-out	with	with-out	with	wit - out
○	16	18	18	20	18	22	17	18	19	18	17	21
△	19	16	22	19	18	24	22	23	21	22	22	24
⟨	16	17	16	25	22	21	17	19	17	17	16	18
Total	51	51	56	64	58	67	56	60	57	57	55	65
Difference	0		8		9		4		0		8	
%	0		14.2		15.5		7.1		0		14.	

As shown in Table 18, in two of the six subject, the total sum of recognition error is just the same in the case with frame-work as that of without frame-work. This indicates that it is possible that such irregular framework has no influence upon the perception of figures.

(2) The comparison of the tendencis of over-estimation and under-estimation of each figure between the recognition test with frame-work and without frame-work.

The result is shown in Table 19.

Table 19

Fr-w. / Tendency / Fig.		○	△	⟨	Total
with	over-estimation	46	43	40	129
	under-estimation	53	81	64	213
with-out	over-estimation	51	70	45	166
	under-estimation	66	58	72	196

Here we find in general a tendency of under-estimation of size either with-, or without frame-work. There are almost no such difference as found in the first and second experiment, that, one under-estimates a figure with frame-work and over-estimates a figure without frame-work. But we find a little more under-estimtion tendency about figure with frame-work than without it.

(3) Differences of the quantities of recognition error according to the kind of the figures.

Table 20

Exp. day / Fig.	I	II	III	IV	Total
○	55	56	57	54	222
△	71	67	57	57	252
⟨	54	57	54	56	221

The differences of them are shown in Table 20.
As the circle is a complete shape, its quantity of recognition error is the least of all. In the case of a triangle the quantites of recognition error are larger than that of a circle and crescent. It is the same as in the results of the first and second experiment, owing to the function of the irregular shape of the frame-work.

Summary of the second series of experiment:

Now we summarize the results of the first, second and third experiment of this series.
(1) When we compare the quantity of error of each experiment according to the difference of it between the recognition test with and without frame-work, we get Table 21.

Table 21
Difference of quantity of error between the case with frame-work and without it of each subject

Sub. / Diff. / Exp.	A		O		K		M		S		Y	
	Diff.	%	Diff.	%	Diff.	%	Diff.	%	Diff.	%	Diff.	%
I	0	0	3	5.0	10	17.5	7	14.3	3	5.3	2	2.9
II	2	4.0	1	2.0	24	43.6	3	5.7	6	10.5	20	36.4
III	0		8	14.2	9	15.4	4	7.1	0	0	8	14.0

In this series of experiment, the subject and the figure used are not many enough. But the percentage of the difference of the quantity of error between the test with and without frame-work is smaller than that of the recognition test with regular frame-work shown in Table 5 (Ohwaki and Onizawa). From this results we know that the frame-work tends, when it is of irregular shape, to influence only a little upon the perception of size of figures. It is remarkable that in the results of Subj. A and S, the quantity of error is just the same whether there is the irregular frame-work or no. In other words, it happens that some irregular frame-work does not influence the perception of the size of figure.
(2) When the frame-work of regular shape is used, the quantity of recognition error is larger in the case without frame-work than in with one and this tendency is found through the result of every one of the figures used. On the contrary, when three kinds of the frame-work of irregular shape is used, the sum total of recognition error is larger in the case without frame-work. But the tendency is not found through the result of every one of the figures. It indicates that the irregularity of the shape of frame-work causes some increase of difficulty of the recognition of size of figures with frame-work.

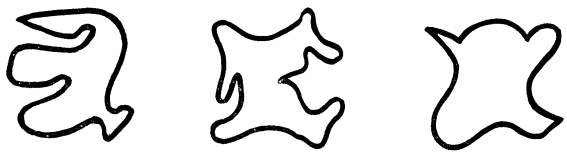
(C) The third series of experiment

In this experiment we intended to see how the frame-work of irregular shape acts to the perception of irregular figures?
In order to test it, we use three kinds of irregular figure.

[Experiment I]

As frame-work of irregular shape in this experiment we use frame-work of j-type.

Experimental apparatus is the same as in the first series.



(X) (y) (Z)

Fig. 12

Stimulus figure:

The stimulus figures of three kinds are shown in Figure 12.

These figures are also of much the same size as used in the first series.

The standard figures are made in the same manner and have the same four different kinds of size as in the fist series.

Comparative figures are also made in the same manner as in the first series but to the kind of their sizes two more is added, that is, those of 6 and 13 mm in height.

Procedure and method of experiment:

These are the same as in the first series excepting the change of the order of presentation of the standard figure, which are shown in Table 22 and 23.

Table 22

Order of presentation of each shape of figures.

Exp. day \ Order	1	2	3
I	z	y	x
II	x	z	y
III	y	x	z
IV	y	z	x

Table 23

Order of presentation of each size of figures.

Exp. day \ Fig. \ Order	x				y				z			
	1	2	3	4	1	2	3	4	1	2	3	4
I	8	4	11	15	11	8	4	15	8	11	15	4
II	11	4	15	8	15	8	4	11	4	11	8	15
III	15	8	11	4	4	8	15	11	11	15	8	4
IV	4	11	15	8	8	4	15	11	15	4	8	11

Instruction is the same as in the fist series.

Subjects:

Subjects are T. Sato, H. Hasegawa, C. Uziie, A. Tamura, and T. Kihara, all of them being students of psychology. The experiment was carried out for four days for each subject.

Place of experiment:

The fourth room of our laboratory was used.

Result of this experiment and consideration:

(I) The sum total of recognition error is shown in Table 24.

Extraordinarily little is the difference of the quantity of recognition error between the case with frame-work and without one in the results of Subj. H, S, and U. It can sefely be said here is no difference.

Only in the results of Subj. K and T, there is some difference of the error between the two cases.

Table 24

Subj. / Fr-w. / Fig.	S		H		U		T		K	
	with	with-out	with	with-out	with	with-out	with	with-out	with	with-out
x	18	19	20	16	22	19	18	20	19	25
y	21	18	20	19	20	18	16	19	21	34
z	18	19	19	20	16	20	16	17	27	25
Total	57	56	59	55	58	57	50	56	67	84
Difference	1		4		1		6		17	
%	1.7		6.7		1.7		12.0		25.3	

From these results we know that in so many occasions it occurs that when the figure as well as the frame-work are irregular, the frame-work scarcely influences upon the perception of size of the figure.

(2) The tendencies of over-and under-estimation in the recognition of the size of each figure are shown in Table 25.

Table 25

Fr-w. / Tenden-cv. / Fig.		x	y	z	Total
with	over-estimation	63	63	71	197
	under-estimation	34	35	25	94
with-out	over-estimation	57	70	71	198
	under-estimation	42	38	30	110

As shown in the table, every figure tends to be over-estimated more than under-estimated, and this tendency is found in both the cases of recognition. In comparison of the sum total, the quantity of over-estimation is much the same in both the cases, while that of under-estimation is somewhat larger in the case without frame-work than in the case with one. This phenomenon is noticed in each of the three figures.

(3) The difference of the quantity of recognition error according to the kind of the figures is showh in Table 26.

Table 26

Exp. day / Fig.	I	II	III	IV	Total
x	46	54	48	48	196
y	54	52	53	47	206
z	50	52	48	47	197

The quantity of recognition error is the largest in the case of Fig. (y) and it may be based upon the fact that the frame-work acts most intensively

to the recognition of Fig. (y) than in the other two, but in the results of the three figures there are only a few differences each other. Though the quantity of recognition error, in general, decreases day by day, the tendency of that decreasing is not uniform through all of them.

[Experiment II]

In this experiment we use frame-work of k-type.

Result of this experiment and consideration:

(1) The total of the sum of the quantity of recognition error is as shown in Table 27.

Table 27

Subj. / Fr-w. / Fig.	S		H		U		T		K	
	with	without	with	without	with	without	with	without	with	without
x	19	16	23	30	17	22	21	18	17	19
y	19	17	26	34	18	19	18	20	16	18
z	21	18	26	29	17	20	19	21	20	16
Total	59	51	75	93	52	61	58	59	53	53
Difference	8		18		9		1			
%	13.5		24.0		17.3		1.7		0	

In the results of Subj. T and U. there is no difference of the quantity of recognition error between the test with and without frame-work. That means the figure and the frame-work hardly influence one another.

While in the results of the other three subjects, H, K and S, there is a difference between the two cases. But the direction of the difference is positive in the one and negative in the other.

(2) Comparison of the tendency of over- and under-estimation in the recognition of size of each figure.

Table 28

Fr-w. / Tendency / Fig.		x	y	z	Total
with	over-estimation	65	82	73	220
	under-estimation	32	15	30	77
without	over-estimation	67	76	64	207
	under-estimation	38	32	40	110

In this experiment, in the same way as in the first experiment of this series, every figure tends to be more over-estimated and such a tendency is seen in the case without frame-work much the same as in that with frame-work. Looking at the tendency of under-estimation alone, however, the

quantity of error is larger in the case without frame-work than in the other. It seems that in the figure of irregular shape, the operative power of the figure acts, when the frame-work surrounding the figure is removed, to fix the figure itself and stabilize itself without relation to frame-work, so that the tendency of under-estimation increases.

[Experiment III]

We use frame-work of 1-type as frame-work of irregular shape in this experiment and the other conditions of this experiment are the same as in the first series.

Result of this experiment aod consideration:

(1) The total of the sum of the quantity of recognition error is shown in the following table.

Table 29

Subj. / Fr-w. / Fig.	S		H		U		T		K	
	with	with-out	with	with-out	with	with-out	with	with-out	with	with-out
x	21	18	26	29	17	20	19	21	20	16
y	18	19	27	25	18	20	16	20	16	17
z	22	17	23	32	19	18	19	20	21	17
Total	61	54	76	86	54	58	54	61	57	50
Difference	6		10		3		7		7	
%	9.8		13.1		5.4		12.9		12.2	

In the result of Subj. H. there is only a few difference in the quantity of the recognition error between the case with and without frame-work. It shows that the frame-work hardly influences upon the perception of figures. On the other hand, in the results of the other subjects there is some difference between the two cases. But it is, in general, very small, being about 10%.

(2) Comparison between the tendencies of over-and under-estimation in the recognition of the size of each figure.

Table 30

Fr-w. / Tenden-cy. / Fig.		x	y	z	Total
with	over-estimation	60	52	78	190
	under-estimation	38	38	26	102
with-out	over-estimation	61	62	77	200
	under-estimation	40	42	27	109

Each of all figures tends to be over-estimated more than to be under-

estimated regardless of the presence of frame-work.

Summary of the first, second and third experiment in this series:

When we summarize all the results of experiment in the third series, so we get Table 31.

Table 31
Difference of quantity of error between the case with frame-work and without it of each subject.

Subj. / Diff. / Exp.	S		H		U		T		K	
	Diff.	%	Diff.	%	Diff.	%	Diff.	%	Diff.	%
I	1	1.7	4	6.7	1	1.7	6	12.0	17	25.3
II	8	13.5	9	17.3	1	1.7	0	0	18	24.0
III	6	9.8	3	5.4	7	12.9	7	12.1	10	13.1

When we compare the quantity of error between the recognition test with frame-work and without it, the difference is very small in general. This fact shows clearly that the influence of the frame-work in this case is much smaller than that of the regular frame-work used with regular figure. It seems that when the frame-work and the figure are both irregular they are comparatively free and independent each other in the recognition and perception. There are several subjects, in whose result there is no difference between the recognition error in the case with frame-work and without one.

(3) CONCLUSION

The results of our experiment are summarized as follows:

(A) In the case of the figurer of irregular shape with the frame-work of regular shape, the perception of size of a figure seems to be influenced to some extent by the function of frame-work. However, in comparision with the results of the experiment by Ohwaki & Onizawa (4) in which the figure of regular shape was used, the regular relationship between the figure and the frame-work is not shown clearly in this experiment. One of the four subjects is scarcely influenced by the frame-work in the perception of the figure. It seems that in the perception of the figure of irregular shape, the figure itself tends to be perceived isolatedly and the influence of the frame-work upon the perception of the figure becomes weak.

(B) In the case of the frame-work of irregular shape, we used the figure of both regular and irregular shape in the experiment. As the result of it we found that in one group of subjects, the frame-work of such a kind had no influence, and in the other group, it had some influence upon the recognition of the size of figures. Consequently, we found that the dynamic relationship between them, that is, the function of the frame-work is weaker than in that of (A).

And in comparison with the results by Ohwaki & Onizawa (4), the regular relationship between the figure and tne frame-work is more unclear

than in that of (A). This unclearness of the regularity must be based upon the irregularity of the shape of figures and frame-work used here. That is, in this case, it happens that we cannot find the reciprocal action of influence such as in the case of Koffka's figures. It seems that both figures and frame-work, if they are of irregular shape, are perceived comparatively isolatedly, i. e., figures apart frame-work or frame-work apart figures, then each one itself tends to draw our energy in the perception of them.

Judging from these facts, it can be concluded that Koffka's theory on frame-work is, on some occasions, not appropriate.

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RÉSUMÉ

M. Koffka mentionne, dans son oeuvre "Principles of *Gestalt* Psychology" que la figure est toujours influencée par son fond.

Afin de constater si toutes les figures sont réglées et influencées par leurs fonds j'a exercé deux sortes d'expériences au moyen de la méthode de la reconfirmation :

1] En cas où la figure est irrégulière et sans sens.
2] En cas où le fond est irrégulier et sans sens.

L'expérience 2 contient :

2a] Le cas où la figure est régulière, et
2b] Le cas où la figure est irrégulière.

Mon étude est donc constituée des trois systèmes d'expérience.

Les résultats obtenus sont comme suit :

1) Quand la figure est irrégulière la différence personnelle chez les sujets est tout à fait remarquable, cela ne se voit pas en cas où la figure est régulière.

Parmi les sujets il y a quelques-uns chez qui on ne trouve qu'un très peu d'influence du fond.

2) Quand le fond est irrégulier et que la figure est irrégulière, la différence personnelle est remarquable. Il y a certains sujets chez qui on ne trouve point d'influence du fond.

3) Quand la figure aussi bien que le fond sont irréguliers, il y a beaucopu

de sujets chez qui on n'en trouve guère l'influence. Cela signifie que la figure et le fond sont indépendants pour que la force de chacun influence l'autre très peu.

Nous en considérons la raison comme suit:

Quand la figure et le fond sont irréguliers ils ne sont pas familiers. Il en résulte qu'ils attirent l'attention des sujets et en suscitent l'intérêt. En conséquence, l'entiere vue unifiée finit par se rompre.

ZUSAMMENFASSUNG

Ist die Figur auf jeden Fall von ihrem Grund unterstützt und beeinflusst, wie K. Koffka einmal in seiner Schrift "Principles of Gestalt Psychology" 1936, S. 185, bewiesen hatte? Um es zu prüfen, haben wir die folgenden zwei Arten der Versuche nach der Wiedererkennungsmethode durchgeführt:

Fall 1., wo die Figur unregelmässig und sinnlos ist, und ihr Grund dagegen regelmässig ist.

Fall 2., wo der Grund die unregelmässige Gestalt hat.

Den 2. Fall können wir weiter in zwei Nebenfälle einteilen.

Fall (2a), wo die Figur von regelmässiger Gestalt ist.

Fall (2b), wo die Figur unregelmässig ist.

Infolgedessen besteht die Arbeit aus drei Versuchsreihen.

Die Versuchsresultat ist stark davon abweicht, wo die Figur und ihr Grund beide von regelmässiger Gestalt sind (Siehe: Y. Ohwaki und T. Onizawa: Function of the ground as frame-work in the perception of size. Tohoku Psychol. Folia. Bd 12. Heft 3-4. 1951).

(1) Im Falle, wo die Figur unregelmässig, ihr Grund aber regelmässig ist, ist der individuelle Unterschied in Bezug auf den Wiedererkennungsfehler an ihrer Grösse viel auffälliger als im Falle, wo dieselbe die regelmässige Gestalt hat. Bei einer Vp. findet sich der Einfluss des Grundes sehr wenig vor.

(2) Im Falle, wo der Grund unregelmässig und die Figur regelmässig ist, ist der individuelle Unterschied des Wiedererkennungsfehlers auch gross. Es findet sich eine Vp., bei der der Einfluss des Grundes gar nicht bemerkbar ist.

(3) Im Falle, wo beide, die Figur und ihr Grund, unregelmässig ist, ist der Einfluss des Grundes auf die Figur bei meisten Vpn. gar nicht bemerkbar. Hier ist die Figur und ihr Grund voneinander beinahe unabhängig, d. h. dabei ist die gegenseitige Einwirkung kaum vorhanden.

Dies Resultat scheint uns daraus hevrorzukommen, dass, wenn die Figur oder ihr Grund eine unregelmässige, d. h. ungeläufige Gestalt hat, dann ist die Figur oder der Grund geneigt, an sich unsere Beachtung oder Interesse zu erfassen. Infolgedessen wird die Kraftzusammenhang zwischen denselben locker oder schwächer werden. Mit anderen Worten wird die Ganzheitsauffassung von der Figur und ihrem Grund stark gestört. Aber es ist selbstverständ lich, dass der individuelle Grad der Störung sehr verschieden ist.