

THE FUNCTIONS OF IMAGES¹.

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(From the Cambridge Psychological Laboratory.)

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§ 1. DESCRIPTION OF THE EXPERIMENTS.

THIS paper may be regarded as a continuation of an already reported “Experimental Study of some Problems of Perceiving and Imaging².” One of the conclusions of that study was that the content of acts of imaging is continually undergoing change, and that the specific nature and conditions of the change call for detailed investigation. In the course of succeeding experiments, the main purpose of which was to determine the general types of transformation of images, certain suggestions as to

¹ A paper (here modified) read at a meeting of the British Association (Psychology Sub-section), Cardiff, 26 August, 1920.

² See this *Journal*, VIII. 1916, pp. 222–66.

the functions of images arose, and in the present paper I propose to formulate and discuss these suggestions.

The experiments themselves fall into two main groups. The material used in the first group consisted of a number of objects so much alike that they could be readily related, but at the same time possessing definite individual characteristics. This material was presented for observation under specified conditions. Afterwards it was removed, and the subjects gave a description of what they had perceived, and answered questions relating to the objects presented. The materials used consisted of five picture-postcards, each bearing a representation of a face of a military or naval officer or man. Faces were chosen because they commonly arouse interest, and the faces of army or navy men because the experiments were conducted during the early days of the late war, when interest in members of the Services was more than ordinarily widespread and intense. Moreover the pictures, while they contained comparatively little detail, and were clearly related, had each a strongly marked individual character. The cards were placed face downwards on a table, always in the same order. The instructions were:

On these picture postcards there are a number of representations of men's faces, one on each card. I want you to look at each card for ten seconds, noting carefully all the characteristics of the face, so that later on you may be able to describe them, and to answer questions concerning them. When I say "Now" take up the uppermost card, and look at it till I say "Now" again; then put it face downwards on the table and take up the second, looking at that also till I say "Now." Treat the other cards in the same way.

The first descriptions of the cards were given, and questions answered, after an interval of 30 minutes from the observation of the last of the five faces. After a week a second description was given, again after a fortnight, and, whenever possible, again after a much longer period. The cards were not exposed for observation more than once.

Nineteen subjects were examined. Of these 9 were women and 10 men, and all were of adult age.

In a second group of experiments the material to be reproduced consisted of picture signs with which certain words were associated. There were three different series of signs, many of them taken directly from pictographic writing. Signs and words were written upon plain cards, each associated pair having a separate card. A series of cards was placed face downwards on a table. The instructions were:

On these cards are a number of signs for words. I want you to learn to associate the sign with the word, so that afterwards if you were given the word you could reproduce the appropriate sign. You may learn the signs in any way and in any order

that you please. You will have ample time to learn them but if you think you have established the associations before I tell you to stop, let me know and I will take the cards away.

At the completion of the learning period, after an interval of fifteen minutes, the subject was told:

Now I am going to give you a piece of dictation, in which some of the words that had signs will be used. Whenever a sign-word comes, write the sign for it. Work as quickly as possible.

After the lapse of a fortnight a further piece of dictation was given, again after the lapse of another fortnight, and later still whenever possible. The actual signs were exposed for observation once only.

This 'method of picture writing,' as it may be called, was adopted, among other reasons, because the definite demand for a specific description was often taken to mean that a subject was being directly required to attempt to evoke a visual image. It was thought that the substitution of graphic representations, effected in the course of rapid writing, for detailed and deliberate description might leave a subject more free to adopt his ordinary methods of reproduction. And this was, in fact, what occurred.

For this group of experiments 17 subjects were employed, of whom 8 were women and 9 were men. As before, they were all of adult age.

In describing the experimental results obtained I propose to confine attention strictly to those that are relevant to the purpose of the present paper. Consequently no attempt will be made to analyse the results in very great detail. For the same reason it appears unnecessary to enter more fully into the exact characters of the material and methods employed. Sufficient has been said to render clear enough the nature of the situations which gave rise to the suggestions about to be advanced.

It will be seen that the paper deals directly with 'reproductive' images only.

§ 2. THE EXPERIMENTAL RESULTS.

I. THE GENERAL INFLUENCE UPON SENSORY IMAGERY OF AFFECTIVE FACTORS.

As was expected, the post-card representations of soldiers and sailors aroused in nearly all subjects very considerable interest, and their perception was accompanied by no small amount of affective tone. This feeling, and the attitudes to which it was attached—of acceptance, satisfaction, dislike, disapproval, and so on—commonly assumed an important *rôle* in determining the process of recall. As a rule, the affective

tone clustered about the 'general impression' of a face. It appeared as soon as a card was exposed to observation, and persisted throughout the course of the experiment. For example, a subject described one face as that of a "very serious-looking young man." This was a 'general impression,' as she said, not based upon any definite analysis of the picture, but in so far as it was attached to any particular feature, attributed vaguely to some effect of the chin. When the first description was called for, the affective accompaniment persisted or recurred. The face was characterized as 'serious,' and 'very determined looking.' The impression was, though indefinitely, set down to the chin, and accordingly the face was—wrongly—turned into complete profile. But the definite turning of the face into profile was rather the result of an attempt to account for a 'general impression' of seriousness, than a direct sensory image evoked immediately through the persistence of the affective accompaniment. After the lapse of three weeks the impression of seriousness had become greatly intensified: "This is the young man in profile to the right. He had a square face, and is very serious and determined looking." What occurred in this instance was that the feeling aroused by the original perception of the face persisted or recurred. With it came, in vaguest possible terms of sensory imagery, an 'impression' of a serious countenance. The seriousness was, equally vaguely, connected with the lower part of the face, and so in the end a definite square chin seen in complete profile was evolved.

In general, it appears certain that the image which is reinstated mainly by the aid of affective cues tends to be of a vague and unanalysed character.

"I think," said one subject, "that this man was a sailor, but I'm not sure about him. He has almost completely faded out. That's all I can say. I have no picture of the man....I've a very vague impression of a rather jolly face."

When the whole of the experiment was over this subject saw the card in question again.

"That's very curious," he said. "About that card, I had the vaguest possible impression of a genial countenance. It was a sort of undefined and shifting frame, but the real face would fit into it very well. It seemed all the while to hover on the brink of being an image. It was not a visual image, and yet I think it came near to being one; and perhaps it was only the extreme indefiniteness that stood in the way."

The whole bearing and evidence of this subject showed that his behaviour in this case was very largely affective.

"What I seemed to be going upon chiefly," said another subject, "was the general impression. You see a thing, and that creates an atmosphere. Then the atmosphere seems to cling on, or to come up again, and you get an image of the thing."

One observer gave four sittings with the picture-sign material. At first she relied mainly upon direct cues which recurred in visual form. In the subsequent tests she showed herself distinctly more sensitive to affective factors. On the final occasion, after an interval, from the latest test, of exactly four months, she strongly maintained that absolutely *all* the reproductions she effected were now carried out by the help of a peculiar 'feeling,' which she could not properly analyse but which appeared to be a compound of affective and motor constituents. The reproductions now became characteristically vague, losing their individuality of form. Where several different signs were said to give rise to the same general feeling-tone, confusion of the signs in question practically always occurred.

In sum, the suggestion is clear, that the function of affection in reproduction was to reinstate a *situation* rather than a specific object, and consequently that the sensory imagery to which it might lead tended to be vague, schematic and relatively undifferentiated.

II. THE MAIN CHARACTERISTICS OF DIRECT SENSORY IMAGERY.

In what follows I shall take it that visual imagery is typical of direct sensory imagery of all kinds. Allowing, that is, for differences in mode, it will be assumed that visual reproduction serves the same functions as reproduction in terms of hearing, of smell, or of any other sense.

(a) *Visualisation and confidence.*

Throughout the whole of the experiments, as consistently as is ever the case in psychology, the occurrence of definite visual imagery tended to set up an attitude of confidence in the accuracy of the reproductions. For example, a subject who was not normally a good visualiser, had described one of the cards already referred to in a halting manner. He was then asked a question, and said: "That question brought back an image." He described the face minutely, adding: "It became distinct when you asked the question, and that was the first time I really had an image of the card." Another subject had returned a most indecisive series of answers to questions concerning some of the special characteristics of a face. Suddenly his whole demeanour changed. He became confident and said: "I had an image just then."

It was not only in the card series that this confident attitude was marked. With totally different material, and with different subjects, the picture-signs brought out exactly the same characteristic. Marked visualisers throughout worked rapidly and with the utmost confidence,

although, as a matter of fact their reproductions were frequently erroneous.

(b) *The clearness of the visual image.*

While the general feeling-tone attaching to a whole situation undoubtedly facilitated its reproduction in crude image form, the actual clearness of the image usually seemed to be traceable to some 'striking' detail¹. This appeared most distinctly from the results of the postcard series. For in this set of experiments it was possible to get definite information concerning the relative clearness of the different faces in the series for a given subject. If we allow for the well-known superiority of the first-presented member of a series in respect of the clearness of its reproduction, we shall find that in 75 per cent. of the total number of reproductions those of one face were clearer than those of any of the others. This face is marked by a large and noticeable moustache, and to the moustache the clearness of the reproduction was practically always attributed.

Thus if an object or situation as a whole merely gives rise to a general pleasing affect, while we are likely to recur to it readily, we are not likely to be able to reproduce it very definitely. But when some detail of a presented object is unusually outstanding, the other features are readily grouped around this detail, and the whole image tends to acquire a distinct and well-defined character.

The conditions which make any particular detail striking call for careful additional investigation. We gain nothing of psychological importance by saying that the 'striking' detail is one which appears 'comic,' or 'out of the way,' or 'pleasing.' For we are then merely left with the further question as to what types of detail do so appear, and why they produce their effect.

Every observer brings to his task of interpreting and responding to a presented situation more or less well-marked tendencies to behaviour and to affectivity. Some of these are general and instinctive; others are personal, and belong to the nature of individual interests or temperamental differences. Certain details in presented situations excite these tendencies more readily than do others. These constitute, probably, the most numerous class of the details which are designated 'striking,' and it is upon them that the formation of clear and distinct images in the main depends.

¹ Cf. J. Philippe: "Qu'est-ce qu'une image mentale?" *Rev. philos.* 1902, LIV. 49-51.

(c) Visualisation and an order of sequence.

If we consider the postcard experiments, some very interesting suggestions arise with regard to the capability of sensory imagery for dealing with 'orders of sequence.'

Every one of the errors made in reporting on the order in which the faces had been presented was made by subjects who appeared to be relying mainly upon a visual mode of reproduction. Of the 19 subjects, 12 were dominantly of visual, and the other 7 more or less clearly of 'vocal' type; 8 of the 12 visualisers made mistakes as to the order of presentation, but none of the vocalisers.

This leads us at once to suspect that the difficulty of retaining an order of sequence is connected with the oft-noted characteristic individuality of the sensory image. The members of the series presented in succession are, that is to say, apprehended by the visualisers in relative isolation. General characters such as a law of order or of successive relation cannot be directly and conveniently dealt with by sensory imagery, owing to its dominantly concrete character (cf. pp. 329, 331 *et seq.*).

Again the very fact that in a succession of images the different members may display very great divergencies as to clearness, may itself lead to difficulty in the reproduction of order. For perhaps the members most clearly reproduced tend to get thrust forward into an early place in the series.

(d) Changes in visual images.

The most definite evidence as to changes introduced into successive reproductions is to be drawn from the picture-sign experiments. The total number of test words dealt with by my subjects was 920. The main transformations that occurred may be comprised under the heads of: omissions, reversals, blending, substitution, simplification and elaboration, and inventions. In all they give 470 instances of change, and when it is remembered that of 53 cases of blending, each involves at least two signs, while some involve three signs, it will be clear that changes affecting the reproduction of material of this nature are very frequent indeed.

An analysis of the modes and conditions of change is of great interest, but would lead away from the subject of the present paper. It is of direct interest, however, that visual images are affected by such transformations to a very great extent. For example one of the best of the visualisers introduced changes into 80 per cent. of the signs with which he dealt, and just over 50 per cent. of these transformations occurred after an interval of more than a week had elapsed since the actual observation.

This result may be fairly regarded as representative of what commonly occurred. That is, if reproductions are obtained in terms of sensory imagery at increasing intervals of time, transformations are unwittingly effected. Processes of change may continue for long periods and in fact for as long as the image may be evoked. The transformations may be of all kinds, but it is of interest to note that all of the subjects who showed any marked tendency towards inventions were adopting the plan of relying upon visual imagery. The presumption is, in fact, very strong that invention, the bringing in of totally new details, is particularly prone to occur in the course of the use of sensory imagery.

III. HOW THE USE OF WORDS AFFECTS DIRECT SENSORY IMAGERY.

There is one medium of reproduction which may be used with equal suitability, whatever the mode of sensory experience to which the object was originally presented. We cannot, in any strict sense of the word, visualise a taste or a smell or a sound, but we can name them all equally well. Thus all those situations which often evoke sensory imagery may be dealt with by the help of words, and words can equally well be employed in other cases also. It is a matter of common observation that many persons, if they have occasion to recur in mind to some object or situation which has been presented visually, do so by finding a series of names for the whole and its parts, without the least resort to visualisation. The words, in this case, act in the place of the sensory images; and, in much the same way, sensory images may, on other occasions, be said to act in the place of words. Very often both are used, and it is in such cases especially that sensory imagery is apt to be of a shortened and fragmentary form.

Now in dealing with the relation between the use of words and direct sensory imagery the distinction between what may be called verbalisation and vocalisation is important. The term verbalisation simply indicates the 'employment of words.' But the mere use of words may not of itself displace sensory imagery. For words may be imaged just as well as any other objects, and may appear in visual or auditory forms. But in vocalisation, which is a special type of verbalisation, the words employed are produced in external or in internal speech; and it is perfectly possible for them to be employed entirely apart from any sensory imagery of the object to which the word refers or, in some instances, of the words themselves. This situation in fact was of very common occurrence in the experiments with which the present paper is concerned.

Further, it is apparent that words may be strung together and spoken by mere habit. There are word-movement habits, just as definitely as there are hand- or leg-movement habits, as the every-day conversation of most people will very well show. But this mere habitual repetition of phrases is to be distinguished from vocalisation proper.

Accordingly in what follows I propose to employ the term 'vocalisation' to indicate the use of words as a means of reproduction, when neither the words nor the objects to which the words refer are necessarily present in any form of sensory imagery; and further when the words are not merely strung together so as to form an automatic series. Such vocalisation affects sensory imagery in ways which it is important to discuss.

(a) *Vocalisation and confidence.*

As definitely as the visualising subjects were confident the vocalising subjects tended to be doubtful. They were prone to enter into long explanations and justifications of their attempted reproductions. An extract from my notes, typical of the behaviour of these subjects, may be given:

A fortnight later (*i.e.* after the first exposure of the signs) there was a further test. Subject F hesitated at the word 'broad.' He was very uncertain, and said, "Oh, this is hopeless. No; I can't think of anything. But there may have been a sign." At nearly every word he continued to pause, saying: "Now let me see, have I had a sign for that?"

Similar remarks are made concerning the procedure of all of the vocalising subjects, and the doubtful attitude adopted was so constant and so marked as to make it appear to me exceedingly unlikely that the diminution of confidence was unconnected with the increased reliance upon words.

(b) *Vocalisation and clearness in reproduction.*

General affective factors and 'striking' details had precisely the same effects as in the case of visualisation, nor did they appear to be less commonly operative. But while the subjects who relied upon sensory imagery, as a rule, adopted a method of direct evocation of the reproduction required, the vocalisers all relied to a far greater degree upon indirect reinstatement through associations. The common procedure was that when a sign was first exposed the subject remarked—usually aloud—"that reminds me of so-and-so," or "that is like so-and-so." When the time for the reproduction arrived, first the phrase employed or the name for the associated object would be given, and then the desired sign. The

associations used were very frequently indeed suggested by some detail of a sign, rather than by its form or meaning as a whole. Thus the use of words tended to set up a more analytic attitude, and as a consequence 'striking' detail tended to be somewhat more often noticed.

(c) *Vocalisation and an order of sequence.*

It has already been stated (see p. 326) that the vocalising subject attains a distinctly superior position as regards accuracy in the reproduction of an order of sequence. In the postcard series absolutely no mistake was made as to order of presentation by a subject who relied mainly upon words. This was connected with the tendency on the part of the vocalisers to analyse whatever was presented for their observation. Once an order of arrangement was definitely attended to, words became a great help. For serial relations can be named as definitely as concrete objects. On a first examination of the postcards the subject would say: "*First A, second B, third C,*" and so on, and the order would thus be at least as definitely fixed as the nature of the members which made up the series. In subsequent reproduction therefore, the order was preserved correctly; for the analysing attitude induced by the use of words directs attention upon the ways in which the members of an order are related one to another; and once the relations in question have been discriminated, words form entirely suitable instruments by which they may be retained.

(d) *Vocalisation and changes in reproduction.*

Reproductions effected by the aid of the use of words were just as subject to transformation as were those expressed in direct sensory imagery. Moreover, the changes were of an exactly parallel character, and continued over as long a period. But in one important respect there was a difference. While the visualiser with his direct individualising tendencies, was rather more inclined to invent new details, the vocaliser, with his bent towards analysis, was prone to blend and confuse the old details. Both with the postcards and with the picture-signs the vocalisers tended to group together some, or all of the members of a series and to formulate some law of their relation. Twice, for example, in the postcard series, subjects who relied upon words formulated a 'law' as to the 'direction of regard' of the different faces. They averred that "the successive faces turned gradually from complete left profile to complete right profile." The influence of such formulated 'laws,' which were generally too simple to meet the actual facts, definitely increased with lapse of time, and often led to a transference of detail from one card and

its blending with that of another. To this, largely, was due the greater tendency on the part of the vocaliser to condensation or blending.

§ 3. THEORETICAL CONSIDERATIONS.

(a) *The most primitive type of sensory imagery.*

Upon the basis of the experimental results which have been briefly described, I propose now to offer some suggestions as to the parts played by images, and by the use of words, in the psychological processes of reproduction.

The first question is as to the most general circumstances in which a sensory image is evolved in order to facilitate a reference to some object or situation not immediately present. In all experiments the image is called up under the direct influence of a 'demand for reproduction.' But clearly this is not the case, as a rule, outside the laboratory. We normally make use of sensory imagery, not to satisfy either an experimenter's or our own curiosity, but to aid our adaptation to some practical situation which has arisen.

Now the image which is merely 'of a situation' appears to be most clearly connected with a general affective tendency (see pp. 322–324). Such affective tendencies, and also moods, and attitudes, are never specialised to particular and individually discriminated objects. They belong to situations as such. They are relatively persistent factors in human response, and may attach to situations which among themselves differ widely.

As we approach the primitive type of organism we find that the modes of response become relatively fewer, and presumably the number of clearly differentiated situations become fewer also. Very detailed and distinct imagery, which is bound up with some narrow and particular set of circumstances, would thus appear often to be a hindrance rather than a help. For it would bring before attention the differences between situations rather than their general likeness. It is hence plausible to suggest that primitive sensory imagery must be of a vague, schematic and undifferentiated character. As such it might well facilitate a *type* of response, while it would in no way lead to very specialised modes of behaviour.

The experiments suggest strongly that sensory imagery of this character is most frequently found to be connected with the persistence or reinstatement of some affective tendency. Whenever an affectively determined image of this kind occurred it was strikingly inadequate to

effect a desired detailed reproduction. It was common at one time to speak of schematic images which are general because, owing to growth in experience, they have *lost* their particular characteristics¹. But it has been less usual to speak of a stage in the development of image forms, in which the imagery, though it is of a sensory character, is essentially vague and schematic, because it has not yet *acquired* individual characteristics. I believe that such a stage does occur, that the function of the image at this stage is wholly to initiate and further some familiar mode of behaviour, and that its occurrence requires the persistence or reinstatement of general affective tendencies, of attitudes, or of moods, which have accompanied prior acts of perception.

It is not, of course, urged that the subjects of my experiments had actually returned for the time to a primitive state, but it *is* urged that in so far as their sensory imagery was affectively determined, they were reacting in a relatively primitive manner. And this is not surprising since the factors of affective tone, moods and attitudes, which are undoubtedly of an elemental nature, persist and may retain their old functions throughout the whole story of mental development.

(b) *The image as an aid to a checked reaction.*

But the sensory image in its normal occurrence, both under experimental conditions and in everyday life, has a distinctively individual character. Like the content of an act of perception, it bears all the marks of particularity. This is well explained if we take it that the direct sensory image arises in two typical situations: (1) when a set of circumstances, being only partially reinstated, the necessary practical adaptation is temporarily held in check, and (2) when response to some exciting condition is called for, but for some reason or another, ordinary forms of practical behaviour are prevented from occurring.

Supposing a reaction similar to one previously performed is checked, then a reproduction in image form of the situation in response to which it formerly occurred may arise, and may act as a reinforcing stimulus to bring about the needed reaction. This was what happened in the course of my experiments. Whenever the demand for reinstatement of some already apprehended content was checked, a definite sensory image was more likely to appear. But the principle seems to operate independently of a direct demand for reproduction. For example, as a result of very different experiments on "Conditions which arouse Mental Images in Thought," Fox maintains that his investigations "show that any delay

¹ See *e.g.* discussion and refs. in Stout's *Analytic Psychology*, London, 1909, II. ch. IX.

or conflict in consciousness is a favourable condition for arousing a relevant mental image, that is one that will in some way help towards a cessation of the conflict¹.”

It is interesting to consider that the holding in check of an active tendency—whether to know or to do something—is precisely the most characteristic condition for the arousal of certain kinds of specific emotion, as contrasted with that merely general affective ‘atmosphere’ of which mention has already been made. The nature of the relation between specific emotion and sensory imagery is a matter demanding much further investigation, but nobody can doubt that the connexion is a very close one. Intense emotional discharge frequently turns an indecisive reaction into one that is both rapid and emphatic. Sensory imagery and certain of the specific emotions, therefore, may well arise under much the same conditions, and may act in concert to promote the same end.

Supposing this view to be correct, we have a perfect explanation of the confidence which, in my experiments, commonly accompanied the appearance of sensory imagery. For the primary function of the image is to manifest itself when a reaction is hesitating, and to lead to a response which is decisive. It was no accident therefore that the visualising subjects all showed superior certainty, since a sensory image, by its nature, leads to decisiveness of response. And this decisiveness is produced independently of the actual accuracy of the image.

Take next the apparent inadequacy of the sensory image in the reproduction of a correct order of sequence. This character is also perfectly consistent with the view that it is a leading function of imagery of this kind to help to produce an immediate and emphatic reaction. For the more narrow, and individual, and definite the limits of apprehension of an object or a situation, the more emphatic will the response tend to become. We often speak of the decisive man as responding “as if there were nothing else in the world but the one object of his reaction.” Hence it is not to be wondered that the characteristic image reproduces as exactly as possible the sense marks of a particular situation. It is the clearness and vividness, not the order of arrangement, of the detail which are important. Order is, in fact, a general characteristic which can be represented in sensory terms only by the use of some cumbrous figure scheme, of the sort employed, for instance, by many of Galton’s subjects².

The function of maintaining an order of sequence is, indeed, one to

¹ This *Journal*, vi. 430.

² See *Inquiries into the Human Faculty*: section on *Number-Forms*.

which nearly all forms of sensory imagery are strikingly ill-adapted while, as we have already seen, words are as strikingly well-adapted. I say "nearly all forms of sensory imagery" because it may be maintained that kinaesthetic imagery is in some respects specially qualified to perform this function. Whether this is so or not is entirely a question for experiment, and my own data throw no light whatever on the matter. But it should be pointed out that in so far as a kinaesthetic series maintains correctly an order of sequence, it never does so by virtue of isolating and responding to the relations themselves which are illustrated in the series. The kinaesthetic series is really of the nature of a habit response. If any member of the series should lose any of its characteristics, then the order of the series is also likely to be disturbed. For in such a series passage is made from one member to the next solely by virtue of some special characteristic belonging to the former. This is not necessarily the case in the vocalised series, where the relations of order may be themselves analysed, and response may be made distinctively to such relations. For then, even though in their reproduction the separate members of the series may suffer change, the order itself may—though, of course, it does not in all instances—remain undisturbed.

The general working hypothesis of this section demands that sensory imagery should possess such a direct clearness and vividness as would facilitate immediate and emphatic response. Now the experiments show that the clearness of the visual image is in the main a matter of 'striking' detail, and they suggest that the 'striking' character of particular detail is due to its relation to pre-existing active and affective tendencies in the individual concerned. But my visualising subjects, as contrasted with the vocalisers, reproduced in a direct and immediate fashion, and not by virtue of associations. That is, the 'striking' detail in the first case itself 'hit off' the tendency so to speak, whereas in the second case it did so often only by virtue of its association with something else. In this way, it may be suggested, the clearness and vividness of sensory imagery are direct and immediate, and belong entirely to the object or situation imaged.

The necessity for securing definiteness and individuality in the sensory image, however, comes into conflict with the equally great necessity for obtaining ready adaptation to the constantly changing demands of daily life. Thus even the sensory image undergoes constant and prolonged transformation. This constitutes at once an advantage and a danger: an advantage because, except in the psychological laboratory, occasion practically never arises for sheer, blank repetition;

and a danger because, owing largely to their incommunicable nature, those changes in sensory imagery which may lead to serious error are exceedingly likely to go uncorrected¹. If I go into a room in the dark, thinking that there is nothing in the way, and hurt myself, the pain corrects for me my error, and I shall go warily upon another occasion. But if I merely picture a church as having a spire on it, when as a matter of fact it has none, my image cannot conflict with anything to its own detriment, and may remain incorrect. It is interesting that these experiments indicate the possibility that inventions are somewhat more likely to occur in the case of sensory imagery than with the use of words. For the introduction of new detail is what might perhaps be expected in a mode of reproduction which for the most part deals directly with individual instances.

In the relative freedom of the sensory image from correction, we have perhaps another reason for the confidence which attends its use. The image must change, since it has to serve the demands of practice in a world which never remains the same from moment to moment. But its changes induce no access of dissatisfaction since, in the main, they tend to be beyond the reach of correction.

(c) *The image as an alternative reaction.*

Imagery of the sensory type, it was suggested, is likely to occur in two typical situations. The first, that of the checked reaction, has already been considered, the second, that of the alternative reaction, remains to be discussed. In this instance response to some exciting conditions is called for, but normal adjustments are out of the question for some reason or other. The imagery which arises under these conditions has, it appears to me, a line of development entirely its own. We get here the extremely vivid sensory imagery which is characteristic of dreams, of reverie, of fatigue, of certain states of drug intoxication, and the like. This is the type, and this is the general condition, of a considerable amount of the imagery which has a large part to play in the development of the arts, and its consideration is fundamental to the construction of a sound psychological aesthetics. The majority of the factors which determine the form, subject-matter, and clearness of such images operates in the manner which Rivers has called 'unwitting².' But the experiments which I have described in the early part of this paper do not deal with the

¹ Cf. J. Philippe: "Sur les Transformations de nos Images Mentales," *Rev. philos.* 1897, 481-493.

² *Instinct and the Unconscious*. Cambridge, 1920, 16.

image as an alternative reaction, or with its peculiar problems. Consequently I do not now propose to attempt to discuss the questions involved.

(d) *Why words tend to be substituted for sensory imagery.*

As we have seen, the marked individual character of sensory images, and the attitude of certainty which attends their use, arise in the main from the function of such images as aiding a checked reaction. But the whole trend of mental development is away from the particular and the individual. Analysis and construction come to play a greater and greater part, and by their aid, situations, which, as regards many of their characters, differ very widely, are brought into relation. No method of reproduction which is largely confined to the reinstatement of individual instances can possibly remain adequate if intellectual and practical development is to proceed. In particular it has often been pointed out that the apprehension of general relation of likeness, which may lead to all kinds of arguments from analogy, is of the greatest importance for intellectual advance.

Now the data of the experiments suggest as strongly as possible that it is precisely the analysing and relating attitude that the use of words favours. As compared with the visualiser, who goes directly to his particular material, the vocaliser commonly secures his reproduction of an absent object or situation by an indirect method. He relies upon association. Moreover the associations are in the majority of instances suggested, not by the object considered as a whole, but by some feature of the object. Indeed many divergent associations are often formed, some with this detail and some with that.

Here we find one of the reasons why vocalisation as compared with visualisation proved to be accompanied by an attitude of uncertainty. The associations formed in connexion with a single object frequently varied so greatly, that when, at the period of reproduction, a tendency arose now to accept and employ this association, and now to revive and employ that one, hesitation was bound to supervene. For according to which association was used the actual reproduction would vary in its details.

Again very probably the decrease of confidence is due to the fact that, on the whole, the employment of words in reproduction leads away from the reinstatement of material in close relation to emotions. Why and how this should be the case are matters of extreme interest, but are beyond the limits of the present paper. It is worth noting, however, that while

development along the line of the sensory image proper may lead, as has already been suggested, to the arts, development along the line of reproduction through the medium of language leads to thinking in the strict sense, with its abstract character and its relative freedom from emotional disturbance.

A third reason for the doubt which often attends vocalisation methods may be due to the fact that words are our habitual instruments of discussion, while obviously no person can conduct a dispute in terms of sensory images merely. A false statement can be as readily checked as, under certain conditions, can a false overt movement. And this consideration should make it clear that the lack of confidence consequent upon the use of words is no serious drawback, for it may easily be dispelled. It does not need to await the sort of Jack-in-the-box, haphazard, appearance of some new sensory image, but can be subjected to the confirmation or denial of a second observer.

The very fact that, by the aid of words, objects and situations are retained and reproduced the more clearly according as they are brought into relation with others, suggests a further great advantage of vocalisation. In these experiments while sensory imagery broke down badly in its attempt to deal with an order of serial relation, the use of words dealt adequately with such an order. Not only do words facilitate an attitude of analysis, but they provide instruments by which general relations may be analysed, and may be indicated fully as definitely as particular objects. In fact if there is any characteristic error incident to the use of words in reproduction it is that of blending or confusion. And this is traceable to that very function which sensory imagery is barely able to perform, the formulation and response to rules and laws by which individuals are related.

Yet with these advantages words lose nothing of the necessary fluidity characteristic of sensory imagery. The capacity for transformation is clearly essential, and, so long as it can readily be checked, wholly advantageous; for all modes of reproduction are primarily meant to serve the purposes of practical adjustment.

It thus appears that words are able to maintain the advantages of sensory imagery, while in addition their ease of communication, and the greater range of situation with which they can adequately deal, make them capable of rendering further development more ready and certain.

An interesting chapter in genetic psychology yet remains to be written on how words actually come to supplement, and, in some cases, to replace, direct sensory imagery, and how, at the same time, the sensory image is

not only normally retained as an element in mental life, but may develop along lines of its own, which lead to types of human response of the very greatest psychological interest.

In this paper I have, for the purposes of clearness, spoken sometimes as if sensory imagery and methods of vocalisation are separate, and even, to some extent, antagonistic. But in actual life, as need hardly be said, they are most frequently mingled. The nature and conditions of the precise help that each can give to the other must be left over for future discussion.

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