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ON PSYCHOPHYSICAL RELATIONS OF THE ASSOCIATIVE EXPERIMENT

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At the second German congress for experimental psychology held at Wurzburg (18-21 April 1906), Dr. Veraguth, Privat docent in neurology at Zurich, reported upon a galvanic phenomenon, called by him "galvano-psychophysical reflexes." The author conducts a current of low tension (about two volts) through the human body, the places of entrance and exit of the current being the palms. He introduces into the circuit of the current a Deprez-d'Arsonval galvanometer of high sensibility, and also a shunt for lowering the oscillations of the mirror. Employing this technique, if one applies to a subject tactile, optic or acoustic irritations of a certain strength, the galvanometer will indicate an increase in the amount of the current, *i.e.*, a lowering of the electrical resistance of the body. Very soon in the course of these experiments it was discovered that the action of the galvanometer was not in direct relation with the strength of the irritation, but more especially with the intensity of the resulting psychical feeling tone. Of great interest is the fact that the inconstancy of the galvanometer did not appear at the same moment with the perception of the irritation, but after a latent period of one to six seconds.

Somewhat later Veraguth observed that a movement (often of great intensity) occurred when the irritation, instead of being actually applied, was merely announced to the subject. This phenomenon he terms, "oscillation through expectation" (*Erwartungs-schwankung*). From these observations Veraguth concludes that in this experiment *feelings are objectively represented*. The only difficulty to be met with in this procedure consists in the technique of the registration of galvano-metric oscillations.

Veraguth takes photographs of the curve of the mirrors' movements on a rotating film; but this method is rather difficult and expensive, furthermore we can obtain only short curves, while for the graphic representation of feelings long curves are most to be desired. I have therefore constructed an apparatus, by means of which curves to an extent of more than thirty to sixty feet can be taken. In such considerable periods of time, many and different experiments can be made without difficulty.

The principle of my apparatus is as follows: I add to the scale a movable slide with a visiere. The slide, pushed forward by the hand, always follows the moving mirror reflex. This manoeuvre can be done very easily and exactly after some practice. To the slide is fastened a cord leading to a so-called ergograph writer which marks the movements of the slide on a kymographic tambour fitted with endless paper, upon which the curves are drawn by a pen point.¹ For measuring the time one may use a "Jaquet chronograph," and for indicating the moment of irritation an ordinary electric marker.

With these arrangements I am able to take long curves

¹ See illustration.

which are of special value for the representation of feeling-tones resulting from the associative experiment.

As it may perhaps be known, I have clearly demonstrated in the Diagnostic Association Studies (Vol. I, J. A. Barth, Leipsig, 1906)² that strong feeling tones often accompany the association, and cause characteristic and regular disturbance in the association processes. I conduct my experiment as follows: I call a series of stimulus words to a subject who is requested to answer as quickly as possible, announcing the first word that comes into her mind. I measure the time that elapses between the pronouncing of the stimulus word and the occurrence of the reaction (the "reaction time"). Having noted a rather large number of reactions (about one hundred), I then make the subject repeat one by one, the answers to the stimulus words (so-called "reproduction method"). What will occur during such an experiment I shall elucidate by an example.

Stimulus Word.	Reaction.	Reaction Time.		Reproduction
		Min.	Sec.	
Head	Hair	1	4	+
Green	Meadow	1	6	+
Water	Deep	5		swim
Stab	Knife	1	6	+
Long	Table	1	2	+
Ship	Wreck	3	4	steamer
Question	Answer	1	6	+
Wool	Knit	1	6	+
Insolent	Gentle	1	4	+
Lake	Water	4		blue
Ill	Well	1	8	+
Ink	Black	1	2	+
Swim	Know	3	8	water

In considering the reactions of this subject there is nothing remarkable to be seen at first sight. She has, with some few exceptions, relatively short reaction times, while there are also a few incorrect reproductions. But upon looking closer we discover that the reactions after water, ship, lake, swim, were followed by a reaction time of rather long duration; and

² Compare the report of Adolf Meyer in "Psychological Bulletin," Vol. II, pp. 242-250; also August Hoch in "Journal of Abnormal Psychology," Vol. I, No. II.

at the same time we observe that with these reactions, the subsequent reproduction is incorrect.

So far as we know, we may suppose that the words "water," "ship," etc., awoke lively feelings retarding the reaction. The incorrect reproduction of the reactions arises likewise, as we can prove by experience, in interference by lively feelings. Regularly the feelings causing such phenomena are those of a disagreeable nature and therefore we venture to suppose that the stimulus words mentioned above gave rise to a complex of ideas having some relation with water, and possessing great importance for the subject. The subject, cautiously questioned, tells us that a short while ago, having to suffer most painful and exciting experiences, she had seriously thought, in a moment of desperation, of *committing suicide by drowning herself*. But as the days began to look brighter her destiny did not bring her to such an untimely end.

The complex of the intention to commit suicide, to which strong feelings are attached, betrayed itself by different psychological disorders in the experiment. In the same or in similar fashion, all other complexes in connection with affections, might naturally betray themselves. Hence the association experiment is a good means of fathoming and of analyzing the personality. According to the opinion of some German authors this method should be applied for the purpose of tracing the complexes of culpability in criminals who do not confess. At the present time many experiments are being carried out along these lines in Germany, experiments which have been of great scientific interest, but which as yet, have not produced results of undoubted practical value.¹

With this experiment, however, apparently so simple, there is one great difficulty, namely, the interpretation of the disorders; or, to express it another way, what sort of complexes are they which cause these disorders ("indications of complexes")? In reply to this question we may say that it is the *routine* of the experiments which is the main thing, and in view of this fact, we suggest that the interpretation is at present rather an art than a science. In the future, perhaps, laws will be found for the method of interpretation.

¹ Vide bibliography.

He who does not possess this routine may easily suggest something wrong, and thus go astray. This reproach, and especially that of arbitrary interpretation, was made concerning my analysis; and consequently every means helping to circumscribe the complex and its feeling-tone is useful. Such a means would seem to be the "galvano-psychophysical reflex."

By representing graphically the galvanic oscillations during the association experiment, we occasionally obtain curves of very great interest, of which I wish to give some few examples. (The vertical strokes indicate the moment at which the stimulus word was given.) It may be seen how

Figure I.

shortly after the preceding reaction the curve quickly rises and then slowly falls again. In this case every reaction is succeeded by a movement of the galvanometer. If by a special proceeding we diminish the sensibility of the apparatus, only the most intensive feeling-tones have influence on the current, so that occasionally we shall obtain very distinct curves, which place before our eyes the strong feeling-tone in a specially clear manner. The following is such an example :

Figure II.

In the beginning we see the curve taking its way horizontally, without any irregularity. In this phase are the following eight reactions :

1. Hot	Cold	5. Mouth	Teeth
2. Hand	Foot	6. Wake	Wake up
3. Apple	Fruit	7. Drink	Eat
4. Naughty	Angry	8. Bed	Sleep

These reactions do not show anything of interest; their

feeling curve accordingly goes in an horizontal line.

9. Pretty Not pretty 11. Call on Not Call on
10. Danger No Danger 12. Workman Workwoman

These reactions are obvious :

1. The first three are uttered in two words, which, as a rule, is unusual with this subject.

2. There are obvious and for the most part contrast associations that are not easily intelligible.

3. There is to be seen beginning with the words, "Not pretty," a striking perseverance in the linguistic form. "Workman," "workwoman" is rather a superficial association.

It is evident that this strange phase takes its origin in "pretty." On the curve we can see, beginning with the reaction "not pretty," the appearance of a strong feeling-tone, which lasts for a long time, and disappears only with the last reaction. The *linguistic perseverance* ("not pretty," "no danger," "not call on") is therefore in connection with a feeling, lasting probably through quite the same time.

What I suspected from the beginning was, that the young man had a sweetheart. He told me that he had been married a week previously. Upon my asking him whether his wife were pretty, he very characteristically replied, "Other people do not find her very pretty, but for me she is quite pretty enough." From this it is evident that the word "pretty" had hit upon a sore point.

The next curve illustrates a very interesting case. The subject is a young, diligent and gentle man, of whom I knew nothing, except the fact of his being an abstainer.

Figure III.

In the beginning we note the curve falling slowly, then taking a rather horizontal course until the sixth stimulus word, where a sudden enormous rise sets in and maintains itself until the thirteenth reaction.

The reactions are as follows :

1. Pay	Money	4. Love	Hatred
2. Snake	Animal	5. Help	Assist
3. Fine	Beautiful	6. Restaurant	Non-alcoholic

With the sixth reaction the rising of the curve begins. The reaction "non-alcoholic" indicates a very individual complex of ideas. And a very strong feeling seems to be attached to the fact that he is an abstainer.

The reaction next following is :

7. *Polished Glass*

accompanied by a new rising of the curve. "Glass" might be another association of the "restaurant" complex.

The associations following next are :

8. Soldier, Military. 9. Write, Letter. 10. Looking-glass, Clear.

which present nothing special and are also galvanically indifferent.

11. *Full Man*

(The German word "volt" full has also the regular meaning "totally drunk"). This association which distinctly indicates the idea of being drunk is again accompanied by a rising of the curve.

The association :

12. Intelligence Prudent

As things present themselves we may be right in our supposition that there is a complex with strong feelings which has some relation with "restaurant" and "drunkenness." When asked, the man confesses that having once been drunk he had committed the crime of a serious assault, and had consequently been sentenced to a long incarceration. Because of these occurrences he had become an abstainer as a means of preventing his getting again into a similar situation. (This confession was corroborated by others as being the truth).

As may be easily understood, this event left behind a serious and lasting impression, deepened by the fact that his former crime had become a great social hindrance to him.

These examples may serve to show that the associative experiment is under certain conditions, a suitable way of demonstrating the feeling-tones which accompany the associations. I say, under certain conditions,—for not

always will one succeed in obtaining such clear and distinct curves as those shown above. The experiment possesses numerous complications, to overcome which a great deal of time and work is required. Moreover, there is still to be mentioned the difficulty that the physical and physiological part of the experiment is still hidden in obscurity, notwithstanding the work of Tarchanoff, Sticker, Sommer and Veraguth. At the present time, Binswanger in Zurich, is occupied with these researches. His work already concluded I will not here anticipate.

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