

## SENSORY STIMULATION BY ATTENTION.

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The important function which is attributed to attention in the processes of sense-perception is very strikingly illustrated in an interesting instance which has recently been brought to my notice, and which throws into sharp relief the phenomena of attention operating in an intensified manner, and consequently modifying sensation to an extreme extent. It very often happens that normal tendencies are most clearly exhibited in unusual or abnormal cases, because there then occurs an inhibition of counter or complimentary tendencies, thus presenting to the observer the unique operation of an undisturbed and unmodified function. Instead of the resultant of many, there is the sole functioning of the one element separated from its usual concomitants. A force thus revealed in isolation is more readily appreciated whenever seen conjoined with accompanying forces in any system however complex.

The instance I wish to present seems to me to be of this nature, a case where the normal functioning of the attention is intensified in a very unusual degree. It is the case of a child about eight years old, a little girl, who as a baby was supposed to be congenitally deaf, as she gave no evidence of hearing any sounds whatsoever. Somewhat later in her development, however, it was noticed that at certain times she seemed to hear, and this always in connection with some objects of special interest, as bright pictures, toys, etc. And this now characterizes her general ability to hear: whenever the subject is one especially interesting to her, she hears without great difficulty; but whenever there is no interest in conversation, it is with greatest difficulty that she can be made to hear at all; and it is impossible to gain her

attention by any sounds, however loud, if she is engrossed in any absorbing task or play. Connected with this naturally there was an extremely tardy beginning of speech and very slow development, though during the last year—her eighth year—there has been a marked acceleration of her progress in this particular. In Preyer's classification of the imperfections and derangements of speech there is no precise place for such a case as this, as it is neither peripheral deafness, nor yet does it seem to be any cerebral derangement.<sup>1</sup> The difficulty seems to be psychical rather than physiological.

The facts as I have given them were narrated to me by a trained nurse, graduate of the New York Hospital Training School, who was in my family for a month or more during this last winter. She had been for several months in the family attending the mother of this child, and had had abundant opportunity for observation and for acquiring accurate information upon the subject. Moreover, she is a woman of very unusual ability, as one of the visiting surgeons of the New York Hospital assured me, and therefore one whose account can be wholly relied upon. In addition to her report of the case, however, I called upon a physician in New York who had known and observed this child for several years, and he fully corroborated the statement as made by the nurse in all particulars. I learned from him also that the child had been examined three different times by an eminent specialist in New York, and no defects either in the outer or middle ear could be detected. The indications all pointed to normal peripheral conditions, and the marked variations in hearing seem due to the central fluctuations of interest and the corresponding concentration or distraction of the attention. This appears only as an exaggerated form of the normal affect of interest upon attention. As Bradley<sup>2</sup> says: "If an idea engrosses, then any sensation which is connected with that idea may in consequence engross. And attention so far has appeared to consist in interest, either direct or transferred; an account which, we shall find, will

<sup>1</sup> *The Development of the Intellect*, p. 36 ff.

<sup>2</sup> *Mind*, Vol. XI, p. 310.

hold good everywhere" (Cf. Waitz, *Lehrbuch*, 634-7). In the ordinary phenomena of hearing, we recognize two momenta, the external stimulus and the inner adaptation of attention. According to Prof. James,<sup>1</sup> "the natural way of conceiving this is under the symbolic form of a brain-cell played upon from two directions. Whilst the object excites it from without, other brain-cells, or perhaps spiritual forces, arouse it from within. The latter influence is the 'adaptation of the attention.' The plenary energy of the brain-cell demands the coöperation of both factors. Not when merely present, but when both present and attended to, is the object fully perceived." Now, in sense-perception the two momenta, stimulus without and attention within, are normally so related that the former generally predominates, and is capable of arousing the activity of the latter, which is thus in a sense a function of the former, always reacting when the stimulus is sufficiently intense. In the case which we are considering, however, the attention does not function in an instinctive manner in response to an outer stimulus, and seems independent of its degree of intensity; but is readily aroused by the inner interest, and then alone is the consciousness of the outer stimulus rendered possible. This child, for instance, understands the sign language, and that is resorted to in order to communicate with her until interest has quickened the attention, and that in turn has stimulated the hearing. This is similar, in a much lessened degree, to the ordinary cases of what Herbart styles apperceptive attention—viz., where strained attention brings to consciousness external stimuli otherwise unnoticed. And this is similar also to what Prof. James<sup>2</sup> refers to as the 'ideational preparation' for sensation, in which, of course, there is increased attention, reinforced by the dominant idea present in the mind. The function of attention in sense-perception is illustrated by Wundt<sup>3</sup> with weak auditory stimuli, as the ticking of a watch at some distance from the ear, so that it can be perceived only with some strain of attention,

<sup>1</sup> James, *Psychology*, I, p. 441.

<sup>2</sup> *Psychology*, Vol. I, pp. 433, 439.

<sup>3</sup> Wundt, *Human and Animal Psychology*, pp. 256-7.

but will fall below the limen of consciousness without any relaxation. At intervals of three or four seconds the regularly recurring impressions alternately appear and disappear. In this child's case, however, the attention is not merely a factor necessary to discriminate concerning very weak stimuli, but the very strongest stimuli cannot excite the attention through reaction; it can only be centrally aroused; the hearing, then, being a function of the attention in her case, rather than the two being complementary functions determined by a law of action and reaction.

Moreover, a child's attention is characterized ordinarily by an extreme susceptibility to the sights and sounds of the outer world, and responds almost instinctively to sensorial stimuli. Sustained concentration of attention in childhood is unusual.<sup>1</sup> It is in mature age that attention follows our permanent interests, and only those objects associated with such interests find place in consciousness. Absorption in contemplation occurs only when a large group of associations have for years been forming about the controlling interest. And even then, with interests of greatest compelling power, diversion occurs whenever sensorial stimuli are sufficiently increased in intensity. This child, however, can have no developed associations of any considerable extent around her controlling interests; and yet her absorption in the same is complete, and her attention is incapable of being distracted. There is also a marked difference in her increased ability to hear whenever questioned concerning scenes which she has herself witnessed and in which she has taken part with evident pleasure to herself. For instance, after attending an exhibition of Hagenbeck's animals in New York, she heard and replied to all questions put to her concerning the animals and their performances. In this no doubt there was an ideational reinforcement of the auditory stimuli through the memory pictures still vividly impressed upon her mind. The ideational processes causing motor discharges which in time would increase the intensity of the sensation. This would form a stimulus additional to the mental energy arising from the increased interest already

<sup>1</sup> James, *Psychology*, I, p. 417.

mentioned.<sup>1</sup> In this connection it may be of interest to quote a sentence from Prof. James that bears upon this point: "We see how we can attend to a companion's voice in the midst of noises which pass unnoticed, though objectively much louder than the words we hear. Each word is *doubly* awakened; once from without by the lips of the talker, but already before that from within by the premonitory processes irradiating from the previous words, and by the dim arousal of all processes that are connected with the 'topic' of the talk. The irrelevant noises, on the other hand, are awakened only once. They form an unconnected train."<sup>2</sup>

In accounting for such a phenomenon, it is well also to take into consideration the physiological conditions which tend to increase the intensity of a sensation when the attention is unusually concentrated upon it. There seem to be indications of increased circulation in the parts concerned. This is stated by Dr. Cappie in his article on 'The Physiology of Attention and Volition'<sup>3</sup>: "The mental effect produced by an impression on a sensory surface is stronger, and details about the impressing cause are more completely gathered in when the mind is concentrated on it. . . . Two factors, at least, may be specified as bearing on this problem. In the first place, when the consciousness is engrossed by an immediate sensation, the sphere of encephalic activity is comparatively restricted. In the second place, the encephalic circulation will be focused in the direction of activity. The molecular agitation occasions a necessity and an attraction for more blood, and determination of this takes place all the more freely on account of the quiescence of the large part of the brain. The latter has, as it were, loosened its hold on the circulation, and the impetus towards those parts which have an attraction for it is thus all the stronger. The increased activity of the circulation then reacts on the energies of the tissue, and the mental effect produced is therefore greater."

<sup>1</sup> Baldwin, *Mental Development*, pp. 462-3.

<sup>2</sup> James, *Psychology*, Vol. I, p. 450.

<sup>3</sup> *Popular Science Monthly*, Vol. XXX, pp. 231-2.

Now, in the case of this child, it seems as though the conditions, both physiological and psychological, are present in exaggerated form, in order to produce the unusual results. The difference, however, between this case and normal instances is a difference rather of degree than of kind.

An additional feature of interest lies in the similarity between the phenomena we have been considering and the phenomena often accompanying attacks of hysteria. In such cases there is generally a very restricted field of attention, and the patient becomes so completely absorbed in some engrossing subject as to appear completely oblivious to all sensorial stimuli whatsoever. For instance, take such a case as cited by Pierre Janet: Lucie, while talking to one person, was insensible to all sounds about her, and could even be touched without being conscious of it. And when Léonie was knitting or writing, you might open or shut the door with a loud noise, speak to her, touch her, etc., without her perceiving it at all. Moreover, there were parts of her body which were so extremely sensitive to touch as to provoke cries of pain and even convulsions; and yet, when preoccupied by work or simple conversation, she could be touched upon the same hyperæsthesia spots, with no indication that she perceived this.<sup>1</sup> This account is very similar to the report which I received in reply to a letter which I wrote to the nurse above mentioned, making further inquiry concerning this child's case, and asking particularly whether she could hear when spoken to from behind, where her attention could not be aroused by any visual stimulus. The following is the answer which I received: "Her ability to hear when interested, in comparison with times when not interested, is very marked. She can hear if you stand behind her and talk very loud, but not very well; and *never* when she has her mind concentrated on another object; for instance, if she is at a window, looking out at something which has her attention, it is impossible to make her hear."

A case somewhat similar, yet with certain interesting peculiarities, is quoted by Pick from Pitres'<sup>2</sup> *Leçons cliniques*

<sup>1</sup> Pierre Janet, *L'Automatisme Psychologique*, pp. 188-9.

<sup>2</sup> *Zeit. für Psych.*, p. 168.

*sur l'hystérie*: "The patient, with eyes open, could hear; but with eyes closed could not; with one eye open it was possible to hear in the ear opposite, but not in the ear upon the same side as the opened eye." In this same article by Pick, *Ueber die sogenannte Conscience Musculaire* (Duchenne), there is a general historical survey from the time of Duchenne to the present concerning cases of anæsthesia, in which motor activities have been mediated through visual attention, indicating the quickening of motor as well as sensory functions, by means of a concentration of attention. In all cases where there was not this aid of attention through auditory or visual direction, the attempted movements were impossible. It has been also observed that in the somnambulistic state subjects are sensitive to the voice of the hypnotizer, but do not hear other voices. M. Janet mentions the case of one in this condition who could see a candle lighted by himself, but not those lighted by others; and adds that such "is not peculiar to the somnambulistic state, but exists in high degree among all persons susceptible to suggestion. It is an exaggerated state of distraction which is not merely temporary, and not the result of voluntary attention directed exclusively to one sense; but it is a state of natural and perpetual distraction which prevents these persons from perceiving any other sensation than that which actually occupies the whole field of consciousness."<sup>1</sup>

The case of this child seems to occupy a position midway between the temporary and permanent states of distraction as mentioned in M. Janet's account. In all of the similar instances which I have given, as parallel to this case, I have endeavored to indicate varying stages of concentrated attention from the normal to the exaggerated and abnormal; and as closely related phenomena we may consider them as different manifestations of one and the same tendency—the intensified force of attention producing an exaggerated modification of the intensity of sensorial stimuli.

<sup>1</sup>P. Janet, *L'Automatisme Psychologique*, p. 189.