THE APPERCEPTION OF THE SPOKEN SENTENCE; A STUDY IN THE PSYCHOLOGY OF LANGUAGE

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The Apperception of the Spoken Sentence:

A Study in the Psychology of Language.

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I.

INTRODUCTION.

Despite the important rôle which it plays in the mental life, language has, until recently, received but scant attention from the psychologist. While all have recognized the significance of language both as a medium for the transmission of experience,[1] and as the precondition of the higher 'intellectual' processes,[2] very few have attempted a detailed analysis of the verbal idea, and only within a few years has the psychophysics of verbal expression and verbal perception been adequately exploited. It is true that some of the Herbartians, especially Lazarus[3] and Steinthal,[4] have given the discussion of language an important place in their psychological systems, and it is true that the English school—Hartley,[5] Locke,[6] and James Mill[7] in particular—have made much of the function of the word in conceptual thought. But the Herbartian treatment of language was limited to the part which verbal symbols played as the condensed representatives of the Herbartian 'Ideas;' and the English treatment of language belongs rather to logic and epistemology than to psychology. In the

[1] Wundt, W: Grundzüge der physiologischen Psychologie. Leipzig 1893, Vol. II, pp. 610 ff. James, W.: Principles of Psychology. N. Y., 1900, Vol. II, pp. 356-358. Hoefler, A.: Psychologie. Wien und Prag, 1897, pp. 537 ff.

[2] Ladd, G. T.: Psychology, Descriptive and Explanatory. N. Y., 1894, pp. 379 ff. Sully: Outlines of Psychology. London, 1885, pp. 337 ff.

[3] Lazarus, M.: Das Leben der Seele. Berlin, 1878, pp. 213 ff.

[4] Steinthal, H.: Einleitung in die Psychologie und Sprachwissenchaft. Berlin, 1881, pp. 290 ff.

[5] Hartley, D.: Observations on Man, 4th ed. London, 1801, pp. 268 ff.

[6] Locke, J.: An Essay Concerning the Human Understanding. Oxford, 1894, Vol. II, Book iii.

[7] Mill, J.: Analysis of the Phenomena of the Human Mind. 2d ed. London, 1878, pp. 127 ff.

earlier literature of the experimental school, the phenomena of language are strangely neglected. The early studies on the association of ideas used the word as a convenient instrument of experimentation, and the related work upon reaction times involved many of the psychological and physiological principles of vocal expression as well as the psychophysics of symbolic perception; but in neither of these instances was language the primary interest. And yet, notwithstanding this early neglect, there has within the past decade been a very promising growth of monographic literature devoted solely to the psychophysics of language as such. If this growth continues at its present rate, the time will come within a very few years when this literature, together with the philological and pathological studies bearing upon the same problems, must be condensed and classified into a true psychology of language. The time is, of course, not yet ripe for such a systematic treatment, but in lieu of the guide which it would afford, the following very brief enumeration of the fields which such a compendium must cover may serve to introduce our own problem, and to give it the advantage of an orientation which, even if tentative and inadequate, will at least be logical.

The general psychology of language divides itself logically into two great sections: (1) the psychology of language considered as the preconditioning mechanism of the higher mental processes; and (2) the psychology of language considered as the medium of communication, through the agency of which experience is transmitted from individual to individual. To the first section belong the introspective studies and analyses of the verbal idea, its composition in terms of sense-modalities and its function in 'thought.' The monographs of Stricker[1] and of Raymond Dodge[2] are examples of the work which will fall under this rubric. The second section includes the great mass of material which deals with word-perception, the psychological unit in reading, speech development, and the phenomena of aphasia, all of which will fall within one or other of two subsections: (a) the psychology of symbolic expression; and (b) the psychology of symbolic interpretation.

The former subsection deals with the conscious processes that are correlated with the expression of symbols, either by gesture, by manual signs, by writing or by speech. It is manifestly a department of the psychology of action, but its problems have hitherto been treated mainly by the genetic or

[1] Stricker, S.: Studien uber die Sprachvorstellungen. Wien, 1880.
[2] Dodge, R.: Die motorische Wortvorstellungen. Halle Dissertation, 1896.

by the pathological method. Among the genetic studies of expression, the work of Baldwin,[1] Preyer,[2] Perez,[3] Schultze,[4] Noble,[5] Kirkpatrick,[6] Tracy,[7] and Lukens[8] furnishes valuable data regarding the ontogenesis of speech. These data must, of course, be verified and supplemented by further observations, and finally interpreted in the light of some comprehensive theory of mental development. In connection with the pathology of expression, the work of Wernicke, Grashey, Lichtheim, Freud, Hughlings-Jackson, Kussmaul, Exner, Charcot, Déjérine, Bastian, Starr, and Elder is too well known to require especial mention. Many of the monographs are already classics in the literature of psychiatry. A general summary of their results, however, interpreted from a psychological rather than from a clinical standpoint, has long been wanting. Perhaps the most satisfactory attempt to fill this want is represented by Joseph Collins's recent work.[9] Bawden's monograph,[10] dealing as it does with the border-line between normal and abnormal expression, will also find its place in this subsection.

The latter subsection—the psychology of symbolic interpretation—deals with the conscious processes that are correlated with the perception of symbols and the apperception of their meaning. It is to this chapter of the psychology of language that the present study belongs. It represents an attempt to determine the nature and relations of the factors which are involved in the perception of spoken symbols and in the apperception of their meaning. Inasmuch, however, as the study was suggested by recent investigations upon the psychophysics of visual perception, a general discussion of the factors involved in any form of symbolic perception, as well as a brief review of these other investigations, will not be out of place.

If we consider symbols apart from their ' meaning ' and look

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[1] Baldwin, J. M.: Mental Development in the Child and the Race.

[2] Preyer: Mind of the Child. Trans. Brown. N. Y., 1888. Mental Development of the Child. Trans. Brown. N. Y., 1893.

[3] Perez, B.: The First Three Years of Childhood. Trans. A. M. Cristie. Chicago, 1895.

[4] Schultze, F.: Die Sprache des Kindes. Leipzig, 1880.

[5] Noble, E.: Child-Speech and the Law of Mispronunciation. *Education*, Sept. and Oct., 1898.

[6] Kirkpatrick, E. A.: How Children Learn to Talk, etc. *Science*, Sept., 1891.

[7] Tracy, F.: The Psychology of Childhood. Boston, 1895.

[8] Lukens, H. T.: A Preliminary Report on the Learning of Language. *Pedagogical Seminary*, Vol. III, pp. 424-460.

[9] Collins, J.: The Genesis and Dissolution of the Faculty of Speech. New York, 1898.

[10] Bawden, H. H.: A Study of Lapses. *Psychological Review Monograph Supplement*, Vol. III, No. 4 (Whole No. 14), April, 1900.

at them simply as different forms of stimuli appealing to one or another of the sense-departments, it is manifest that certain psychophysical principles condition their efficiency for perception. (1) The symbols must over-step the spatial, qualitative, temporal and intensive limina of the sense-department to which they appeal; and (2) the symbolic elements must overstep the differential limen of the modality to which they belong, *i. e.*, they must, as perceptive elements, be discriminably different. In the ordinary visual symbolism, these differences are spatial,—differences of form, of spatial extent, of spatial position. In the typical auditory symbolism—speech—the differences in the expressive stimuli are more complicated. They are (1) a qualitative difference, (2) a temporal difference (both of which may be called primary differences), and (3) an intensive difference (which is more or less secondary in its nature). In more concrete terms, the differences in the symbolic elements appealing to the ear are: (1a) in the case of consonants, modal differences of a complex nature due to the different forms of adjustment and release of the various parts of the vocal apparatus concerned in the production of consonants; (1b) in the case of vowels, simpler qualitative differerences due to the modifications of the laryngeal clangs by the changes in the form of the pharynx and the buccal cavity; (2a) temporal differences within the complex temporal unit of expression (rhythm); (2b) temporal differences in the rapidity with which one symbol element succeeds another symbol element (quantity and pause); (3) intensive differences, due to the fact that certain symbol elements may be emphasized and that the innervation for certain other symbol elements may be weakened.

It is evident that a psychophysical examination of the conditions underlying the perception of symbols must proceed along the lines marked out by an analysis similar to that given above. One of the problems of such an investigation would be the determination of the value of each of these factors in word and sentence perception. This we find to be the point of view of those who have recently approached the study of language from the psychophysical side. They have consistently held to the problem of perception, and they have treated this problem according to psychophysical methods. This work has, however, been confined almost exclusively to visual perception, and the majority of monographs that have been produced are studies in the psychology of reading.

Cattell[1] made the first important experimental determination of the time required for the perception of letters and words. His prin-

[1] Cattell, J. McK.: Ueber die Zeit der Erkennung und Benennung, etc. Phil. Studien, Vol. I, pp. 635 ff.

cipal conclusions are as follows. (1) The maximal rapidity with which a word can be read, when given in a context, varies directly with the subject's knowledge of the language to which the word belongs; (2) if the words do not form sentences, and the letters do not form words, the time required for reading them is approximately doubled; the time required for the perception of a letter is very little shorter than that required for the perception of a word; (3) the less familiar a word is, the smaller is the difference in the time required for reading it backwards and reading it forwards.

During the same year in which Cattell made these determinations, Grashey[1] published a paper, based upon a study of aphasia, in which he maintained that the unit of perception in reading was the letter and not the word. This position was adopted by Wernicke, Leube and other alienists. Loewenfeld,[2] six years later, basing his conclusions also upon aphasic observations, affirmed that with the practiced reader the operation was not literal but verbal. He supported this observation by experiments with blurred words, in which he found that when the words were familiar a considerable amount of blurring did not interfere with the perception, while quite the opposite obtained with unfamiliar words. Goldscheider and Mueller[3] subjected this problem to an elaborate experimental treatment. They found the time of perception to be dependent (1) upon the number of elements, and (2) upon the uniformity of their arrangement. In the case of elements of different kinds, the type or plan of arrangement was much more easily perceived than the separate characteristics of the single elements. In the exposure of letters which did not form words, the following results were obtained. (1) Four letters were correctly perceived upon the first exposure; (2) five letters were always correctly seen upon the second exposure. As regards letter-series forming syllables, words, and word-groups, it was found that series of four letters were correctly read at the first exposure; more than four letters were not successfully read at the first exposure, unless they were quite familiar. If the entire word is not perceived, there is a tendency to fill out the perceived letters into any word that may contain them. In words of eight letters or more, more than one exposure is invariably required. While only eight letters can be perceived in .03 sec., three words that make connected 'thought' can be correctly perceived in the same time. In actual reading, letters are either of 'determining' or of 'indifferent' significance for perception. To the former category belong in general the consonants and especially the initial letters. General conclusions: (1) In ordinary reading, there is no reason to believe that each letter is perceived as such. (2) For the production of the verbal (auditory-kinaesthetic) idea, and for the purposes of conceptual 'apperception,' the perception of the total number of letters uniting to form the word is not necessary, the perception of certain determining letters being sufficient for these purposes. (3) It is probable that the determining letters evoke the phonetic letter-sound images corresponding to them, and that these in turn evoke the complete verbal (auditory-kinaesthetic) image. (4) The word-image procedure in reading is not to be distinguished from 'literal' reading by the perception of 'determining' letters. The word-image is the succession of letter images.

[1] Grashey, H.: Ueber Aphasie und ihre Beziehung zur Wahrnehmung. Archiv für Psych. u. Nervenkrankheit, Vol. XVI. (1885.) pp. 654-689.

[2] Loewenfeld: Ueber zwei Fälle von amnestischer Aphasie, etc. Deutsche Zeitschrift für Nervenheilkunde, Vol. II. I Heft.

[3] Goldscheider, A., und Mueller, R. F.: Zur Psychologie und Pathologie des Lesens. Zeitsch. für klinische Medicin, Vol. XXIII, pp. 130-167.

'Reading in word-images' is, therefore, in reality a reading in letter groups.

Pillsbury's problem[1] was in many respects closely related to that of Goldscheider and Mueller. He attempted to determine the "relative importance of sensation and the more general and remote factors which are involved in the very simple and familiar operation of reading a word." The method employed was the mutilation of type-written words by omitting, blurring and substituting letters. Results: (1) The various kinds of changes made in the words stand in ease of recognition in the following order: omitted, substituted, blurred. (2) A disfigurement of the first letter is easily recognized, but disfigurements coming later are apt to be overlooked. (3) Where more than one letter is disfigured the first disfigurement is not so often overlooked as are the others. (4) There is about as much chance of recognizing a misprint when it stands alone as when others are combined with it in the same word; if there is any difference, it is in favor of recognizing a change when others are present. (5) The strength of suggestion which comes from the word itself is entirely independent of the length of the word. (6) The proportion of misprints overlooked is greatly increased under the influence of the suggestion of associated words.

Erdmann and Dodge[2] consider Goldscheider and Mueller's results untenable. (1) Words are optical wholes, but the spoken reproductions are letter combinations. (2) If a printed line (the context of which may be readily understood) is read, and the head meantime kept in an immovable position, there is a regular alternation between the pauses of rest and the eye movements. The number of movements is much smaller in reading the mother-tongue than in reading a foreign language; and the more familiar the context, the more uniform are the durations of the rest-pauses and the movements. (3) The number of rest-pauses and movements is three times as great when the reader attends to the text itself as when he attends to the contents of this text. (4) When the attention is directed upon the text, rather than the contents, the field of most distinct vision includes about four letters (p. 68). (5) The rapid alternation of the black and white text-elements following one another during the eye-movements completely excludes the possibility that we cognize the letters in the course of such movements (p. 71). During the course of the eye-movement in reading there is lacking a perceptive contents corresponding to the actual stimuli presented by the letters, if, as is ordinarily the case, the attention is not directed to this perceptive contents. (6) Visual perception of the letters in reading occurs exclusively during the rest-pauses of the eye; these can, therefore, be designated reading-pauses. The areas of simultaneous perception in reading are greater than the areas of distinct perception of the single letters, and the range of these reading-areas excludes the possibility that all single letters contained in them are distinctly perceived. The sum total of the visual angles subtended while reading a line is smaller than the visual angle for the entire line. (7) Under similar conditions, four to five times as many letters can be read in word-connection as without word-connection. In the reading of letters exposed without word-connection, the last to be exposed are generally either not read at all or falsely read. (8) The fact that we perceive familiar words under conditions that exclude any perception of the single elements is due to the typical forms which the words

[1] Pillsbury, W. B.: The Reading of Words. This *Journal*, Vol. VII, pp. 315 ff.
[2] Erdmann, B., and Dodge, R.: Psychologische Untersuchungen ueber das Lesen auf experimenteller Grundlage. Halle, 1898.