

A STATISTICAL SUMMARY OF RECENT EXPERIMENTAL STUDIES OF LEARNING AND MEMORY

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More than seven per cent of all the space in twenty-two psychological journals during the last six years has been devoted to experimental studies of learning and memory. The present report is an attempt to summarize certain trends of the experiments which have appeared in English during the years 1925 to 1930 inclusive.¹ Data are presented to bear on the following questions:

1. What journals have devoted relatively the greatest amount of space to experimental studies of learning and memory?
2. What has been the trend for the six year period with respect to the number of pages devoted to such studies?
3. What has been the size of the groups used in the learning and memory experiments?
4. What different kinds of subjects have been experimented upon?
5. What has been the age of the human subjects used?

It is evident that most of these questions can be most conveniently answered with tables. The figures given in the summaries are, in the main, reliable. No rigid set of criteria was established to determine whether certain studies were or were not concerned with learning or memory. The journals cited were examined and any reports of an experimental nature, regardless of their titles, that is, any in which factors were systematically varied in an attempt to determine their effect upon learning or memory, were included. The selection of materials was subjective, and some differences of opinion might exist as to whether all of the proper studies have been analyzed. One partic-

¹ The journals studied totaled 53,671 pages of psychological literature of which number 3,937 pages dealt with experimental studies of learning and memory. The following publications were examined: (1) *American Journal of Psychology*, (2) *Archives of Psychology*, (3) *Australasian Journal of Philosophy and Psychology*, (4) *British Journal of Psychology*, (5) *British Psychological Monographs*, (6) *University of California Publications in Psychology*, (7) *Genetic Psychology Monographs*, (8) *University of Iowa Studies in Psychology*, (9) *Journal of Abnormal Psychology*, (10) *Psychological Clinic*, (11) *Journal of Comparative Psychology*, (12) *Journal of Applied Psychology*, (13) *Journal of Experimental Psychology*, (14) *Journal of General Psychology*, (15) *Journal of Educational Psychology*, (16) *Mind*, (17) *Mental Hygiene*, (18) *Pedagogical Seminary*, (19) *Psychoanalytic Review*, (20) *Psychological Review*, (21) *Psychological Bulletin*, (22) *Psychological Monographs*.

ular factor that might cause disagreement was the tendency for some authors to label their studies "experimental" when they were quite obviously statistical. Such reports were not included in this summary, nor were a few lengthy theoretical articles supported by meagre and incidental experimentation.

Journals contributing most to experimental studies of learning and memory.—Table I indicates the percentage of the total number of pages of experimental material dealing with learning and memory for the period 1925-1930 which was contributed by each of six psycholog-

TABLE I

PERCENTAGE OF THE TOTAL NUMBER OF PAGES DEALING WITH EXPERIMENTS ON LEARNING AND MEMORY CONTRIBUTED BY DIFFERENT JOURNALS

Journal	Per cent
Journal of Experimental Psychology.....	19.6
Journal of Comparative Psychology.....	19.5
Pedagogical Seminary	19.4
Archives of Psychology	13.6
Journal of Educational Psychology	9.3
American Journal of Psychology	6.7
Other sixteen journals	11.9

ical journals. Of this total number of pages the Journal of Experimental Psychology, Journal of Comparative Psychology, and Pedagogical Seminary contributed more than nineteen per cent each. The six periodicals listed were responsible for approximately ninety per cent of the work of this type reported in English. But slightly more than ten per cent was scattered through the other sixteen publications.

Trend for the six year period.—With respect to the percentage of pages devoted yearly to the type of study under consideration it appears that interest has been on the increase for the last six years. As is represented in Table II, with the exception of a slump in 1929, there has been a more or less constant tendency to devote more attention to experimental studies of learning and memory.

TABLE II

PERCENTAGE OF THEIR TOTAL NUMBER OF PAGES DEVOTED TO EXPERIMENTAL STUDIES OF LEARNING AND MEMORY BY TWENTY-TWO JOURNALS FOR A SIX YEAR PERIOD

Year	Per cent
1925	9.7
1926	11.9
1927	16.6
1928	20.5
1929	15.1
1930	26.2

Number of subjects used per experimental group.—Attention has been called frequently to the tendency for drawing conclusions from studies using too few subjects. However, the *total* number of subjects used in any experimental program is of little consequence. The important consideration is, obviously the number of subjects used per experimental group. The statement "These results are based upon the use of more than sixty rats" becomes relatively meaningless when further investigation reveals the fact that these sixty were divided into six groups of ten each. In view of this consideration, Table III shows the number of subjects per group, and gives for each year the percentage of the total number of groups within certain class limits.² It is evident that much improvement is possible with respect to this aspect of experimental technique, nor does it appear that much progress has come about in the last six years. More than twenty-three per cent of

TABLE III

PERCENTAGE OF THE TOTAL NUMBER OF EXPERIMENTAL GROUPS USED EACH YEAR WHICH FALL WITHIN CERTAIN CLASS LIMITS.

Year	Number of individuals per group								
	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81 up
1925	4	22	23	7	6	8	1	9	22
1926	25	31	19	6	1	10	1	0	7
1927	20	23	8	8	9	1	2	7	24
1928	30	12	14	6	1	7	6	2	20
1929	34	15	13	6	12	1	3	3	12
1930	29	27	24	5	6	3	1	1	4
Mean	23.7	21.7	17.0	6.4	5.7	5.0	2.3	3.7	14.8

the groups used for the six year period numbered ten or less. It would seem that such studies are relatively useless for comparative purposes. In quite a number of studies college classes were used for research purposes with the apparent implication that any two classes were sufficiently equated for experimental purposes. This assumption is questionable. The whole matter of the equation of experimental and control groups is quite unsettled, especially in the field of infra-human study. Researchers using animal subjects rarely make an attempt toward preliminary equation of groups, even though this precaution is apparently necessary in the case of highly inbred white rats.³ Labeling conclusions tentative does not seem to be sufficient justification for the use of groups which are compared without being subjected to some sort of preliminary equation. Such studies merely serve to agitate

² Even though some authors described their procedure so inadequately as to make it impossible to get data with respect to size of groups, there are still more groups represented in Table III than there were studies reported. This is due to the fact that many single investigations employed as many as six different groups.

³ Corey, Stephen M., Equating groups in comparative experiments, *Jour. Comp. Psychol.*, Vol. 10, pp. 282-294, 1930.

further those who have already noticed a measure of inconsistency in psychological results.

Kind of subjects used in experiments on learning and memory.—Granting that the ability to learn is characteristic of all animal life, and for such an assumption there seems to be considerable evidence, it is of interest that so few studies have been reported upon subjects other than vertebrates. One who wishes to approach the problems of learning phylogenetically must progress very sketchily until he reaches the fishes. Table IV partially summarizes the present status of affairs with respect to this factor by giving the percentage of the total number of learning and memory studies which were concerned with humans, rats and mice, and all other animals. The majority of the work dealt

TABLE IV

PERCENTAGE OF THE TOTAL NUMBER OF LEARNING AND MEMORY STUDIES DEVOTED TO DIFFERENT ANIMALS.

Subjects	1925	1926	1927	1928	1929	1930	Mean
Humans	68	51	56	50	56	71	58.7
Rats and mice.....	23	19	33	34	40	25	29.0
All others	9	30	11	16	4	4	12.3

with humans with the almost entire neglect of all phyla except the vertebrate. Less than one per cent of all experimental investigations of learning and memory ability were performed on invertebrates. There appears to have been no particular trend for the six year period with respect to the type of subjects used.

Age of the human subjects used.—Theoretically, the problems of learning at any one developmental level are neither more nor less important than those of any other. For an all inclusive and systematic psychology of the growth of human learning ability it is essential that there be at least a large number of studies for each age. That this situation does not prevail has frequently been noted. There are many studies of the learning and retention of college and graduate students, but experimental investigations of the ability of pre-school and primary children are relatively scarce. In view of the great practical value of such studies in connection with the school, their rarity is even more to be lamented. Teaching methods are more often based upon theories of learning and memory discovered and developed through experiments on animals and adults than upon a keen understanding of the same processes in children. Table V gives the percentages of the total number of experimental studies which were concerned with human subjects at the different age levels. The limits of the age groups cited are arbitrary, but are never-the-less most consistent with the designations used

TABLE V

PERCENTAGE OF THE TOTAL NUMBER OF HUMAN STUDIES PERFORMED ON DIFFERENT AGE GROUPS.

Group	1925	1926	1927	1928	1929	1930	Mean
Pre-school	6	12	16	6	11	9	10.8
Grades I-IV	21	8	5	12	4	2	6.1
Grades V-VIII	21	5	10	20	6	8	11.7
High School	3	13	4	11	15	10	9.3
Adults	59	62	65	52	63	71	62.1

in the studies reported. Children are certainly neglected. More than sixty-two per cent of the studies conducted were performed on adults. Grades V, VI, VII, and VIII came next and the four lowest grades last.

Summary. The following statements summarize the tables:

1. The Journal of Experimental Psychology, Journal of Comparative Psychology, Pedagogical Seminary, Archives of Psychology, Journal of Educational Psychology, and the American Journal of Psychology contributed 88.1 per cent of the experimental literature dealing with learning and memory during the years 1925-1930 inclusive.
2. There appears to have been an increase in the amount of attention devoted to such studies during the period under consideration.
3. Of all the groups used in experiments on learning and memory, 23.7 per cent included less than ten individuals. Few precautions were taken to equate experimental and control groups in infra-human studies.
4. Of all the different kinds of subjects used, 58.7 per cent have been human, with less than one per cent devoted to the invertebrates.
5. Of those studies dealing with human subjects, 62.1 per cent involved the use of adults whereas but 17.8 per cent were concerned with school children.