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THE PSYCHOMOTOR DOMAIN--A SELECTIVE BIBLIOGRAPHY WITH ANNOTATIONS.

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PUB DATE JUN 66

EDRS PRICE MF-$0.25 HC-$0.88 20P.

DESCRIPTORS- *ANNOTATED BIBLIOGRAPHIES, *PSYCHOMOTOR SKILLS, BASIC SKILLS, *SKILL DEVELOPMENT, *PHYSICAL DEVELOPMENT, PERCEPTION,

SEVENTY-FIVE ALPHABETIZED, ANNOTATED CITATIONS ABOUT THE PSYCHOMOTOR DOMAIN, WITH PUBLICATION DATES FROM 1923 THROUGH 1965, ARE PRESENTED FOR USE BY THOSE CONCERNED WITH DEVELOPING PHYSICAL ABILITIES AND SKILLS. REPRESENTATIVE AREAS COVERED ARE (1) DEVELOPMENT OF VISUAL AND MOTOR SKILLS, (2) EDUCATIONAL PSYCHOLOGY, (3) EFFECTS OF ANOXIA AND STRESS ON LEARNING, (4) HUMAN BEHAVIOR, (5) LEARNING, (6) LEARNING TRANSFER, (7) MATURATION, (8) MOTIVATION, (9) PERCEPTION, (10) RETENTION, AND (11) TEACHING. THIS DOCUMENT IS AVAILABLE FOR 50 CENTS FROM DIVISION OF HOME ECONOMICS EDUCATION, DEPARTMENT OF VOCATIONAL AND TECHNICAL EDUCATION, COLLEGE OF EDUCATION, UNIVERSITY OF ILLINOIS, URBANA, ILLINOIS, 1966. (FP)

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by

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June 1966

INTRODUCTION

This annotated bibliography is a by-product of a project aimed at the development of a classification system for educational objectives, psychomotor domain.

In reviewing related literature, Mrs. Griggs and Mrs. Carlson, research assistants on the project, became aware of a number of references that they believed would prove helpful to those concerned with the development of physical abilities and skills. It was their desire to share these references with others so concerned which prompted development of this publication.

--Elizabeth Simpson, Chairman
Division of Home Economics
Education

SELECTIVE BIBLIOGRAPHY WITH ANNOTATIONS--PSYCHOMOTOR DOMAIN

Allport, Floyd M. Theories of Perception and the Concent of Structure. New York: John Wiley and Sons, Inc., 1955.

In the words of the author, this book has "a dual purpose, first, to review and examine the trend of psychological thinking about perception and, second, to tell the reader something about the solution I have found for my own problem and the possible relation of that solution to the problems which perceptual experiment and theory must solve." Two chapters are devoted to sensory and motor factors in perception.

Bachman, John C. "Specificity versus Generality in Learning and Performing Two Large Muscle Motor Tasks," Research Quarterly. 32:3-11, March 1961.

The purpose of this study was to investigate task specificity versus generality in the learning of two motor skills involving balance. The initial and final skill, and amount of learning, were studied on two 10-trial large muscle motor learning tasks. Three hundred and twenty males and females were tested.

Baker, Katherine E. and Ruth C. Wylie. "Transfer of Verbal Training to a Motor Task,"Journal of Experimental Psychology. 40:632-38, 1950.

This experiment investigates the transfer effects of varying amounts of verbal training upon the subsequent learning of a motor task. A discrimination learning problem in which the subject learned to press the appropriate one of four switches upon the appearance of a red or green light was the motor task used in this experiment.

Bartley, S. Howard. Principles of Perception. New York: Harper and Brothers, 1958.

The role of awareness both as an object of study and as a factor in the activities of those who study it is emphasized rather than the retention of mentalistic concepts and usages. Criticism of commonly used definitions of the terminology used in psychology are provided in the hope of clarifying verbal communication about human behavior.

Beardslee, David C., and Michael Werthermer. Readiness in Perception. Princeton, New Jersey: D. Van Nostrand Co., Inc., 1958.

A collection of important papers is arranged in a sequence which the author hopes will present an understanding of "why things look as they do."

Berelson, Bernard, and Gary A. Steiner. Human Behavior. New York: Harcourt, Brace and World, Inc., 1964.

This book "is an inventory of knowledge: the present state of scientific knowledge about human behavior." There are 1,045 findings which are supported by summaries of extensive research by scholars in the fields of anthropology, psychology, sociology, and related fields. The authors dedicated a chapter to perceiving.

Bourasse, G. L., and Robert M. Guion. "A Factorial Study of Dexterity Tests," Journal of Applied Psychology. Vol. 43 (No. 3, June 1959), 199-204.

A battery of dexterity tests and vision tests were given to identify a tweezer dexterity factor and to determine the relationship between fine dexterities and visual skills. From the centroid method of analysis three of the five hypothesized factors were identified: manual dexterity, visual sensitivity, visual feedback. The tweezer dexterity and finger dexterity factors failed to appear.

Breckenridge, Marian E., and Vincent E. Lee. Child Development. Philadelphia: W. B. Saunders Co., 1960.

Fundamental contributions from current publications in the area of child development have been incorporated in this edition of Child Development. Practical application of theory has resulted in an eclectic point of view. Parts of the book are devoted to perception and motor control.

Cole, Lawrence E., and William F. Bruce. Educational Psychology. New York: World Book Co., 1958.

Stress is focused upon the child who is being taught. Reading, writing, arithmetic, and science must be made meaningful to him. Motor skill is emphasized at different age levels.

Cratty, Bryant J. "Comparison of Learning a Fine Motor Task with Learning a Similar Gross Motor Task, Using Kinesthetic Cues," Research Quarterly. 33:212-21, 1962.

The purpose of this study was "to compare the performance and learning rates of a fine motor task and of a gross motor task, while holding constant the sensory cues and the maze patterns utilized." The subjects, 60 male university students, were given the task of learning to travel two irregularly patterned mazes using tactual kinesthetic cues.

Cratty, Bryant J. Movement Behavior and Motor Learning. Philadelphia: Lee and Febiger, 1964.

The author's purpose is to provide physical educators and others who are concerned with motor activity a clearer understanding of human movement and skill learning. Its focus is upon voluntary, observable movement and the factors which underlie individual performance and learning differences.

Cratty, Bryant J. "Transfer of Small-Pattern Practice to Large-Pattern Learning," Research Quarterly, 33:523-35, 1962.

The investigator compared the large-pattern learning proficiencies of four groups of subjects to determine the influence of prior small pattern practice. The tasks were mazes containing irregular patterns and no blind alleys and were learned blindfolded. Traversal time was the learning criterion.

Crow, Lester D., and Alice Crow. "Acquiring Motor Skills and Knowledge," Educational Psychology. New York: American Book Company, 282-308, 1963.

A brief account is given of motor development in early childhood and the value of proper motor development for further skill learning by the child. Implications for the teacher are given concerning how he should guide the learner in development of skill in any area. Three possible stages for learning motor skills are listed beginning with the initial spurt to the practice plateau to competence in that skill.

Crow, Lester D., and Alice Crow. Readings in Human Learning. New York: David McKay Co., Inc., 1963.

A selection of readings which begins with an explanation of what learning is, and moves quickly to a presentation of the (1) importance of general background in learning, (2) principles and conditions of learning, (3) various theories of learning, and (4) developmental aspects of learning. Excerpts are included from authorities in motor learning. One chapter devoted to the subject is of particular interest.

Dember, William N. The Psychology of Perception. New York: Holt, Rinehart and Winston, 1964.

Topics which would be covered in a one-semester laboratory course in perception are incorporated in this book. Of particular interest to those who are studying motor learning are chapters 5-8 which include: Organization of Visual Perception, Influence of Context, Effects of Learning on Perception, and Set and Perception.

Ellfeldt, Lois, and Eleanor Metheny. "Movement and Meaning: Development of a General Theory," Research Quarterly. 29:264-72, October 1958.

"A tentative general theory of the meaning of human movement--kinesthesia as a somatic-sensory experience which can be conceptualized by the human mind was developed within the context of the basic assumptions of the philosophy of symbolic transformation as they relate to the nature of the process which enables human beings to find meaning in their sensory perceptions." The authors also identified the essential elements common to all forms of human movement. A vocabulary was developed to these elements. The relationships among these elements were analyzed in relation to the process of human thought by using this vocabulary.

Fleishman, Edwin A. "An Analysis of Positioning Movements and Static Reactions," Journal of Experimental Psychology. Vol. 55, No. 1, 13-24, January 1958.

In this study, Fleishman was concerned with the interrelationships among the skills in the areas of positioning movements and static reactions. A series of tasks were developed and standardized for measurement of these skills. The battery of tasks was administered to 200 subjects and the results subjected to factor analysis. He found that skill in static reactions is considered a separate class of skill from positioning movements which were found to have a high degree of specificity and therefore little predictive value.

Fleishman, Edwin A. "Dimensional Analysis of Psychomotor Abilities," Journal of Experimental Psychology. Vol. 48, 437-454, December 1954.

This study is one in a series of studies designed to provide a functional classification of abilities which would account for individual differences in psychomotor performance. Fleishman gave a battery of tests especially selected to measure certain categories hypothesized to exist in studies previously done. These tests were taken by some 400 subjects and the results were subjected to the Thurstone centroid factor analysis. By these procedures he isolated ten relatively independent factors in psychomotor skill.

Fleishman, Edwin A., and Walter E. Hempel. "A Factor Analysis of Dexterity Tests," Personnel Psychology. Vol. 7, 15-32, Spring 1954.

In this study, Fleishman and Hempel investigated the nature of factors contributing to manual performance and found evidence contrary to the notion that manual dexterity is a unitary ability. From the tests used five factors were found important. These factors were defined and analyzed as to the type of occupation which would require this factor as an important part of its execution. It is thought by Fleishman and Hempel that such a battery of tests could be used for classification to predict success in a wide variety of jobs. Also this battery might facilitate observations concerning job analysis and the abilities desired and required for a certain job.

Frandolig, Carol Hatch. Validation of Three Instruments to Predict Clothing Construction Ability at the High School Level. Unpublished master's thesis.

This thesis is an attempt to revise and validate a battery of instruments, previously investigated by Ella Joyce Groft, measuring the ability of high school students in clothing construction. A second purpose was to predict achievement of students through the use of regression equations. Frandolig concludes from her study, that regression equations would be useful in prediction of clothing construction success but recommends that further research be done with a new sample of students. She includes clothing construction tests and pre-tests with keys.

Franklin, Joseph C., and Josef Brazek. "The Relation Between Distribution of Practice and Learning Efficiency in Psychomotor Performance," Journal of Experimental Psychology. 37:16-24.

An important problem in the study of the learning process is the relative effectiveness of spaced versus concentrated practice. "The purpose of the experiment was to ascertain the relative learning efficiency of concentrated and distributed practice in training men on two psychomotor tests--gross body reaction time and pattern tracing."

Fuzak, John A. Research Report on the Role of Physical Maturation in Determining the Ability of Junior High School Boys to Perform Complex Finger Coordination Activities in Industrial Arts, and An Index to Level of Ability. American Technical Society, 1958.

Through research cited, Fuzak attempts to answer the question as to whether there is a relationship of physical maturity to the readiness of pupils to learn to perform complex finger coordinative manipulations in industrial arts classes and if there is, what practical indicator can be used by the classroom teacher to determine the level of physical maturity. He found that his basic assumption concerning physical maturity positively correlated with learning readiness. Strength of grip seemed to be a reliable indicator of level of physical maturity as measured by a simple hand dynamometer.

Gagne, Robert M., and Edwin A. Fleishman. Psychology and Human Performance. New York: Henry Holt and Co., 1959.

A "dimensional approach" has been used to provide the reader with a systematic description of human behavior. Several chapters are particularly relevant to the Taxonomy of Educational Objectives, Psychomotor Domain. They are as follows: Human Abilities, Learning and Retention, Discrimination and Identification, Motor Skills and Training.

Gagne, Robert M., Katherine E. Baker, and Harriet Foster. "Transfer of Discrimination Training to a Motor Task," Journal of Experimental Psychology. 40:314-28, 1950.

"The learning of one class of motor skills involves the establishment of different responses to each of a given set of stimuli." This study deals with the learning of a skill in which a subject must learn to make a number of different manual responses to the same number of visual stimuli.

Geldard, Frank A. The Human Senses. New York: John Wiley and Sons, Inc., 1953.

The basis for the understanding of human nature is through an appreciation of man's senses and of the fundamental role they play in the attainment of knowledge and the regulation of behavior.

Gray, J. Stanley, George Sustare, and Anthony Thompson, "An Apparatus for Measuring Operational Hand Steadiness," Journal of Applied Psychology. 37:57-58, 1953.

"Skilled work involves operational steadiness." The investigators devised an apparatus to measure hand steadiness in three dimensions.

Guilford, P. J. "A System of Psychomotor Abilities," American Journal of Psychology. Vol. 71, 164-174, 1958.

Guilford has developed a system for classifying factors of psychomotor abilities isolated previously by Fleishman and Hempel and involving an interrelationship between mental functioning and abilities of the individual. He has developed a matrix with one side listing the type of ability and the other side listing parts of the body involved. He states that this matrix leaves open many possibilities for further development.

Harmon, John M., and Arthur G. Miller. "Time Patterns in Motor Learning," Research Quarterly. 21:182-187, 1950.

Report of a study done to find a basis for improvement in methods of teaching of basic or beginning motor skills.

Hartson, L. D. "Analysis of Skilled Movements," The Personnel Journal. Vol. 11, 28-43, June 1932.

The emphasis of Hartson's study is in distinguishing the different types of movement which function simultaneously in any coordinate action. This action study analyzes skilled movement, dividing it into fundamental movement forms of which he lists two main classifications, then further subdivides these into smaller areas. One conclusion drawn is that coordinate movement is a combination of types of movement. A review and analysis of related literature from industrial engineering and applied psychologyare cited.

Hartson, L. D. "Contrasting Approaches to the Analysis of Skilled Movements," Journal of General Psychology. 20:263-293, 1939.

Included in this article is a classification of work types to facilitate analysis of the movement process; there are also samples of the subtypes.

Hochberg, Julian E. Perception. Englewood Cliffs, New Jersey: Prentice-Hall, 1964.

The author attempts to answer the general question of "why things look as they do" by presenting the history of theories and facts of perception.

Killip, Devore Eugene. The Effects of Discovery on the Learning of Manual Skill. Master's thesis. University of Illinois, October 1963, as reported in Training Research Laboratory Manual, Technical Report No. 2, Psychological and Educational Factors in Transfer of Training, Phase 1, U.S. Office of Education, Contract 2-20-003, Lawrence M. Stolurow, Principal Investigator.

Dentistry requires a variety of highly refined special skills. Killip has concerned himself with the learning of a manual skill involving finger and manual dexterities, and sensory skills. Two groups of dental students learned the same motor task using a cord-drived straight handpiece to remove a specified amount of dentin-like material. One group received instruction on how to do it before beginning; the other practiced before instruction. His hypothesis was that the former group would learn more rapidly and the method would have greater inductive transfer value between the language of instruction and the cue response relationships. According to Killip's findings, these two hypotheses were supported.

Kimble, Gregory A. Principles of General Psychology. Ronald Press Company, New York, 1956.

The book is divided into four major sections which deal with basic methodology, sensation and perception, modifications of behavior and behavior dynamics. The sensory processes in general are discussed in the section of sensation and perception, and motor learning is discussed in the section on the modification of behavior.

Klausmeir, Herbert J. Learning and Human Abilities. New York: Harper and Brothers, 6-10, 1961.

A further development of Guilford's classification system has been done by Klausmeir. He has added content and outcomes to Guilford's factors or processes of the psychomotor domain. He lists four reasons for differences in performance between the more skillful and less skillful individual. These are better differentiations of cues to guide the actions, more rapid trial, correction, and confirmation of responses, more rapid movements or other responses, and more highly coordinated movements or other responses.

Kohfeld, David Lloyd. The Prediction of Perceptual Motor Learning from Independent Verbal and Motor Measures. Unpublished master's thesis. University of Illinois, 1964.

In his thesis, Kohfeld concerns himself with the possibility that as a person becomes proficient at a task, he is less able to verbalize concerning his performance. From a study of task trials, he confirmed his hypothesis that in early tasks verbal comprehension is more important in learning whereas motor skill is more critical in later learning.

Kuhlen, Raymond G. The Psychology of Adolescent Development. New York: Harper and Brothers, 1952.

The psychological development during the teen years is emphasized. The essential nature of adolescence is examined and described in the light of objective evidence provided by modern psychological research. Part of a chapter is concerned with the development of motor ability and strength.

Laban, Rudolf, and F. C. Lawrence. Effort. London: MacDonald and Evans, 1947.

Much is written about "industrial effort," "war effort," "cultural effort," without realizing that each action is built up from mental and manual effort of individuals.

During World War I when time and effort was of considerable importance, effort control was introduced which made it possible to achieve in 10 to 20 hours what previously occupied 100 hours. This research was possible only through a large number of contributors since

"knowledge has become too complex to be mastered by one man, and many branches of knowledge have to contribute to the elucidation of special problems." This was made possible since, "motion, visible everywhere in the whole universe, permeates all these sciences and practical fields of application, thus to build an almost inextricable network of common interest in its study."

Leavitt, H. J., and H. Schlossberg. "The Retention of Motor Skills," Journal of Experimental Psychology. 34:404-417, October 1944.

An experiment designed to test the validity of the widespread belief that motor habits are retained better than verbal materials.

Lindgren, Henry Clay, and Donn Bryne. Psychology: An Introduction to the Study of Human Behavior. John Wiley and Sons, Inc., New York, 1961.

Designed to aid students to develop a better and more complete understanding of human behavior, their own as well as others'. This book is divided into seven parts. Part three, Basic Principles of Behavior, deals with the physiological processes, learning processes, perceptual process, motivation and emotional behavior.

Lindsay, Doreen. "Relationships Between Measures of Kinesthesia and the Learning of a Motor Skill," Microfilm. 612.76, L64r.

A report of the author's study from which she concluded that a motor skill can be learned by practice, mainly by the aid of kinesthetic cues and knowledge of results. A factor common to kinesthetic tests and the motor skill was indicated by a low, but significant correlation.

Liponetz, Ferdinand John. Basic Physiology of Exercise. Minneapolis, Minnesota: Burgess Publishing Co., 1954.

The material is a compilation of data used in teaching Physiology of Exercise and allied courses. Consequently, it may be considered as a "bridge" between chemistry and biology, on one side, and physical education and athletics on the other. Text has been divided into two sections, which are as follows: The Phenomenon of Muscular Action, Control and Movement, and Exercise in Physical Education and Athletics.

Loree, M. Ray. Psychology of Education. New York: The Ronald Press Co., 1965.

Psychological concepts, principles and theories are applied to educational problems. Three strategies have been adopted in this text: (1) discussions of psychology as a science and the research methodologies of psychology, (2) detailed descriptions of research studies, and (3) educational and psychological problems are analyzed in terms of stimulus, organisms and response variables. Several chapters of the text are devoted to perception, motor skills and motivation.

McGraw, L. W. "A Factor Analysis of Motor Learning," Research Quarterly. 20:316-335, 1949.

A condensation of a doctoral dissertation. The investigator's purpose was to identify some factors of motor learning and to study the relationship between motor learning and certain physical abilities.

Madigon, Marion E. Psychology Principles and Application. St. Louis: C. V. Mosby Co., 1957.

This text gives a brief introduction to the study of psychology and a foundation for the learning process. The chapter on Sensing and Perceiving is particularly relevant.

Metheny, Eleanor. "Meaning, Movement, and the Cognitive Domain." Speech presented for the Physical Education Division of the AAHPER in Washington, D.C., May 11, 1964.

Thesis of the paper is that the term psychomotor is not a parallel of the terms cognitive and affective. Metheny suggests that the proper mate for affective, which is derived from afferent, is efferent, rather than motor. Instead of psychomotor domain, she suggests calling it the effective domain. The effective domain would be subdivided into the psycho-effective and somato-effective. Reference is made to influence of the mind and influence of the body.

Mohr, Dorothy, R. "The Contributions of Physical Activity to Skill Learning," Research Quarterly. 31:321-50, May 1960.

A review of research to locate the values on contributions of physical activity to skill learning as supported by published research. The majority of the studies in the report were published between 1939 and 1950. For the most part they were also in periodicals published in the United States.

Morgan, Clifford T. Introduction to Psychology. McGraw-Hill Book Co., Inc., 1961.

This book provides a broad coverage of the important and representative areas of psychology. Chapter ten deals with perception and attention, which covers sensory discrimination and the role of attention and cooperation among the senses.

Morehouse, Lawrence, and Miller, Augustus T. Physiology of Exercise. St. Louis: C. V. Mosby Co., 1959.

The physical potentialities of the human body are analyzed through the requirements which are necessary for exercises. Essential physiological background is provided for the reader who may be limited in the basic principles of chemistry and physics. Several chapters are devoted to nervous control of muscular activity, physiological mechanisms in movement behavior, skills and analysis of movement. A glossary of terms is also included.

Mouly, George J. Psychology for Effective Teaching. New York: Henry Holt and Co., 1960.

Problems which are encountered in the classrooms by teachers are emphasized by discussing how children behave and why they act as they do. Psychological theory and research in specific teaching situations are applied to traditional topics as physical growth, emotional, social, and intellectual development.

Munn, Norman L. Psychology. Cambridge: The Riverside Press, 1956.

This is a survey of modern scientific psychology and suggestions regarding psychological knowledge and procedures which are applicable in the solution of personal and social problems. Several chapters are denoted to attending and perceiving, vision and hearing and the other senses.

Nelson, Dale O. "Effect of Swimming on Learning of Selected Gross Motor Skills," Research Quarterly. 28:374-78, 1957.

"The purpose of this investigation was to study the effect of swimming on the learning and performance of two complex gross motor skills." The investigator approached this problem by determining the extent of transfer of learning (negative or positive) between swimming and activities which involve dissimilar movements and patterns when these activities were learned concurrently.

Nelson, Dale O. "Studies of Transfer of Learning in Gross Motor Skills," Research Quarterly. 28:364-373, 1957.

The purpose of this investigation was to study the transfer of learning in gross motor skills which involve some similar patterns and elements. Six skills were selected and paired for this study. The subjects were ninety men taking college physical education classes.

Nevers, John E. "The Effects of Physiological Age on Motor Achievement," Research Quarterly. 19:103-10, 1948.

Master's thesis designed to investigate the effect, if any, the various cycles of maturity, prepubescent, pubescent and postpubescent, have upon a boy's endurance and ability to perform motor skills.

Norrie, Mary Louise. The Relationship Between Measurement of Kinesthesia and Motor Performance. Unpublished master's thesis. University of California, 1952.

This study is an investigation into the relationship between measures of kinesthesia and motor performance. The investigator hypothesized a positive relationship. Two groups of subjects were chosen, one with poor motor performance in a PE class, the other with extremely good motor performance. A battery of seven tests was given to each group. Five tests differentiated significantly between those selected to be of good motor performance and those of poor.

Parker, James F., Jr., and Edwin A. Fleishman. "Ability Factors and Component Performance Measures as Predictors of Complex Tracking Behavior," Psychological Monographs. Vol. 74, 1-36, No. 16, 1960.

Parker and Fleishman designed this study to provide information concerning the kinds of ability which best predict performance in learning a complex perceptual motor skill such as that required in complex tracking tasks. Also examined was the relation between measures in early performance and later proficiency. Complexity and unusual characteristics of this tracking task seemed to emphasize different kinds of abilities which were not previously found important in laboratory psychomotor tasks. Appropriate response movements were indicative of proficiency in this task rather than abilities in manipulation. Also found was that task proficiency at later stages of learning depends upon combinations of ability different from those of initial stages.

Pascal, Gerald R. Behavioral Change in the Clinic--A Systematic Approach. New York: Greene and Stratton, 1959.

"The present work is an attempt to apply the scientific method to the problem of changing gross human behavior." Human behavior is observed so that given the stimulus we can predict the response, or given the response we can state the evoking stimulus.

Phillips, Marjorie, and Dean Summers. "Relation of Kinesthetic Perception to Motor Learning," Research Quarterly. 25:456-69.

The primary purpose of this investigation was to determine whether positional measures are related to a motor skill, and if so, whether the relationship is more evident in the early stages of acquiring the skill than in the later stages. Another purpose was to discover whether there are any differences in kinesthetic perception in the preferred and nonpreferred arms while bowling. The subjects, 115 college women, were tested on 12 positional measures of kinestheses while bowling.

Purdy, Bonnie J., and Aileene Lockhart. "Retention and Relearning of Gross Motor Skills After Long Periods of No Practice," Research Quarterly. 33:265-72, 1962.

Gross motor skills may be retained to a high degree by all levels of skill ability after long periods of no practice; also, relearning to previous levels of proficiency can be rapid. It appears that initial performance in gross motor skills is a valuable index to future performance.

Ruch, Floyd L. Psychology and Life. Chicago: Scott, Foresman and Co., 1953.

The changes of psychology are presented by the author in order to enable one to understand their actions and how to control the behavior of others.

Russell, Roger W. "The Effects of Mild Anoxia on Simple Psychomotor and Mental Skills," Journal of Experimental Psychology. 38:178-87, 1948.

An investigation of the effects of mild anoxia on three simple psychomotor and mental skills was conducted. The skills studied were finger dexterity, arm-hand coordination and simple addition. Two hundred and forty-four Army Air Corps Cadets served as subjects.

Ryan, E. Dean. "Effects of Stress on Motor Performance and Learning," Research Quarterly. 33:111-119, 1962.

This study was designed to test the hypothesis that externally induced tension will facilitate performance on a relatively easy motor skill but it will impair performance on a more difficult motor skill. It was also designed to test the further hypothesis, based on the Hullian theory, that the learning per se will not be influenced by tension.

Seashore, Robert. "An Experimental and Theoretical Analysis of Fine Motor Skills," American Journal of Psychology. 53:86-98, 1940.

Correlational analysis of individual differences in sensory-motor coordinations has indicated the existence of areas in which tests are moderately related. Grouping of tests shows that the boundaries of the groups usually cut across those of (1) specific musculature and (2) specific sense-fields. Also, the grouping of tests shows that the group-boundaries mark off every similar pattern of movement.

Skinner, B. F. "Are Theories of Learning Necessary?" Psychological Review. Vol. 57:193-216, July 1950.

Three types of learning theories are presented, which are as follows: (1) changes which are supposed to take place in the nervous system when an organism learns, (2) references to "mental" events, as in saying that an organism learns to behave in a certain way because it "finds something pleasant" or because it "expects something to happen, and (3) explanatory events are not directly observed.

Smith, Karl U. and William M. Smith. Perception and Motion. Philadelphia: W. B. Saunders Co., 1962.

This book can be divided into two basic sections: the historical development of the science of motion and perception, and concepts of neurogeometric theory, based on experimental evidence as cited. In working out the author's theory, they try to determine the nature of perceptual motor integration.

Smith, Leon E., and John S. Harrison. "Comparison of the Effects of Visual, Motor, Mental and Guided Practice Upon Speed and Accuracy of Performing a Simple Eye-Hand Coordination Task," Research Quarterly. 33:299-307, 1962.

The purpose of this study was to compare the effects of visual, motor, mental, and guided practice upon the speed and accuracy of the performance of a simple eye-hand coordination task. The subjects were six different groups of ten male university students. Five groups received different types of practice between the tests and one group acted as a control.

Solley, William H. "The Effects of Verbal Instruction of Speed and Accuracy upon the Learning of a Motor Skill," Research Quarterly. 23:23-40, 1952.

Report of a study made to determine the relative effects of emphasizing speed, accuracy, or speed and accuracy equally, upon the learning and performance of a motor skill involving both speed and accuracy.

Spence, Kenneth W. "Cognitive versus Stimulus-Response Theories of Learning," Psychological Review. Vol. 57:159-172, October 1950.

The cognition, S-S, and the stimulus-response, S-R theorists are compared and contrasted in respect to their interpretations of learning.

Stetson, R. H. "Mechanism of the Different Types of Movement," Psychological Monographs. Vol. 32:18-40, No. 3, 1923.

Stetson classifies movements into two groups: fixation, slow movements and fast movements. He feels that the purpose of many skilled movements occurs at the end of the stroke; therefore, he has developed a three-fold classification system of the termination of skilled movements. These are: the moving member swings loose about the joint and movement is terminated by ligaments and passive muscles; the moving member is arrested by the antagoinistic muscle group; the moving member is arrested by an obstacle, a "block."

Straus, Edwin. The Primary World of Senses. London: The Free Press of Glencoe, 1963.

Straus begins by pointing out the dependence of modern psychology on Cartesian philosophy. The doctrine of conditioned reflexes is given careful critique. A discussion is presented on stimuli, signs, and signals. Sensing and movement are considered historiologically in very detailed account.

Swartz, Paul. Psychology. Princeton, New Jersey: D. Van Nostrand Co., Inc., 1963.

The wholeness of behavior both biological and sociocultural are emphasized in the first part of the book. In the latter part of the book, the following chapters are of particular interest: The Role of Biological Factors in Behavior and Attending and Perceiving.

Taylor, Stanford E. "Eye Movements in Reading, Facts and Fallacies," American Educational Research Association. Vol. 2, No. 4, November 1965.

Many questions concerning eye movements in reading are answered in this issue of American Educational Research Association. Some areas explored are: oculomotor activity, stopping vs. movement in reading, and the question as to whether the eye can be trained to move in a specific direction and speed.

Twining, Wilbur E. "Mental Practice and Physical Practice in Learning a Motor Skill," Research Quarterly. 20:432, 1949.

A report of an experiment designed to examine the statistical significance of the difference in the learning of a motor skill through mental practice as differentiated from physical practice.

Walters, C. "Motor Ability and Educability Factors of High and Low Scoring Beginning Bowlers," Research Quarterly. Vol. 30, No. 1, 1959.

The author concludes that at beginning levels of learning, motor learning in gross motor activities is probably more dependent upon inherent physical makeup, strength, speed, and past experiences than upon intelligence and analytical reasoning.

Welford, A. T. Ageing and Human Skill. London: Oxford University Press, 1958.

Skills of the ageing and impairment of skill efficiency are of major concern to Welford. He lists basic characteristics of skill and gives a thorough outline of the processes including the receptor-effector aspect, the learned aspect and the serial nature of skill. Six ways to identify a breakdown or partial impairment of the efficiency of any stage are presented.

Woodworth, Robert S. Dynamics of Behavior. New York: Henry Holt and Co., 1958.

There are detailed discussions on such ideas as preparatory set, the theories of motivation, perception and learning. The author tended to concentrate on motivation, perception, and learning.

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An important problem in the study of the learning process is the relative effectiveness of spaced versus concentrated practice. "The purpose of the experiment was to ascertain the relative learning efficiency of concentrated and distributed practice in training men on two psychomotor tests--gross body reaction time and pattern tracing."

Fuzak, John A. Research Report on the Role of Physical Maturation in Determining the Ability of Junior High School Boys to Perform Complex Finger Coordination Activities in Industrial Arts, and An Index to Level of Ability. American Technical Society, 1958.

Through research cited, Fuzak attempts to answer the question as to whether there is a relationship of physical maturity to the readiness of pupils to learn to perform complex finger coordinative manipulations in industrial arts classes and if there is, what practical indicator can be used by the classroom teacher to determine the level of physical maturity. He found that his basic assumption concerning physical maturity positively correlated with learning readiness. Strength of grip seemed to be a reliable indicator of level of physical maturity as measured by a simple hand dynamometer.

Gagne, Robert M., and Edwin A. Fleishman. Psychology and Human Performance. New York: Henry Holt and Co., 1959.

A "dimensional approach" has been used to provide the reader with a systematic description of human behavior. Several chapters are particularly relevant to the Taxonomy of Educational Objectives, Psychomotor Domain. They are as follows: Human Abilities, Learning and Retention, Discrimination and Identification, Motor Skills and Training.

Gagne, Robert M., Katherine E. Baker, and Harriet Foster. "Transfer of Discrimination Training to a Motor Task," Journal of Experimental Psychology. 40:314-28, 1950.

"The learning of one class of motor skills involves the establishment of different responses to each of a given set of stimuli." This study deals with the learning of a skill in which a subject must learn to make a number of different manual responses to the same number of visual stimuli.

Geldard, Frank A. The Human Senses. New York: John Wiley and Sons, Inc., 1953.

The basis for the understanding of human nature is through an appreciation of man's senses and of the fundamental role they play in the attainment of knowledge and the regulation of behavior.

Gray, J. Stanley, George Sustare, and Anthony Thompson, "An Apparatus for Measuring Operational Hand Steadiness," Journal of Applied Psychology. 37:57-58, 1953.

"Skilled work involves operational steadiness." The investigators devised an apparatus to measure hand steadiness in three dimensions.

Guilford, P. J. "A System of Psychomotor Abilities," American Journal of Psychology. Vol. 71, 164-174, 1958.

Guilford has developed a system for classifying factors of psychomotor abilities isolated previously by Fleishman and Hempel and involving an interrelationship between mental functioning and abilities of the individual. He has developed a matrix with one side listing the type of ability and the other side listing parts of the body involved. He states that this matrix leaves open many possibilities for further development.

Harmon, John M., and Arthur G. Miller. "Time Patterns in Motor Learning," Research Quarterly. 21:182-187, 1950.

Report of a study done to find a basis for improvement in methods of teaching of basic or beginning motor skills.

Hartson, L. D. "Analysis of Skilled Movements," The Personnel Journal. Vol. 11, 28-43, June 1932.

The emphasis of Hartson's study is in distinguishing the different types of movement which function simultaneously in any coordinate action. This action study analyzes skilled movement, dividing it into fundamental movement forms of which he lists two main classifications, then further subdivides these into smaller areas. One conclusion drawn is that coordinate movement is a combination of types of movement. A review and analysis of related literature from industrial engineering and applied psychologyare cited.

Hartson, L. D. "Contrasting Approaches to the Analysis of Skilled Movements," Journal of General Psychology. 20:263-293, 1939.

Included in this article is a classification of work types to facilitate analysis of the movement process; there are also samples of the subtypes.

Hochberg, Julian E. Perception. Englewood Cliffs, New Jersey: Prentice-Hall, 1964.

The author attempts to answer the general question of "why things look as they do" by presenting the history of theories and facts of perception.

Killip, Devore Eugene. The Effects of Discovery on the Learning of Manual Skill. Master's thesis. University of Illinois, October 1963, as reported in Training Research Laboratory Manual, Technical Report No. 2, Psychological and Educational Factors in Transfer of Training, Phase 1, U.S. Office of Education, Contract 2-20-003, Lawrence M. Stolurow, Principal Investigator.

Dentistry requires a variety of highly refined special skills. Killip has concerned himself with the learning of a manual skill involving finger and manual dexterities, and sensory skills. Two groups of dental students learned the same motor task using a cord-drived straight handpiece to remove a specified amount of dentin-like material. One group received instruction on how to do it before beginning; the other practiced before instruction. His hypothesis was that the former group would learn more rapidly and the method would have greater inductive transfer value between the language of instruction and the cue response relationships. According to Killip's findings, these two hypotheses were supported.

Kimble, Gregory A. Principles of General Psychology. Ronald Press Company, New York, 1956.

The book is divided into four major sections which deal with basic methodology, sensation and perception, modifications of behavior and behavior dynamics. The sensory processes in general are discussed in the section of sensation and perception, and motor learning is discussed in the section on the modification of behavior.

Klausmeir, Herbert J. Learning and Human Abilities. New York: Harper and Brothers, 6-10, 1961.

A further development of Guilford's classification system has been done by Klausmeir. He has added content and outcomes to Guilford's factors or processes of the psychomotor domain. He lists four reasons for differences in performance between the more skillful and less skillful individual. These are better differentiations of cues to guide the actions, more rapid trial, correction, and confirmation of responses, more rapid movements or other responses, and more highly coordinated movements or other responses.

Kohfeld, David Lloyd. The Prediction of Perceptual Motor Learning from Independent Verbal and Motor Measures. Unpublished master's thesis. University of Illinois, 1964.

In his thesis, Kohfeld concerns himself with the possibility that as a person becomes proficient at a task, he is less able to verbalize concerning his performance. From a study of task trials, he confirmed his hypothesis that in early tasks verbal comprehension is more important in learning whereas motor skill is more critical in later learning.

Kuhlen, Raymond G. The Psychology of Adolescent Development. New York: Harper and Brothers, 1952.

The psychological development during the teen years is emphasized. The essential nature of adolescence is examined and described in the light of objective evidence provided by modern psychological research. Part of a chapter is concerned with the development of motor ability and strength.

Laban, Rudolf, and F. C. Lawrence. Effort. London: MacDonald and Evans, 1947.

Much is written about "industrial effort," "war effort," "cultural effort," without realizing that each action is built up from mental and manual effort of individuals.

During World War I when time and effort was of considerable importance, effort control was introduced which made it possible to achieve in 10 to 20 hours what previously occupied 100 hours. This research was possible only through a large number of contributors since

"knowledge has become too complex to be mastered by one man, and many branches of knowledge have to contribute to the elucidation of special problems." This was made possible since, "motion, visible everywhere in the whole universe, permeates all these sciences and practical fields of application, thus to build an almost inextricable network of common interest in its study."

Leavitt, H. J., and H. Schlossberg. "The Retention of Motor Skills," Journal of Experimental Psychology. 34:404-417, October 1944.

An experiment designed to test the validity of the widespread belief that motor habits are retained better than verbal materials.

Lindgren, Henry Clay, and Donn Bryne. Psychology: An Introduction to the Study of Human Behavior. John Wiley and Sons, Inc., New York, 1961.

Designed to aid students to develop a better and more complete understanding of human behavior, their own as well as others'. This book is divided into seven parts. Part three, Basic Principles of Behavior, deals with the physiological processes, learning processes, perceptual process, motivation and emotional behavior.

Lindsay, Doreen. "Relationships Between Measures of Kinesthesia and the Learning of a Motor Skill," Microfilm. 612.76, L64r.

A report of the author's study from which she concluded that a motor skill can be learned by practice, mainly by the aid of kinesthetic cues and knowledge of results. A factor common to kinesthetic tests and the motor skill was indicated by a low, but significant correlation.

Liponetz, Ferdinand John. Basic Physiology of Exercise. Minneapolis, Minnesota: Burgess Publishing Co., 1954.

The material is a compilation of data used in teaching Physiology of Exercise and allied courses. Consequently, it may be considered as a "bridge" between chemistry and biology, on one side, and physical education and athletics on the other. Text has been divided into two sections, which are as follows: The Phenomenon of Muscular Action, Control and Movement, and Exercise in Physical Education and Athletics.

Loree, M. Ray. Psychology of Education. New York: The Ronald Press Co., 1965.

Psychological concepts, principles and theories are applied to educational problems. Three strategies have been adopted in this text: (1) discussions of psychology as a science and the research methodologies of psychology, (2) detailed descriptions of research studies, and (3) educational and psychological problems are analyzed in terms of stimulus, organisms and response variables. Several chapters of the text are devoted to perception, motor skills and motivation.

McGraw, L. W. "A Factor Analysis of Motor Learning," Research Quarterly. 20:316-335, 1949.

A condensation of a doctoral dissertation. The investigator's purpose was to identify some factors of motor learning and to study the relationship between motor learning and certain physical abilities.

Madigon, Marion E. Psychology Principles and Application. St. Louis: C. V. Mosby Co., 1957.

This text gives a brief introduction to the study of psychology and a foundation for the learning process. The chapter on Sensing and Perceiving is particularly relevant.

Metheny, Eleanor. "Meaning, Movement, and the Cognitive Domain." Speech presented for the Physical Education Division of the AAHPER in Washington, D.C., May 11, 1964.

Thesis of the paper is that the term psychomotor is not a parallel of the terms cognitive and affective. Metheny suggests that the proper mate for affective, which is derived from afferent, is efferent, rather than motor. Instead of psychomotor domain, she suggests calling it the effective domain. The effective domain would be subdivided into the psycho-effective and somato-effective. Reference is made to influence of the mind and influence of the body.

Mohr, Dorothy, R. "The Contributions of Physical Activity to Skill Learning," Research Quarterly. 31:321-50, May 1960.

A review of research to locate the values on contributions of physical activity to skill learning as supported by published research. The majority of the studies in the report were published between 1939 and 1950. For the most part they were also in periodicals published in the United States.

Morgan, Clifford T. Introduction to Psychology. McGraw-Hill Book Co., Inc., 1961.

This book provides a broad coverage of the important and representative areas of psychology. Chapter ten deals with perception and attention, which covers sensory discrimination and the role of attention and cooperation among the senses.

Morehouse, Lawrence, and Miller, Augustus T. Physiology of Exercise. St. Louis: C. V. Mosby Co., 1959.

The physical potentialities of the human body are analyzed through the requirements which are necessary for exercises. Essential physiological background is provided for the reader who may be limited in the basic principles of chemistry and physics. Several chapters are devoted to nervous control of muscular activity, physiological mechanisms in movement behavior, skills and analysis of movement. A glossary of terms is also included.

Mouly, George J. Psychology for Effective Teaching. New York: Henry Holt and Co., 1960.

Problems which are encountered in the classrooms by teachers are emphasized by discussing how children behave and why they act as they do. Psychological theory and research in specific teaching situations are applied to traditional topics as physical growth, emotional, social, and intellectual development.

Munn, Norman L. Psychology. Cambridge: The Riverside Press, 1956.

This is a survey of modern scientific psychology and suggestions regarding psychological knowledge and procedures which are applicable in the solution of personal and social problems. Several chapters are denoted to attending and perceiving, vision and hearing and the other senses.

Nelson, Dale O. "Effect of Swimming on Learning of Selected Gross Motor Skills," Research Quarterly. 28:374-78, 1957.

"The purpose of this investigation was to study the effect of swimming on the learning and performance of two complex gross motor skills." The investigator approached this problem by determining the extent of transfer of learning (negative or positive) between swimming and activities which involve dissimilar movements and patterns when these activities were learned concurrently.

Nelson, Dale O. "Studies of Transfer of Learning in Gross Motor Skills," Research Quarterly. 28:364-373, 1957.

The purpose of this investigation was to study the transfer of learning in gross motor skills which involve some similar patterns and elements. Six skills were selected and paired for this study. The subjects were ninety men taking college physical education classes.

Nevers, John E. "The Effects of Physiological Age on Motor Achievement," Research Quarterly. 19:103-10, 1948.

Master's thesis designed to investigate the effect, if any, the various cycles of maturity, prepubescent, pubescent and postpubescent, have upon a boy's endurance and ability to perform motor skills.

Norrie, Mary Louise. The Relationship Between Measurement of Kinesthesia and Motor Performance. Unpublished master's thesis. University of California, 1952.

This study is an investigation into the relationship between measures of kinesthesia and motor performance. The investigator hypothesized a positive relationship. Two groups of subjects were chosen, one with poor motor performance in a PE class, the other with extremely good motor performance. A battery of seven tests was given to each group. Five tests differentiated significantly between those selected to be of good motor performance and those of poor.

Parker, James F., Jr., and Edwin A. Fleishman. "Ability Factors and Component Performance Measures as Predictors of Complex Tracking Behavior," Psychological Monographs. Vol. 74, 1-36, No. 16, 1960.

Parker and Fleishman designed this study to provide information concerning the kinds of ability which best predict performance in learning a complex perceptual motor skill such as that required in complex tracking tasks. Also examined was the relation between measures in early performance and later proficiency. Complexity and unusual characteristics of this tracking task seemed to emphasize different kinds of abilities which were not previously found important in laboratory psychomotor tasks. Appropriate response movements were indicative of proficiency in this task rather than abilities in manipulation. Also found was that task proficiency at later stages of learning depends upon combinations of ability different from those of initial stages.

Pascal, Gerald R. Behavioral Change in the Clinic--A Systematic Approach. New York: Greene and Stratton, 1959.

"The present work is an attempt to apply the scientific method to the problem of changing gross human behavior." Human behavior is observed so that given the stimulus we can predict the response, or given the response we can state the evoking stimulus.

Phillips, Marjorie, and Dean Summers. "Relation of Kinesthetic Perception to Motor Learning," Research Quarterly. 25:456-69.

The primary purpose of this investigation was to determine whether positional measures are related to a motor skill, and if so, whether the relationship is more evident in the early stages of acquiring the skill than in the later stages. Another purpose was to discover whether there are any differences in kinesthetic perception in the preferred and nonpreferred arms while bowling. The subjects, 115 college women, were tested on 12 positional measures of kinestheses while bowling.

Purdy, Bonnie J., and Aileene Lockhart. "Retention and Relearning of Gross Motor Skills After Long Periods of No Practice," Research Quarterly. 33:265-72, 1962.

Gross motor skills may be retained to a high degree by all levels of skill ability after long periods of no practice; also, relearning to previous levels of proficiency can be rapid. It appears that initial performance in gross motor skills is a valuable index to future performance.

Ruch, Floyd L. Psychology and Life. Chicago: Scott, Foresman and Co., 1953.

The changes of psychology are presented by the author in order to enable one to understand their actions and how to control the behavior of others.

Russell, Roger W. "The Effects of Mild Anoxia on Simple Psychomotor and Mental Skills," Journal of Experimental Psychology. 38:178-87, 1948.

An investigation of the effects of mild anoxia on three simple psychomotor and mental skills was conducted. The skills studied were finger dexterity, arm-hand coordination and simple addition. Two hundred and forty-four Army Air Corps Cadets served as subjects.

Ryan, E. Dean. "Effects of Stress on Motor Performance and Learning," Research Quarterly. 33:111-119, 1962.

This study was designed to test the hypothesis that externally induced tension will facilitate performance on a relatively easy motor skill but it will impair performance on a more difficult motor skill. It was also designed to test the further hypothesis, based on the Hullian theory, that the learning per se will not be influenced by tension.

Seashore, Robert. "An Experimental and Theoretical Analysis of Fine Motor Skills," American Journal of Psychology. 53:86-98, 1940.

Correlational analysis of individual differences in sensory-motor coordinations has indicated the existence of areas in which tests are moderately related. Grouping of tests shows that the boundaries of the groups usually cut across those of (1) specific musculature and (2) specific sense-fields. Also, the grouping of tests shows that the group-boundaries mark off every similar pattern of movement.

Skinner, B. F. "Are Theories of Learning Necessary?" Psychological Review. Vol. 57:193-216, July 1950.

Three types of learning theories are presented, which are as follows: (1) changes which are supposed to take place in the nervous system when an organism learns, (2) references to "mental" events, as in saying that an organism learns to behave in a certain way because it "finds something pleasant" or because it "expects something to happen, and (3) explanatory events are not directly observed.

Smith, Karl U. and William M. Smith. Perception and Motion. Philadelphia: W. B. Saunders Co., 1962.

This book can be divided into two basic sections: the historical development of the science of motion and perception, and concepts of neurogeometric theory, based on experimental evidence as cited. In working out the author's theory, they try to determine the nature of perceptual motor integration.

Smith, Leon E., and John S. Harrison. "Comparison of the Effects of Visual, Motor, Mental and Guided Practice Upon Speed and Accuracy of Performing a Simple Eye-Hand Coordination Task," Research Quarterly. 33:299-307, 1962.

The purpose of this study was to compare the effects of visual, motor, mental, and guided practice upon the speed and accuracy of the performance of a simple eye-hand coordination task. The subjects were six different groups of ten male university students. Five groups received different types of practice between the tests and one group acted as a control.

Solley, William H. "The Effects of Verbal Instruction of Speed and Accuracy upon the Learning of a Motor Skill," Research Quarterly. 23:23-40, 1952.

Report of a study made to determine the relative effects of emphasizing speed, accuracy, or speed and accuracy equally, upon the learning and performance of a motor skill involving both speed and accuracy.

Spence, Kenneth W. "Cognitive versus Stimulus-Response Theories of Learning," Psychological Review. Vol. 57:159-172, October 1950.

The cognition, S-S, and the stimulus-response, S-R theorists are compared and contrasted in respect to their interpretations of learning.

Stetson, R. H. "Mechanism of the Different Types of Movement," Psychological Monographs. Vol. 32:18-40, No. 3, 1923.

Stetson classifies movements into two groups: fixation, slow movements and fast movements. He feels that the purpose of many skilled movements occurs at the end of the stroke; therefore, he has developed a three-fold classification system of the termination of skilled movements. These are: the moving member swings loose about the joint and movement is terminated by ligaments and passive muscles; the moving member is arrested by the antagoinistic muscle group; the moving member is arrested by an obstacle, a "block."

Straus, Edwin. The Primary World of Senses. London: The Free Press of Glencoe, 1963.

Straus begins by pointing out the dependence of modern psychology on Cartesian philosophy. The doctrine of conditioned reflexes is given careful critique. A discussion is presented on stimuli, signs, and signals. Sensing and movement are considered historiologically in very detailed account.

Swartz, Paul. Psychology. Princeton, New Jersey: D. Van Nostrand Co., Inc., 1963.

The wholeness of behavior both biological and sociocultural are emphasized in the first part of the book. In the latter part of the book, the following chapters are of particular interest: The Role of Biological Factors in Behavior and Attending and Perceiving.

Taylor, Stanford E. "Eye Movements in Reading, Facts and Fallacies," American Educational Research Association. Vol. 2, No. 4, November 1965.

Many questions concerning eye movements in reading are answered in this issue of American Educational Research Association. Some areas explored are: oculomotor activity, stopping vs. movement in reading, and the question as to whether the eye can be trained to move in a specific direction and speed.

Twining, Wilbur E. "Mental Practice and Physical Practice in Learning a Motor Skill," Research Quarterly. 20:432, 1949.

A report of an experiment designed to examine the statistical significance of the difference in the learning of a motor skill through mental practice as differentiated from physical practice.

Walters, C. "Motor Ability and Educability Factors of High and Low Scoring Beginning Bowlers," Research Quarterly. Vol. 30, No. 1, 1959.

The author concludes that at beginning levels of learning, motor learning in gross motor activities is probably more dependent upon inherent physical makeup, strength, speed, and past experiences than upon intelligence and analytical reasoning.

Welford, A. T. Ageing and Human Skill. London: Oxford University Press, 1958.

Skills of the ageing and impairment of skill efficiency are of major concern to Welford. He lists basic characteristics of skill and gives a thorough outline of the processes including the receptor-effector aspect, the learned aspect and the serial nature of skill. Six ways to identify a breakdown or partial impairment of the efficiency of any stage are presented.

Woodworth, Robert S. Dynamics of Behavior. New York: Henry Holt and Co., 1958.

There are detailed discussions on such ideas as preparatory set, the theories of motivation, perception and learning. The author tended to concentrate on motivation, perception, and learning.

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