

# *Fundamental Motor Patterns*

RALPH L. WICKSTROM



SECOND EDITION

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*Ripon College, Ripon, Wisconsin*

SECOND EDITION



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# Fundamental Motor Patterns

## **PREFACE**

This book has been revised extensively to incorporate new material on fundamental motor patterns and to deal more explicitly with approaches to motor pattern development. There is not a large amount of new material on fundamental skills, but much of what is new is of relatively high quality and includes additional longitudinal data. The interpretation of developmental changes currently is more clearly defined in terms of stages and trends, and reference is made to both of these interpretations in nearly every chapter.

On the recommendation of Frank Smoll and others who have used the first edition of this book, a new chapter on walking has been added. The inclusion of walking was intended to add continuity to the study of locomotion by starting at an earlier level. The chapter on walking rightfully takes its place near the beginning of the book and serves to illustrate the specific ways in which several basic principles of motor development operate.

Attempts to put information concerning motor pattern development into a form that can be used directly by classroom and specialist teachers are discussed, and examples of some proposed plans have been included. The popular emphasis on transforming knowledge into a practical form will be seen throughout this edition, especially in connection with skill analysis. At the end of each chapter, there are additional suggestions for analyzing motor patterns by direct visual observation.

The study of motor pattern development is still relatively new, and much remains to be learned. In the next few years, there probably will be an enormous increase in knowledge because the means for studying motor development are more readily available and the interest in using them seems to be more widespread.

It is hoped that this revised edition will contribute to the expansion of knowledge by being provocative as well as practical. Perhaps it will foster respect for a critical approach to the blending of theory and practice in this important area of study.

*Ripon, Wisconsin*

R. L. WICKSTROM

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# 1

## **INTRODUCTION**

Where there is life, there is movement; where there are children, there is almost perpetual movement. Children normally run, jump, throw, catch, kick, strike, and perform a multitude of basic skills. They learn these first as general skills and later in modified versions as specific sport skills. They combine the skills into patterns of increasingly greater specificity and complexity. This continuing process of motor skill development seems to take place in a varying degree regardless of whether adults do anything to help or to hinder it. The improvement can be explained partly in terms of increased capability that accompanies growth and development and partly in terms of a natural, untutored process that results from imitation, trial and error, and freedom of movement. This natural process often produces Topsy-like skill development that represents lost opportunities for progress of a much higher order. Specifically, it falls far short of what might be considered optimum motor skill development.

The concept of optimum skill development has been in existence for many years, but its lofty possibilities have escaped serious notice. The idea of optimum development is grandiose and has the appearance of being too heady to be practical. It is often thought to be highly theoretical or simply quixotic. That timeworn reservation has been eased somewhat by the impressive achievements of children who are given early, carefully designed opportunities to learn motor skills. Children who are exposed to circumstances that are appropriately encouraging tend to develop motor skill at a level beyond that which is normally expected. Their performances suggest that it is reasonable to hope for change in the bases for establishing expectations for skill development. Motor skill expectations probably should be set on the basis of what is possible under

conditions that approach the optimal, as these conditions become known, rather than on what happens under natural or normal conditions.

The concept of optimum skill development is broad and has implications for the approach used by everyone who deals with movement; i.e., the parent, the teacher, and the coach. Each of these adults has a different role to play in the total skill development of the child, and each exerts his major influence at a particular level of development. Yet their efforts are bonded into a total influence. What is done to promote motor skill development at one level either affects or is affected by what is done to promote it at other levels. The assurance of a positive contribution from all those who participate in the promotion of basic skill development is strongly dependent upon the common possession of a broad understanding of human movement.

Everyone who works with motor skill development should have a basic knowledge of how people move. Glassow has suggested that the study of human movement should begin with an attempt to identify basic movement patterns. The point is sound because, in a sense, patterns of movement are a fundamental and significant part of the language of movement. They are descriptions of what happens whenever human movement occurs. Considering this primary relationship, preparation for promoting optimum skill development can reasonably begin with the study of certain basic motor patterns. This approach can provide an understanding of the nature of each fundamental skill which, in turn, can build into an awareness of the larger scheme of movement.

## TERMINOLOGY

A brief discussion of terminology is an important preliminary to the consideration of basic movement patterns. Terminology currently used in connection with movement is a reflection of 40 years of movement pattern study. What is needed is language precise enough to differentiate and clarify but not so incisive as to provoke incessant controversy. The terminology selected for use in this book allows moderate overlapping of meanings and is reasonably liberal toward the interchangeable use of terms.

**MOVEMENT.** A movement is a change in position by any segment of the body. The normal anatomic segments are the parts that move, but the size of the segment can vary, especially when the arms or legs are involved. The entire arm might swing forward, the forearm might extend, or there might be flexion at the wrist. A movement by each of these segments could be contained within a single movement pattern along with other movements.

**MOVEMENT PATTERN.** A movement pattern is a series of movements organized in a particular time-space sequence. Movement patterns range from the almost random to the highly structured and from the simple to the complex. The meaning of the term *movement pattern* has been the subject of diverse interpretations. It is used here primarily in reference to the patterns of the basic motor skills and some narrowly defined sport skills. There are other equally useful and more expansive interpretations of the meaning of the term. It is often used to refer to an enlarged pattern formed by joining two or more fundamental skills into a continuous sequence. The fundamental skills of running and jumping are combined at the basic level as a run and jump and at the advanced level as a running high jump. A myriad of combined patterns of this sort are included in the normal motor activities of children and adults.

The term *movement pattern* is also used to refer to the common elements that appear in many skills performed in the same plane. Batting in baseball, the forehand stroke in tennis, and the sidearm throw in softball are performed at different velocities according to unique timing patterns, but in essentially the same horizontal plane with enough common elements to form a general movement pattern. The acceptance of this interpretation has been cautious but is growing because it stresses the interrelationships of basic skills and encourages an understanding of the comprehensive concept of movement. But it is important to remember that the observed similarities in movement patterns performed in the same plane are similarities in configuration and not necessarily similarities in kinematic factors, which tend to be quite specific.<sup>5,19</sup>

**FUNDAMENTAL SKILL.** A fundamental skill is a common motor activity with a general goal. It is the basis for more advanced and highly specific motor activities. Running, jumping, throwing, catching, galloping, skipping, kicking, and climbing are typical of the identifiable general motor activities included in the category of fundamental skills. Examples of attempts to present a skill hierarchy including fundamental skills can be found in the books of Schurr<sup>22</sup> and of Godfrey and Kephart.<sup>10</sup>

**FUNDAMENTAL MOTOR PATTERN.** A fundamental motor pattern is the general pattern of movements used in the performance of a fundamental skill. It is the composite of the common elements in the form used by skilled, mature performers. Other terms used frequently to convey essentially the same meaning are mature motor pattern, mature form, good form, basic form, and skilled form. The comprehensive meanings of these terms are not identical, but they all successfully set forth the idea of a movement pattern that is basic yet highly effective.

**DEVELOPMENTAL MOTOR PATTERN.** A developmental motor pattern is any movement pattern used in the performance of a fundamental skill that meets the minimal requirement for the skill but does not measure up to the mature pattern. By this definition, all developmental patterns are relatively immature patterns and involve less than skilled form. Typical developmental patterns for some of the basic skills have been identified in connection with the study of motor skill development. These unique patterns of timing and movement symbolize progress toward the achievement of mature patterns. Several special terms—unitary pattern, arm-dominated pattern, block rotation, and opening up—have been devised to describe the unique developmental motor patterns.

*Unitary Pattern.* A unitary pattern is one in which the movements are performed simultaneously rather than sequentially. Many of the developmental patterns in throwing, striking, and jumping tend to be unitary.

*Arm-dominated Pattern.* In an arm-dominated pattern, the arm(s) is the only major segment moving or is the segment initiating and leading the movement. If the primary movement is confined to the arm(s) and upper spine, the pattern is more accurately termed *top-dominated*. Throwing and striking patterns often fall into either of these two categories.

*Block Rotation.* Block rotation is unitary movement of the entire trunk; pelvis, spine, and shoulders rotate simultaneously. It occurs regularly in developmental throwing and striking patterns.

*Opening Up.* A movement pattern is opened up when there is simultaneous movement of body parts in opposite directions. This important process increases range of motion, unlocks unitary action, and contributes significantly to the development of velocity in various forms of throwing and striking.

**SPORT SKILL.** A sport skill is an advanced and refined version of a fundamental skill that is used in a particular way in a particular sport. The golf swing is an advanced form of striking, the running high jump is an advanced form of jumping, and the football pass is an advanced form of throwing. The presence of the fundamental motor pattern in the larger specific sport skill pattern offers visual evidence of the underlying relationship between basic and sport skills.

**FORM AND PERFORMANCE.** Form and performance are two well-known terms used, respectively, to describe the process and the product of movement. The relationship between them is a bit complicated and is an important one to explore because of its relevance to the concept of optimum motor skill development.

*Form.* Form is the process entailed in movement. "Form is a way of performing, a work method, a design of performance."<sup>16</sup> It includes movements, the time-space arrangement of movements, and the total visual effect produced. The relative quality of the process is indicated by the use of qualifying terms that fall somewhere in the range between good and bad, mature and immature, skilled and unskilled, effective and ineffective, or satisfactory and unsatisfactory. Positive qualifying terms imply economy of movement and conformance to effective body mechanics; negative qualifying terms indicate major departure from the compound of similarities in the form used by the highly skilled.

*Performance.* A performance is a motor activity that is to be done or that has been done. The term can be used acceptably to refer to the act (the child threw a ball) or to signify the outcome (a distance of 150 feet). A measured performance is not good, bad, satisfactory, or unsatisfactory in absolute terms. It is relatively good or bad depending upon the extent to which an expected outcome is achieved. A running high jump of 42 inches could be an exceptionally good jump for a child, but it would ordinarily be a mediocre jump for an adult because of the differences in the usual standards of expectation.

There is a positive but not a direct causal relationship between form and performance. Mature form enhances performance, but good performance is not totally dependent upon mature form. This side of the relationship is prominent and is emphasized when children are involved. A child who is able to use the mature form in throwing or in kicking ordinarily is not able to throw or kick as far as an adult who uses the same form. Even when two children use identical form in throwing or kicking for distance, one might throw or kick much farther than the other. In both instances the relationship between form and performance is strongly influenced by factors classified as human abilities. Strength, speed of movement, reaction time, and eye-hand coordination are among the general traits that impose limitations upon performance. Some of the abilities such as speed of movement, strength, and neuromuscular integration are particularly important factors influencing performance in tasks where the outcome is measured in terms of height, distance, or frequency. Other factors have an important bearing on accuracy of performance.

The difference in ability factors can be used to show another facet of the relationship between form and performance. An abundance of the ability factors required in a particular skill make it possible to compensate for minor violations of good form

without noticeably detracting from measurable performance. Accordingly, one competitor might be able to kick or throw farther than another even though his form is not so effective. This situation is common, but it certainly is not a strong argument for accepting ineffective form. For optimum performance, all ability should be applied directly to the task rather than having part of it used to overcome minor deviations in form. It is especially important to emphasize the basic aspects of good form when the fundamental skills are being learned because, ultimately, good form is more productive of good performance than is poor form. The growing realization of this important relationship is reflected in the favorable trend toward a concern not only with what is done (performance), but also with how it is done (form). This trend augurs well for the continued growth of the large view of motor skill development.

## **MOTOR DEVELOPMENT**

Motor development encompasses the development of the abilities that are essential to movement and the subsequent acquisition of motor skills. It may be viewed as an extensive, more or less continuous, lifelong process beginning at the prenatal stage and continuing through adult life.<sup>13</sup> This broad view of motor development must be kept to the fore and not allowed to slip from sight by concentrating on development at a particular stage, especially the earliest one. The motor development that ordinarily occurs in infancy and in childhood is the foundation for an almost endless process of motor skill development, yet what happens during early periods of life is only a part of the entire process. Equally important is the motor development associated with the learning of basic skills and the acquisition of advanced skills that normally follows and can occur at any age. The early part of the process or any stage of motor development can be explored in proper perspective if it is kept within the framework of the lifelong process concept.

There is a vast amount of literature describing the nature and direction of physical growth during the early years of life. The principles based upon the accumulated evidence indicate that the sequence of development is predictable and approximately the same for all children, but the rate at which specific changes take place varies from one child to another. Further, neuromuscular development follows a cephalocaudal pattern, a proximal-distal direction, and proceeds from gross to specific refinement. These broad generalities concerning physical growth and neuromuscular development help set expectations for motor skill development without tying them specifically to an age schedule.



Examples of the presence of the principles of development are scattered throughout the literature in movement studies such as the one on running and walking by Bernstein.<sup>5</sup> He demonstrated precisely that refinement of leg action in the two modes of locomotion proceeds in a proximal-distal direction and at a slower pace than was thought to be the case.

There is rapid physical growth during the first 2 years of life, and gross motor patterns appear. The child naturally develops the ability to perform many simple motor tasks during these years, but his development of fundamental motor skills is limited until he possesses the abilities necessary to improve his means of locomotion. Learning to walk is a signal event because it offers the infant a wider exposure to those aspects of his environment that encourage the expansion of motor behavior. The scope of his movement increases rapidly as he progresses from crawling and creeping and learns to walk. He acquires many new forms of movement, including upright patterns of locomotion and the simplest fundamental motor skills.

The early motor achievements of children have been observed and chronicled by Gesell, Bayley, Wellman, Shirley, and other pioneers in the field of motor development.<sup>4,9,24,27</sup> The accumulation of information has made it possible to gain insight into the natural progress that takes place as children move through various stages of development toward the achievement of mature motor patterns. The insight is limited to natural progress because it is based upon what children do under ordinary circumstances and not what they can do if given the most favorable opportunity. This is a significant qualification that applies to the bulk of the data on motor performances of children. The gap between what children do and what they can do holds an important secret to the better understanding of optimum motor development. Isolated attempts to arrange the most favorable circumstances for motor performance have produced results that strike a direct blow at the obsession with spontaneously demonstrated readiness that has been a deterrent to optimum skill development. Children seem to be capable of using certain motor patterns before they normally are asked to try them and long before the patterns appear in their motor behavior. The advantages of unusually early introduction to skills can be illustrated by the successes produced when some infants have been given the opportunity to move in the water. The early opportunity, more than the so-called swimming reflex, seems to be the really important influence on success. Considering the impact of current evidence, it is easy to conclude that the opportunities for development of fundamental skills probably are offered too late far more often than too early.



The first 5 years of life generally are regarded as a period during which the fundamental motor patterns emerge as the child deals with problems of locomotion and as he manipulates the various objects in his environment. The elementary school years have been characterized as a period of skill refinement more than a period of new skill acquisition. Typical of the research supporting this view is the work of Bernstein and Kurochkin and his associates, which indicates that the skill of walking does not truly reach adult form until puberty.<sup>5,15</sup>

The widely promoted general descriptions of motor skill development in childhood stress the acquisition of the basic skills and the development of mature form. They emphasize an orderly progression toward higher levels of achievement, including an introduction to sport skills. In subsequent years there is a continuation of the process toward progressively higher standards of mature performance. With a slight modification in the ultimate degree of development, the same general progression can apply to motor development at any stage of life.

### **MOTOR PATTERN DEVELOPMENT**

There are broadly defined minimal standards for all fundamental skills. The minimal standard for running, for example, requires that the feet move forward alternately and that the push-off from the support foot be followed by a brief period of nonsupport. When this standard is met, the skill has been achieved at its barest level of proficiency. The next major goal in the development of the skill is the achievement of the standard of mature form. All movement patterns used in the performance of the skill in the interim fit into the category of developmental patterns.

Starting with a monumental study by Wild in 1937, there has been a gradual increase in the amount of available information concerning the movement patterns children use as they progress toward mature form in the fundamental skills.<sup>29</sup> The gradual changes in form that have been observed can be interpreted in two different ways: as developmental stages or as developmental trends.

**DEVELOPMENTAL STAGES.** A stage may be defined as a distinct movement pattern that commonly is present at one of the progressive levels of skill development. If the development of a particular fundamental skill is interpreted in terms of stages, the number of stages and the movement characteristics of each must be determined. These determinations have become complex rather than simple problems. A brief consideration of the use of stages in connection with throwing will serve to illustrate the