Chapter 4

History of the Motor Performance Study and Related Programs

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Introduction

The Motor Performance Study (MPS), currently in its 32nd year of operation, is a unique contribution to the understanding of growth and motor performance in children and youth. This long term program has been supported by the Department of Kinesiology and Michigan State University since its inception and is known nationwide for its blend of teaching, service, and research in a campus setting. The Department of Kinesiology is proud of the longevity of the MPS, the rich data it provides in contributing to the body of knowledge in physical growth and motor development, and of the impact it has made on the lives of children in mid-Michigan.

The Motor Performance Study was the brainchild of Dr. Vern Seefeldt. A prerequisite condition of his employment as an Assistant Professor at Michigan State University in the fall of 1966 was the opportunity to conduct on-campus research with children and youth. Following a year of planning, proposal writing, and review at various administrative levels, the proposal for a longitudinal study of growth and motor skill acquisition was approved by Provost Howard Neville on November 12, 1967. Initial research data were collected in December 1967, and an instructional program was begun in January 1968.

Shortly after implementation of the MPS instructional program, it became apparent that some children had difficulty learning in larger group settings and needed instruction on an individual basis. This individual instruction evolved into what became known as the Remedial Motor Clinic (RMC). The RMC provided services to children and youth with motor problems until the end of the 1991–1992 school year when it was merged with the Sports Skills Program offered through adapted physical education.

A third program with a focus on movement skill acquisition, the Early Childhood Motor Development Program (ECP), was begun in the fall of 1975. Dr. John Haubenstricker, upon joining the faculty in the fall of 1973, developed a proposal for the assessment of motor behavior in young children. Faculty in the Institute for Family and Child Study in the College of Human Ecology approved the proposal in

November 1974. Data were collected at three on-campus sites during the following winter and spring quarters. The enthusiasm generated by the study resulted in the development of a curriculum and the subsequent enrollment of students in the fall of 1975, with Susan Miller as the Head Instructor. The ECP still exists as an instructional program on the campus today. The focus of this chapter will be to provide a brief history of each program—the MPS, the RMC, and the ECP. Included in each history will be the events leading to the creation of the program, its goals and objectives, administrative leadership, programmatic offerings, and research outcomes.

Motor Performance Study

The Motor Performance Study (MPS) at Michigan State University was initiated with the premise that a longitudinal study of the interrelationships between physical growth, biological maturity, and gross motor skill acquisition could contribute valuable information to an understanding of how children and youth grow and develop (Seefeldt, 1996). Previous studies had addressed some of the questions that were the subject of the proposed study: patterning of early gross movements (Ames, 1937; Bayley, 1936; Gesell & Thompson, 1934; Gutteridge, 1939); the acquisition of motor skills in adolescence (Brace, 1946; Clarke, 1971; Espenschade, 1940; Jones, 1949); and, the relationship of physical growth to biological maturity (Reynolds, 1946; Shuttleworth, 1937, 1939). However, none of the longitudinal efforts had studied the interrelationships of physical growth, biological maturity, and motor skill acquisition across the age span of 2-18 years, which was the purpose of the MPS.

The Proposal

Upon his arrival on campus in the fall of 1966, Vern Seefeldt began to explore the possibility of initiating a longitudinal study of growth and motor skill acquisition. Because of the relationship that Gale Mikles, head of the professional curriculum, had established with President John Hannah, Mikles and Seefeldt were able to meet personally with President Hannah on November 10, 1966, to discuss the proposed study. President Hannah gave his approval for the proposed study on the condition that the work was to be research-based and that Provost Neville and Dr. John Ivey, Dean of the College of Education, approved the written proposal that was to be prepared by Seefeldt.

Prior to writing a draft proposal, Seefeldt met with numerous individuals whose professional interests indicated a possible working relationship with the proposed MPS. Included in the meetings were Dean Andrew Hunt, College of Human Medicine; Dr. John Feurig, Radiology; Lee Shulman, Psychologist, College of Education; Frank Beeman, Director of Intramurals; and, members of the Department of Health, Physical Education and Recreation—Dixie Durr, Bill Heusner, and Wayne Van Huss.

The first draft of the proposal was completed in January 1967, and submitted to Leland Dean, Assistant Dean, College of Education. During the winter and spring of

1967, the proposal was read by individuals in various departments and colleges that held research interests in child development. After several revisions, which included the incorporation of information regarding space requirements, personnel, financial structure, and the legal obligations of the College and University, the proposal was resubmitted to Dean Ivey in late June 1967. Dean Ivey forwarded the proposal to Provost Neville on July 8, 1967. Provost Neville approved the establishment of the MPS on September 12, 1967, but with the stipulation that assessments and instruction not begin until Winter Term, 1968.

In November 1967, Seefeldt met with Helen Clegg, feature writer for the *Lansing State Journal*, to discuss the MPS. On Sunday, November 12, 1967, Clegg wrote of her interview with Seefeldt and the proposed MPS in the *Family Section* of the newspaper, and announced that the study could accommodate only a limited number of enrollees. Although no telephone numbers were provided in the article, by 8:00 a.m. the next day the Michigan State University switchboard was inundated with requests for information about the Motor Performance Study. By afternoon on November 13, 1967, the quota of 110 enrollees had been filled. In addition, another 171 potential enrollees had requested application forms. A waiting list for entry into the program existed well into the 1990s.

Initial research data were collected on 110 children 2.5 to 8.0 years of age in December 1967. The first instructional session of the MPS was conducted on January 6, 1968, and consisted of four levels. Coed classes were held with 20 boys and girls in a Kindergarten/Nursery class and 20 children in a First Grade class. In addition, separate classes were held for 20 boys and 20 girls in Second/Third Grade combinations. The classes met for approximately 2.5 hours with each class receiving instruction in three different activities.

General Purpose and Objectives

The general purpose of the MPS was to examine the longitudinal relationship of physical growth, biological maturity and motor skill acquisition of children and youth. Specifically, the purpose was to determine:

1. the changes over time that occur in the physical growth, biological maturity, and motor skill acquisition of children and youth.
2. the processes involved in the attainment of basic and complex motor skills.
3. the influence of changes in the learners' environments on their rates of motor skill acquisition.

Although the major objective of the MPS was to provide a research setting for the study of physical growth and motor development, it had two additional objectives. The second objective was to provide undergraduate physical education major and minor students with a laboratory setting for the observation and teaching of elementary school children. The third objective was to provide the enrollees in the program with

the opportunity to learn the sports skills and dances of their culture under the supervision of competent instructors (Seefeldt, 1972).

Enrollment Plan

The MPS was designed to provide for the addition of new enrollees at young ages each year and the retention of enrollees through their adolescent years. The proposed enrollment plan, by chronological age of enrollees and calendar year, is shown in Table 1. Note that the vertical line in the Table 1 divides children in the pre-instructional group (younger than 5.0 years of age) from those in the instructional program (5.0 years of age and older).

Table 1. Projected 10-year enrollment of the Motor Performance Study, with subjects classified according to chronological age by year of entry to the study.

	Chronological Age														
Year	2.5	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1967*	10	10	10	20	20	20	20								110
1968**	10	10	10	20	20	20	20	20	20						150
1969	10	10	10	20	20	20	20	20	20	20					170
1970	10	10	10	20	20	20	20	20	20	20	20				190
1971	10	10	10	20	20	20	20	20	20	20	20	20			210
1972	10	10	10	20	20	20	20	20	20	20	20	20	20		230
1973	10	10	10	20	20	20	20	20	20	20	20	20	20	20	250
1974		10	10	20	20	20	20	20	20	20	20	20	20	20	240
1975			10	20	20	20	20	20	20	20	20	20	20	20	230
1976				10	20	20	20	20	20	20	20	20	20	20	210

*Cohort 1967 was actually enrolled in January 1968.
**Cohort 1968 was enrolled during the summer term of 1968.

Instructional Program

Participants. The participants in the MPS were selected as volunteers on a first-enrolled, first-educated basis. An initial fee of $10.00 per quarter was assessed to cover the cost of the instructional program. The fee may have prevented the participation of children from families with low incomes because most of the enrollees were from families of middle to upper class socioeconomic status. Upon enrollment, the parent/caregivers also made a commitment to continue to enroll their child(ren) until mature physical growth had been attained. This commitment may have excluded some families who were unsure of their income over the ensuing years or who were employed in occupations where mobility was required as a condition of employment.

The enrollment plan shown in Table 1 was modified during the first year of the instructional program. The need for modification resulted from the initiation of a new curriculum in the fall of 1968 that required all sophomore physical education majors to complete one term of cadet teaching at the elementary level. To accommodate the 125 sophomore majors, Seefeldt requested that the number of enrollees be increased by 100 and that the duration of the program be extended indefinitely (Seefeldt, 1968).

With the enrollment limits removed and the duration of the program extended indefinitely, enrollment in the program soared to over 200 in the summer of 1968 (see Table 2). By summer 1974, more than 340 children were enrolled and double sessions (morning and afternoon) had become necessary. The enrollments peaked in 1975 and began a gradual decline thereafter. The reason for the decline was twofold. First, children who became competent in the fundamental motor skills and basic sports skills began to participate in community-sponsored competitive sports programs that were becoming increasingly popular in the 1970s and 1980s. The MPS activity program was no longer the only "game" in town. A second reason for the decline in participation was the decision in the late 1970s not to add new families to the research component of the program because it had become difficult to schedule all the participants for semi-annual assessment of their physical growth and motor performance. Thus, as participants matured or discontinued the program, they were not replaced on a systematic basis. However, some consistency in enrollment was maintained during the 1980s by permitting families to enroll their children in the instructional program, but not requiring them to participate in the research component of the study.

Several trends influenced the enrollment status of the MPS instructional program in the 1980s and 1990s. The economic recession in the early 1980s resulted in a reduced demand for physical education teachers as school districts began to reduce physical education program offerings to meet budget shortfalls. At the same time, awareness of the contributions of preventative health measures to the economic welfare of businesses and industries resulted in the development of health promotion programs that offered new avenues of employment for physical education majors. By the late 1980s, less than 20 percent of the physical education majors in the School of Health, Counseling Psychology, and Human Performance at Michigan State University were preparing for careers in teaching. Some of the physical education majors began to question the requirement of participating in teacher preparation courses when their career goals focused on corporate fitness, cardiac rehabilitation, athletic training, and other health-related fields.

When Michigan State University converted to the semester system in 1992, a new curriculum was developed that resulted in a disciplinary major in physical education and exercise science rather than a major in teaching. Majors in physical education and exercise science no longer were required to take courses in teaching techniques and to

Table 2. Enrollment by quarter or semester in the instructional program of the Motor Performance Study

Year	Winter	Spring	Summer	Fall	Total
		Quarter System			
1968	87	75	208	221	591
1969	186	148	254	261	849
1970	NA*	301	242	290	——
1971	233	239	209	273	954
1972	285	276	343	277	1181
1973	257	299	427	202	1185
1974	209	204	480	239	1132
1975	347	351	477	312	1487
1976	239	302	354	272	1167
1977	247	213	185	197	842
1978	210	237	200	217	864
1979	228	211	246	196	881
1980	204	178	203	168	753
1981	207	159	202	166	734
1982	196	151	NA	200	——
1983	152	163	183	143	641
1984	NA	NA	175	126	——
1985	151	120	183	151	605
1986	172	168	186	163	689
1987	187	152	163	154	656
1988	197	188	163	191	739
1989	189	157	146	185	677
1990	187	149	116	166	618
1991	161	137	102	130	530
1992	132	105	79	150	466
		SemesterSystem			
1993	——	157	68	88	313
1994	——	130	72	139	341
1995	——	194	——	87	281
1996	——	145	——	72	217
1997	——	152	——	75	227
1998	——	143	——	46	189
1999	——	78	——	——	78

*NA = Not available

participate in cadet teaching. Thus, a large campus-based physical activity program for children was no longer needed for the preparation of teachers of physical education. The influx of graduate students without prior teaching experience into disciplinary areas of the department also reduced the pool of potential teaching staff for the program. The summer program was phased out after 1994 because of staff and scheduling difficulties created by the semester system and the new curriculum. In addition, the availability of new community facilities and programs greatly reduced public demand for the program by the mid-1990s. The fall and spring semester programs continued to be offered during the 1990s, but at increased costs to the families because most of the teaching staff were now employees rather than students. (The initial fee of $10 for eight sessions in 1968 had risen to $80 for 10 sessions in 1999.) After more than 31 years of continuous operation, the decision was made to close the activity program for children at the end of the 1999 spring semester.

Purpose. In addition to providing the opportunity for physical education majors to observe and teach children, the service component of the program was designed to help children learn the sports skills and dances of our culture under the supervision of qualified instructors. Thus, the program was to be instructional, rather than recreational or competitive, in nature.

Activities. The focus of the program was to provide developmentally appropriate instruction and activities that would enable children to achieve proficiency and prepare them for participation in more highly organized activities as they matured. Children in kindergarten and first grade were taught a variety of fundamental locomotor skills (e.g., running, jumping, skipping), body-control skills (e.g., balancing, turning, stretching), and ball skills (e.g., throwing, kicking, striking). In addition, they received instruction in swimming, ice skating, and rhythms. Swimming and ice skating lessons were available to children at all grade levels during specified terms. Second and third grade children learned basic sports skills, gymnastics stunts, and dance movements that were combined into simple game, dance, and gymnastic activities. Fourth and fifth grade children received instruction in more complex sports skills, lead-up games, and gymnastic activities. Children in the older grades learned offensive and defensive skills and strategies in a variety of individual and dual sports (e.g., tennis, badminton, wrestling) and team sports (e.g., baseball, softball, basketball). Activities offered through the program across its history are listed in Table 3.

Although the program schedule of activities for each term was determined by the MPS Coordinator, the curricular content and teaching progressions for each of the activities were the responsibility of the supervisor or head instructor so that instruction could be adapted to the abilities of the children in each class. Resource materials were provided for specialized activities such as swimming and ice skating. Books and other instructional materials were made available when requested. Cadet teachers planned lessons and taught them under the supervision of the head instructor.

Children in kindergarten and first grade participated in the activities assigned by the coordinator. However, beginning with the second grade, children could choose activities

from a limited number of options. As children proceeded through the grades, the number of activity options increased so that by the fifth grade, children could choose from among three or four activities each class period.

Table 3. Activities offered through the Motor Performance Study instructional program

Archery	Figure Skating	Racquetball
Aerobics	Floor Hockey	Rhythms
Apparatus	Football Skills	Roller Blading
Badminton	Fundamental Skills	Soccer
Ball Skills	Golf	Softball
Baseball	Gymnastics	Softball Skills
Basketball	Ice Hockey	Swimming
Body Management	Ice Skating	Synchronized Swimming
Bowling	Judo	Team Game Skills
Chasing & Fleeing Activities	Kickball	Tennis
Cheerleading	Lead-up Games	Track & Field
Combatives	Life Saving	Volleyball
Creative Movement/Rhythms	Low Organization Games	Wrestling
Dance	PaddleballYoga	
Diving	Physical Fitness	

Staff. Responsibility for the MPS instructional program was assigned to a faculty coordinator, assisted by a part time secretary. Four coordinators served the program during its 31-year history: Vern Seefeldt (1967-1969, 1971-1978); D. Conrad Milne (1969-1970); David Fuller (1970-1971); and John Haubenstricker (1978-1999). Secretaries that provided support for the program included Joyce Rost, Deborah Hogle, Sandy Swope, Lynn Vela, Cindy (Krisko) Casey, Lucy Repovz, Marsha Stedron, Karlene (Tupper) Wojtysiak, Charla Dawdy, and Amy Rivard.

When a curriculum revision was initiated in the late 1970s and cadet teaching was offered as a separate course (HPR 490), a graduate student was assigned the task of supervising the lesson planning and instruction of the cadet teachers in cooperation with the class supervisors. A number of graduate assistants served in this capacity or as administrative assistants to the coordinator. These included David Hird, Toni Poll, Crystal Fountain (Branta), Molly Sapp, Beverly Ulrich, Gail Bremer, Ardavan E-Lotfalian, Rubin LaBoy, Kathy Wilson, Joy Kiger, Jeff Walkley, Mary (Yager) Painter, Steve Smith, Fred Heldmeyer, Lynn Forsblom, Al Bransdorfer, Terry Duncan, Debra Stuart, Cathy Lirgg, Tina Cate, Paul Behen, Clersida Garcia, Michelle Hamilton, Melissa Chase, David Kinunnen, and Saidon Amri.

The success of the MPS instructional program rested with the quality of the supervisors or head teachers. There were many outstanding supervisors in the history of the program. Unfortunately, it is impractical to list all of them here because of the large number. Supervisors generally were graduate students in the department who had prior teaching experience and were experts in the activities that they taught. It was their responsibility to plan and implement the instruction for their activity and to involve up to five or six cadet teachers in the process. When necessary, undergraduate majors, other university students, or individuals from off-campus with expertise in specific activities were employed as supervisors or instructors to teach in the program. Often, one or two volunteers would assist with the program. For the most part, the volunteers were former participants, now of high school age, who wanted to gain experience working with children. Occasionally, parents or university students would volunteer to assist with the program.

Schedule. The instructional program was offered eight Saturday mornings each term and on a daily basis during the first half session of the summer. Initially, three 40-minute periods were scheduled for each grade or combination of grades. However, as the program grew and more facilities were required, more time was needed to move children from one teaching station to the next. Consequently, the number of instructional periods was reduced to two 50-minute periods and travel time between classes was increased. When the University converted to the semester system in 1992, activities were offered 10 or 11 Saturdays each semester and the two-period schedule was retained.

The summer program was offered Mondays through Thursdays over a five-week period with Fridays reserved for testing. This schedule worked well until the Department of Athletics began to offer summer sports camps. Competition for facilities became intense and as a compromise the program was reduced to a four-week (16-day) program. When the University began to sponsor the Michigan Festival, the program was further reduced to a three-week (15-day) program. With the conversion to the semester system, the summer school academic schedule was altered. Consequently, few students were available to staff the program in July and the summer program was discontinued after the 1994 session.

Research Program

As previously stated, the primary purpose of the MPS was to conduct a longitudinal investigation of the relationships between physical growth, biological maturity, and motor performance. To fulfill this purpose, Seefeldt selected 13 measures of physical growth and 7 measures of motor performance to be assessed semi-annually. A measure of dynamic balance was added to the battery of measures for a period of several years, but was discontinued because of the amount of time required to administer the task. The measures are listed in Table 4. Roentgenograms of the hand and wrist to enable the assessment of skeletal age were taken each summer until 1975. In addition, the qualitative performance of children on selected motor skills was recorded on 16mm film or videotape at various times during the study.

The faculty members who were primarily involved in conducting the longitudinal research were Vern Seefeldt, John Haubenstricker, and Crystal Branta. Haubenstricker became the principal investigator in 1978 when Seefeldt became Director of the Institute for the Study of Youth Sports. Branta, who joined the department faculty in fall 1978, became coordinator of both the Remedial Motor Clinic and the Early Childhood Motor Development Program in fall 1979 and became principal investigator in the early childhood research program. Across the years, other faculty members assisted with data collection (e.g., Leigh Brakora, Lynn Forsblom, Lynnette Overby). Graduate students in motor development and in related areas made major contributions to the research program by assisting with collecting, recording, and analyzing data; and in preparing papers or poster presentations for professional meetings. At times, undergraduate students assisted with the collection of data.

Data Collection. Instructions and protocols for obtaining the growth and motor performance data were developed to assure consistency in the collection of data among the participants and across time. Instruction and practice in the data collection procedures were provided to faculty and students before they were permitted to collect data independently.

Table 4. Physical growth and motor performance measures assessed semi-annually in the Motor Performance Study

Physical Growth	
Weight	Arm girth
Standing height	Thigh girth
Sitting height	Calf girth
Biacromial (shoulder) width	Triceps skinfold
Bicristal (hip) width	Subscapular skinfold
Acrom-radiale (arm) length	Umbilical skinfold
Radio-stylion (forearm) length	
Motor Performance	
Flexed-arm hang	Agility shuttle run
Jump-and-reach	Standing long jump
Thirty-yard dash	400-ft shuttle run
Sit-and-reach	Beam walk

The participants were assessed in June-July and December-January of each year. Families were informed of the dates that measurements were scheduled and were requested to schedule an appointment with the program secretary. Families that failed to respond were contacted by telephone, usually by the coordinator or the secretary, to secure an appointment. At the peak of enrollment in the late 1970s and early 1980s, over 600 children and adolescents (instructional and non-instructional) were eligible for measurements during an assessment period. Characteristically, over 80% of the participants were measured at each six month interval. Subsequently, when enrollment in the program was reduced, as many as 95% of the participants were measured during a measurement cycle. Over its 31-year history, data were obtained on slightly over 1200 participants. The number of times these individuals were assessed ranged from 1 to 38. In 1999, approximately 40 participants still remain in the study. The majority of these (n=25) are second generation participants whose parents are interested in tracking the longitudinal growth and development of their children.

Research Results. Research efforts associated with the MPS have yielded both quantitative and qualitative results. These results have been presented at numerous professional conferences and in several publications; however, no comprehensive monograph of the longitudinal study has yet been written.

Semi-annual data on the physical growth and motor performance of the participants have been collected across the history of the study. The first research data from the study were presented in1971 (Haubenstricker, Milne, & Seefeldt, 1971; Milne, Haubenstricker, & Seefeldt, 1971). The most recent databased presentations occurred in 1998 (Branta, et al., 1998; Haubenstricker, et al., 1998). Unpublished normative data on the physical growth and motor performance of children and youth have been prepared for internal use several times. The most recent norms were presented in 1997 (Haubenstricker, J., Wisner, D., Seefeldt, V., & Branta, C., 1997). Key publications containing research results on the MPS were chapters by Branta, Haubenstricker and Seefeldt (1984) and by Haubenstricker and Seefeldt (1986).

The focus of research in the MPS varied across the decades. In addition to the semi-annual measurements, much of the research in the early and mid-1970s involved the collection of qualitative data in the form of 16mm film records. Infants, children and youth were filmed performing various fundamental motor skills. From 1971 through 1976, developmental sequences for 10 fundamental motor skills were hypothesized following careful examination of the film records. The skills included running, galloping, hopping, skipping, jumping, throwing, catching, kicking, punting, and striking. The movement behaviors of the performers were examined for their complexity in the preparatory, execution, and follow-through phases of the skills. The developmental sequence for kicking is presented in Table 5 as an example of the detailed movement analysis conducted by the motor development faculty. The developmental sequences became part of the content for the growth and development course

required of all physical education majors at Michigan State University. Knowledge of the sequences is useful for evaluating the performance of children on these skills, and in aiding them to improve their performance. The value of the developmental sequences is evidenced by purchase of instructional films on these skills by other educational institutions, and by the incorporation of the sequences into textbooks on motor development (e.g., Payne & Isaacs, 1999). Upgraded videotapes of the sequences were developed in the late 1980s.

During the 1980s, considerable effort was also devoted to verification of the developmental sequences generated in the 1970s. With few exceptions, the sequences hypothesized withstood the test of external review. Results were presented at regional or national professional meetings.

By the 1980s, the accumulation of longitudinal data also permitted more extensive analyses on selected questions. The questions were organized under the following themes:

1 The relationship of biological maturity to physical growth.
2 The influence of physical growth on motor behavior.
3 The relationship of qualitative to quantitative motor performance.
4 The development of body size and structure.
5 Gender differences in motor performance.
6 Secular trends in physical growth and motor performance.
7 The stability of growth and motor performance.

Some of the research themes of the 1980s, such as gender differences and the stability of physical growth and motor performance measures, were carried into the 1990s. New themes also emerged. Among these were the influence of biological maturity on motor performance, the proportion of adult growth and performance values achieved by children and youth at various chronological ages, and the influence of childhood physical activity on adult physical activity patterns. Research papers on each of these themes have been presented at a variety of professional meetings. The cumulated data on over 1200 participants, over a third of whom were enrolled until they achieved adult stature, provide a rich database for examining questions that have not yet been answered. This longitudinal database is unique in that it incorporates data on both girls and boys from infancy to adulthood in the areas of growth, maturation, and motor performance. One major task that remains, however, is the preparation of a comprehensive monograph summarizing the data gathered in the Motor Performance Study.

Table 5. Developmental sequence of kicking

Stage 1	*Preparatory Phase* – The performer is usually stationary and positioned near the ball. If the performer moves prior to kicking, the steps are short and concerned with spatial relationships rather than attaining momentum for the kick. *Force Production* – The thigh of the kicking leg moves forward with the knee flexed and is nearly parallel to the surface by the time the foot contacts the ball. Knee joint extension occurs after contact, resulting in a *pushing* rather than a striking action. Upper extremity action is usually bilateral, but may show some opposition in older performers. (If the performer is too far from the ball as the extremity moves to meet the ball, the knee flexes only slightly and the leg swings forward form the hip in a pushing action.) *Follow-through Phase* – The knee of the kicking leg continues to extend until it approaches 180°. If the trunk is inclined forward following contact with the ball; the performer will step forward to regain balance. If the trunk is leaning backward, the kicking leg will move backward after ball contact to achieve body balance.
Stage 2	*Preparatory Phase* – The performer is stationary. Initial action involves hyperextension at the hips and flexion at the knee so that the thigh of the kicking leg is behind the mid-frontal plane. The arms may move into a position of opposition in situations of extreme hyperextension at the hips. *Force Production* – The kicking leg moves froward with the knee joint in a flexed position. Knee joint extension begins just prior to foot contact with the ball. Arm-leg opposition occurs during the kick. *Follow-through Phase* – Knee extension continues after the ball leaves the foot, but the force of the kick usually is not sufficient to move the body forward. Instead, the performer usually steps sideward or backward.
Stage 3	*Preparatory Phase* – The performer takes one or more deliberate steps to approach the ball. The support leg is placed near the ball and slightly to the side of it. *Force Production* – The kicking foot stays near the surface as it approaches the ball resulting in less flexion than in stage two. The trunk remains nearly upright, thereby preventing maximum force production. The knee begins to extend prior to contact. Arm-leg opposition is evident. *Follow-through Phase* – The force of the kick may carry the performer past the point of contact if the approach is vigorous. Otherwise the performer may remain near the point of contact.
Stage 4	*Preparatory Phase* – The approach involves one or more steps with the final "step" being an airborne *run* or *leap*. This permits hyperextension of the hip and flexion of the knee as in stage two. *Force Production* – The shoulders are retracted and the trunk is inclined backward as the supporting leg makes contact with the surface and the kicking leg begins to move forward. The movement of the thigh nearly stops as the knee joint begins to extend rapidly just prior to contact with the ball. Arm-leg opposition is present as in the previous two stages. *Follow-through Phase* – if the forward momentum of the kick is sufficient, the performer either hops on the support leg or scissors the legs while airborne in order to land on the kicking foot. If the kicking foot is not vigorous, the performer may merely step in the direction of the kick.

Remedial Motor Clinic

The Remedial Motor Clinic (RMC) had its genesis in the MPS instructional program. Children who had difficulty adapting to group instruction in the MPS were given the opportunity to receive individual instruction at special times during the week. During the early years (1968-1973), the individualized instruction was provided by physical education undergraduate and graduate students under the supervision of a faculty leader.

As awareness of the specialized instruction grew in the community, inquiries and referrals from outside the MPS program were made to the department. Seefeldt and Dr. Jeralynn Plack developed a checklist to evaluate the gross motor skills of the children referred to them. If the outcome of the screening test indicated the need for individualized instruction, parents were required to complete an application form, sign a consent form, and obtain signed consent from their family physician that the child could engage in physical activity without undue risk to the child's health. When these mandated authorizations were obtained, the child was admitted into the program.

Faculty Leadership

Initial leadership was provided by Dr. Vern Seefeldt in conjunction with his duties as coordinator of the MPS. When Dr. Jeralyn Plack joined the faculty in the fall of 1970, she took primary responsibility for organizing the instructional activities. Dr. John Haubenstricker was appointed Coordinator of the RMC in 1973 when Dr. Plack accepted a position at another university. He served in this capacity until fall 1979 when Dr. Crystal Branta assumed responsibility for the RMC. Branta was coordinator for a period of 11 years (1979-1990). Dr. Yevonne Smith served as interim coordinator in 1990-1991 while Dr. Branta was on sabbatical leave. Dr. Lynnette Overby was the coordinator of the RMC during its final year of existence (1991-1992).

Purpose

The purpose of the RMC was to provide an avenue for the detection, study and remediation of gross motor skill deficits in children. To fulfill this purpose, the clinic provided screening services, an instructional program, and engaged in research.

Research

Although the primary purpose of the RMC was to provide instruction to children with gross motor deficiencies, a major research effort involved the identification of characteristics associated with gross motor dysfunction in children. Participants in the RMC were filmed extensively while performing various motor tasks, including those contained in the screening instrument. Careful analysis of the performances revealed that not only were the participants generally delayed in their motor skill development when compared to their age mates, they also exhibited identifiable behaviors that contributed to their motor deficiencies. An instructional film was produced in 1974 that

depicted examples of the 10 characteristics that commonly contributed to the child's motor dysfunction. Subsequently, the film was used extensively in the Department's growth and motor development courses. The findings also were presented at a professional meeting and shared with teachers through an article in a professional journal.

Enrollees in the RMC also participated with children from the MPS in an experiment to determine the validity of the *Bruininks-Oseretsky Test of Motor Proficiency* (BOT) in identifying children with gross motor dysfunction. The results of the study showed that the BOT was effective in differentiating children with gross motor dysfunction from those with normal motor function. The findings were presented at a national symposium in 1981.

Screening Services

All children referred to the RMC were screened for gross motor deficiencies to determine their eligibility for the instructional program. After Haubenstricker became coordinator in 1973, he and Seefeldt revised the 1-page Seefeldt-Plack screening list into a 3-page evaluation instrument. The instrument was used to screen the children referred to the clinic. The components assessed by the test items included body balance, body image and control, object projection, hand-eye coordination, foot-eye coordination, hand-eye-foot coordination, body projection, and selected locomotor skills. After several more revisions (the last one in September 1975), a 16mm film was produced depicting the various items in the instrument. The film was used as an educational tool in undergraduate and graduate motor development classes, and as an aid to prepare graduate students to assist with the screening process. The evaluation instrument was used for screening purposes until the early 1980s when commercial instruments such as the *Bruininks-Oseretsky Test of Motor Proficiency* (Bruininks, 1979) and the *Test of Gross Motor Development* (Ulrich, 1985) became available.

As the reputation of the RMC grew in the greater Lansing community, the screening service of the RMC was requested by parents, educators, and physicians to verify the existence of gross motor dysfunction in their children, students or patients. These screenings were done on a fee basis, with a written report provided to the individual or agency requesting the service. These requests occurred more frequently during the 1980s when comparisons could be made to the reference norms provided by the standardized tests mentioned previously.

Instructional Program

One of the goals of the RMC was to provide individualized instruction for the remediation of motor skill deficiencies. The plan of instruction for each of the enrollees was based on the results of the initial assessment.

Instructional sessions were offered from 4:00 to 5:00 p.m. two days per week, initially on Tuesdays and Thursdays, and later also on Mondays and Wednesdays. During the summer, the program was offered four days per week for a 5-week period. Most children

spent one session each week in the gymnasium learning motor skills and one session in the pool acquiring swimming skills. A few children requested to stay in the gymnasium or pool for both periods.

Undergraduate physical education majors provided individual instruction under the supervision of graduate supervisors. The undergraduate students received an orientation to the clinic, its policies and procedures, and to their responsibilities. Students were required to plan lessons, teach them, and prepare end-of-term reports to the parents on the progress of the children. Two graduate students, Crystal Branta and Molly Sapp, compiled existing forms and printed materials of the RMC into a handbook in 1975. The handbook was revised, as needed, several times in subsequent years. Molly Sapp also produced a set of slides for use during the orientation sessions. These proved to be very effective in preparing students for their responsibilities.

Many of the graduate students who assisted with the MPS also served as supervisors for the RMC. Available records indicate that the RMC supervisors included Paula Serra, Betty Lessard, Betty Luberto, Leigh Brakora, Marcia Lerner, Joan Henn, Crystal (Fountain) Branta, Molly Sapp, Richard Howell, Lynne Pirie, Rick Evans, David Hird, Dale Ulrich, Joy Kiger, Mary (Yager) Painter, Clersida Garcia, and Jackie Goodway.

Enrollment in the RMC varied from term to term and year to year. The capacity of the RMC was primarily determined by the number of undergraduate students available to teach the children. Enrollments during the school year in the mid-1970s ranged from the mid-20s to the mid-40s. Summer enrollments usually were in the high teens to low 20s. The capacity of the clinic was reduced in the 1980s with the decline in the number of undergraduate physical education majors due to the economic recession. Enrollments in the 1980s generally were in the high teens or low 20s. When the university converted to the semester system, the RMC was merged with the Sports Skills Program offered by Dr. Gail Dummer in adapted physical education.

The Early Childhood Motor Development Program (ECP)

Interest in the motor skill development of preschool age children increased during the mid 1970s. Numerous educators were aware of the importance of motor skill development of children, but they lacked research-based information to guide their decisions regarding program content, instructional methods, and equipment modifications that would be appropriate for young children. Other teachers and most parents thought that motor skills developed naturally and that free play activities were all that children needed to acquire the various fundamental motor skills. Their approach would be to provide the play space and equipment and allow children to develop skills. The paucity of research on the motor development of young children set the stage for the establishment of the Early Childhood Motor Development Program (ECP) at Michigan State University.

Motor development specialists believed that motor skills played a positive role in the overall development of children and that instruction was key to augmenting change in skill patterns. Following Haubenstricker's proposal for a motor skills study and the initial data collection, Susan Miller, a doctoral student, conducted a dissertation investigation in 1975-1976 entitled, "The Facilitation of Fundamental Motor Skill Learning in Young Children." Her study compared the motor skill development of children ages 3-5 years in a teacher-instructed group, a parent-instructed group, a free-play group, and a control group. One significant aspect of this research was its length, lasting from October through May, as much of the previous research had been of much shorter duration. Miller's results indicated that children in the instructed groups performed significantly better than those in the free-play situation, thereby supporting the belief that motor skills need to be taught in order to help children improve their abilities.

These results were so exciting to the motor development faculty that the research was continued and the instructional program expanded. Miller served as the first coordinator of the instructional aspect of the ECP, followed by Beverly Ulrich and Leigh Brakora. The ECP was housed on the third floor of Jenison Fieldhouse and served approximately 200 children a year from 1976 until the late 1980s. Numerous graduate and undergraduate students taught classes in the ECP. Sessions were conducted Monday through Thursday in the morning, afternoon, or evening and on Saturday mornings.

Objectives of the ECP

The guiding objectives of the ECP were established by Miller and Haubenstricker and were designed to assist children in improving their overall movement abilities. These objectives were:

1. To learn to move the body efficiently in a variety of ways.
2. To learn the fundamental skills necessary for participation in sports and games: throwing, catching, kicking, punting, running, hopping, skipping, jumping, and striking.
3. To develop the qualities of balance, strength, flexibility, coordination, agility, power, and endurance.
4. To develop a body image which included (a) knowledge of the names, locations, and relationships of body parts, (b) a sense of laterality and directionality, and (c) an understanding of one's relative position in space.
5. To experience the concepts of space, time, force, and flow through movement: Up, down, fast, slow, heavy, light, etc.
6. To learn to move in response to rhythm.
7. To learn to use movement as a form of personal expression and as a medium for dramatic enactment.

8. To develop creativity, initiative, self-confidence, and social skills through movement and group experience.
9. To experience the joy of moving.

Curriculum

The initial curriculum consisted of five major content areas with plans for specific time allotments for instruction and practice in each area. Table 6 provides the curriculum overview. This initial plan provided the basic guidelines for curriculum development throughout the years. Modifications have been made according to the needs of specific classes and various individuals during the program's existence.

Program Expansion

From 1987-1989 , Haubenstricker and Branta acquired a Kellogg Health Promotion Grant of $75,000 to focus on early childhood motor skills. The ECP was expanded to included classes in Spartan Village and the Child Development Laboratories (CDL). Classes were held in the morning before CDL sessions, at the noon hour between morning and afternoon sessions, on Saturday mornings, and during the summer. Monica Chapin served as the first coordinator of the motor skills classes in the CDL. Other individuals serving in that capacity over the subsequent years were Tina Cate, Cathy Hornbogen, Geffrey Colon, and David Kinnunen. Doreen Espinoza is currently directing the motor skills classes at the ECP.

During the mid 1990s the class sessions at Jenison Fieldhouse were phased out due to increased parking difficulties at that site and less demand for classes as community programs and the Kellogg grant programs expanded. The instructional program and its impact on children and future teachers and program directors continues today via the CDL site. Graduate and undergraduate students in Kinesiology and in Human Ecology gain valued experience with the motor skill development of children in that laboratory. In addition, various research studies were conducted and continue to date involving the laboratory and the children enrolled.

Research Program

The primary focus of research in the ECP has been to document the motor skill development of young children ages 2-6 years, experiment with the best ways in which to help children learn skills, and seek an understanding of the etiology of change in motor behavior over the course of the preschool years. Both longitudinal and cross-sectional studies have been completed via the ECP.

Faculty

Primarily two faculty members have been responsible for the oversight of the research conducted through the ECP. Dr. John Haubenstricker was the initial faculty member in charge of the research. Dr. Crystal Branta assumed the Principle Investigator role

Table 6. Content areas, sample activities and skills, and time allotments for the ECP.

Content Area		Time Allotment
Fundamental Motor Skills		40%
Locomotor:	run, jump, gallop, hop, skip, roll, etc.	
Object control:	throw, catch, kick, strike, dribble, etc.	
Stability:	bend, stretch, sway twist, curl, hang, etc.	
Body Image and Body Management Activities		30%
Body part identification and relationships, challenge and self-testing activities, tumbling, obstacle course tasks, apparatus activities, etc.		
Rhythmic Activities		15%
Finger plays, actions songs, simple dances, clapping and moving to rhythm instruments, etc.		
Exploratory and Creative Movement Experiences		10%
Story games, dramatic play, activities emphasizing movement elements of time, space, force, and flow, etc.		
Basic Motor Capacities		5%
Activities related to climbing, balance, strength, flexibility, coordination, agility, etc.		

when she joined the faculty in 1979. Dr. Vern Seefeldt also assisted with the data collection throughout the years, as did numerous graduate and undergraduate students.

Data

From 1975-1992, data were collected semi-annually on both the qualitative and quantitative aspects of motor development. Motor skill stage data, based on the stages identified through the MPS research, were recorded for throwing, catching, kicking, punting, striking, running, jumping, galloping, hopping, and skipping. Also, distance jumped, time to run a 30-yard dash, time to complete an agility shuttle run, and balance times were collected. These data allowed investigators to analyze the relationship between the patterns used in skill execution (e.g., jumping) and the quantitative result of that skill (e.g., distance jumped) (see Haubenstricker & Branta, 1997). Numerous national, regional, and state presentations also were made in both the physical education and child development fields during these years.

The skill pattern data were analyzed to determine the means and standard deviations for girls and boys by 6-month age intervals. These data allowed researchers and educators

Table 7. Kicking: Percent of children performing at specific stages by age and sex.

	Age in Months												Females		Males	
	30-35		36-41		42-47		48-53		54-59		60-65		Total		Total	
	F	M	F	M	F	M	F	M	F	M	F	M	%	N	%	N
Stage 4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.4	0.0	0.0	0.0	0	0.4	1
Stage 3	3.0	5.1	14.8	20.6	19.4	43.5	21.7	59.1	30.8	51.2	28.6	60.7	18.7	34	40.3	100
Stage 2	12.1	46.2	22.2	38.2	27.8	30.6	43.5	31.8	46.2	36.6	64.3	39.3	33.5	61	36.3	90
Stage 1	81.8	48.7	63.0	41.2	52.8	24.2	34.8	9.1	23.1	9.8	7.1	0.0	47.3	86	22.6	56
Other Patterns	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0
No Attempt	3.0	0.0	0.0	0.0	0.0	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.5	1	0.4	1
Total No.	33	39	27	34	36	62	46	44	26	41	14	28	100	182	100	248

to examine the range of behaviors exhibited by children at each age, to determine the most common patterns demonstrated by age and gender, and to use the results to make programmatic decisions in the ECP. An example of the data collected throughout the years of the ECP is depicted in Table 7. These data on kicking correspond to the stages outlined in Table 5 in the MPS research section. Several graduate students also conducted their research projects within the laboratory classes of the ECP.

ECP data also have provided the basis for numerous publications. For example, Branta published "Motoric and fitness assessment of young children," in 1992 and "The Physical Domain" in *A Practical Guide for Creating Developmentally Appropriate Programs for the Early Primary Years* in 1993. Throughout the 1980s and 1990s, Haubenstricker published a series of articles, such as "Teaching young children to throw and catch" in the *Pipeline*. These data have been extremely valuable to researchers in understanding how children develop their skill repertoire and to educators in applying research to practice.

The longitudinal data collection on skill patterns continued until 1992 when the University converted to the semester system. At that time the faculty made the decision to concentrate on analyzing the extensive database that had been accumulated rather than continuing to collect additional data. However, individual research projects are still conducted when specific research questions are raised.

Integration of Research, Outreach, and Teaching

The ECP, RMC, and MPS were designed and conducted to fulfill the various missions of Michigan State University. Each program had components related to the three aspects of the mission—teaching, research, and service outreach. For example, students who worked in the programs were enrolled in specific classes in the department. Students had identifiable objectives to accomplish through their participation and were evaluated on how well they accomplished those goals, thereby reflecting the teaching mission of the University. Faculty and graduate students conducted research, both longitudinal and cross-sectional and presented and published these data. The motor development group at Michigan State University has become known for the long-term laboratory research programs that it has conducted on campus. While some grants, both internal and external, were obtained to conduct these studies and to expand programs, much of the funding was generated by fees for service. Each enrollee paid a fee to be involved in the community service/outreach program. These fees supported the instructional endeavors by providing funds to hire additional student help in the classes. Likewise they supported the research program by funding graduate student labor for data analysis and data collection and by providing funds to offset the travel costs to professional conferences. Moreover, the information obtained

from these programs was filtered back into program revisions to benefit the participants and the MSU students enrolled in classes and was disseminated throughout the state, region, and nation to impact a broader audience.

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