TGMD

TEST OF GROSS MOTOR DEVELOPMENT

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TEST OF GROSS MOTOR DEVELOPMENT

Dale A. Ulrich

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8700 Shoal Creek Boulevard
Austin, Texas 78758

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Contents

Preface

Every effort has been made to design an instrument to measure the basic skills in the gross motor domain and to meet the critical needs of professionals who implement gross motor programs. In all aspects of this test's development, input was sought from both practitioners and motor development researchers.

It is hoped that the *Test of Gross Motor Development* will fill a void in motor behavior assessment. In reviewing the literature, one finds that deficiencies exist. First, most of the assessment instruments are unpublished or lack standardization. Second, many of the published tests measure the product of motor performance in terms of time, distance, or accuracy. If the results of this type of test indicate that a child is deficient, it is difficult to know which aspects of movement are defective. The TGMD was designed to evaluate the gross motor skill process or pattern exhibited by a child. Many children who display deficiencies in motor performance in terms of time, distance, or accuracy exhibit immature movement patterns. Third, of the published tests, most offer a norm-referenced interpretation exclusively and provide no information useful for instructional programming. The tests of gross motor development that provide relevant information for making direct instructional decisions generally lack nationally representative norms and cannot be used to make interindividual comparisons.

The current state of affairs in motor behavior testing influences teacher behavior. Of 252 teachers surveyed who deliver motor skill programs to handicapped and nonhandicapped children, 95 of these teachers do not include motor assessment as a regular part of their program. The reason provided by 23% of the individuals who do not use motor assessment is dissatisfaction with available testing instruments. Many of the teachers who assess motor skills believed that multiple tests had to be used to obtain the information they needed to make decisions about a child's locomotion and object control ability. The *Test of Gross Motor Development* will allow examiners to administer one test in a relatively brief time and gather data for making important educational decisions.

This work is dedicated to two physical education professionals: one with an influence on my philosophy of life, the other with an impact on the development of this test. Dr. Edward Shea, a colleague and friend at Southern Illinois University-Carbondale, has proved that maintaining appropriate levels of physical fitness through a lifetime of participation in competitive leisure sports is the key to successful aging. The scholarly works of Dr. Margaret Safrit and many of her past doctoral students at the University of Wisconsin have made the test development process a manageable task.

Dale A. Ulrich

Acknowledgments

Sincere appreciation is expressed to the following professionals who were instrumental in the collection of normative data in their geographic areas or who contributed in other ways to the development of the TGMD.

Peter Aufsesser, Lyn Nelson, Robert Pierce, Terri Williams (California); Juanita Gibson, Gale Webster, Mary Womack (Georgia); Frank Altereo, Denise Goralski, Maryann Lampert, Mary McKenzie, Joy Scholz, Kathy Wiggins, Bev Ulrich (Illinois); Andrea Riese (New Jersey); Barb Black, Terry Hollinger, Jean Ross (Pennsylvania); Judy Werder (Texas); Patricia Patterson (Wisconsin); David Chapman (Wyoming).

Note

Teachers, clinicians, and researchers who use the TGMD are invited to send copies of their work, along with any suggestions for improving the test, to the author in care of PRO-ED, 5341 Industrial Oaks Blvd., Austin, Texas 78735.

1
Overview of the TGMD

A major component of most preschool and elementary education programs including those in special education is gross motor development. During this period of education, a child's motor ability begins to emerge. One important aspect of early childhood screening programs is the evaluation of gross motor development. A need exists for well-constructed, standardized tests of gross motor development that include skills of locomotion and object control. This chapter will define gross motor development, explain its importance, list the purposes for developing the TGMD, describe the test, and discuss its uses.

Definition of Gross Motor Development

Williams (1983) describes gross motor development as "the skillfull use of the total body in large muscle activities that require temporal and spacial coordination of movement of a number of body segments simultaneously" (p. 10). Gross motor development frequently includes skills that are used to transfer the body from one location to another and to propel and receive objects.

Most authorities agree that gross motor behavior develops in a sequential manner (Gallahue, 1982; Roberton, 1982; Williams, 1983; Zaichkowsky, Zaichkowsky, & Martinek, 1980) as depicted in Figure 1. It is generally accepted that individuals progress through the various stages at different rates based on biological and environmental factors (Malina, 1980; Rarick, 1982; Seefeldt & Haubenstricker, 1982).

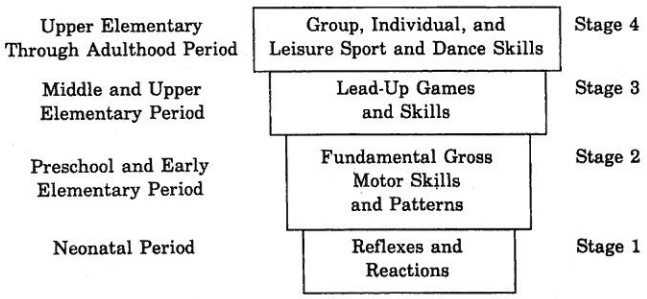


Figure 1. Developmental progression in the mastery of the gross motor behavior domain (adapted from Gallahue, 1982; Schurr, 1980).

Seefeldt and Haubenstricker (1982) note that when adequate levels of performance on fundamental gross motor skills and patterns are not mastered, individuals experience a proficiency barrier that may reduce their potential for learning more advanced sport skills.

Importance of Gross Motor Development

Piaget (1952) was among the first to indicate the important role of human movement in the development of cognition. Children must explore their environment if they are to develop maximum cognitive abilities. During the early years, children spend much time interacting with their environment through movement activities such as crawling, creep-

ing, walking and jumping. This period of time is critical if the child is to master the gross motor skills.

Mastery of sport and dance skills presented at the top of Figure 1 is influenced by achievement levels of the lower fundamental gross motor skills and patterns. The sport and dance skills involve combinations of fundamental gross motor skills. In baseball an individual must perform the fundamental gross motor skills of striking, catching, and throwing a ball, as well as running the bases. A child who has developed a high degree of fundamental motor skill proficiency should have an easier time acquiring sport skills than those who experience deficits.

During the elementary school years, a child's gross motor proficiency plays a significant role in self-concept and social skill development (Gallahue, 1982; Williams, 1983). A child who is less skilled than his or her peers will usually be picked last to participate in group games during recess and after school activities. Being picked last or not at all, because peers perceive another child's gross motor skills as being deficient, promotes withdrawal from physical activity. Withdrawal from activity decreases a child's opportunity for social interaction and skill acquisition.

Purposes of the Test

The first purpose underlying the Test of Gross Motor Development was to design a test representing content frequently taught to children in preschool and early elementary grades (ages 3–10 years) including special education. The second purpose was to develop a test that could be used by a wide variety of professionals with a minimum amount of training. The third purpose was to design a test that provided norm- and criterion-referenced interpretations. The final purpose was to place a priority on the gross motor skill sequence rather than the product of performance. To master fundamental gross motor skills, a child must develop a mature movement pattern prior to attempting the quantitative aspects of time, distance, and accuracy.

Description of the Test

The Test of Gross Motor Development is an individually administered test that evaluates the gross motor functioning of children 3 to 10 years of age. The test measures 12 gross motor skills frequently taught to children in preschool, early elementary, and special education classes.

The skills are grouped into two subtests each of which assesses a different aspect of gross motor development (i.e., locomotion and object control). A brief description of the two subtests follows.

Subtest 1: Locomotion

This subtest measures the run, gallop, hop, leap, horizontal jump, skip, and slide, skills that move the center of gravity from one point to another.

Subtest 2: Object Control

This subtest measures the two-hand strike, stationary bounce, catch, kick, and overhand throw, skills that project and receive objects.

Uses of the Test

The primary uses of this test are: (a) to identify children who are significantly behind their peers in gross motor skill development and should be eligible for special education services in physical education, (b) to plan an instructional program in gross motor skill development, (c) to assess individual student progress in gross motor skill development, (d) to evaluate the gross motor program, and (e) to serve as a measurement instrument in research involving gross motor development. Each of these primary functions is discussed next.

Identification/Screening

Typically, professionals who identify children with motor skill deficiencies use devices that objectively measure the quantitative product of performance or subjectively evaluate the skill process or pattern. Several frequently used developmental scales require the test administrator to judge the performance of a child without providing specific behavioral criteria to observe (e.g., Denver Developmental Screening Test; Bayley Scales of Infant Development). This practice generally results in creating measurement error attributed to interrater inconsistency. If a student is identified as being deficient by observing the product of performance in terms of accuracy, time, or distance, little explanation for this deficiency can be provided. The process or pattern being used to help explain possible performance problems has to be observed. If students are significantly below their peers in per-

forming gross motor skill patterns, they may qualify for special education services in physical education.

Instructional Programming

Specific gross motor skill strengths and weaknesses can be identified with this test. Precise measurement of mastery or nonmastery of specific behavioral components within each gross motor skill will help teachers design programs that will facilitate maximum learning. Children can be grouped for instruction on the basis of skills they have not mastered. The goal of preschool and early elementary gross motor programs is to have all children achieve a predetermined level of mastery in fundamental gross motor skill development. Additional or specially designed instruction can be prescribed for children who are experiencing gross motor skill delays. An individualized education program (IEP) can be developed with the information provided by this test. Annual goals and short-term objectives along with a statement of the present level of functioning can easily be developed from the test results.

Assessment of Individual Student Progress

The third use of the test is to provide a means for continuous evaluation of student progress in mastering gross motor skills. Objective-based instruction requires that educational prescriptions be updated when progress is made or changed when interventions are not successful. Documentation of student progress is required by law for children who are receiving specially designed instruction in the form of an IEP. This standardized instrument is capable of documenting the effectiveness of instructional programming in gross motor development. By counting the number of specific performance criteria that have been learned over time, a statement of student progress can be made. Also, the standard scores provided for both subtests and gross motor composite can be used for this purpose.

Program Evaluation

The effectiveness of a specific gross motor development program can be evaluated by randomly selecting students from various classes, pretesting each student, implementing the instructional program, and following up with a post-test of the selected students. A comparison of pre- and post-test results will indicate whether the students made significant progress. Professionals responsible for delivering gross motor programs should have a valid and reliable assessment tool to document the effectiveness of their programs.

Research Tool

The Test of Gross Motor Development should be useful to researchers who are interested in studying the effects of various instructional paradigms on the gross motor development of handicapped and nonhandicapped children. Assessment training studies with various professional groups (e.g., regular physical education teachers, adapted physical education specialists, classroom teachers, paraprofessionals, and parents) is yet to be explored. The availability of reliable, valid, and well-standardized instrumentation is a necessary prerequisite to research of this type. Current gross motor research methodology suggests that subjects' performances be videotaped or filmed for analysis. The specific performance criteria established and illustrated for each skill will facilitate accurate measurement.

2

Test Administration and Scoring Procedures

This chapter provides information necessary to administer and score the test items. The discussion includes (a) examiner competency, (b) time requirements, (c) testing conditions, (d) general guidelines for administration, (e) standard procedures, (f) standard scoring criteria, and (g) specific subtest instructions and illustrations.

Examiner Competency

The TGMD was designed for use by a wide range of professionals. Examiner competency is based on the ability to observe the three to four performance criteria for each skill. For best results, test administrators must establish a mental picture of a mature performance as described by the specific behavioral criteria listed for that skill. It is strongly recommended that testers view the illustrations provided for each skill in this chapter and practice observing the specific components on children prior to any formal assessments.

The examiner should become familiar with the specific test item directions and scoring procedures. Testers will be required to toss a ball to children for catching and striking. Therefore, tossing the ball underhand from the required distances should be practiced.

Time Requirements

During the collection of norms, approximately 15 minutes was required to assess one child. Testing time will vary with the age of the child and the ability of the test administrator. Test administrators should have several balls available for the striking, catching, kicking, and throwing items to minimize the time spent on retrieval after each trial.

Testing Conditions

The testing environment should be arranged to minimize distractions and according to specific directions for each item. The equipment specified in each item is commonly found in motor skill programs and is listed in the directions for each item. Testing conditions should be arranged prior to beginning the test to help minimize administration time. A list of needed equipment is described below.

Student Record Book
Masking tape, chalk, traffic cones, or other marking devices
4-6 inch light-weight ball
Plastic bat
8-10 inch playground ball
6-8 inch sponge ball
8-10 inch plastic or slightly deflated playground ball
Tennis ball

Students should wear rubber soled shoes for testing. This minimizes the chance of slipping and falling, thus promoting safety and maximum effort in performing many of the locomotor skills.

General Guidelines for Test Administration

The examiner can assure a reliable administration of the test by following several general guidelines.

1. Read the entire test to acquaint yourself with items, equipment, directions, and performance criteria.
2. Practice administering the test several times.
3. Establish rapport with the child. Initiate friendly conversation emphasizing how much fun he or she will have performing the skills. Encourage the student to give maximum effort. Using terms such as "throw hard," "jump far" will promote the best efforts. For young children, explain that several of the skills may be too hard for them to perform and they are not expected to be good at everything. Provide positive reinforcement for effort in attempting to perform skills that are beyond their ability.
4. Although the test administrator should observe one student performing at a time, it may be more economical in terms of time to test two or three students together. As each child is assessed on an item, the other students are encouraged to watch and rest. If testing students in a group, alternate the sequence of individuals so that one student does not always go first or last.

Standard Procedures

Standardized procedures must be followed when the child's scores are to be compared with the available norms. If the examiner is not interested in comparing a student's scores with the normative data, adaptations of the procedures and performance criteria can be made to meet the unique needs of the examiner. Instructional decisions can be made without reference to test norms.

The following requirements are standard for administering each test item in an attempt to minimize any discriminatory practices:

1. Fill-in the appropriate information on the cover sheet of the Student Record Book.
2. Precede assessment with an accurate demonstration and verbal request.
3. Provide a practice trial to assure that the student understands what to do.
4. Provide one additional demonstration when the student does not appear to understand the task.

Standard Scoring Criteria

Each gross motor skill includes three or four behavioral components that are presented as performance criteria. In general, these behaviors represent a mature pattern of the skill. The specific steps in scoring all items are listed below.

1. Require the subject to perform three trials of each gross motor skill.
2. Observe the student performing the skill and concentrate on the performance criteria.
3. Where the student performs a behavioral component two out of three trials correctly, mark a "1" in the appropriate box in the correct assessment column. Where the student does not perform a behavioral component two out of three trials correctly, mark a "0." There are two separate columns provided for each of the assessment occasions. The student's initial assessment data should appear in the first column. An example of a completed assessment for the *run* test item appears in Figure 2.

LOCOMOTOR SKILLS					
Skill	**Equipment**	**Directions**	**Performance Criteria**	**1st**	**2nd**
RUN	50 feet of clear space, colored tape, chalk or other marking device	Mark off two lines 50 feet apart Instruct student to "run fast" from one line to the other	1. Brief period where both feet are off the ground	/	
			2. Arms in opposition to legs, elbows bent	/	
			3. Foot placement near or on a line (not flat footed)	/	
			4. Non-support leg bent approximately 90 degrees (close to buttocks)	0	

Figure 2. An initial assessment for the run test item.

Specific Subtest Instructions and Illustrations

Subtest 1. Locomotor Skills

SKILL: Run

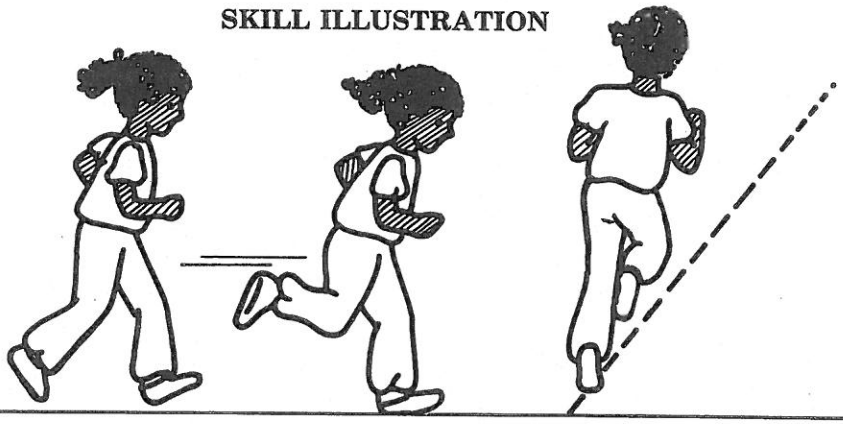
EQUIPMENT/CONDITIONS: A minimum of 50 feet of clear space and masking tape, chalk, or other marking device.

DIRECTIONS: Mark off two lines 50 feet apart. Instruct the student to "run fast" from one line to the other.

PERFORMANCE CRITERIA:

1. Brief period where both feet are off the ground.
2. Arms move in opposition to legs, elbows bent.
3. Foot placement near or on a line (not flat footed).
4. Nonsupport leg bent approximately 90 degrees (close to buttocks).

SKILL ILLUSTRATION



SKILL: Gallop

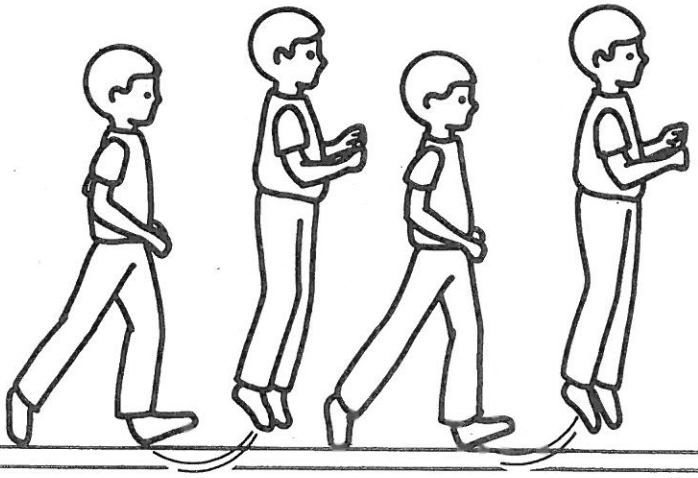
EQUIPMENT/CONDITIONS: A minimum of 30 feet of clear space.

DIRECTIONS: Mark off two lines 30 feet apart. Tell the student to gallop from one line to the other three times. Tell the student to gallop by leading with one foot and then the other.

PERFORMANCE CRITERIA:

1. A step forward with the lead foot followed by a step with the trailing foot to a position adjacent to or behind the lead foot.
2. Brief period where both feet are off the ground.
3. Arms bent and lifted to waist level.
4. Able to lead with the right and left foot.

SKILL ILLUSTRATION



SKILL: Hop

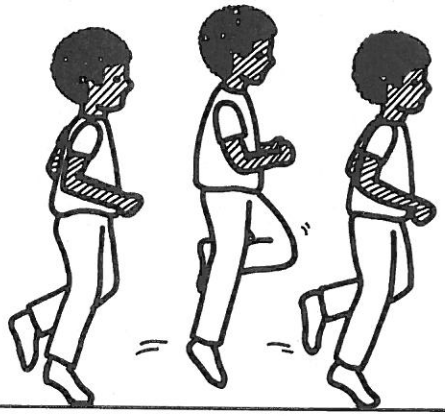
EQUIPMENT/CONDITIONS: A minimum of 15 feet of clear space.

DIRECTIONS: Ask the student to hop three times, first on one foot and then on the other.

PERFORMANCE CRITERIA:

1. Foot of nonsupport leg is bent and carried in back of the body.
2. Nonsupport leg swings in pendular fashion to produce force.
3. Arms bent at elbows and swing forward on take off.
4. Able to hop on the right and left foot.*

SKILL ILLUSTRATION



*This criteria does not require the performance of the other three.

SKILL: Leap

EQUIPMENT/CONDITIONS: A minimum of 30 feet of clear space.

DIRECTIONS: Ask the student to leap. Tell the student to take large steps by leaping from one foot to the other.

PERFORMANCE CRITERIA:

1. Take off on one foot and land on the opposite foot.
2. A period where both feet are off the ground (longer than running).
3. Forward reach with arm opposite the lead foot.

SKILL ILLUSTRATION

SKILL: Horizontal Jump

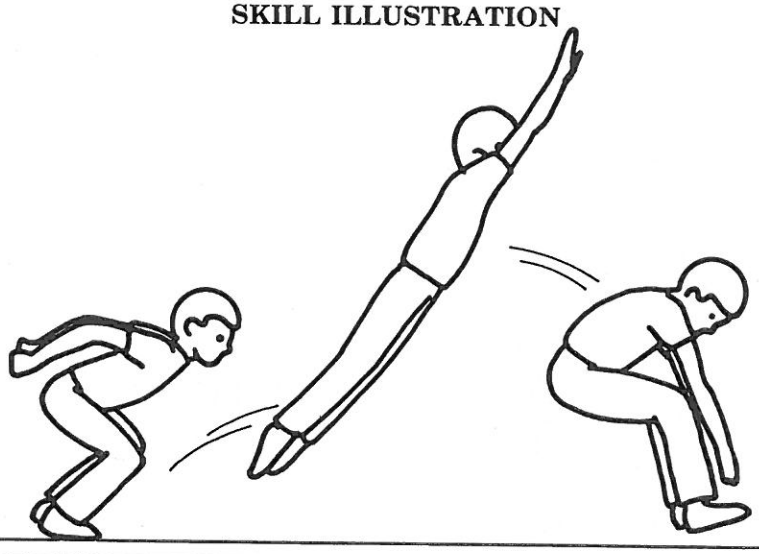
EQUIPMENT/CONDITIONS: A minimum of 10 feet of clear space and masking tape, or other marking device.

DIRECTIONS: Mark off a starting line on the floor, mat, or carpet. Have the student start behind the line. Tell the student to "jump far."

PERFORMANCE CRITERIA:

1. Preparatory movement includes flexion of both knees with arms extended behind the body.
2. Arms extend forcefully forward and upward, reaching full extension above head.
3. Take off and land on both feet simultaneously.
4. Arms are brought downward during landing.

SKILL ILLUSTRATION



SKILL: Skip

EQUIPMENT/CONDITIONS: A minimum of 30 feet of clear space and masking tape, or other marking device.

DIRECTIONS: Mark off two lines 30 feet apart. Tell the student to skip from one line to the other three times.

PERFORMANCE CRITERIA:

1. A rhythmical repetition of the step-hop on alternate feet.
2. Foot of nonsupport leg carried near surface during hop phase.
3. Arms alternately moving in opposition to legs at about waist level.

SKILL ILLUSTRATION

SKILL: Slide

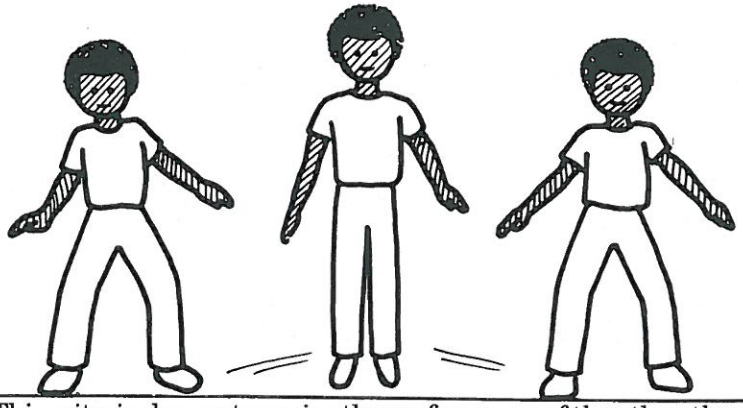
EQUIPMENT/CONDITIONS: A minimum of 30 feet of clear space and masking tape, or other marking device.

DIRECTIONS: Mark off two lines 30 feet apart. Tell the student to slide from one line to the other three times facing the same direction.

PERFORMANCE CRITERIA:

1. Body turned sideways to desired direction of travel.
2. A step sideways followed by a slide of the trailing foot to a point next to the lead foot.
3. A short period where both feet are off the floor.
4. Able to slide to the right and to the left side.*

SKILL ILLUSTRATION



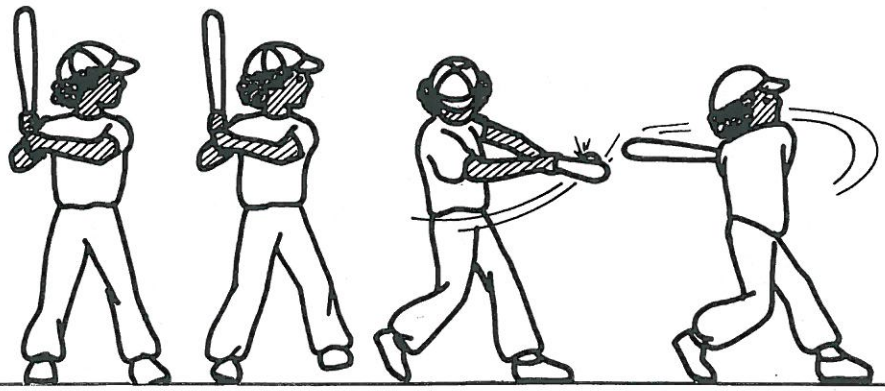
*This criteria does not require the performance of the other three.

Subtest 2. Object Control Skill Subtest

SKILL: Two-Hand Strike
EQUIPMENT/CONDITIONS: A 4-6 inch lightweight ball and a plastic bat.
DIRECTIONS: Toss the ball softly to the student at about waist level. Tell the student to hit the ball hard. Count only those tosses that are between the student's waist and shoulders.

PERFORMANCE CRITERIA:
1. Dominant hand grips bat above nondominant hand.
2. Nondominant side of body faces the tosser (feet parallel).
3. Hip and spine rotation.
4. Weight is transferred by stepping with front foot.

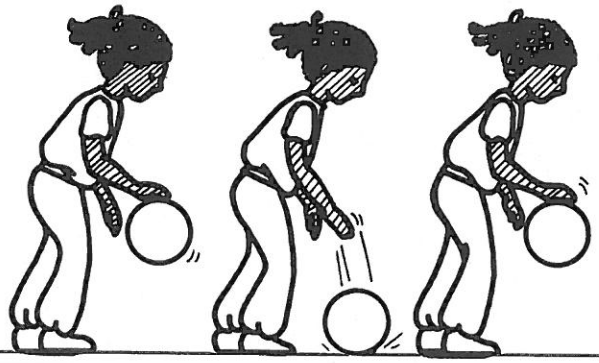
SKILL ILLUSTRATION



SKILL: Stationary Bounce
EQUIPMENT/CONDITIONS: An 8-10 inch playground ball and a flat hard surface.
DIRECTIONS: Tell the student to bounce the ball three times using one hand. Make sure the ball is not underinflated. Repeat three separate trials.

PERFORMANCE CRITERIA:
1. Contact ball with one hand at about hip height.
2. Pushes ball with fingers (not a slap).
3. Ball contacts floor in front of (or to the outside of) foot on the side of the hand being used.

SKILL ILLUSTRATION



SKILL: Catch

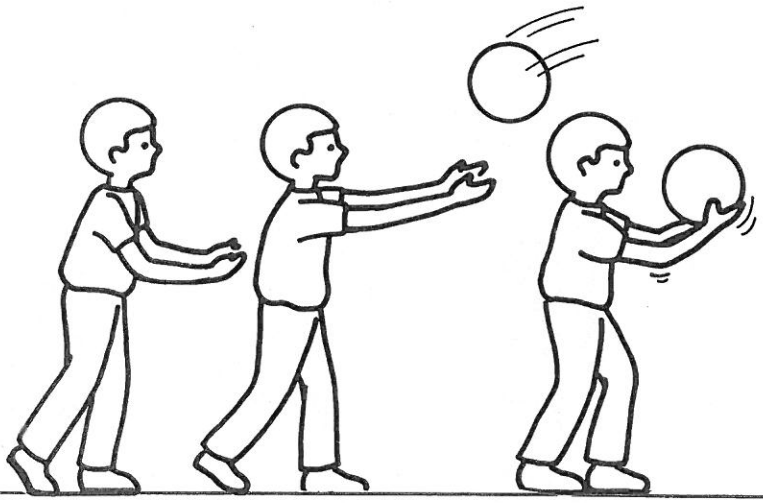
EQUIPMENT/CONDITIONS: A 6-8 inch sponge ball, 15 feet of clear space, masking tape or other marking device.

DIRECTIONS: Mark off two lines 15 feet apart. Student stands on one line and the tosser on the other. Toss the ball underhand directly to student with a slight arc, saying "catch it with your hands." Only count those tosses that are between student's shoulders and waist.

PERFORMANCE CRITERIA:

1. Preparation phase where elbows are flexed and hands are in front of body.
2. Arms extend in preparation for ball contact.
3. Ball is caught and controlled by hands only.
4. Elbows bend to absorb force.

SKILL ILLUSTRATION



SKILL: Kick

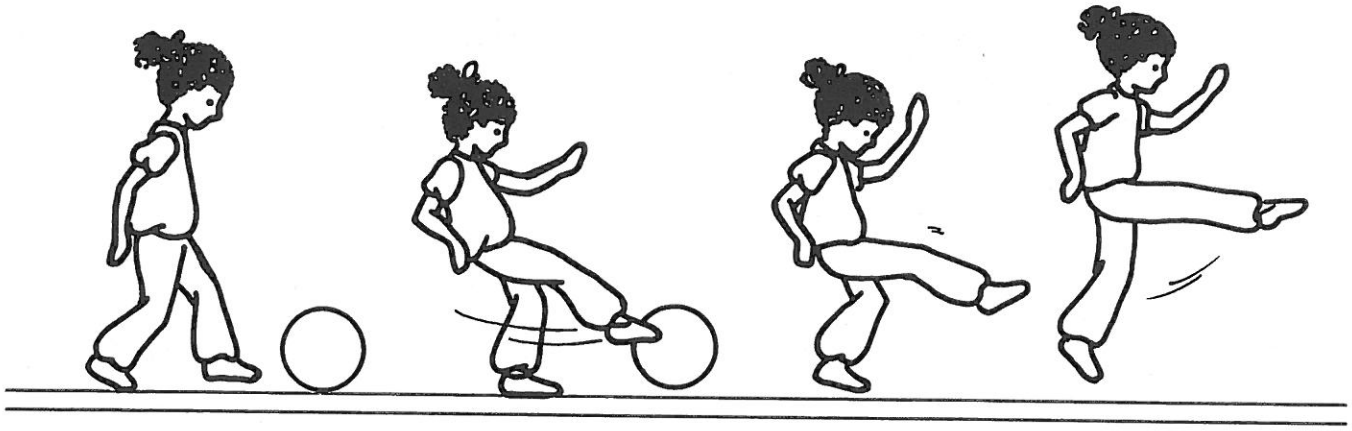
EQUIPMENT/CONDITIONS: An 8-10 inch plastic or slightly deflated playground ball, 30 feet of clear space, masking tape or other marking device.

DIRECTIONS: Mark off one line 30 feet away from a wall and one that is 20 feet from the wall. Place the ball on the line nearest the wall and tell the student to stand on the other line. Tell the student to kick the ball "hard" toward the wall.

PERFORMANCE CRITERIA:

1. Rapid continuous approach to the ball.
2. The trunk is inclined backward during ball contact.
3. Forward swing of the arm opposite kicking leg.
4. Follow-through by hopping on nonkicking foot.

SKILL ILLUSTRATION



SKILL: Overhand Throw

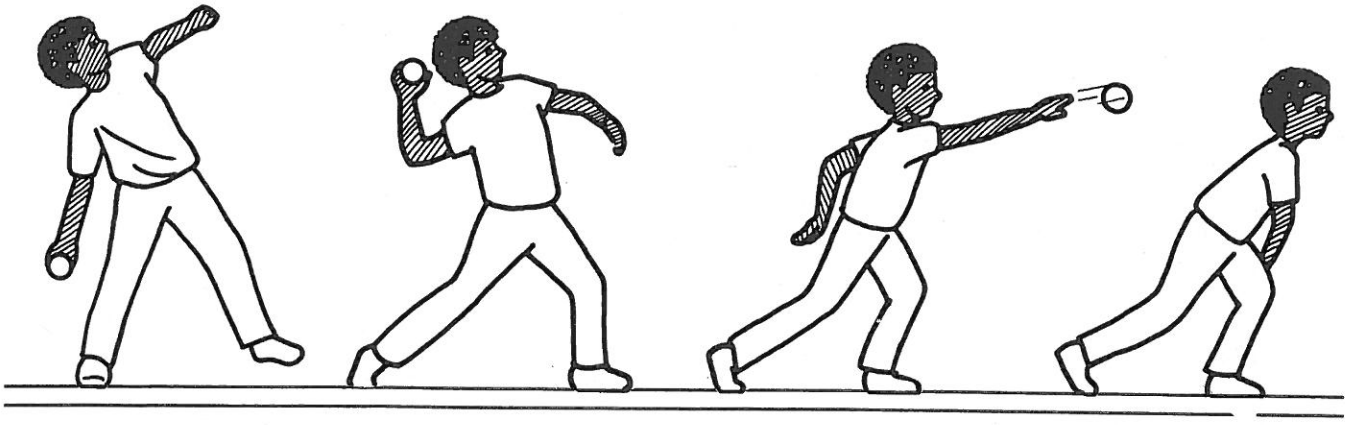
EQUIPMENT/CONDITIONS: A tennis ball, a wall, and 25 feet of clear space.

DIRECTIONS: Tell the student to throw the ball "hard" at the wall.

PERFORMANCE CRITERIA:

1. A downward arc of the throwing arm initiates the windup.
2. Rotation of hip and shoulder to a point where the nondominant side faces an imaginary target.
3. Weight is transferred by stepping with the foot opposite the throwing hand.
4. Follow-through beyond ball release diagonally across body toward side opposite throwing arm.

SKILL ILLUSTRATION



3

Interpreting Test Results

The purpose of this chapter is to explain how the results of the TGMD are to be interpreted. Specific topics to be discussed include: (a) completing the cover page of the Student Record Book, (b) interpreting test scores, (c) interpreting TGMD results for instructional programming, and (d) cautions to be considered when interpreting and sharing test results.

Completing the Cover Page of the Student Record Book

The purpose of the cover page of the Student Record Book is to provide a means of presenting pertinent information about the examiner and the child to parents and educational decision makers. The test examiner stores the Student Record Book including the information related to the test results and the recommendations in the child's permanent file. Figure 3 provides an example of a completed cover page.

Section I: Student and Examiner Data

Information pertaining to the student including name, school, sex, grade, date of testing, date of birth, and chronological age should be provided. Information related to the examiner including name, title, and purpose of testing should also be furnished. Space is provided in the cover page for two separate testing occasions.

Section II: Record of Scores

The child's raw scores, percentiles, and standard scores are listed in this section. Raw scores can be obtained from page 3 (Locomotor Skill subtest score) and page 4 (Object Control Skill subtest score) of the Student Record Book. Raw scores are recorded first. Percentiles and standard scores are recorded next using the information provided in Tables A and B in the Appendix. To arrive at the Gross Motor Development Quotient (GMDQ), the two subtest standard scores should be summed and transformed into the GMDQ by using information in Table C in the Appendix. In Table C, the examiner should locate the column "Sum of Standard Scores" and move down the column until the sum of the student's two subtest standard scores is found. The corresponding "Quotient" is the child's GMDQ and should be placed in the space provided in Section II.

Section III: Comments/Recommendations

The remaining space is provided for recording specific comments about the child derived during the testing session. Summarize the comments noted in the comments section of the Student Record Book. Comments that will facilitate instructional decisions should be summarized. Several examples are listed below:

1. Child acts impulsively.
2. Child perseverates on many skills.
3. Child performs object control skills with mixed dominance.
4. Child appears to have a short attention span.
5. Child falls frequently during movement tasks.

Recommendations based on test results and other informal observations should be recorded. This information should be maintained in the child's permanent file.

Name Josh S.

School/Agency North Elementary

Sex: Male X Female _____ Grade K

TGMD

TEST OF GROSS MOTOR DEVELOPMENT

Dale A. Ulrich

TESTING INFORMATION

1ST TESTING

	Year	Month	Day
Date Tested	1984	11	28
Date of Birth	1979	9	6
Chronological Age	5.	2	22

Joy Scholz
Examiner's Name

Adapted P.E. Consultant
Examiner's Title

Screening for special education
Purpose of Testing

2ND TESTING

	Year	Month	Day
Date Tested			
Date of Birth			
Chronological Age			

Examiner's Name

Examiner's Title

Purpose of Testing

RECORD OF SCORES

1ST TESTING

Subtests	Raw Scores	%iles	Std. Scores
Locomotor Skills	8	2	4
Object Control Skills	2	5	5

Sum of Standard Scores = 9

Gross Motor Development Quotient (GMDQ) = 67

2ND TESTING

Subtests	Raw Scores	%iles	Std. Scores
Locomotor Skills			
Object Control Skills			

Sum of Standard Scores = _____

Gross Motor Development Quotient (GMDQ) = _____

COMMENTS/RECOMMENDATIONS

Josh appeared to be easily distractable during testing and required many additional demonstrations of most skills to understand the task. He required physical assistance to perform several skills. He has not established a preferred side for throwing and kicking. Based on the results of this test and teacher observation, it is recommended that Josh be provided with a specially designed physical education program.

Figure 3. An example of a completed cover page of the Student Record Book.

Test Scores and Their Interpretation

The TGMD provides four different scores: raw scores, percentiles, subtest standard scores, and a composite quotient. This section will discuss each type of score and provide suggestions for interpretation.

Raw Scores

Raw scores indicate the number of motor behaviors, expressed as performance criteria, mastered across the locomotor and object control subtests. The number of motor behaviors and their level of difficulty differ; therefore, raw scores from different subtests are not comparable. The maximum raw score for the locomotor subtest is 26 while the maximum raw score for the object control subtest is 19. Raw scores can be useful for research purposes and as one indication of how much progress has been made by a student over time. The subtest raw scores are used to locate the corresponding standard score in Tables A and B in the Appendix.

Subtest Percentiles

The percentile rank is based on the position a child occupies in a group. Percentiles will range from zero to 100 and indicate the percent of the distribution of scores that is equal to or below the child's obtained value. A percentile of 60 indicates that 60% of the standardized sample of that age scored at or below the raw score that converts to the 60th percentile. Consult Tables A and B in the Appendix to convert raw scores to percentile ranks.

Subtest Standard Scores

Parents may find that percentiles are easier to understand, but professionals will find the standard scores more beneficial when reporting test results. Because standard scores provide equivalent indices, they are most useful for making comparisons between the two subtests and with the results of other tests. The TGMD subtest standard scores are derived from the raw scores where the mean score is set at 10 and the standard deviation at 3. The following guide is provided for interpreting subtest standard scores:

Standard Score	Description	% Included
17-20	Very Superior	2.34
15-16	Superior	6.87
13-14	Above Average	16.12
8-12	Average	49.51
6- 7	Below Average	16.12
4- 5	Poor	6.87
1- 3	Very Poor	2.34

Standard scores are an excellent means of determining a child's strengths and weaknesses across the two subtests and provide professionals with a way of reporting a student's present level of functioning in locomotion and object control. Tables A and B in the Appendix are used to convert raw scores into standard scores.

Gross Motor Development Quotients

The Gross Motor Development Quotient (GMDQ) is another type of standard score. This composite score represents a broad indication of gross motor skill competence. Because the composite consists of all 12 skills, it is generally a more reliable measure than the shorter subtests. This standard score has a mean of 100 and a standard deviation of 15. The scores are derived by adding the two subtest standard scores and converting the sum to a quotient using Table C in the Appendix. The following guide is provided for interpreting the GMDQ:

Quotient	Descriptions	% Included
131-165	Very Superior	2.34
121-130	Superior	6.87
111-120	Above Average	16.12
90-110	Average	49.51
80- 89	Below Average	16.12
70- 79	Poor	6.87
35- 69	Very Poor	2.34

Many school districts or agencies have established standard performance criteria for eligibility to receive specialized services. Available literature indicates that most schools or agencies have established a -1 or -1.5 standard deviation from the mean as their eligibility criterion. In the case where the eligibility criterion was set at -1 standard deviation from the mean, a student would need to obtain a locomotor or object control skill subtest standard score of 6 or below. If the eligibility criterion was set at -1.5 standard deviations from the mean, it would require a subtest standard score of 5 or below. When the eligibility

decision is based on the gross motor development quotient, a child would need to obtain a GMDQ of 84 or below to meet the −1 standard deviation criterion. A GMDQ of 77 or below is needed to meet the −1.5 standard deviation level.

Case Study

This section presents a case study that illustrates how the Test of Gross Motor Development results are interpreted.

Fay: Fay was 6 years old when she was initially tested using the TGMD. She was referred to the adapted physical education consultant by the special education classroom teacher to help determine whether her level of gross motor development was deficient enough to require specialized services in adapted physical education. Previous screening of other developmental areas indicated that her language was also deficient. The results of Fay's performance on the TGMD are provided in Figure 4.

Fay's standard score for the locomotor skill subtest was 4 while her standard score for the object control skill subtest was 2. Fay's GMDQ was 58. The results indicate that Fay is performing very poorly for her chronological age and meets the −1.5 standard deviation eligibility criterion established for receiving specialized services. Fay's evaluation team recommends that she receive adapted physical education and that an individualized education program be developed with specific gross motor goals and objectives. This service will be provided in a small group setting by the adapted physical education consultant.

Interpreting TGMD Results for Instructional Programming

One of the primary concerns of professionals responsible for delivering physical education services is the transformation of standardized test results into instructional programming. The test information provided on the student's Record Book facilitates this task. The teacher's responsibility is to plan instructional activities to help the student learn the motor behaviors (performance criteria) that have not been mastered. By reviewing the completed Student Record Book, the teacher can select the unlearned behaviors that are the highest priority and develop instructional objectives that will guide the gross motor development program.

Table 1 provides information to help the teacher decide which gross motor skills are frequently mastered by a certain age. This table could be used to help select the skills for a student's instructional program, assuming the student has not already acquired the performance criteria for the skills. Tables 2 and 3 provide information on the age at which 60% and 80% of the standardization sample achieved each specific performance criterion across the 12 gross motor skills. This should be helpful in deciding which performance criteria to include in the gross motor program and for establishing realistic expectations.

The results of the gross motor development assessment provide the teacher with specific information directly related to instruction. It allows the teacher to pinpoint specific skill strengths and weaknesses that guide the instructional process.

Table 1
Age at Which 60% of the Standardization Sample Achieved All of the Performance Criteria for Each of the Gross Motor Skills

Gross Motor Skill	Age
Run	6
Gallop	8
Hop	8
Leap	9
Jump	10
Skip	7
Slide	9
Two-Hand Strike	10
Stationary Bounce	8
Catch	8
Kick	10
Overhand Throw	10

Name Fay W.

School/Agency Diant City Elementary

Sex: Male _____ Female X Grade 1

TGMD

TEST C
GROS
MOTO
DEVELOPMEN

Dale A. Ulrich

TESTING INFORMATION

1ST TESTING

	Year	Month	Day
Date Tested	85	1	7
Date of Birth	78	9	6
Chronological Age	6	4	1

D. Chapman
Examiner's Name

Supervisor - Adapted Phy. Ed.
Examiner's Title

Determine need for special services
Purpose of Testing

2ND TESTING

	Year	Month	Day
Date Tested			
Date of Birth			
Chronological Age			

Examiner's Name

Examiner's Title

Purpose of Testing

RECORD OF SCORES

1ST TESTING

Subtests	Raw Scores	%iles	Std. Scores
Locomotor Skills	8	2	4
Object Control Skills	2	<1	2

Sum of Standard Scores = 6

Gross Motor Development Quotient (GMDQ) = 58

2ND TESTING

Subtests	Raw Scores	%iles	Std. Score
Locomotor Skills			
Object Control Skills			

Sum of Standard Scores = _____

Gross Motor Development Quotient (GMDQ) = _____

COMMENTS/RECOMMENDATIONS

Fay appears to have a very short attention span requiring that activities be changed frequently. Test results support teacher observation indicating that she is experiencing gross motor problems. It is recommended that Fay be placed in adapted physical education provided by the specialist and that her IEP include specific gross motor goals & objs.

Figure 4. Fay's TGMD results.

Table 2

Age at Which 60% and 80% of the Standardization Sample Achieved the Specific Performance Criteria for the Locomotor Skills

Skill	Performance Criteria	60%	80%
Run	1. Brief period where both feet are off the ground	3	3
	2. Arms move in opposition to legs, elbows bent	4	5
	3. Foot placement near or on a line (not flat footed)	3	4
	4. Nonsupport leg bent approximately 90 degrees (close to buttocks)	5	7
Gallop	1. A step forward with the lead foot followed by a step with the trailing foot to a position adjacent to or behind the lead foot	4	5
	2. Brief period where both feet are off the ground	3	3
	3. Arms bent and lifted to waist level	8	10
	4. Able to lead with the right and left foot	4	5
Hop	1. Foot of nonsupport leg is bent and carried in back of the body	5	6
	2. Nonsupport leg swings in pendular fashion to produce force	7	8
	3. Arms bent at elbows and swing forward on take off	7	10
	4. Able to hop on the right and left foot	4	5
Leap	1. Take off on one foot and land on the opposite foot	6	8
	2. A period where both feet are off the ground (longer than running)	7	8
	3. Forward reach with arm opposite the lead foot	8	10
Jump	1. Preparatory movement includes flexion of both knees with arms extended behind the body	5	7
	2. Arms extend forcefully forward and upward, reaching full extension above head	9	10
	3. Take off and land on both feet simultaneously	3	3
	4. Arms are brought downward during landing	6	8
Skip	1. A rhythmical repetition of the step-hop on alternate feet	5	6
	2. Foot of nonsupport leg is carried near surface during hop phase	6	7
	3. Arms alternately moving in opposition to legs at about waist level	7	8
Slide	1. Body turned sideways to desired direction of travel	5	7
	2. A step sideways followed by a slide of the trailing foot to a point next to the lead foot	4	5
	3. A short period where both feet are off the floor	3	5
	4. Able to slide to the right and to the left side	4	7

Table 3
Age at Which 60% and 80% of the Standardization Sample Achieved the Specific Performance Criteria for the Object Control Skills

Skill	Performance Criteria	60%	80%
Two-Hand Strike	1. Dominant hand grips bat above nondominant hand	3	5
	2. Nondominant side of body faces the tosser	5	7
	3. Hip and spine rotation	8	9
	4. Weight is transferred by stepping with front foot	8	10
Stationary Bounce	1. Contacts ball with one hand at about hip height	7	8
	2. Pushes ball with fingers (not a slap)	6	8
	3. Ball contacts floor in front of (or to the outside of) foot on the side of the hand being used	7	8
Catch	1. Preparation phase where elbows are flexed and hands are in front of body	4	5
	2. Arms extend in preparation for ball contact	4	6
	3. Ball is caught and controlled by hands only	7	8
	4. Elbows bend to absorb force	7	8
Kick	1. Rapid continuous approach to the ball	4	4
	2. The trunk is inclined backward during ball contact	8	9
	3. Forward swing of the arm opposite kicking leg	8	9
	4. Follow-through by hopping on the nonkicking foot	10	NA[1]
Overhand Throw	1. A downward arc of the throwing arm initiates the windup	6	7
	2. Rotation of hip and shoulder to a point where the nondominant side faces an imaginary target	7	8
	3. Weight is transferred by stepping with the foot opposite the throwing hand	6	8
	4. Follow-through beyond ball release diagonally across body toward side opposite throwing arm	8	10

[1]This performance criterion was not achieved by 80% of the standardization sample at any age between 3–10 years.

Case Study

This section will present details of a case study that illustrates how the results of the TGMD can be used to plan gross motor instruction.

John: John was 7 years old and enrolled in the second grade at a neighborhood elementary school. His teacher administered the TGMD at the beginning of the school year as a regular part of the adapted physical education program. The information provided helped John's teacher design his physical education program. Figure 5 presents the results of John's performance on the initial assessment.

According to the results of John's initial evaluation, he is deficient in many skills. John's adapted physical education teacher has decided to work on locomotor and object control skills because John is deficient in both areas. Based on the information in Tables 2 and 3, his teacher has developed the following program objectives for John's IEP:

1. John will be able to demonstrate a run, moving his arms in opposition to his legs with his elbows bent, four out of five trials, three consecutive classes.
2. John will be able to demonstrate a gallop, stepping with the lead foot followed by a step with the trailing foot, four out of five trials, three consecutive classes.

3. John will be able to demonstrate a hop of any kind on the right foot and then the left, four out of five trials, three consecutive classes.
4. John will be able to demonstrate a slide with a short period where both feet are off the ground, four out of five trials, three consecutive classes.
5. John will be able to demonstrate a catch where his arms extend in preparation for ball contact, four out of five trials, three consecutive classes.
6. John will be able to demonstrate an overhand throw where he transfers his weight by stepping with the foot opposite the throwing hand, four out of five trials, three consecutive classes.

Cautions to be Considered When Interpreting and Sharing Test Results

When interpreting test scores it is important to remember that all scores contain some error. Test administrators should keep in mind that a student's true score is unknown. The standard error of measurement (discussed in Chapter 4) reflects the average amount of measurement error in test scores and provides information on the amount one may expect a test score to vary due to measurement error.

The standard error of measurement obtained for the locomotor and object control subtest standard scores and the gross motor development quotient are .60, .52, and 3.0 respectively. The standard error of measurement can be employed like a standard deviation to form a band around a child's obtained score. For example, if a ±1 SEm band is used, this band is expected to span the child's true score 68% of the time. If Josh had an obtained locomotor subtest standard score of 4, his ±1 SEm band would be 3.4–4.6. The test administrator could be confident that this band would include Josh's true standard score two out of three times.

Reliability will be discussed in detail in Chapter 4. The standard error of measurement is influenced by the reliability of test scores. Examiners should note that the testing environment is a source of error that can impact on the reliability of a set of test scores. Such factors as interruptions, noise level, distractions, and temperature should be controlled by the examiner.

Test results should be shared only with individuals who are legally qualified to review the information. It is important to consider the following two issues when sharing test results:

1. The examiner should have a thorough understanding of the test including its purposes, content, and development.
2. The test scores should be reported along with the examiner's interpretation and recommendations. Discuss the results thoroughly before deciding on the final recommendations.

LOCOMOTOR SKILLS					
Skill	**Equipment**	**Directions**	**Performance Criteria**	**1st**	**2nd**
RUN	50 feet of clear space and masking tape, chalk, or other marking device	Mark off two lines 50 feet apart Instruct student to "run fast" from one line to the other	1. Brief period where both feet are off the ground 2. Arms in opposition to legs, elbows bent 3. Foot placement near or on a line (not flat footed) 4. Nonsupport leg bent approximately 90 degrees (close to buttocks)	1 0 1 0	
GALLOP	A minimum of 30 feet of clear space	Mark off two lines 30 feet apart Tell student to gallop from one line to the other three times Tell student to gallop leading with one foot and then the other	1. A step forward with the lead foot followed by a step with the trailing foot to a position adjacent to or behind the lead foot 2. Brief period where both feet are off the ground 3. Arms bent and lifted to waist level 4. Able to lead with the right and left foot	0 1 0 0	
HOP	A minimum of 15 feet of clear space	Ask student to hop three times, first on one foot and then on the other	1. Foot of nonsupport leg is bent and carried in back of the body 2. Nonsupport leg swings in pendular fashion to produce force 3. Arms bent at elbows and swing forward on take off 4. Able to hop on the right and left foot	0 0 0 0	
LEAP	A minimum of 30 feet of clear space	Ask student to leap. Tell him/her to take large steps leaping from one foot to the other.	1. Take off on one foot and land on the opposite foot 2. A period where both feet are off the ground (longer than running) 3. Forward reach with arm opposite the lead foot	0 0 0	
HORIZONTAL JUMP	10 feet of clear space and tape or other marking device	Mark off a starting line on the floor, mat, or carpet Have the student start behind the line Tell the student to "jump far"	1. Preparatory movement includes flexion of both knees with arms extended behind the body 2. Arms extend forcefully forward and upward, reaching full extension above head 3. Take off and land on both feet simultaneously 4. Arms are brought downward during landing	1 0 1 0	
SKIP	A minimuim of 30 feet of clear space, marking device	Mark off two lines 30 feet apart Tell the student to skip from one line to the other three times	1. A rhythmical repetition of the step-hop on alternate feet 2. Foot of nonsupport leg is carried near surface during hop 3. Arms alternately moving in opposition to legs at about waist level	0 0 0	
SLIDE	A minimum of 30 feet of clear space and masking tape or other marking device	Mark off two lines 30 feet apart Tell the student to slide from one line to the other three times facing the same direction	1. Body turned sideways to desired direction of travel 2. A step sideways followed by a slide of the trailing foot to a point next to the lead foot 3. A short period where both feet are off the floor 4. Able to slide to the right and to the left side	0 1 0 1	
			LOCOMOTOR SKILLS SUBTEST SCORE	7	

Figure 5. John's performance results.

OBJECT CONTROL SKILLS					
Skill	**Equipment**	**Directions**	**Performance Criteria**	**1st**	**2nd**
TWO-HAND STRIKE	4–6 inch light-weight ball, plastic bat	Toss the ball softly to the student at about waist level Tell the student to hit the ball "hard" Only count those tosses that are between the student's waist and shoulders.	1. Dominant hand grips bat above nondominant hand 2. Nondominant side of body faces the tosser (feet parallel) 3. Hip and spine rotation 4. Weight is transferred by stepping with front foot	1 0 0 0	
STATIONARY BOUNCE	8–10 inch playground ball, hard, flat surface (floor, pavement)	Tell the student to bounce the ball three times using one hand Make sure the ball is not underinflated Repeat three separate trials	1. Contacts ball with one hand at about hip height 2. Pushes ball with fingers (not a slap) 3. Ball contacts floor in front of (or to the outside of) foot on the side of the hand being used	0 0 0	
CATCH	6–8 inch sponge ball, 15 feet of clear space, tape or other marking device	Mark off 2 lines 15 feet apart. Student stands on one line and the tosser on the other. Toss the ball underhand directly to student with a slight arc and tell him/her to "catch it with your hands" Only count those tosses that are between student's shoulders and waist.	1. Preparation phase where elbows are flexed and hands are in front of body 2. Arms extend in preparation for ball contact 3. Ball is caught and controlled by hands only 4. Elbows bend to absorb force	1 0 0 0	
KICK	8–10 inch plastic or slightly deflated playground ball, 30 feet of clear space, tape or other marking device	Mark off one line 30 feet away from a wall and one that is 20 feet from the wall Place the ball on the line nearest the wall and tell the student to stand on the other line. Tell the student to kick the ball "hard" toward the wall	1. Rapid continuous approach to the ball 2. The trunk is inclined backward during ball contact 3. Forward swing of the arm opposite kicking leg 4. Follow-through by hopping on the nonkicking foot	1 0 0 0	
OVERHAND THROW	3 tennis balls, a wall, 25 feet of clear space	Tell student to throw the ball "hard" at the wall	1. A downward arc of the throwing arm initiates the windup 2. Rotation of hip and shoulder to a point where the nondominant side faces an imaginary target 3. Weight is transferred by stepping with the foot opposite the throwing hand 4. Follow-through beyond ball release diagonally across body toward side opposite throwing arm	0 0 0 0	
			OBJECT CONTROL SKILLS SUBTEST SCORE	3	

Figure 5. John's performance results.

4
Test Development

Each aspect in the test development process is discussed in this chapter. In particular, details concerning item development, item analysis, standardization procedures, parallel and test reliability and validity are presented. The TGMD can be interpreted in either norm- or criterion-referenced fashion; therefore, procedures suggested for developing both types of tests were followed.

Test Item Development

The following characteristics of a well-designed, criterion-referenced test item were used as a guide in developing the test items (Popham, 1978):

1. An established descriptive scheme in the form of a performance objective;
2. Sufficiently limited focus on those behaviors judged most relevant; and
3. Use of observable behaviors as performance criteria.

The primary step in selecting items was to develop performance objectives that could be used as the descriptive scheme for each test item. Functional performance objectives must include (a) the givens or conditions under which the student will be evaluated, (b) the observable behaviors that the test administrator looks for during the student's performance, and (c) the standard for achievement of the objective.

The major task in the development of each objective was to select observable behaviors that represented the mature pattern for each motor skill. Three steps were followed in this process.

1. The motor development literature was reviewed and the most common behavioral components used to describe a mature pattern for each of the twelve gross motor skills were selected.
2. Three content experts rated each behavioral component on the following criteria: (a) the component could be reliably observed by a teacher in an educational setting and (b) the component was consistent with the literature that describes a mature performance.
3. Those components that received negative ratings by two or more content experts on any of the criteria were deleted.

Item Analysis

Using the procedures just described, a preliminary pool of 50 items was generated. These items were analyzed by testing 279 children ranging in age from 3-12 years. The resulting data were used in making decisions as to which items to include in the final test edition. A final item analysis was conducted on the total standardization sample of 909 children.

The primary concern during the item analysis program was to ensure adequate discrimination power. The index of discrimination provides information on the proportion of high and low scorers on a test who perform an item correctly (Safrit, 1981). The discrimination power was determined by using the biserial correlation technique, where each gross motor skill score is correlated with the total subtest score. Measurement experts suggest that at minimum the skill-subtest coefficients should be statistically significant. Safrit (1981) suggests using a .3 as the lowest acceptable value, while Anastasi (1982) notes that in certain cases a .2 may be acceptable assuming significance is achieved.

Table 4 presents the discrimination powers for the locomotor skill scores by age level; Table 5 presents discrimination powers for the object control skills.

Table 4
Discriminating Power of the Locomotor Skills by Age Level

Age Level	Run	Gallop	Hop	Leap	Jump	Skip	Slide
3 year olds	.71	.74	.64	.12*	.34	.38	.76
4 year olds	.64	.66	.67	.55	.66	.63	.69
5 year olds	.38	.50	.74	.49	.63	.75	.51
6 year olds	.53	.61	.69	.55	.63	.62	.59
7 year olds	.49	.67	.72	.65	.50	.55	.55
8 year olds	.55	.69	.59	.40	.29	.66	.66
9 year olds	.46	.68	.63	.42	.55	.56	.41
10 year olds	.49	.66	.57	.62	.54	.59	.62

*Not significant beyond the .05 level.

Table 5
Discriminating Power of the Object Control Skills by Age Level

Age Level	Strike	Bounce	Catch	Kick	Throw
3 year olds	.60	.62	.73	.51	.70
4 year olds	.53	.62	.62	.32	.74
5 year olds	.76	.77	.79	.84	.80
6 year olds	.66	.64	.63	.65	.72
7 year olds	.60	.63	.64	.70	.72
8 year olds	.69	.59	.39	.69	.67
9 year olds	.65	.51	.57	.41	.63
10 year olds	.64	.64	.59	.69	.59

Normative Procedures

The norms for a test provide the reference information for which comparisons can be made among students. Since a student's performance is evaluated in terms of other students' performances, it is critical that norms adequately represent the population to whom an individual's results are to be compared.

The norms for the TGMD are based on test performance of 909 subjects residing in eight states (California, Georgia, Illinois, Kentucky, Maryland, Missouri, Pennsylvania, and Wyoming). The norms were collected by a wide range of professionals, including regular physical education teachers, adapted physical education specialists, classroom teachers, graduate preservice teachers, and university faculty members.

General Characteristics of the Norming Sample

Stratified quota sampling was used during the collection of nationally representative norms to ensure that sample selections were representative of the U.S. population based on the 1980 census. The following stratification variables were used in the sampling design:

1. Age–three through ten years
2. Gender–male, female
3. Race–white, black, other
4. Community size–cities, rural areas
5. Geographic region–northeast, north central, south, west.

Every child in the norming sample was tested between April 1983 and September 1984. Table 6 presents the distribution of the sample by gender, race, community size, and geographic region. Sample demographics were compared to the United States population reported in the *Statistical Abstract of the United States* (1980).

Table 6
Normative Sample by Gender, Race, Community Size, and Geographic Region

Variable	Percent Sample	Percent U.S. Population
Gender:		
Male	49.6	49
Female	50.4	51
Race:		
White	84.1	86
Black	14.4	12
Other	1.5	2
Community Size:		
Cities	81.7	73.7
Rural	18.3	26.3
Geographic Region:		
Northeast	18.9	22
North Central	31.6	27
South	18.6	32
West	30.9	19

Sampling Procedures

The primary goal of the sampling plan was to approximate the distribution of the population in the United States for the characteristics of gender, race, community size, and geographic region. A minimum sample size by age established prior to data collection was 100. A three-stage procedure was adopted to select the subjects included in the standardization program.

Stage 1: Sampling of communities. Within each geographic region, communities were selected with respect to size (central city, suburban or small town, rural) and socio-economic status. Care was taken to select communities that had a good mixture of general characteristics representative of the U.S. population. For each of the community sizes, quotas of subjects were based on the 1980 census.

Stage 2: Sampling of schools. School district personnel within selected communities were surveyed to determine whether participation would be permitted. From the list of schools granting permission, those most representative of a cross-section of the community were chosen. Some parochial schools were included in the normative sample. All school personnel were assured that schools were not to be compared in present or future data analysis.

Stage 3: Sampling of subjects. Based on class lists, the selection of subjects within each age level was entirely random. In certain cases, substitutions were made to obtain the required balance of gender and race. No subjects with severe handicaps were included in the sample. Preschools with a good cross-section of population characteristics were selected in the same manner.

Normative Information

Information concerning the types of norms that accompany the TGMD are discussed in this section. Included are discussions of the TGMD standard score norms that are provided for the two subtests (locomotor and object control skills) and total gross motor composite score, percentile rank norms, and the relationship of the TGMD standard scores to other deviation standard scores.

Subtest Standard Score Norms

The standard scores for the subtests are derived from the cumulative frequency distribution of the raw scores made by the subjects in the standardization sample. The raw score means and standard deviations for the subtests were calculated at each 12 month age interval between 3-0 and 10-11 and presented in Table 7. Tables A and B in the Appendix allow for convenient conversion of the subtest raw scores into standard scores.

Table 7
Means[1] and Standard Deviations for the Locomotor and Object Control Skill Subtests and the Total Gross Motor Composite for the Normative Sample by Age Level

Age Level	Locomotor Skill Subtest		Object Control Skill Subtest		Total Gross Motor Composite	
	M	SD	M	SD	M	SD
3 (N=105)	8.0	2.8	2.7	2.0	10.7	4.2
4 (N=103)	11.6	3.5	4.7	2.0	16.3	4.8
5 (N=110)	16.3	4.0	7.7	4.2	24.0	7.2
6 (N=153)	18.3	4.1	9.9	3.6	28.2	6.4
7 (N=133)	20.4	3.6	13.3	3.7	33.8	6.2
8 (N=101)	23.2	2.4	15.4	2.6	38.7	4.2
9 (N=102)	23.2	2.4	16.0	2.7	39.2	4.1
10 (N=102)	24.1	2.2	17.5	1.7	41.7	3.3

[1]Unit of measurement is expressed in terms of the number of performance criteria (behaviors) achieved at each age level.

The means of boys and girls were also tested for differences. Finding no significant differences at the .01 level, separate norms for males and females were unnecessary.

The standard scores for the total gross motor composite are also deviation scores. Unlike the standard scores for the subtests, these scores are not derived directly from the raw scores or from the cumulative frequency distribution. Instead, they are formed by pooling the standard scores of the subtests.

The values that result from summing the standard scores of the subtests are converted into quotients having a mean of 100 and a standard deviation of 15. The quotients that correspond to the sum of the standard scores for the subtests are found in Table C in the Appendix. Procedures used to develop the quotients are basically the same as those used by Wechsler (1974) to develop the quotients for his WISC-R composites (i.e., his Verbal, Performance, and Full-Scale Intelligence quotients).

Percentile Ranks

Raw scores can also be converted into percentiles using Tables A and B in the Appendix. Percentiles are generally the most often used derived score because of their ease of interpretation. It is much easier to explain a student's relative performance to a parent using percentiles. Understanding that Jamie performed at the 25th percentile rank, and that 75% of his age peers who took the test made higher scores, should be easy to understand for most parents.

Relationship of TGMD Scores to Other Deviation Standard Scores

Some test administrators may want to compare a student's TGMD standard scores to those of another test using a different type of standard score. Examples of other standard scores that are reported for various test results include: T-scores (M=50, SD=10), stanines (M=5, SD=1.96), and z-scores (M=0, SD=1). To help the interested test administrator convert scores from one type to another, Table 8 was prepared, showing the relationship among frequently employed standard scores.

Table 8
Relation of Various Standard Scores to Percentile Rank and to Each Other

Percentile Rank	Standard Scores					
	TGMD Gross Motor Quotients	TGMD Subtest Scores	NCE scores	T-scores	z-scores	stanines
99	150	20	99	83	+3.33	9
99	145	19	99	80	+3.00	9
99	140	18	99	77	+2.67	9
99	135	17	99	73	+2.33	9
98	130	16	92	70	+2.00	9
95	125	15	85	67	+1.67	8
91	120	14	78	63	+1.33	8
84	115	13	71	60	+1.00	7
75	110	12	64	57	+0.67	6
63	105	11	67	53	+0.33	6
50	100	10	50	50	0.00	5
37	95	9	43	47	−0.33	4
25	90	8	36	43	−0.67	4
16	85	7	29	40	−1.00	3
9	80	6	22	37	−1.33	2
5	75	5	15	33	−1.67	2
2	70	4	8	30	−2.00	1
1	65	3	1	27	−2.33	1
1	60	2	1	23	−2.67	1
1	55	1	1	20	−3.00	1

Test Reliability

Reliability is a major consideration in evaluating the psychometric properties of a test. The degree of confidence that an examiner has in the results of a test is a function of reliability. Recalling that the TGMD was designed to provide both norm- and criterion-referenced interpretations, this section of the manual will present information required to support reliability of both test orientations. The first part of this section will address reliability from a norm-referenced perspective, including stability, inter-scorer, internal consistency, and the standard error of measurement. The second part of this section addresses an issue important to criterion-referenced interpretation: reliability of mastery decisions.

Stability

Stability reliability is the extent to which a child's test score remains consistent across testing occasions. The general strategy for estimating stability is by the test-retest method, requiring short intervals of time between occasions. A comprehensive investigation was completed using generalizability theory to evaluate this aspect of reliability (Ulrich & Wise, 1984). This approach has become the standard procedure to follow in physical education research (Keogh, Griffin, & Spector, 1981; Mosher & Schutz, 1983; Stamm & Moore, 1980; Taylor, 1979). The primary advantage of using generalizability theory over the more classical test theory is its flexibility in providing information on the relative magnitude of variance components in terms of percentage of the total variance. Correlational procedures sum across all sources of error while generalizability procedures allow the investigator to select specific sources (i.e., occasions for stability reliability) and estimate their contribution to the total variance.

Ten subjects from a University Motor Skill Clinic were selected to be videotaped. The subjects were from 3 to 10 years of age and represented a wide range of gross motor development. There were an equal number of males and females and two of the subjects were moderately handicapped. Twenty raters, none of whom had any previous experience or training in the use of the test, were randomly selected from two sections of an undergraduate adapted physical education course.

Variance components were estimated using a two-facet generalizability study with 20 raters observing 10 students on two occasions. The estimated variance components for the occasions facet for the locomotor and object control subtests were .53 and .49 respectively. The relative magnitudes of these variance components expressed in percent of total variance were 1% and 2%. Based on these results it appears that testing children across two occasions contributes very little to measurement error.

The generalizability theory analogue of the reliability coefficient is the generalizability coefficient. A generalizability coefficient was calculated on the ratings of the 20 scorers across the two occasions for each of the 12 gross motor skills (Ulrich & Wise, 1984). Table 9 presents the test-retest generalizability coefficients obtained from this analysis.

Table 9
Estimated Test-Retest Generalizability Coefficients for the Gross Motor Skills

Locomotor Subtest Skills	Generalizability Coefficients	Object Control Subtest Skills	Generalizability Coefficients
Run	.84	Two-Hand Strike	.97
Gallop	.97	Stationary Bounce	.99
Hop	.98	Catch	.95
Leap	.97	Kick	.97
H. Jump	.97	Overhand Throw	.98
Skip	.97		
Slide	.99		
Mean	.96	Mean	.97

Inter-Scorer

The same study used to estimate test stability was used to investigate inter-scorer reliability, the facet of interest being scorers. The estimated variance components for scorers in the locomotor and object control subtests was .53 and .81 respectively. The relative magnitude of these estimated variance components expressed in percent of total variance was 1% and 4% respectively. It appears from this investigation that the inter-scorer source of error contributes very little to the total variance associated with the test scores. Table 10 presents the inter-scorer generalizability coefficients for the locomotor and object control subtest skills. The coefficients were calculated on the independent ratings of 20, 10, and 2 raters. Based on this investigation it appears that the TGMD provides consistent information across multiple scorers.

Internal Consistency

Internal consistency reflects the homogeneity of items within a test and provides information on the extent to which each item measures the same function or trait. Internal consistency can vary across different age levels and therefore should be reported for each level reflected in the norms.

Subjects were 25 children drawn from the standardization sample of each of the eight age levels. The split-half reliability coefficients for the subtests are presented in Table 11. These coefficients were adjusted using the Spearman-Brown formula. All of the coefficients are statistically significant ($p < .05$).

Standard Error of Measurement

The standard error of measurement (SEm) is an absolute measure of precision (Safrit, 1981). The SEm allows the examiner to estimate the amount of error associated with a student's true score. When we test a child, we usually test only once; therefore, we do not know the child's true score but use the observed score as an estimate. The SEm establishes a range within which the true score probably lies. The SEm is usually calculated with the formula: $SEm = SD\sqrt{1-r}$.

The SEm was calculated for the subtest raw scores for each of the eight age levels using subjects from the normative sample. The mean test-retest generalizability coefficients reported for the locomotor and object control subtests in Table 9, along with the standard deviations presented in Table 7 were used to estimate the SEm. The standard errors of measurement associated with the TGMD subtest raw scores at each age level are presented in Table 12.

Table 10
Estimated Inter-Scorer Generalizability Coefficients for the Gross Motor Skills

Locomotor Subtest Skills	Generalizability Coefficients			Object Control Subtest Skills	Generalizability Coefficients		
Run	.84[1]	.79[2]	.77[3]	Two-Hand Strike	.97	.96	.86
Gallop	.97	.96	.85	Stationary Bounce	.99	.98	.94
Hop	.98	.97	.90	Catch	.96	.93	.87
Leap	.97	.96	.86	Kick	.97	.96	.80
H. Jump	.97	.96	.84	Overhand Throw	.98	.97	.89
Skip	.98	.96	.87				
Slide	.99	.98	.93				
Mean	.95	.94	.86	Mean	.97	.96	.87

[1]Coefficient is based on 20 raters.
[2]Coefficient is based on 10 raters.
[3]Coefficient is based on 2 raters.

Table 11
Internal Consistency Reliability[1] of Locomotor and Object Control Subtests at Eight Age Levels (Decimals Omitted)

Age Level	Locomotor Skill Subtest	Object Control Skill Subtest
3 year olds	83	78
4 year olds	90	67
5 year olds	88	93
6 year olds	84	84
7 year olds	79	84
8 year olds	80	71
9 year olds	86	73
10 year olds	87	72
Mean	85	78

[1]Split-Half coefficients adjusted with the Spearman-Brown formula.

Table 12
Standard Errors of Measurement for TGMD Subtest Raw Scores by Age Level

Age Level	Locomotor Skill Subtest	Object Control Skill Subtest
3 year olds	.56	.35
4 year olds	.70	.35
5 year olds	.80	.73
6 year olds	.82	.62
7 year olds	.72	.64
8 year olds	.48	.45
9 year olds	.48	.47
10 year olds	.44	.29

The SEm was also calculated for the TGMD subtest and gross motor composite standard scores. The standard deviation set for the subtest standard scores was 3 while the gross motor composite standard score distribution had a standard deviation of 15. The mean test-retest generalizability coefficients reported for the two subtests were used in this procedure. The SEm obtained for the locomotor subtest standard scores was .60 and the SEm for object control subtest standard scores was .52. To calculate the SEm for gross motor composite standard scores the mean test-retest generalizability coefficient (.96) across all 12 gross motor skills in Table 8 was used. The SEm obtained was 3.0.

Reliability of Mastery Decisions

As mentioned earlier in this chapter, the results of the TGMD can be interpreted in both a norm- and criterion-referenced manner. Stability, inter-scorer, and internal consistency reliability are basic norm-referenced issues while the reliability of decisions made with the test results is a criterion-referenced issue. One use of the TGMD is as a tool in making educational decisions about students. A frequent decision that must be made in preschool and early elementary physical education, as well as adapted physical education, is whether a student has mastered the domain of gross motor skill development. In general, if students have mastered the content, they should progress to more complex sport and leisure skills. If the student has not mastered the content, instruction should be planned to help the student learn those unlearned skills. In certain cases, specially designed physical education programs must be developed along with an appropriate individualized education program.

Consumers of this test must feel confident that the mastery and nonmastery decisions that are made with the test results are reliable. Two studies have been completed to estimate the reliability of mastery decisions. The first study (Ulrich, 1984) involved two groups of students. Group one consisted of 80 nonhandicapped children in the age range of 3-10 years. Group two consisted of 40 moderately mentally handicapped individuals in the same age range. Subjects were evaluated individually on two occasions separated by a one-week period. Based on Popham's (1981) suggestion, two realistic test mastery cut-off scores were established: 70% and 85%. Students who scored at or above the test mastery level were classified as masters of fundamental gross motor development while those not achieving this level were classified as nonmasters. The proportion of students classified consistently across the two occasions was calculated along with the Kappa (K) statistic, which takes into account chance agreement. The results are summarized for both groups in Table 13. Results suggest that mastery decisions made with the total composite score for gross motor development are very reliable for both groups.

Table 13
Reliability of Mastery Decisions for Handicapped and Nonhandicapped Children Using Two Cut-Off Scores

Group	Mastery Level	Proportion of Agreement	Kappa[1]
Nonhandicapped	85%	.89	.78
	70%	.92	.84
Mentally Handicapped	85%	.87	.62
	70%	.93	.83

[1]The Kappa statistic takes into account chance agreement.

The second investigation (Chapman, 1984) was conducted with 53 preschoolers from 38-83 months of age (m = 64 months). Based on the younger age range and the anticipated reduction of mastery status variability, three different cut-off scores were established for this group: 60%, 50%, and 45%. Procedures were identical to the first study. The proportion of decision agreement (P) across two days, along with the Kappa statistic, were calculated and are found in Table 14. These results suggest that consistent decisions can be made with the total gross motor composite score.

Table 14
Reliability of Mastery Decisions for Nonhandicapped Preschool Children Using Three Cut-off Scores

Mastery Level	Proportion of Agreement	K[1]
60%	.92	.83
50%	.91	.82
45%	.89	.69

[1]Kappa takes into account chance agreement.

Validity of Test Results

Validity refers to the effectiveness of a test in measuring what it is intended to measure. Establishing the validity of a test is a continuous undertaking. The degree to which validity is studied depends on the inferences to be made from the test results. When considering the validity of the TGMD, it is important to remember that the test results can be interpreted in both a norm- and criterion-referenced manner. Therefore, strategies for validating the results must incorporate requirements for both types of interpretations. Content and construct validity will be addressed for the norm-referenced test results; while performance criteria selection validity and instructional sensitivity will be discussed as criterion-referenced issues.

Content Validity

Content validity is established by showing that the test covers a representative sample of behaviors in the desired performance domain (Anastasi, 1982). In reference to tests of psychomotor skills, Safrit (1981) suggests that "when a skill test incorporates and directly measures the important components of the skill being evaluated, logical validity, which may be considered a special case of content validity, may be claimed" (p. 53).

Content validity was established by having three content experts judge whether the specific gross motor skills selected represented skills that are frequently taught to children in preschool and early elementary grades. They were also asked to judge whether the skills were representative of the gross motor skill domain. The criteria for selection of these content experts included a minimum of

1. Eighteen semester hours of credit in motor development beyond the master's degree;
2. Three years experience teaching physical education to children; and
3. Three years experience observing and evaluating children's gross motor development.

The criteria were used to help ensure the view of persons knowledgeable about the research literature in gross motor development and the practitioner. The results of the independent judgments were unanimous in declaring the skills as representative of the gross motor domain and frequently taught to this age group.

Construct Validity

Construct validity refers to the degree to which a test score measures an underlying theoretical construct or trait. Most constructs relate to human behavior. The construct of interest in the TGMD is fundamental gross motor development. This construct is embedded in the conceptual framework of motor proficiency. Most authorities have accepted the idea

that motor behavior has four primary stages: reflexes and reactions; fundamental gross motor skills and patterns; lead-up games and skills; and group, individual and leisure sports skills and dances. The importance of gross motor development was discussed in Chapter 1.

To explain the underlying structure of the TGMD, factor analysis of the 12 gross motor skills was performed on the standardization sample. It was hypothesized that the principal underlying structure of the test would reflect gross motor development. The principal components method of factor analysis with varimax rotation was used. By using factor analysis the minimum number of independent dimensions needed to account for most of the common variance in the original set of variables (skills) is determined. Table 15 summarizes the results of this analysis and suggests that one primary dimension is present. This factor accounts for 62% of the total common variance and appears to reflect general gross motor development. Nine of the twelve skills have loadings on this factor at or above .50. By incorporating the percent of variance criterion of 70% and the scree test it appears that three factors can be extracted. Seventy-five percent of the common variance shared by all 12 skills is explained by these factors. Therefore, the skills are in fact highly related, giving support to construct validity.

A second hypothesis tested was that gross motor development would improve significantly across age levels. Based on the literature available in motor development, a close relationship exists between gross motor development and chronological age. Table 16 presents information on the correlation of subtest scores and total composite raw scores with chronological age, for males and females in the standardization sample. These results suggest that the scores are all highly related to chronological age. An analysis of variance was also conducted on the same sample using the general linear model procedures to test for a significant age effect. Chronological age was significant beyond the .01 level for subtest and total composite raw scores.

A third hypothesis tested to externally validate the construct measured by the TGMD was that mentally retarded children would score significantly lower than nonhandicapped children of similar chronological age. A group of 80 mildly and moderately mentally retarded subjects ranging in chronological age between four and ten years (M=7.5) was compared to a group of nonhandicapped subjects of similar age (M=7.2). All children were tested individually by a trained examiner who followed standardized procedures. A multivariate analysis of variance (MANOVA) was conducted using the general linear model procedures (Frund & Littell, 1981), with the 12 gross motor skill items as the dependent measures. MANOVA yielded a significant ($p < .01$) group effect indicating that the nonhandicapped groups exhibited consistently more mature gross motor patterns than the mentally retarded.

Table 15
Rotated Factor Loadings for the Gross Motor Skills for the Standardization Sample (N=909)

Gross Motor Skills	Factor		
	1	*2*	*3*
Run			.89
Gallop		.76	
Hop	.59	.57	
Leap	.68	.44	
Jump	.63	.48	
Skip	.50	.57	
Slide		.78	
Strike	.83		
Bounce	.73		
Catch	.73		
Kick	.79		
Throw	.83		
% of Variance	62%	8%	5%

Note: Rotations of factors were orthogonal. Loadings below .40 were deleted.

Table 16
Correlations of Subtest Scores and Total Composite Scores with Chronological Age by Gender, for the Standardization Sample

Scores	Males (N=451)	Females (N=458)	Total (N=909)
Locomotor Subtest	.81	.82	.81
Object Control Subtest	.85	.85	.84
Gross Motor Composite	.86	.87	.86

Performance Criteria Selection Validity

Popham (1978) suggests that the test criterion, against which the students' performance is referenced, should be validated. As mentioned in an earlier section of this manual, a major task was to decide

which qualitative behaviors (performance criteria) to include in each skill item that would represent the mature performance pattern. Many qualitative behaviors are mentioned in the motor development literature to describe a fundamental gross motor skill (e.g., Cratty, 1976; Espenschade & Eckert, 1981; Roberton, 1982; 1984; Wickstrom, 1982; Williams, 1983). A list of frequently cited qualitative behaviors for each gross motor skill was developed by reviewing the available literature. The three content experts used to investigate content validity were required to independently rate each of the qualitative behaviors on (a) their observability in the physical education class without the use of sophisticated video technology and (b) their consistency with motor development research describing the mature pattern. The raters were requested to rate each component by placing an "X" in an appropriate space if the component was consistent and another "X" in an appropriate space if they felt that a teacher could observe the component without much difficulty. If raters disagreed with a component's consistency or observability they marked an "O" in the appropriate spaces.

It was anticipated that minor discrepancies would exist and be tolerated since a compromise was sought between (a) what content experts consider the components of a mature pattern for each skill, (b) what components could reliably be observed in a physical education class, and (c) administrative utility (as few components as necessary). All qualitative behavioral components that were used to represent the performance criterion (mature pattern) received a minimum of two "Xs" on their observability and consistency with motor development literature. These results help to support the selection of performance criteria in the skill items.

Instructional Sensitivity

The idea of developing instructional programs to meet individual students' needs is not a new idea but only since the enactment of P.L. 94-142 have individualized education programs in schools been mandated. The basic argument in favor of individualizing instruction comes from research suggesting that students differ in learning rates, learning styles, and capacity for learning, and therefore group-based instruction on a common curriculum may be inappropriate to meet their unique needs. Tests used to monitor students' progress should be linked to the instruction and be sensitive to measuring change. Consumers of test results need to know that the test reflects the effects of instruction. According to Haladyna and Roid (1981), when the purpose of a test is to measure the effects of instruction on student learning, the primary concern should be instructional sensitivity.

An investigation was conducted to evaluate the instructional sensitivity of the TGMD (Ulrich & Ulrich, 1984). Thirty-four preschoolers with a mean age of 47.2 months were randomly assigned to one of two groups. Group 1 received formal instruction on fundamental gross motor skills while Group 2 received supervised free play. Both groups met in the gymnasium for 30 minutes three times weekly for 10 weeks. All conditions for both groups including personnel and equipment were identical. The only difference was that formal motor skill lessons were implemented with Group 1, while Group 2 was encouraged to play with the equipment but no formal instruction was provided. Each session for both groups began and ended by having all children sitting and singing a group song.

The TGMD was administered individually to each subject by a trained administrator blind to group affiliation. The total test score was used in subsequent data analysis. A one-way analysis of covariance was used to examine the group effect, using the pretest scores as the covariate. Results indicated that, when differences attributed to pretest scores were extracted, there were differences between groups in post-test scores. Group 1 performed significantly better than Group 2 ($F_{1,30}=21.41$, $p<.0001$) with no interactions present. This result appears to indicate that the test is sensitive to formal instruction in fundamental gross motor development. Preschool teachers should feel confident that when reasonably effective instruction is implemented a minimum of 10 weeks, students will show performance improvement reflected in increased test scores.

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Appendix

Normative Scores for Subtests and Gross Motor Composite

Table A: Standard Scores and Percentiles for Locomotor Subtest for Different Ages

Table B: Standard Scores and Percentiles for Object Control Subtest for Different Ages

Table C: Converting Sums of Standard Scores to GMDQ

Table A
Standard Scores and Percentiles for Locomotor Subtest for Different Ages

Standard Score	Ages								Percentile Rank
	3	4	5	6	7	8	9	10	
1	0	0-3	0-3	0-4	0-5	0-8	0-9	0-13	
2	1	4	4-6	5-6	6-7	9-12	10-12	14-16	<1
3	2	5	7	7	8-10	13-15	13-16	17	1
4	3	–	8-9	8-10	11	16-17	17-18	18	2
5	–	6	10	11-12	12-15	18	19	19	5
6	4	7	11-12	13	16	19-20	20	20-21	9
7	5	8	13	14-15	17	21	21	22	16
8	6	9	14	16	18-19	22	22	23	25
9	7	10-11	15	17	20	23	23	24	37
10	8-9	12	16	18-19	21	24	24	25	50
11	–	13	17	20	22	–	–	–	63
12	10	14-15	18-19	21	23	25	25	26	75
13	11	16	20-21	22-23	24	–	–		84
14	12	17	22-23	–	25	26	26		91
15	13	18	24	24	26				95
16	14	19	25-26	25-26					98
17	–	20-26							99
18	15								>99
19	16-26								
20									

Table B
Standard Scores and Percentiles for Object Control Subtest for Different Ages

Standard Score	Ages								Percentile Rank
	3	4	5	6	7	8	9	10	
1				0-1	0-3	0-4	0-5	0-6	
2			0	2	4	5	6-7	7	<1
3		0	1	3	5	6-9	8-9	8-12	1
4		1	–	–	–	10	10-11	13-14	2
5	0	2	2	4	6	11	–	15	5
6	–	–	3	5	7-8	12	12	16	9
7	1	3	4	6	9-10	13	13	–	16
8	–	–	5	7-8	11	14	14-15	17	25
9	2	4	6	9	12-13	15	16	–	37
10	–	–	7	10	14	16	17	18	50
11	3	5	8	11	15	17	–	–	63
12	–	6	9-11	12-13	16	–	18	–	75
13	4	7	12-13	14	17	18	–	19	84
14	5	–	14-15	15	18	–	19		91
15	6-8	8	16-17	16-17	–	19			95
16	9-10	9	18	18-19	19				98
17	11-12	10-12	19						99
18	13	13-15							>99
19	14-19	16-19							
20									

Table C
Converting Sums of Standard Scores to GMDQ

Sum of Std. Scores	Quotient	Sum of Std. Scores	Quotient
38	154	20	100
37	151	19	97
36	148	18	94
35	145	17	91
34	142	16	88
33	139	15	85
32	136	14	82
31	133	13	79
30	130	12	76
29	127	11	73
28	124	10	70
27	121	9	67
26	118	8	64
25	115	7	61
24	112	6	58
23	109	5	55
22	106	4	52
21	103	3	49
		2	46

Name _____

School/Agency _____

Sex: Male _____ Female _____ Grade _____

TGMD

TEST OF GROSS MOTOR DEVELOPMENT

Dale A. Ulrich

TESTING INFORMATION

1ST TESTING

	Year	Month	Day
Date Tested			
Date of Birth			
Chronological Age			

Examiner's Name

Examiner's Title

Purpose of Testing

2ND TESTING

	Year	Month	Day
Date Tested			
Date of Birth			
Chronological Age			

Examiner's Name

Examiner's Title

Purpose of Testing

RECORD OF SCORES

1ST TESTING

Subtests	Raw Scores	%iles	Std. Scores
Locomotor Skills			
Object Control Skills			
Sum of Standard Scores =			
Gross Motor Development Quotient (GMDQ) =			

2ND TESTING

Subtests	Raw Scores	%iles	Std. Scores
Locomotor Skills			
Object Control Skills			
Sum of Standard Scores =			
Gross Motor Development Quotient (GMDQ) =			

COMMENTS/RECOMMENDATIONS

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LOCOMOTOR SKILLS

Skill	Equipment	Directions	Performance Criteria	1st	2nd
RUN	50 feet of clear space, colored tape, chalk or other marking device	Mark off two lines 50 feet apart Instruct student to "run fast" from one line to the other	1. Brief period where both feet are off the ground 2. Arms in opposition to legs, elbows bent 3. Foot placement near or on a line (not flat footed) 4. Nonsupport leg bent approximately 90 degrees (close to buttocks)		
GALLOP	A minimum of 30 feet of clear space	Mark off two lines 30 feet apart Tell student to gallop from one line to the other three times Tell student to gallop leading with one foot and then the other	1. A step forward with the lead foot followed by a step with the trailing foot to a position adjacent to or behind the lead foot 2. Brief period where both feet are off the ground 3. Arms bent and lifted to waist level 4. Able to lead with the right and left foot		
HOP	A minimum of 15 feet of clear space	Ask student to hop 3 times, first on one foot and then on the other	1. Foot of nonsupport leg is bent and carried in back of the body 2. Nonsupport leg swings in pendular fashion to produce force 3. Arms bent at elbows and swing forward on take off 4. Able to hop on the right and left foot		
LEAP	A minimum of 30 feet of clear space	Ask student to leap Tell him/her to take large steps leaping from one foot to the other	1. Take off on one foot and land on the opposite foot 2. A period where both feet are off the ground (longer than running) 3. Forward reach with arm opposite the lead foot		
HORIZONTAL JUMP	10 feet of clear space, tape or other marking devices	Mark off a starting line on the floor, mat, or carpet Have the student start behind the line Tell the student to "jump far"	1. Preparatory movement includes flexion of both knees with arms extended behind the body 2. Arms extend forcefully forward and upward, reaching full extension above head 3. Take off and land on both feet simultaneously 4. Arms are brought downward during landing		

LOCOMOTOR SKILLS

Skill	Equipment	Directions	Performance Criteria	1st	2nd
SKIP	A minimum of 30 feet of clear space, marking device	Mark off two lines 30 feet apart Tell the student to skip from one line to the other three times	1. A rhythmical repetition of the step-hop on alternate feet 2. Foot of nonsupport leg carried near surface during hop 3. Arms alternately moving in opposition to legs at about waist level		
SLIDE	A minimum of 30 feet of clear space, colored tape or other marking device	Mark off two lines 30 feet apart Tell the student to slide from one line to the other three times facing the same direction	1. Body turned sideways to desired direction of travel 2. A step sideways followed by a slide of the trailing foot to a point next to the lead foot 3. A short period where both feet are off the floor 4. Able to slide to the right and to the left side		
			LOCOMOTOR SKILLS SUBTEST SCORE		

OBJECT CONTROL SKILLS

Skill	Equipment	Directions	Performance Criteria	1st	2nd
TWO-HAND STRIKE	4-6 inch light-weight ball, plastic bat	Toss the ball softly to the student at about waist level Tell the student to hit the ball hard Only count those tosses that are between the student's waist and shoulders	1. Dominate hand grips bat above nondominant hand 2. Nondominant side of body faces the tosser (feet parallel) 3. Hip and spine rotation 4. Weight is transferred by stepping with front foot		
STATIONARY BOUNCE	8-10 inch playground ball, hard, flat surface (floor, pavement)	Tell the student to bounce the ball three times using one hand Make sure the ball is not underinflated Repeat 3 separate trials	1. Contact ball with one hand at about hip height 2. Pushes ball with fingers (not a slap) 3. Ball contacts floor in front of (or to the outside of) foot on the side of the hand being used		

OBJECT CONTROL SKILLS

Skill	Equipment	Directions	Performance Criteria	1st	2nd
CATCH	6-8 inch sponge ball, 15 feet of clear space, tape or other marking device	Mark off 2 lines 15 feet apart. Student stands on one line and the tosser on the other. Toss the ball underhand directly to student with a slight arc and tell him/her to "catch it with your hands." Only count those tosses that are between student's shoulders and waist.	1. Preparation phase where elbows are flexed and hands are in front of body 2. Arms extend in preparation for ball contact 3. Ball is caught and controlled by hands only 4. Elbows bend to absorb force		
KICK	8-10 inch plastic or slightly deflated playground ball, 30 feet of clear space, tape or other marking device	Mark off one line 30 feet away from a wall and one that is 20 feet from the wall. Place the ball on the line nearest the wall and tell the student to stand on the other line. Tell the student to kick the ball "hard" toward the wall.	1. Rapid continuous approach to the ball 2. The truck is inclined backward during ball contact 3. Forward swing of the arm opposite kicking leg 4. Following-through by hopping on nonkicking foot		
OVERHAND THROW	3 tennis balls, a wall, 25 feet of clear space	Tell student to throw the ball "hard" at the wall	1. A downward arc of the throwing arm initiates the windup 2. Rotation of hip and shoulder to a point where the nondominant side faces an imaginary target 3. Weight is transferred by stepping with the foot opposite the throwing hand 4. Following-through beyond ball release diagonally across body toward side opposite throwing arm		
			OBJECT CONTROL SKILLS SUBTEST SCORE		