Examiner's Manual

PDMS-2

M. Rhonda Folio

Rebecca R. Fewell

Peabody Developmental Motor Scales

second edition

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Preface

PUBLICATION OF THE *Peabody Developmental Motor Scales–Second Edition* (PDMS–2) is the culmination of over a decade of research by the authors, a response to reviewers' suggestions for improving the original *Peabody Developmental Motor Scales* (PDMS) (Folio & Fewell, 1983), and modifications based on feedback from examiners. The purpose of this preface is to review briefly how the PDMS has developed and changed over the years, to summarize the reviews written about the test, and to describe the characteristics of this revision.

Peabody Developmental Motor Scales

The original impetus for the development of the PDMS can be traced to our efforts to improve motor development assessment and programming for young children with disabilities. In the late 1960s and early 1970s, we were unable to find any comprehensive measures of motor development that could be used to assess and to plan interventions for young children with disabilities. We studied motor development in children and identified the important sequential skills within the domains of gross and fine motor development. The culmination of these efforts was our publication in 1974 of an experimental version of the PDMS (Folio & DuBose, 1974). This publication included a motor development assessment scale and a sequential set of programmed activities.

Additional work on the scales was completed by Folio (1975) as part of her doctoral dissertation. Evidence for the reliability and validity of the experimental version of the scales, as well as for the effectiveness of the developmental activities on preschoolers' motor growth, was presented in this work.

Teaching Resources published the first commercially available version of the PDMS (Folio & Fewell, 1983). At the time, it was the only test battery available that assessed both gross and fine motor skills and that was standardized on a population of children from birth to 84 months of age. Since it was published, the PDMS has become widely accepted by diagnosticians, occupational therapists, physical therapists, psychologists, early intervention specialists, and adapted physical education teachers.

The PDMS was a unique product because it provided examiners with both a test of motor development and a series of activities for remediation of specific problems. The

Gross Motor Scale had 170 items grouped into five skill clusters: Reflexes, Balance, Receipt and Propulsion, Nonlocomotor, and Locomotor. The Fine Motor Scale had 112 items grouped into four skill areas: Grasping, Hand Use, Eye–Hand Coordination, and Manual Dexterity.

The activity cards provided an individualized motor intervention program keyed to the results from the assessment. The PDMS included a 12-page response scoring booklet containing a summary sheet, a motor development profile form, and a detailed response form for each scale. A profile was arranged to show a child's motor competence in each of the skill areas and for the total scale.

The PDMS was standardized on a sample of 617 children from 20 states across the United States. Thirty-three examiners tested the children. The collection of the sample and standardization of the instrument were supervised by Dr. John Svinicki. Items were rated on a 3-point scale (i.e., 2, 1, 0), which was applied in the following manner: children received a score of 2 points when they performed the skill according to the specified criteria; 1 point when their behavior was a clear resemblance to the item criterion but did not fully meet the criterion; and 0 points when they failed to attempt the item, or there was no evidence that the skill was emerging.

Reliabilities for the Gross Motor and Fine Motor scores were reported to be high. Test–retest and interrater reliabilities were reported to have coefficients in the 90s for the Gross and Fine Motor Scales and for the Total score. Content validity was supported by showing that the test items were similar to those skills reported in the research literature on motor development and to items on other motor scales. Construct validity was determined by showing that the PDMS scores increased as a function of age (i.e., older children earned higher scores than younger children). Construct validity was also demonstrated by showing that children with motor problems scored significantly lower than children in the normative sample.

In addition, criterion-related validity was demonstrated by comparing the scores of 43 children on the PDMS with their scores on the *Bayley Scales of Infant Development* (Bayley, 1969). PDMS scores on Balance, Locomotor, and Nonlocomotor subtests significantly correlated with the Bayley Psychomotor scores (coefficients were .64, .52, and .43, respectively). The PDMS Fine Motor scores correlated significantly with the Bayley Mental scales. The scores for the four fine motor skill categories were also significantly correlated with Bayley's Mental and Psychomotor scores. The resulting coefficients ranged from .76 to .80.

In 1986 Teaching Resources was purchased by Developmental Learning Materials (DLM) of Allen, Texas. Later, DLM was purchased by The Riverside Publishing Company and a revision of the PDMS was begun. In 1996 PRO-ED purchased the PDMS from The Riverside Publishing Company and completed the revision.

Reviewer's Comments on the PDMS

From its initial publication, the PDMS has been reviewed widely. Reviews have been published in journals, test critique books, and books devoted to current assessment practices, early intervention, adapted physical education, and motor development. For the most part, the reviewers were complimentary of the first edition. Among the highlights of these comments, reviewers praised the scoring system that allowed partial credit for performance and allowed examiners to test fine and gross motor skills separately. Additionally, they liked having clusters of items to note particular strengths and weaknesses of a child's motor performance. The following are excerpts and comments from reviewers:

> While the authors' goal of bridging the gap between assessment and programming is commendable, the inclusion of the activity cards as part of the test kit and the attention devoted to them in the manual is likely to meet with some disfavor. . . . Most therapists are likely to find the PDMS a useful assessment tool. The PDMS seems particularly well-suited for evaluation of older infants and children suspected of having motor development delays and of infants and children with known mild to moderate delays or disorders of motor development. (Palisano & Lydic, 1984, pp. 74–75)

> The PDMS has several unique features. First, it contains a very useful set of activity cards for programming purposes. It is appropriate with non-handicapped, mildly handicapped, and severely handicapped children. Further, unlike many other developmental scales, it has been standardized and norms are available from a national sample. Finally, the PDMS provides a comprehensive evaluation and programming system that can be used to develop an in-depth diagnostic prescriptive program for children who need intensive interventions in motor skill development. (Venn, 1987, pp. 312–313)

Eason (1984) commented that the strengths of the PDMS include its three-point scoring system, the inclusion of both fine and gross motor components, the standardization plan, and its technical characteristics. Ulrich (1984) thought that the PDMS had certain advantages over other motor tests in that it included a larger number of gross and fine motor items. Furthermore, the gross and fine motor domains were broken into smaller skill clusters that helped the therapist or teacher pinpoint skill clusters that were in need of remediation. Horvat and Kalakian (1996) pointed out that the PDMS was easy to use and provided valid information that is useful for identifying developmental needs. Moreover, they noted that the accompanying curricular activity cards were particularly helpful in movement analysis.

Although reviewers were generous in praising the PDMS, they were critical of several aspects of the test and suggested ways to improve future editions. First, a major weakness was reported to be the manner in which the receipt and propulsion items were scored. Eason (1984) and Ulrich (1984) pointed out that many items measured primarily the distance and accuracy of the objects thrown rather than the motor pattern used by the child to make an accurate throw.

Therapists who use the PDMS suggested that having specific criteria established for ratings of 1 and 0 would be helpful. Users also suggested that illustrations portraying the physical motions being measured would clear up confusion in many items. Other examiners thought that some of the materials were bulky to transport and should be eliminated from the test. Block (1995) cautioned examiners not to rely exclusively on the skills measured by the PDMS when writing a child's Individualized Education Program or Individualized Family Service Plan. He suggested that examiners should translate children's performance on the PDMS items into everyday functional skills before writing their individualized motor programs.

Characteristics of the PDMS–2

After considering the test reviews, comments and queries from examiners, and our own experiences with the PDMS, we improved and updated the second edition of the PDMS in the following ways:

1. New normative data were collected, in the winter of 1997 and the spring of 1998.
2. Characteristics of the normative sample relative to geography, gender, race, and other critical variables are the same as those reported in the *Statistical Abstract of the United States* (U.S. Bureau of the Census, 1997) and are therefore representative of the current U.S. population.
3. The normative information has been stratified by age.
4. Studies showing the absence of gender and racial bias have been added.
5. Reliability coefficients were computed for subgroups of the normative sample (i.e., individuals with motor disabilities or speech–language disorder, European Americans, African Americans, Hispanic Americans, females, males) as well as for the entire normative sample.
6. New validity studies have been conducted; special attention has been devoted to showing that the test is valid for a wide variety of subgroups as well as for the general population.

7. New scoring criteria were written to clearly specify performance levels necessary for children to receive 2, 1, or 0 points on each item.
8. Illustrations have been added to enhance administration of each item.
9. Revisions have been made in the format for administering and scoring the test.
10. Items criticized in the earlier edition were eliminated.
11. The Activity Cards have been revised and reformatted into an instruction and treatment program, the Motor Activities Program, in accordance with the current practices in therapy and motor programming.
12. Each item was evaluated using both conventional item analyses to choose "good" statistical items and the new differential item functioning analyses to find biased items.

Acknowledgments

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Sincere appreciation is extended to the following professionals who field-tested the PDMS–2, provided normative data on students from their geographic areas, or contributed in other ways to the development of this test: Lillian J. Bray, Wendy W. Harris, Kathleen Bridget Jedlovec, Jeanine Kirk, Gerry Rodgers (Alabama); Dee Berline, Kristen Luoma (Alaska); Aliza Alpern, Patricia Brubaker, Christine Jones, Beth Sherman Kozura (Arizona); Crystal Baxter, Linda Collier, Deborah Gangluff, Cynthia Gunselman, Vicki Guthrie, Diana Huchingson, Janet Kerr, Dianna Lessig, Tina Mankey, Andrea Martin, Lacey Roberts, Donna Sasser, Dennis Shaffer, Melissa Tewalt, Corey Tinkle, Cathy Townsend, Christy Turner, Karyn Watson, Rose Windham, Tracey Ziener (Arkansas); Linda Adintori, Nancy Dilger, Sarah W. Field, Marilyn Foust, Ann Hyde, Mavis Johnson, Joyce Jung, Kathy Kaut, Jenny Kreitman, Lisa Peschel McCann, Jerri Romley, Joan M. Surus, Sue Trautman, Christine Wright (California); Kristy Azbell, Brenda Lala Black, Leslie Crockett, LeAnn Hoye, Sandra Landers, Wendy Shoemaker, Nancy Turner (Colorado); Bonnie Loiseau (Connecticut); Nancy Ranalli, Jody Tate (Delaware); Sahra Arzaga, Jean Blank, Jane Cheney, Diane Esposito-Comeaux, Dorthy Frederick, Martine Gedeon, Patty Helsel, Barbara Linder, Rachel Schusterman,

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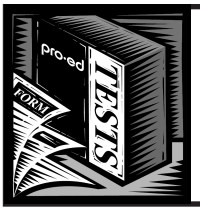
Note

Clinicians and researchers who use the PDMS–2 are invited to send copies of their work, along with any suggestions for improving the test, to the authors in care of PRO-ED, 8700 Shoal Creek Boulevard, Austin, TX 78757-6897.



1

Rationale and Overview of the PDMS–2

WITH THE PASSAGE OF THE Education of the Handicapped Act Amendments of 1986 and later the Individuals with Disabilities Education Act Amendments of 1997, the federal government mandated that services be provided to young children with developmental delays. The effect of this legislation has been a sharp increase in the number of young children referred for assessment to determine eligibility for early intervention or therapy services. The *Peabody Developmental Motor Scales* (PDMS) was the first nationally standardized assessment to provide separate gross and fine motor scores. Because of this, the PDMS was quickly adopted by assessment teams around the country as a measure of motor development. This chapter discusses the rationale upon which the *Peabody Developmental Motor Scales–Second Edition* (PDMS–2) was conceptualized, overviews the scales, and describes the scales' uses.

Rationale Underlying the PDMS–2

Most well-constructed standardized tests are based on a set of ideas that govern the selection of formats, content, and items for its scales or subtests. When the original PDMS was developed, we did not adhere to any specific theoretical perspective; instead we adopted a developmental framework and built subtests and items that were based on the work of then current developmentalists.

Motor development has been widely researched since the 1930s. Shirley (1931), McGraw (1939), Gesell (1940), and Bayley (1969, 1993) have made major contributions to the understanding of the motor development of very young children. These researchers viewed motor skills as extensions, combinations, and refinements of rudimentary movements. Further, they held that motor behaviors emerged as a consequence

of the interaction between the child's maturation and experience. From this initial research, the first assessment instruments of motor development emerged.

Theorists in the 1970s and 1980s proposed that motor skills could be improved through practice, environmental interaction, and learning, which promote the integration of the identified sequential maturational stages of motor development (Gallahue, 1982, 1993; Gallahue & Ozmun, 1995; McClenaghan & Gallahue, 1978; Robertson & Halverson, 1984; Thelen & Smith, 1993). More recently, researchers have gathered evidence that appears to verify these theorists' position that motor skills are improved through intervention. Folio (1975), DuBose and Folio (1977), Harris (1981), Jenkins, Fewell and Harris (1983), Campbell and Stewart (1986), Boucher and Doescher (1992), and Block and Davis (1996) have demonstrated that children receiving targeted motor intervention programs that promote the identified sequential skills make significant gains in motor development.

Block (1995) urged the use of both qualitative and quantitative approaches to assessment. Qualitative refers to how well the child performs the skill relative to using the correct movement components. Quantitative refers to how much of the skill the child is able to perform. Wickstrom (1983), Robertson and Halverson (1984), Halverson and Williams (1985), Ulrich (1985), Eichstaedt & Kalakian (1993), Payne and Issacs (1995), and Gallahue and Ozmun (1995) advocate the use of both approaches to the evaluation of motor skills. Consequently, where appropriate, we have incorporated quantitative and qualitative criteria in the PDMS–2.

Overview of the PDMS–2

The PDMS–2 is composed of six subtests that measure interrelated motor abilities that develop early in life. It was designed to assess the motor skills in children from birth through 5 years of age, and reliability and validity have been determined empirically. The normative sample consists of 2,003 persons residing in 46 states. The PDMS–2 can be used by occupational therapists, physical therapists, diagnosticians, early intervention specialists, adapted physical education teachers, psychologists, and others who are interested in examining the motor abilities of young children.

The methods used to build the PDMS–2 and the procedures for administering, scoring, and interpreting the scales are described later in the manual. Before addressing these topics, however, some basic information about the PDMS–2 is useful. Specifically, the information provided in this section describes the subtests that make up the PDMS–2, the composites that can be formed by combining the subtests, and the components of the scales.

Description of the Subtests

The six subtests that make up the PDMS–2 are described briefly in this section. Detailed justifications for the selection of formats, items, and components are discussed in the Content-Description Validity section of Chapter 7; administration and scoring procedures are presented in Chapter 3; and interpretation of results is described in Chapter 4.

Reflexes. The 8-item Reflexes subtest measures aspects of a child's ability to automatically react to environmental events. Because reflexes typically become integrated by the time a child is 12 months old, this subtest is given only to children from birth through 11 months of age.

Stationary. The 30-item Stationary subtest measures a child's ability to sustain control of his or her body within its center of gravity and retain equilibrium.

Locomotion. The 89-item Locomotion subtest measures a child's ability to move from one place to another. The actions measured include crawling, walking, running, hopping, and jumping forward.

Object Manipulation. The 24-item Object Manipulation subtest measures a child's ability to manipulate balls. Examples of the actions measured include catching, throwing, and kicking. Because these skills are not apparent until a child has reached the age of 11 months, this subtest is given only to children ages 12 months and older.

Grasping. The 26-item Grasping subtest measures a child's ability to use his or her hands. It begins with the ability to hold an object with one hand and progresses to actions involving the controlled use of the fingers of both hands.

Visual–Motor Integration. The 72-item Visual–Motor Integration subtest measures a child's ability to use his or her visual perceptual skills to perform complex eye–hand coordination tasks, such as reaching and grasping for an object, building with blocks, and copying designs.

Description of the Composites

The results of the subtests may be used to generate three global indexes of motor performance called composites.

Gross Motor Quotient. The Gross Motor Quotient (GMQ) is a composite of the results of the subtests that measure the use of the large muscle systems. Three of the following four subtests form this composite score:

Reflexes (birth to 11 months only)

Stationary (all ages)

Locomotion (all ages)

Object Manipulation (12 months and older)

Fine Motor Quotient. The Fine Motor Quotient (FMQ) is a composite of the results of the two subtests that measure the use of the small muscle systems:

Grasping (all ages)

Visual–Motor Integration (all ages)

Total Motor Quotient. The Total Motor Quotient (TMQ) is formed by a combination of the results of the gross and fine motor subtests. Because of this, it is the best estimate of overall motor abilities.

Test Components

The PDMS–2 kit includes the Examiner's Manual, Profile/Summary Form, Examiner Record Booklet, Guide to Item Administration, Motor Activities Program, Peabody Motor Development Chart, manipulatives, and optional computerized scoring program.

Examiner's Manual. The Examiner's Manual gives the rationale for the test, a description of the constructs being measured, the psychometric information on reliability and validity, the general instructions for administering and scoring the test, the information on interpreting the results, and the normative tables.

Profile/Summary Form. The Profile/Summary Form enables the examiner to record the child's PDMS–2 scores and graphically display the child's performance. On this form the examiner records the PDMS–2 raw scores, percentiles, age equivalents, and standard scores for subtests and quotients; plots the PDMS–2 standard scores for the subtests and quotients on the profile section to get a gross estimate of the child's strengths and weaknesses; and marks each item on which the child met the criterion for mastery during testing on the Profile of Item Mastery Section, enabling the examiner to

compare the child's performance on the items he or she has mastered with that of the normative sample.

Examiner Record Booklet. Each Examiner Record Booklet contains all of the PDMS–2 items. Booklets contain abbreviated instructions for administering items once the examiner is thoroughly familiar with the more detailed instructions found in the Guide to Item Administration. The booklets contain clearly marked entry points to be used to locate the beginning item for each subtest based on the child's age.

Guide to Item Administration. The Guide provides detailed descriptions of every item in the PDMS–2. Each item description includes (a) the age at which 50% of the children in the normative sample have mastered the item, (b) the position the child should be in when the item is administered, (c) the stimulus (if needed) for presenting the item, (d) the procedure used to test the item, (e) the criterion used to score the item, and (f) the illustration of a child performing the item. Examiners *must* become thoroughly familiar with the procedures in this guide before relying on the abbreviated instructions provided in the Examiner Record Booklet.

Motor Activities Program. The Motor Activities Program is the instruction and treatment program for the PDMS–2. It consists of 104 activities organized developmentally by six skill units. After a child's motor skills have been assessed and the examiner has completed all sections of the Profile/Summary Form, the examiner selects activities from the Motor Activities Program to use to facilitate the child's development in specific skill areas.

Peabody Motor Development Chart. The development chart provides the examiner with a convenient reference for most of the motor skills measured by the PDMS–2 and the ages at which 50% of the normative sample performed the skill. Each subtest is represented, and illustrations show children demonstrating some of the behaviors described.

Test Manipulatives. The manipulatives needed for administering all levels of the PDMS–2 are listed in Figures 1.1 and 1.2. The first figure shows the materials that are included in the test kit. The second figure shows materials that must be supplied by the examiner. The examiner should be able to find the additional materials in most infant, preschool, and primary programs; physical or occupational therapy rooms; gyms; or play courts. The examiner should use materials that are as similar as possible to the materials shown in Figures 1.1 and 1.2.

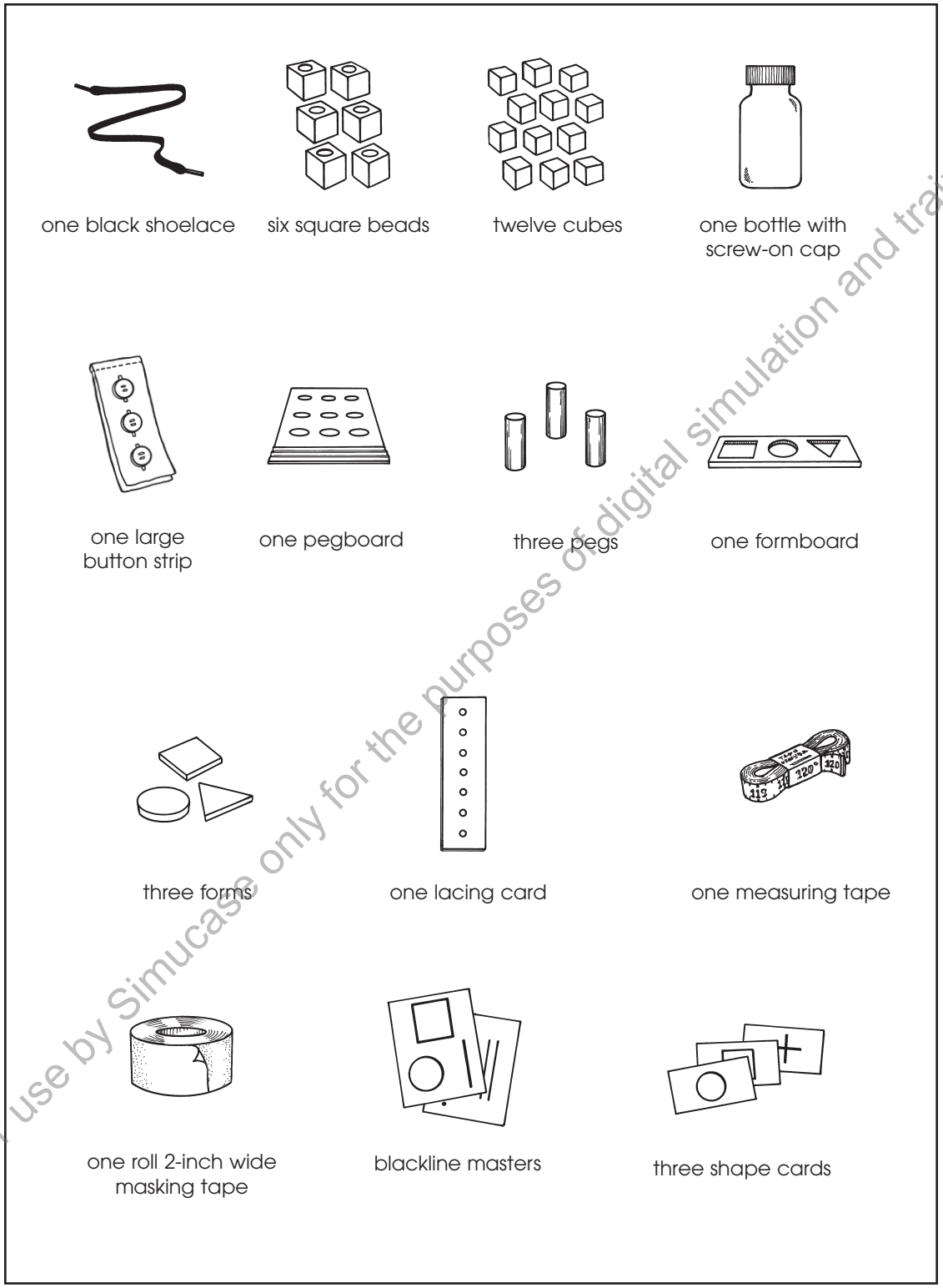


Figure 1.1. Materials included in the PDMS–2 kit.

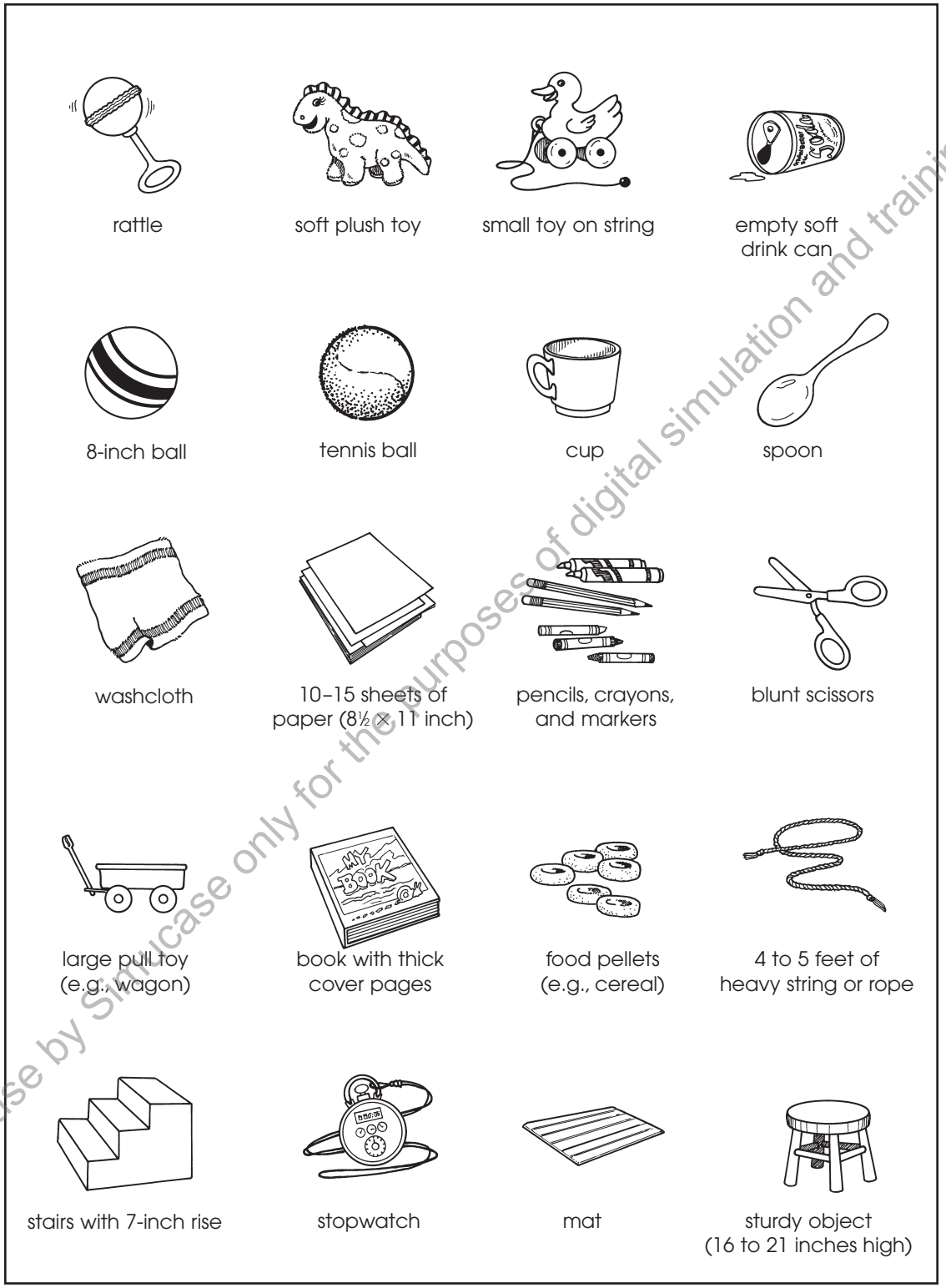


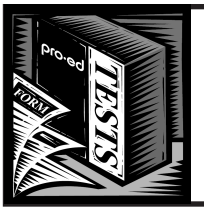
Figure 1.2. Additional required materials not provided in the PDMS–2 kit.

Optional PDMS–2 Software Scoring and Report System. The optional PDMS–2 Software Scoring and Report System allows the examiner to accurately and quickly score the PDMS–2. The program converts raw scores into standard scores, percentile ranks, and age equivalents, and generates a report that is suitable for inclusion in a student's permanent record. This computerized program can be run on IBM-compatible PCs with Windows.

Uses of the PDMS–2

The PDMS–2 has five principal uses. First, the PDMS–2 results can be used to estimate a child's motor competence relative to his or her peers. Second, the GMQ and FMQ can be compared to determine if a child is relatively disparate in his or her motor abilities. Third, the PDMS–2 has value for educational and therapy intervention because both qualitative and quantitative aspects of individual skills are assessed. Skill deficits can be identified and translated into individualized goals and objectives. Fourth, the PDMS–2 can be used to evaluate a child's progress. The quantitative information gathered on a child's performance during successive administrations of the test allows the examiner to make comparisons across administrations. Finally, the PDMS–2 has value as a research tool because the scores can be used to study the nature of motor development in various populations of children, the role of motor ability in academic success, and the effectiveness of various motor interventions.

Tests that are used for the purposes for which the PDMS–2 was developed should satisfy rigorous technical criteria, such as those advocated by the American Psychological Association (1985). The PDMS–2 was constructed with these criteria clearly in mind, especially as they relate to reliability, validity, normative information, and methods for reporting scores.



2

Information To Consider Before Testing

IMPORTANT MATTERS THAT AN examiner should consider before administering the *Peabody Developmental Motor Scales–Second Edition* (PDMS–2) are discussed in this chapter. These matters include information about (a) examiner competence, (b) time required to administer the test, (c) environment for testing, (d) accounting for situational and subject error, and (e) other information about testing.

Examiner Competence

Examiners who give and interpret the PDMS–2 should have a thorough understanding of test statistics; general procedures governing test administration, scoring, and interpretation; specific information about gross and fine motor ability testing; and development in children who are not progressing typically. Supervised practice in administering and interpreting gross and fine motor ability tests is also desirable. This experience can be obtained from numerous sources. Most often, the training can be acquired by enrolling in college courses devoted to assessment. Such courses frequently are found in departments of occupational therapy, physical therapy, adaptive physical education, and special education, among others. Workshops sponsored by local school agencies or private consultants are other sources of training. Examiners with such experience should have little difficulty in giving, scoring, and interpreting the PDMS–2 properly.

Examiners who are using the PDMS–2 for the first time should consider the following recommendations:

1. Study the content of this manual carefully. Ask a colleague or supervisor about any information that you do not understand.

2. Thoroughly practice administering and scoring the subtest items. Practice administering the test to at least three children before using it in a real situation. Ask someone who is experienced in test administration to observe your testing and help you with scoring and interpretation. We recommend that new examiners demonstrate 100% accuracy in scoring the Profile/Summary Form before performing this task independently.
3. Develop a relaxed, comfortable relationship with the child being tested. Establish and maintain eye contact, and show interest in the child's performance. Your attentiveness will usually encourage the child to give his or her best performance.
4. When the child is unable to perform a task quickly, proceed to the next item. Young children can become frustrated if they experience frequent delays in the presentation of items.
5. Be sensitive to the needs of children with known disabilities or delayed development, and present instructions in a manner that is appropriate for each child (see "Administering the PDMS–2 to Children with Disabilities" in Chapter 3).

Time Required To Administer the Test

The time required to administer the entire PDMS–2 varies from approximately 45 to 60 minutes. The subtests comprising either the Gross Motor or the Fine Motor composites can be administered in 20 to 30 minutes. Administration time is kept to a minimum by the inclusion of basals and ceilings and by administering only selected groups of items to each child. Testing a child with disabilities usually requires a longer period of time. The testing may be broken into shorter sessions if the child has a very short attention span or if other conditions make it more convenient to administer individual sections of the scales at different times. We recommend that each scale be completed within a 5-day period.

Environment for Testing

The testing environment may be a room, hallway, or even an outdoor space. All testing need not necessarily be in the same space or at the same time. Arrange the testing environment to minimize distractions. If possible, the room or space should be free from noise and people; however, if a child is reluctant to separate from his or her parent or caregiver, allow the parent or caregiver to remain during testing. Also, allow the parent or caregiver to hold the child if you think that will increase the likelihood that the child will respond.

When administering the Gross Motor subtests, use a mat, cushioned table, or carpeted floor when appropriate. With ambulatory children, test in a space large enough for activities requiring ball throwing and running. Stairs should be nearby for the items requiring them. The child should wear shoes with rubber or nonslippery soles, such as sneakers. It is better to have the child go barefoot than to wear socks only.

Some items, particularly in the Gross Motor subtests, require measured distances, taped lines, or targets. It is important to prepare these materials prior to testing a child. The examiner can easily recognize when special materials are needed because they are set in boldfaced type on the Examiner Record Booklet and are specified in the Guide to Item Administration.

In the Fine Motor subtests, items often specify that the infant is to be seated. He or she can be held on the examiner's or another adult's lap or placed in a chair-table, highchair, or some other safe equipment with similar support. In testing the fine motor skills of a preschool-aged child, the preferred arrangement is for the child to be seated at a table that permits him or her to comfortably place feet on the floor. If the child's feet do not touch the floor, provide a box, stool, or other support so that the child's feet are positioned comfortably. If the child is able to sit with an adapted chair and does so regularly, then it is appropriate to use it in the administration of items requiring the seated position.

Lighting should be from overhead so no shadows are cast as the child marks on paper. The table should be large enough to allow the examiner and the child to sit opposite each other or side by side, whichever is the best arrangement for the child. Also, the table must accommodate the manipulative materials required for the items and the Examiner Record Booklet. Only those test materials needed to administer a single item should be on the table at one time. All other materials should be within the examiner's reach but out of the child's view. Some examiners find it convenient to position the other testing materials on a low stool, placed nearby.

Accounting for Situational and Subject Error

Lyman (1991) noted that the reliability of any test can be affected by five inherent sources of error: (a) test content, (b) stability over time, (c) examiner–scorer, (d) examinee, and (e) situation. When considering these error sources, the first three are the responsibility of the test designers. Chapter 6 presents information on the reliability of the PDMS–2 and shows that the results may be interpreted with confidence.

The final two sources of error variance arise from the situation in which children are tested and within the children themselves. Numerous factors can affect these two sources of error. An examiner has the responsibility to control or account for the obvious variables that can adversely affect the child's performance (e.g., noisy room, no rest

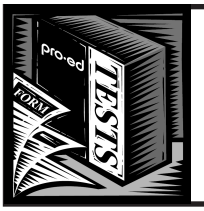
breaks, poor lighting, uncomfortable furniture). In all situations, these error sources and others should be considered in the analysis of results.

How a testing situation influences a child's performance cannot be accurately measured. Similarly, how a child's physical and emotional well-being will contribute to test error cannot be precisely determined. Therefore, examiners must be alert to certain conditions (e.g., fatigue, state of health, nervousness, attitude toward the test, attention level). Because information of this type is impressionistic and subjective, it should be treated only as a possible factor that may have influenced performance.

Other Information About Testing

Some important concerns about testing were not included in the previous sections of this chapter. We suggest that the examiner also consider the following points related to motivation and test administration:

1. Have readily available all materials necessary for administering the test, including the Examiner's Manual, the Guide to Item Administration, the Examiner Record Booklet, the Profile/Summary Form, and the manipulatives. **Caution: Some of the manipulatives required for administration of the PDMS–2 are not included in the kit and need to be acquired by the examiner before testing** (see Figure 1.2 in Chapter 1).
2. Administer the subtests in a quiet, comfortable, nondistracting environment.
3. Keep the child at ease and on task.
4. Do not, through speech or gesture, comment on the accuracy of any item.
5. Stop testing if the child tires or loses interest. Continue testing at another time.
6. From time to time, you may believe that the results of a particular testing session are invalid (e.g., the child was ill, something occurred during the testing session that distracted or confused the child, the results were noticeably different from those the examiner expected). On those occasions, the child should be retested at a later time.
7. Administer the test using the Examiner Record Booklet only after you have a thorough knowledge of the instructions in the Guide to Item Administration. Abbreviated item instructions are provided in the Examiner Record Booklet for the examiner's convenience. The same booklet can be used to administer the PDMS–2 four times to the same child.



3

Administration and Scoring

GENERAL DIRECTIONS FOR administering and scoring the *Peabody Developmental Motor Scales–Second Edition* (PDMS–2) are presented in this chapter. These matters include information about administrative procedures and scoring the test.

Administration Procedures

This section describes how the PDMS–2 is to be used to obtain normative scores and to plan instructional programs. This is followed by procedures to employ when testing children with disabilities.

Test Administration for Normative Scores and Instructional Programming

To achieve a valid interpretation of a child's PDMS–2 performance, the scales must be administered exactly as specified in the Guide to Item Administration. This guide provides the examiner with a complete description of every item, an illustration of the activity, and the scoring criteria. The guide is to be used as a reference when the examiner has any questions about item administration or scoring. For convenience, an abbreviated version of this material is included in the Examiner Record Booklet. The examiner may give and score the test from the Examiner Record Booklet only after becoming thoroughly familiar with the Guide to Item Administration.

Occasionally, an examiner will want to probe a child's skills for the purposes of instructional or treatment programming. In these instances the directions can be

adapted to fit the child's individual needs while retaining the intent of the item. When the purpose of testing is both eligibility or placement and instructional or treatment programming for a child with disabilities, the examiner should first administer an item as directed.

Administering the Items of the PDMS–2

To administer an item correctly, the examiner must follow the instructions as written in the Guide to Item Administration. Instructions differ for the various items. It is important that the examiner follow the exact procedures as some instructions are read and others are demonstrated. The instructions must be repeated up to three times (sometimes called "trials") for each item if needed, to give the child an opportunity to achieve a maximum score on the item. For example, some items require that the child demonstrate the criteria on two of three trials to achieve the maximum score. If a child passes the criteria for a score of 2 on the first trial and the criteria for a score of 2 do not state two of three trials, then the examiner marks "2" for that item on the Examiner Record Booklet. If the criteria for the score of 2 require two of three trials, then the examiner must administer at least one more trial for the child to meet the criteria. If the child does not complete the performance criteria on the second trial, the child is administered a third and final trial. If the child loses interest in an item before the third trial, the examiner should administer another item and return to the incompletely administered item at a later time. In summary, each item is administered until the child receives a 2 or has received three trials.

After the third and final trial for an item, the examiner can do one of two things. In most circumstances, the examiner marks the score as appropriate for the performance (i.e., "2," "1," or "0"). If, in the clinical view of the examiner, the child's performance was not optimal because of a nonmotor disability, the examiner can readminister the item using appropriate adaptive instructions. For example, if a child who is deaf or has a very serious receptive language deficit could not hear or understand the directive that the examiner read to the child, as required in the Examiner Record Booklet, the examiner may readminister the item in a manner that would enable the child to understand the instruction. The examiner would not actually touch the child or put him or her through the task, but would demonstrate the action so that the request is clear. Some examiners may want to use a doll to demonstrate the tasks. The examiner must use his or her own clinical judgment as to when it is appropriate to use adapted instructions and should follow the instructions in the next section. When adaptations are used, the norms for the test are not accurate because adaptations were not used when the test was standardized. We recommend that the appropriate notations be made and that the scores be recorded as they normally would with a clear statement that they must be considered as nonstandard scores due to the adapted administration of some items.

Administering the PDMS–2 to Children with Disabilities

As mentioned in the Preface, we developed the original PDMS because of our need for an instrument that would provide information about the motor skill development of children with disabilities. When administering the scales to children with disabilities, it often is not possible to strictly adhere to the directions provided. We offer the following suggestions:

1. Make notations on the Examiner Record Booklet to identify the special adaptations made in item administration. Some items may need major modifications or may need to be omitted entirely. If the examiner omits an item, then it must be scored as a 0.
2. Adhere to the scoring criteria as closely as possible. However, if this is not possible, modify the scoring and note modifications in the Examiner Record Booklet.
3. Ask someone who knows the child well about the impact that the child's disability has on his or her ability to understand instructions, see objects move in space, and so forth, and adapt your administration of the test accordingly.

Scoring the PDMS–2

General directions for scoring the PDMS–2 are presented in this section. Specifically, information is included about scoring criteria, item administration, test administration, and recording comments.

Scoring Criteria

The PDMS–2 norms are based on scoring each item as 2, 1, or 0. The examiner must decide how to score the item based on his or her judgment of the child's performance, and the specific criteria provided for each item. The general criteria for scoring items are as follows:

2 The child performs the item according to the criteria specified for mastery

1 The child's performance shows a clear resemblance to the item mastery criteria but does not fully meet the criteria

0 The child cannot or will not attempt the item, or the attempt does not show that the skill is emerging.

In general, the examiner will have little difficulty deciding whether a response should receive a score of 2 because the child's performance either does or does not meet the criteria for mastery. In the first edition of the PDMS, some examiners found judging whether a response should be scored as 0 or 1 difficult because specific criteria were not provided for each item. The PDMS–2 has remedied this problem by giving the examiner a clear explanation of the criteria for scoring 1 or 0 on every item in the test.

The Guide to Item Administration provides the examiner with detailed descriptions of every item in the PDMS–2 along with illustrations and the criteria for scoring. Once the examiner becomes proficient in the use of the PDMS–2, the Guide will not be needed for administering the test. The abbreviated instructions included in the Examiner Record Booklet will be sufficient to allow examiners to give the test.

Test Administration

To shorten testing time, entry points, basals, and ceilings are used on all but one of the subtests. For five subtests—Stationary, Locomotion, Object Manipulation, Grasping, and Visual–Motor Integration—the child's age dictates the item with which testing begins. The remaining subtest, Reflexes, is administered only to children less than 1 year old, and testing always begins with the first item. However, when the examiner is administering the PDMS–2 to an older child with known motor or neurological disabilities, it may be appropriate and informative to administer the Reflexes subtest.

Entry Points.

The entry points are marked on each subtest in the Examiner Record Booklet. The entry points were determined empirically to allow the examiner to begin testing on an item that 75% of children in the normative sample at that age passed. When testing children with known disabilities, the examiner should use clinical judgment to determine the most appropriate entry point. That is, testing should begin with items on which the child can be successful.

Basal Level.

The basal is established when the child receives a score of 2 on three items in a row. The last three 2s before the 1 or 0 become the basal level. The examiner begins testing with the entry point item. If the child does not score 2 on each of the first three items administered—that is, if the child scores 0 or 1 on any of the first three items administered starting from the entry point—the examiner should test backward until the child scores 2 on three items in a row. This is the basal. All items below the basal are scored 2.

Ceiling Level.

Once the basal has been established, the examiner administers progressively more difficult items until a ceiling is established. The ceiling is established

when the child scores 0 on each of three items in a row. After the ceiling has been established, testing is discontinued. All items above the ceiling are scored 0. The proper use of basals and ceilings is illustrated in the examples shown in Figures 3.1 and 3.2.

In the example presented in Figure 3.1, the testing began with Item 13 on the Locomotion subtest because Kevin was 7 months old. Progressively higher numbered and increasingly more difficult items were administered until he scored 0 on three items in a row, thus reaching the ceiling at Item 22. Kevin achieved a basal along the way by receiving a score of 2 on three items in a row (i.e., Items 15 through 17) and a ceiling by receiving a score of 0 on three items in a row (i.e., Items 20 through 22). No further testing was needed. In summary, Kevin received a score of 2 on Items 1 through 17 for a total of 34 points. Two additional scores of 1 were given on Items 18 and 19, making a total raw score of 36.

In Figure 3.2, Kisha's basal and ceiling for the Visual–Motor Integration subtest are presented. Because Kisha is 48 months old, her testing was started at Item 61, Copying Cross. Kisha received a score of 2 on Item 61, and a 1 on Item 62. Because a score of 2 was not received on Item 62, it was necessary to discontinue testing forward and begin testing backward from Item 60 to establish a basal (i.e., 3 consecutive 2 scores in a row). In testing backward, Kisha received scores of 2 on Items 59, 58, and 57, establishing the basal. To establish the ceiling, more difficult items were administered. Following the administration of Item 57, the examiner resumed forward testing on Item 63 because Kisha previously received a score of 1 on Item 62. Testing forward, Kisha scored 0 for Items 63 and 64, 1 for Items 65 and 66, and 0 for items 67 through 69. Testing was discontinued when the ceiling was established (i.e., three 0 scores in a row). Because Items 57 through 59 formed the basal, Kisha receives a score of 2 for each of Items 1 through 59 for a total of 118. Next, Kisha receives credits for the points she was awarded up to the ceiling. She was awarded an additional 6 points to give her a total raw score for the Visual–Motor Integration subtest of 124.

Recording Comments

Additional information about a child can be obtained through careful observation during testing. This information can be used when writing the narrative report summarizing the child's performance on the PDMS–2. The examiner is encouraged to observe and note the following behaviors.

1. The child's interest in the task
2. The child's approach to understanding the instructions (e.g., looks at examiner, listens, then looks at material; clarifies instructions; shows awareness of what is to be done)

Item #	Age in Months	Item NAME, *Position,* and Description	Score Criteria	Administration 1	2	3	4
13 Start: 7 months	6	FLEXING BODY *(Lying on back, bare feet)* Gently bend both legs toward head 3 times. Do not place feet in child's hands, but encourage child to grasp them by saying, "Get your feet."	2 Grasps both feet and holds them for 3 seconds 1 Grasps both feet and holds them for 1–2 seconds or grasps 1 foot and holds it for 3 seconds 0 Legs remain on surface	2	1st item given		
14	6	PUSHING UP *(Lying on stomach, head turned to side, forearms resting on surface)* Attract child's attention to **rattle.** Shake rattle 12 in. in front of child's forehead and 6 in. above child's head.	2 Elevates head and stomach by pushing up with arms, bearing weight on palms for 5 seconds 1 Elevates head and stomach by pushing up with arms, bearing weight on palms for 3–4 seconds 0 Bears weight for less than 3 seconds	2	2nd item given		
15	6	EXTENDING ARM *(Lying on back)* Shake **toy on a string** and then hold it 12 in. to right of child's head and 12 in. above surface. Repeat procedure to opposite side.	2 Shifts weight to side and supports self with arm for 3 seconds while extending opposite arm to reach for toy (both sides) 1 Shifts weight to side and supports self with arm for 1–2 seconds while extending opposite arm to reach for toy (1 or both sides) 0 Remains on back	2	3rd item given		
16	7	ROLLING *(Lying on back)* Shake **rattle** at midline 12 in. above child. Lower rattle to surface on child's left, out of child's reach. Repeat procedure on opposite side.	2 Rolls from back to stomach (both sides) 1 Rolls from back to stomach (1 side only) 0 Remains on back	2	4th item given		
17 Start: 8 months	7	ROLLING *(Lying on back)* Attract child's attention to **toy** by shaking it to side of child. Repeat procedure on opposite side.	2 Rolls from back to stomach, leading with hips and thighs, followed by stomach and then shoulders (both sides) 1 Rolls from back to stomach (1 side only) 0 Remains on back	2	5th item given		
18 Start: 9 months	8	MOVING FORWARD *(Lying on stomach)* Place **toy** 5 ft. in front of child. Say, "Get the toy."	2 Moves forward 3 ft. using arms 1 Moves forward at least 2 ft. but less than 3 ft. using arms 0 Moves less than 2 ft.	1	6th item given		
19 Start: 10 months	9	RAISING SHOULDERS AND BUTTOCKS *(Lying on stomach)* Sit 3 ft. in front of child. Hold your hands out to child and say, "Come here."	2 Raises and bears weight on hands and knees for 5 seconds and rocks back and forth for 2 cycles 1 Raises and bears weight on hands and knees for 1–5 seconds 0 Remains on stomach	1	7th item given		
20	9	CREEPING *(Hands and knees)* Place **toy** on floor 6 ft. in front of child. Say, "Get the toy." Move toy back as child approaches.	2 Creeps forward on hands and knees, using a cross-lateral pattern (opposite arms and legs moving together) for 5 ft. 1 Creeps forward on hands and knees using cross-lateral pattern for 4 ft. or creeps without using cross-lateral pattern for 5 ft. 0 Remains stationary or moves on stomach	0	8th item given		
21	9	SCOOTING *(Sitting)* Sit beside child on floor. Say, "Watch me." Demonstrate scooting by using your hands to propel your body forward on your buttocks to retrieve toy. Place **toy** 5 ft. in front of child. Say, "Scoot like I did and get the toy."	2 Maintains sitting posture and uses hands and legs to scoot forward 3 ft. 1 Maintains sitting posture and scoots forward 1–2 ft. 0 Moves less than 1 ft. forward	0	9th item given		

basal

ceiling

Figure 3.1. Example of determining basals and ceilings on Locomotion subtest for 7-month-old Kevin.

Item #	Age in Months	Item NAME, *Position*, and Description	Score Criteria	Administration 1	2	3	4
22 Start: 11 months	9	PIVOTING *(Sitting)* Place child in sitting position on floor. Attract child's attention to **toy**, then place it 2 ft. from child's right side. Say, "Turn and get the toy." Repeat procedure on opposite side.	2 Turns on buttocks using legs or arms to pivot body 90 degrees (both sides) 1 Turns on buttocks using legs or arms to pivot body 90 degrees (1 side only) 0 Pivots less than 90 degrees	0	9th item given		ceiling

Figure 3.1. Continued.

3. The child's approach to problem solving (e.g., recites instructions aloud as he or she performs the task; moves rapidly to manipulatives paying little attention to instructions)
4. The child's comments or nonverbal responses to the tasks
5. The child's latency or perseveration of response
6. The child's use of self-corrections
7. The child's preferred hand use in grasping, drawing, cutting, throwing, and similar tasks
8. The child's directionality in transferring materials (i.e., from left to right or from right to left)
9. The child's smoothness, agility, and coordination in the execution of motor movements
10. The child's ability to separate movements of one part of the body from another
11. The child's extraneous or overflow activity prior to, during, or after performing an item
12. The child's feelings about his or her performance (e.g., after performing a particularly challenging task, the child smiles with pride at his or her accomplishment)

Item #	Age in Months	Item NAME, *Position*, and Description	Score Criteria	Administration 1	2	3	4
57 Start: 43–46 months	37–38	CUTTING PAPER *(Sitting at a table)* Cut piece of **8.5 × 11 in. paper** in half. Give **1 piece of paper** and **scissors** to child. Say, "Cut the paper like I did."	2 Cuts paper into 2 pieces 1 Cuts paper ¾ or less across 0 Snips with scissors	2	6th item given		
58	39–40	LACING STRING *(Sitting at a table)* **Lacing strip and lace** Say, "Watch me lace." Lace down through 1st hole, up through 2nd hole. Lace string through 3 holes. Show strip to child, then remove lace and give to child. Say, "You do it like I did."	2 Laces 3 holes 1 Laces 2 holes 0 Puts lace through 0–1 hole	2	5th item given		
59	39–40	COPYING CROSS *(Sitting at a table)* Place **paper, marker,** and **card with cross** on table. Say, "Draw lines just like these that cross in the middle."	2 Draws intersecting lines that are within 20 degrees of perpendicular 1 Draws intersecting lines that are more than 20 degrees from perpendicular 0 Fails to intersect lines	2	4th item given		
60	41–42	CUTTING LINE *(Sitting at a table)* Give child **paper with 5 × ¼ in. line** and **scissors**. Run your finger along line and say, "Cut on the line."	2 Cuts within ½ in. of line the entire length of line 1 Cuts in direction of line but more than ½ in. from line 0 Snips with scissors	1	3rd item given		
61 Start: 47–54 months	41–42	COPYING CROSS *(Sitting at a table)* Place **paper, marker,** and **card with cross** on table. Say, "Draw lines just like these that cross in the middle."	2 Draws intersecting lines that are within 20 degrees of perpendicular and lengths on each side of middle vary no more than ¼ in. 1 Draws intersecting lines that are more than 20 degrees from perpendicular and/or lengths on each side of middle vary more than ¼ in. 0 Fails to intersect lines	2	1st item given		
62	41–42	DROPPING PELLETS *(Sitting at a table)* Place **bottle** and **10 food pellets** on table. Say, "Put the food in the bottle as fast as you can. Put only 1 in at a time."	2 Puts 10 pellets in bottle in 30 seconds or less 1 Puts 5–10 pellets in bottle in 31–60 seconds 0 Puts 4 or fewer pellets in bottle in 60 seconds	1	2nd item given		
63 Start: 55–62 months	41–42	TRACING LINE *(Sitting at a table)* Place **paper with 5 × ¼ in. line** on table with line in horizontal position. Run your finger along the line and say, "Draw on this line. Try to stay right on the line."	2 Deviates off line no more than 2 times and by no more than ½ in. 1 Deviates off line 3–4 times and by no more than ½ in. 0 Deviates off line more than 4 times	0	7th item given		
64	49–50	COPYING SQUARE *(Sitting at a table)* Place **paper, marker,** and **card with square** on table. Say, "Draw a square."	2 Draws lines that are straight and within 15 degrees of vertical and horizontal, with closed corners 1 Draws lines that deviate from vertical or horizontal by 16–30 degrees or a corner is open 0 Draws lines that deviate from vertical or horizontal by more than 30 degrees or 2 corners are open	0	8th item given		
65	49–50	CUTTING CIRCLE *(Sitting at a table)* Give child **paper with circle on it** and **scissors**. Run your finger around circle and say, "Cut out the circle along the line."	2 Cuts within ¼ in. of line for ¾ of circle 1 Cuts within ½–¼ in. of line for ¼–¾ of circle 0 Cuts out circle more than ½ in. from line	1	9th item given		

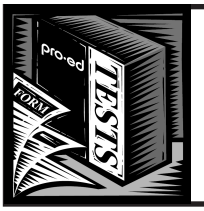
basal

Figure 3.2. Example of determining basals and ceilings on Visual–Motor Integration subtest for 48-month-old Kisha.

Item #	Age in Months	Item NAME, *Position*, and Description	Score Criteria	Administration 1	2	3	4
66 Start: 63–71 months	51–52	BUILDING STEPS *(Sitting at a table)* Build steps as pictured in Guide to Item Administration (**3 cubes** on bottom). Leave steps standing briefly. Then knock down and give **6 cubes** to child. Say, "Build the steps like I did."	2 Builds steps as illustrated 1 Builds steps with space between cubes or without proper alignment 0 Builds structure other than steps	1	10th item given		
67	53–54	CONNECTING DOTS *(Sitting at a table)* Place **paper with 2 dots** and **marker** on table. Point to dots and say, "Draw a straight line from 1 dot to the other dot."	2 Connects dots; line does not deviate more than ¼ in. from horizontal 1 Connects dots; line deviates between ¼ and ½ in. from horizontal 0 Fails to connect dots or line deviates more than ½ in. from horizontal	0	11th item given		
68	53–54	CUTTING SQUARE *(Sitting at a table)* Give **paper with square on it** and **scissors**. Run your finger around square and say, "Cut out the square along the lines."	2 Cuts out square within ¼ in. of lines 1 Cuts out square within ½–¼ in. of lines 0 Cuts out square more than ½ in. from lines	0	12th item given		
69	53–54	BUILDING PYRAMID *(Sitting at a table)* **12 cubes** Build 6-cube pyramid as pictured in Guide to Item Administration and leave standing. Put **6 cubes** in front of child and say, "Build one like mine."	2 Builds pyramid as illustrated 1 Builds pyramid but cubes are touching in some places 0 Builds structure other than pyramid	0	13th item given		

ceiling

Figure 3.2. Continued.



4

Interpreting the PDMS–2 Results

IN THIS CHAPTER, WE DISCUSS how to record, analyze, and interpret the PDMS–2 scores. Specifically, the topics relate to (a) completing the Profile/Summary Form, (b) test scores and their interpretation, (c) what the composites measure, (d) what the subtests measure, (e) conducting discrepancy analyses, (f) cautions in interpreting test results, (g) using the Motor Activities Program, and (h) sharing the test results.

Completing the Profile/Summary Form

Space is provided on the Profile/Summary Form for specifying pertinent information about the student and the examiner, recording test results, graphically displaying results, and indicating referral information and recommendations. As an example, page 1 of Tim's completed Profile/Summary Form is provided in Figure 4.1.

Section I: Identifying Information

Section I on the front page of the Profile/Summary Form provides space for recording relevant data about the child being tested and about the examiner giving the test. As expected, this information includes the examinee's name, gender, and age, as well as the examiner's name and title.

The examinee's exact age is determined by subtracting the birth date from the date on which he or she was tested. For example, consider Juan who was born on June 6, 1998, and tested on November 16, 1999:

PDMS–2

Profile/Summary Form

Peabody Developmental Motor Scales — Second Edition

Section I. Identifying Information

Child's Name: Tim Thomas — Female ☐ Male ☑

	Year	Month	Day
Date Tested	~~98~~ 98	~~11~~ 22	~~16~~ 46
Date of Birth	97	11	17
Chronological Age	1	11	29
Prematurity Adjustment		– 1	– 14
Corrected Age	1	10	15
Age in Months		22	

Examiner's Name: Sara Stevens

Examiner's Title: Occupational Therapist

Section II. Record of Scores

PDMS–2	Raw Score	Age Equivalent	%ile	Standard Scores		
Reflexes	—	—	—	—		—
Stationary	34	10m	9	6		6
Locomotion	94	20m	25	8		8
Object Manipulation	12	18m	16	7		7
Grasping	39	13m	16		7	7
Visual–Motor Integration	80	18m	9		6	6
Sum of Standard Scores				21	13	34
				GMQ	FMQ	TMQ
Quotients				81	79	78
Percentiles				10	8	7

Section III. Profile of Scores

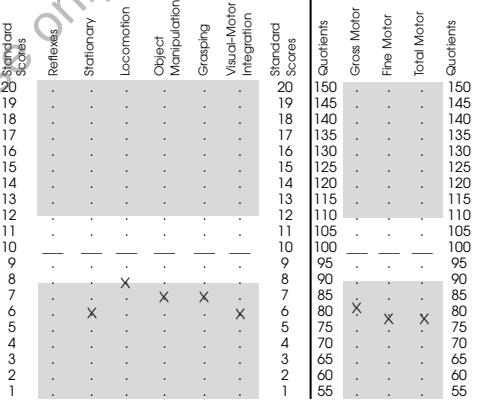


Figure 4.1. Sample Profile/Summary Form, completed for 22-month-old Tim.

	Year	Month	Day
Date Tested	99	11	16
Date of Birth	98	6	6
Chronological Age	1	5	10

Juan is 1 year, 5 months, and 10 days old.

Occasionally, you have to borrow a year (12 months) or a month (30 days) to subtract properly. For example, as shown in Figure 4.1, Tim's birthday is November 17, 1997. He also was tested on November 16, 1999:

	Year	Month	Day
Date Tested	99	11	16
Date of Birth	97	11	17

Because 17 cannot be subtracted from 16, 30 days (i.e., 1 month) are borrowed from the adjacent month's column and added to the 16 days. The date of testing is now 99-10-46:

	Year	Month	Day
Date Tested	99	10	46
Date of Birth	97	11	17

However, because 11 months cannot be subtracted from 10 months, 12 months (i.e., 1 year) are borrowed from the adjacent year's column. The date of testing becomes 98-22-46. Simple subtraction is applied (see below), and Tim's age is found to be 1 year, 11 months, and 29 days.

	Year	Month	Day
Date Tested	98	22	46
Date of Birth	97	11	17
Chronological Age	1	11	29

For purposes of using the normative tables, *do not round* Tim's age upward. Thus, he is 1 year, 11 months of age, not 2 years, 0 months. Any days less than 30 are always discarded.

When testing children who were born prematurely, an additional step is added to the age calculation. After the child's chronological age has been determined, an adjustment is

made for prematurity. Write the number of months and days that the child was premature on the Prematurity Adjustment line. If you do not know the days, simply use the months. Next, subtract the prematurity figures from the child's Chronological Age to determine the premature child's corrected age. Suppose, for example, that Tim was 6 weeks premature at birth. In the following calculation, the adjustment is made and Tim's corrected age becomes 1 year, 10 months.

	Year	Month	Day
Date Tested	98	22	46
Date of Birth	97	11	17
Chronological Age	1	11	29
Prematurity Adjustment		–1	–14
Corrected Age	1	10	15

The prematurity adjustment is used only when children are less than 24 months old. *After children reach the age of 24 months, the prematurity adjustment is not used.*

Finally, the child's age is converted to months by multiplying the number of years by 12 and adding the number of months. Age in months is used to determine scoring information.

Section II: Record of Scores

In Section II, the examiner records the child's raw score, percentile, age equivalent, and standard score for each subtest in the spaces provided. The raw scores are recorded first. Age equivalents that correspond to the raw scores are found in Appendix C and are recorded next. These are followed by the percentiles and standard scores, which are located in the normative tables in Appendix A. A complete description of age equivalents, percentiles, and standard scores is provided later in this chapter.

For example, Tim scored 94 points on the Locomotion subtest (Figure 4.1). This score converts to an age equivalent of 20 months (see Appendix C). Because he is 22 months old (adjusted), the examiner consults Table A.23 in Appendix A to transform the raw score of 94 into a percentile of 25 and a standard score of 8. Each of these scores is recorded in Section II. Note that standard scores must be recorded twice—once in one of the first two columns, and once in the last column so that quotient standard scores can be calculated.

The quotients represent the constructs in the model that was used to build the test. For example, the standard scores for Stationary, Locomotion, and Object Manipulation are

summed, and the summed value is converted into a Gross Motor Quotient (GMQ) using Appendix B. The same procedure is used to form the remaining two quotients, Fine Motor Quotient (FMQ) and Total Motor Quotient (TMQ). The appropriate standard scores are summed, and each summed value is converted into a quotient using the table in Appendix B.

For example, to calculate the GMQ for Tim, his standard scores on the Stationary, Locomotion, and Object Manipulation subtests are summed and transformed into the GMQ by consulting Appendix B. In Tim's case, the sum of the standard scores is 21 (6 + 8 + 7), which translates to a GMQ of 81. Tim's Total Motor Quotient (TMQ) is formed by summing standard scores for all of the subtests (i.e., 6 + 8 + 7 + 7 + 6 = 34) and consulting the table in Appendix B to convert the sum into a TMQ of 78.

At times, examiners will need to reference other kinds of standard scores such as *T*-scores *z*-scores, or stanine scores. The PDMS–2 provides other kinds of scores in Table 4.1. In this table, percentile ranks are in the far left column. Once the child's percentile rank for any subtest is recorded in the third column of Section II, Record of Scores section of the Profile/Summary Form, the various standard scores can be obtained. Tim has a percentile rank of 9 for Stationary. Turning to Table 4.1, the 9 corresponds to a PDMS–2 Quotient of 80, a subtest score of 6, a Normal Curve Equivalency (NCR) of 22, a *T*-score of 37, a *z*-score of –1.33, and a stanine of 2. This useful table will enable examiners to always be able to report the equivalent standard scores preferred or required by the local service agency.

Section III: PDMS–2 Profile of Scores

In Section II, the test's results are reported in numeric form; in Section III, the results are presented graphically. To form the profile, the standard scores for the subtests and the quotients are plotted on the graph. From a quick glance, the examiner can identify the presence of any discrepancies among the scores plotted.

Section IV: Profile of Item Mastery

In Section IV, each skill that the child has mastered is plotted. Each item is charted based on the age in months when 50% of the normative sample demonstrated mastery of this skill. The examiner places a check on the line beside each item on which the child scored a 2. The examiner then shades the entire vertical column that corresponds with the child's age in months. The profile provides a visual display of motor skills that the child has mastered, of his or her strengths and weaknesses, and of how he or she compares to the performance of the normative sample. This is a particularly helpful guide for the examiner when writing instructional objectives.

Table 4.1
Relation of Various Standard Scores to Percentile Rank and to Each Other

	Standard Scores					
Percentile Rank	PDMS–2 Quotient	PDMS–2 Subtest Score	NCE Score	*T*-score	*z*-score	Stanine
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	67	57	+0.67	6
63	105	11	64	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 Scores and Their Interpretation

The PDMS–2 yields five types of scores: raw scores, age equivalents, percentiles, and standard scores (sometimes called scale scores) for the subtests, and quotients for the composites. These scores are the most important information associated with a child's PDMS–2 performance because their analysis, augmented by additional test information, direct observation of behavior, and knowledge acquired from other sources, will eventually result in a proper diagnosis of the child's motor problem. Because of their importance, we discuss each type of score and provide suggestions for their proper use and interpretation.

Raw Scores

Raw scores are the total points accumulated by a child on a subtest (i.e., the child will receive a 2, 1, or 0 for each item). Because the level of difficulty for items on different subtests varies, raw scores are of little clinical value. For example, the fact that a child scored 10 raw score points on both the Stationary and Locomotion subtests does not necessarily mean that his or her motor abilities represented by the subtests are equal. In fact, a raw score of 10 achieved on two subtests may mean the child has done poorly on one subtest and well on another. The value of raw scores is generally limited to research purposes (i.e., to make group comparisons or to compute correlation coefficients).

Age Equivalents

Age equivalents for tests are usually labeled according to the content of the test. Thus, age equivalents associated with tests of reading are called "reading ages," those associated with tests of vocabulary are called "vocabulary ages," and those associated with tests of mental ability (e.g., tests of intelligence or aptitude) are called "mental ages." The age equivalents for the PDMS–2 are called "motor ages." Appendix C lists the age equivalents for PDMS–2 subtest raw scores. For example, a raw score of 57 on the Locomotion subtest yields an age equivalent of 10 months.

The use of age equivalents has come under close scrutiny in recent years, so much so that the American Psychological Association (1985), among others, has advocated the discontinuance of these scores. In fact, the organization has gone so far as to encourage test publishers to stop reporting test scores as age and grade equivalents. Nevertheless, age equivalents are currently mandated by many educational agencies and school systems. Additionally, parents, Individualized Education Program teams, and intervention staff need to communicate about a child's competence using language that all understand. Parents understand ages. Developmental ages are often used to convey information to

parents of young children. Age equivalent scores can convey to parents that their child is passing items that children of a certain chronological age typically pass.

Because age equivalents are problematic, we recommend that PDMS–2 users read the cautions associated with age equivalents found in the works of Aiken (1994), Anastasi and Urbina (1997), Linn and Gronlund (1995), and Salvia and Ysseldyke (1998). We prefer the use of standard scores and percentiles to age equivalents when reporting results to parents and other professionals.

Percentiles

Percentiles, or percentile ranks, represent values that indicate the percentage of the distribution that is equal to or below a particular score. For example, a percentile of 56 means that 56% of the standardization sample scored at or below the examinee's score. Obviously, this interpretation is easy to understand, thus making percentiles a popular score for practitioners to use when sharing test results with others. Note that the distance between two percentile ranks becomes much greater as those ranks are more distant from the mean or average (i.e., the 50th percentile). Percentiles are generated for the subtests and quotients using tables in Appendixes A and B, respectively.

Subtest Standard Scores

Standard scores provide the clearest indication of an examinee's subtest performance. Based on the distribution with a mean of 10 and a standard deviation of 3, subtest standard scores are converted from raw scores using Tables A.1 through A.37 in Appendix A. Guidelines for interpreting subtest standard scores are shown in Table 4.2.

Standard scores allow examiners to make comparisons across subtests. It was stated earlier that if a student scores 10 raw score points on both the Stationary and Locomotion subtests, examiners are unable to make interpretations based solely upon raw scores. However, standard scores of 18 for both subtests tell the examiner that the child scored equally well on both measures (i.e., Very Superior, as shown in Table 4.2). In the same way, if a child obtains a standard score of 3 for Locomotion and 18 for Visual–Motor Integration, an examiner could conclude that Locomotion was a relative weakness, whereas Visual–Motor Integration was a relative strength.

The rightmost column in Table 4.2 refers to the percentage of the population that would be included within the categories listed in the middle column. Note that it corresponds to a normal or normalized distribution of the population. This column helps the examiner understand that most (nearly 50%) of the population is Average and that scores considered Very Superior or Very Poor are sufficiently rare to warrant attention.

Table 4.2
Guide to Interpreting PDMS–2 Subtest Standard Scores

Standard Scores	Description	Percentage Included in Bell-Shaped Distribution
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

Composite Quotients

The most reliable scores for the PDMS–2 are the quotients. The GMQ, FMQ, and TMQ are derived by adding the subtest standard scores and converting the sum to a quotient (i.e., a standard score having a mean of 100 and standard deviation of 15) using Appendix B. A guide to interpreting composite scores is located in Table 4.3.

What the Composite Quotients Measure

In this section, we provide guidelines for interpreting the composite quotients in terms of diagnosing strengths and weaknesses in motor development. We also discuss criteria for determining when differences between quotients are large enough to be clinically interesting. The quotients are important because they reflect the examinee's ability relative to the basic constructs built into the test. Also, because they comprise several representative subtests rather than only one, the quotients tend to be highly reliable.

The quotients discussed in this section relate to the model underlying the PDMS–2 that was described in Chapter 1. In that chapter, we pointed out that motor development could be conceptualized as gross motor abilities, fine motor abilities, and total motor abilities. The PDMS–2 subtests were combined in such a way as to form composites to represent these three constructs. Thus, three quotients are generated that

Table 4.3
Guide to Interpreting PDMS–2 Quotient Scores

Quotient Scores	Description	Percentage Included in Bell-Shaped Distribution
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

reflect on the student's status relative to the motor constructs that are incorporated into the PDMS–2. These quotients indicate a child's ability relative to gross motor, fine motor, and total motor development.

Gross Motor Quotient

The GMQ is derived from the standard scores of three subtests for children less than 1 year old (i.e., Reflexes, Stationary, and Locomotion) and three subtests for children 1 through 5 years old (i.e., Stationary, Locomotion, and Object Manipulation). The GMQ measures a child's gross motor development—that is, the ability to use the large muscle systems to react to environmental changes, assume a stable posture when not moving, move from place to place, and catch, throw, and kick balls. High scores on the GMQ are made by children with well-developed gross motor abilities. These children would have above average movement and balance skills. They are likely to be children who could be described as agile, well coordinated, and graceful in their movements. Low scores are made by those who have weak movement and balance skills. These children may have difficulty in learning to crawl, walk, and run. A deficit in gross motor abilities can be mild and the child's movements may be described as clumsy, uncoordinated, or inefficient. More severe gross motor problems may limit a child's use of his or her legs to such a degree that the child will need assistance to move from place to place.

Fine Motor Quotient

The FMQ is derived from the standard scores of two subtests for all children (i.e., Grasping and Visual–Motor Integration). The FMQ measures a child's fine motor development—that is, the ability to use his or her fingers, hands, and to some extent arms to grasp objects, stack blocks, draw figures, and manipulate objects. High scores on the FMQ are made by children with well-developed fine motor abilities. These children would have above average skills picking up small objects, drawing figures, and stringing beads. They are likely to be described as good with their hands. Low scores are made by children who have weak grasping and visual–motor integration skills. They have difficulty in learning to pick up objects, drawing designs, and using hand tools. A fine motor deficit can be mild; the child's skills may be described as immature or inefficient. Some children may have problems severe enough to need specially designed utensils to feed themselves.

Total Motor Quotient

The TMQ comprises the quotient scores of the two composites, the Gross Motor Quotient and the Fine Motor Quotient, for all children. It is probably the best estimate of overall motor abilities.

What the Subtests Measure

A subtest is built to tap a very specific content area within a relatively larger domain. For instance, the Locomotion subtest measures the child's ability to move from place to place. However, gross motor skills are comprised of many abilities, of which locomotion is only one. Although such an ability does yield some information about a person's motor skills, a better index of gross motor skills would be the Gross Motor Quotient because it is a composite of three subtests and represents many skills. Each of the subtests measures a different gross motor ability. In short, the examiner can have more confidence in interpreting composite quotient scores than in evaluating individual subtest scores.

Because of this, the composite scores should be given more credence and attention than the subtest scores. This said, evaluation of subtest performance remains useful in generating hypotheses or speculations about why a person did well or poorly on a composite, but important decisions about diagnosis and placement should rest primarily on the interpretation of the composite values.

The subtest findings should be interpreted only in terms of the specific content and skills measured. The subtests and their particular contents are as follows:

Reflexes—Measures the child's ability to automatically react to environmental events.

Stationary—Measures the child's ability to sustain control of his or her body within its center of gravity and retain equilibrium.

Locomotion—Measures the child's ability to transport his or her body from one base of support to another.

Object Manipulation—Measures the child's ability to throw, catch, and kick balls.

Grasping—Measures the child's ability to use his or her hands and fingers.

Visual–Motor Integration—Measures a child's ability to integrate and use his or her visual perceptual skills to perform complex eye–hand coordination tasks.

Conducting Discrepancy Analyses

Occasionally examiners will want to know if the difference between two subtest scores or quotients is significant. This is usually done by applying one of several discrepancy analysis procedures. Examiners can analyze scores within the PDMS–2 (e.g., they can compare the Locomotion subtest score to the Object Manipulation subtest score or compare the Gross Motor Quotient to the Fine Motor Quotient). One can test the differences between any two of the five PDMS–2 subtests for children 2 weeks to 11 months old, between any two of the five subtests for children from 12 months through 72 months old, and between the PDMS–2 quotients. *Only subtest-to-subtest and quotient-to-quotient comparisons can be made*. A procedure for comparing scores within the PDMS–2 is described here and an example is presented to show how comparisons are made.

The first step in conducting a discrepancy analysis between two PDMS–2 subtest scores is to calculate a Difference Score. A Difference Score is computed by subtracting the lower test standard score from the higher test standard score. For example, consider Tim's standard score performance on Locomotion (8) and Object Manipulation (7). His Difference Score is 1 point. The next step is to determine if the difference of 1 point is large enough to be of any interest. We describe one method that can be used to examine Difference Scores; it examines the statistically significant difference between two subtest scores or the gross and fine motor quotients.

The first step in examining Difference Scores is to see if the difference is beyond that which would be expected by chance alone. Difference Scores required for significance for all subtest and quotient comparisons are shown in Table 4.4. These Difference

Table 4.4
Comparison of PDMS–2 Subtest Standard and Quotient Difference Scores for Significance

PDMS–2 Values	St	Lo	Ob	Gr	Vi	GMQ
Subtests						
Reflexes (Re)	3	2	—	2	2	—
Stationary (St)	—	2	3	3	2	—
Locomotion (Lo)		—	2	2	2	—
Object Manipulation (Ob)			—	3	2	—
Grasping (Gr)				—	2	—
Visual–Motor Integration (Vi)					—	—
Quotients						
Gross Motor Quotient (GMQ)						—
Fine Motor Quotient (FMQ)						8

Scores in Table 4.4 are derived from Anastasi and Urbina's (1997) formula to determine how large a Difference Score must be in order to be statistically significant. This formula has been adapted to read:

$$\text{Difference Score} = SD\, z_a \sqrt{2 - r_{11} - r_{22}}$$

where SD = standard deviation of the two scores, z_a = statistical significance level, r_{11} = reliability of the first score, and r_{22} = reliability of the second score.

For the subtests, the standard deviation is 3; the standard deviation of the quotients is 15. For our purposes, we set the significance level at .05, which is represented on the z-distribution table as 1.96. Table 6.1 of this manual provides coefficient alphas, a measure of internal consistency reliability for the PDMS–2 subtests and quotients. Because Tim's 1-point Difference Score for the Locomotion and Object Manipulation comparison is below the 2-point criterion, we can conclude that the two subtests are not significantly discrepant at the .05 confidence interval. Similar comparisons can be made for all subtest pairs (see Table 4.4).

The same procedure is used to compare PDMS–2 quotients. Tim's Gross Motor Quotient (81) can be compared to his Fine Motor Quotient (79). Using Anastasi and

Urbina's (1997) formula, we found that the Difference Score must be 8 points to be discrepant at the .05 level of confidence (see Table 4.4). Because the Difference Score is only 2 points, one may conclude that the two composites do not differ significantly.

Figure 4.1 is an example of a PDMS–2 Profile/Summary Form, completed for Tim. An examination of Tim's standard score for Locomotion (8) falls within the "average" category. The standard scores for Stationary (6), Object Manipulation (7), Grasping (7), and Visual–Motor Integration (6) fall within the "below average" category (see Table 4.2 for a guide to interpreting standard scores).

Examination of Tim's quotient scores, shown in Figure 4.1, suggests that his motor skills are below par. In particular, he has below average gross motor skills and poor fine motor skills (see Table 4.3 for a guide to interpreting quotient scores).

Cautions in Interpreting Test Results

In this manual, a method for testing motor abilities has been presented. Even though this test battery was designed carefully, standardized thoroughly, and researched extensively, certain limitations involved in its use should be considered.

Test Reliability: A Cause for Concern

The fact that inherent test error cannot be extracted entirely from a measurement instrument is reason for caution in the interpretation of test results. Put another way, even the most reliable of tests that possess "acceptable" levels of reliability still have an alarming amount of error in them.

Anastasi and Urbina (1997) described a procedure for estimating a test's "true variance" that is based on pooling the error associated with time sampling, content sampling, and interscorer difference. Assuming that a particular test is reliable at the lowest acceptable level (i.e., .80) at all three of these sources of error, the true variance of the test is only 40%. This "acceptable" test actually has more error in its scores than it has true variance! Certainly, considerable caution is required in such instances. Examiners should be cautious in interpreting the results of even those tests that are reliable at the highest levels because they still possess considerable error. For example, a test with almost perfect reliability (i.e., .95) at all three of these sources of error still contains 15% error.

Because of this, test results, especially when they are used to make judgments about individuals, must always be handled carefully. Results based on tests having reliabilities of less than .80 should be considered with great caution or not used at all. In every case, diagnoses and hypotheses resting on test data need to be confirmed by other observations.

Tests Don't Diagnose

Too often examiners forget the dictum that "tests don't diagnose, people do" and base their diagnoses exclusively on test results, a hazardous enterprise at best. Test results are merely observations, not diagnoses. They specify a performance level at a given time under a particular situation, but they do not tell the examiner why a person performed as he or she did.

The questions concerning the why of the test performance are the very essence of diagnosis, and they can be answered only by an insightful, competent test examiner. Test results make useful contributions to diagnosis, but in the end, practical diagnoses rest on the clinical skills and experience of examiners. Test results are only aids to clinical judgment.

Many factors can combine to cause a person to perform in a particular way on a test. For example, serious health problems may have limited a child's motor experiences and could affect the child's test performance in such a way as to produce scores that on the surface are the same as those made by individuals diagnosed as having mild motor delays or even cerebral palsy. The examiner is responsible for forming hypotheses about the cause of the problem and for diagnosing the case. In any one instance, the diagnosis could be health conditions, restricted early experiences, mental retardation, or family problems. To make such judgments, the examiner requires information that goes far beyond that which is available from test results.

Using the PDMS–2 Motor Activities Program

The Motor Activities Program is the instructional and treatment program for the PDMS–2. It is organized in units that specifically address the skills assessed in each subtest of the PDMS–2. Each unit includes a series of activities. Each activity includes the following: instructional objectives or benchmarks, reason(s) for teaching the skill or skills, examples of related skills as they occur in the natural environment, elements to focus on in addressing the skill or skills, and suggestions for five instructional strategies. The Motor Activities Program was developed to assist examiners in the development of appropriate Individualized Family Service Plans and Individualized Education Programs, and in the generation of detailed instructional interventions. The instructional strategies described in the program include functional tasks that are developmentally appropriate. Wherever possible, these strategies were designed to be incorporated into a family's daily routine. In addition, the case studies provide examples for therapists or other early childhood specialists to use as models for designing interventions.

Sharing the Test Results

Test results should be shared with responsible persons eligible to receive such information. The examiner should always consider the following three points when sharing the results from the PDMS–2:

1. A thorough understanding of the purposes, content, and construction of the PDMS–2 is necessary prior to any presentation. The Examiner's Manual should be made available when presenting results to those people unfamiliar with the test. The section "Uses of the PDMS–2" in Chapter 1 would be of particular interest, as well as the data in Chapters 5 through 7 concerning normative statistics, reliability, and validity.
2. When test scores are shared, they should always be accompanied by a personal interpretation from the examiner regarding (a) their meaning, (b) possible alternative interpretations, (c) reports of other diagnostic workups and how they relate (if at all) to the PDMS–2, (d) suggestions for instructional changes if necessary, and (e) recommendations for further testing that may be appropriate. All of these points should be discussed before making final recommendations to parents or other professionals.
3. Every effort should be made to translate the PDMS–2's results into the language that is familiar to the person with whom the information is being shared. Examiners should refrain from using motor development and therapy jargon when such terminology is unnecessary.

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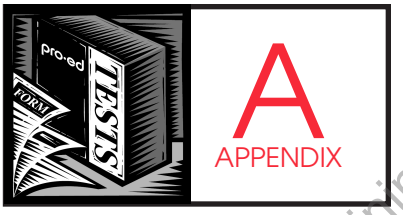


Converting Subtest Raw Scores to Percentiles and Standard Scores

Table A.13
Converting Subtest Raw Scores to Percentiles and Standard Scores

Age 12 Months

Percentile Rank	PDMS–2 Subtests					Standard Scores
	Stationary	Locomotion	Object Manipulation	Grasping	Visual–Motor	
<1	<18	<17		<15	<7	1
<1	18–20	17–22		15–19	7–10	2
1	21–23	23–27		20–24	11–18	3
2	24–26	28–33		25–27	19–27	4
5	27–29	34–39		28–29	28–34	5
9	30–31	40–47		30–31	35–39	6
16	32–33	48–54	0	32–33	40–45	7
25	34–35	55–60	1	34–35	46–52	8
37	36	61–64	2	36–37	53–58	9
50	37	65–68	3–4	38	59–64	10
63	38	69–72	5–6	39	65–68	11
75	39	73–76	7–8	40	69–72	12
84	40	77–80	9–10	41	73–75	13
91	41–42	81–84	11–12	42	76–77	14
95	43–44	85–88	13–14	43	78–79	15
98	45–46	89–92	15–16	44	80–81	16
99	47	93–95	17–18	45	82–84	17
>99	48–49	96–97	19–20	46	85–86	18
>99	50–51	98–99	21–22	47	87–89	19
>99	>51	>99	>22	>47	>89	20

Table A.14
Converting Subtest Raw Scores to Percentiles and Standard Scores

Age 13 Months

Percentile Rank	PDMS–2 Subtests					Standard Scores
	Stationary	Locomotion	Object Manipulation	Grasping	Visual–Motor	
<1	<18	<23		<20	<9	1
<1	18–20	23–27		20–23	9–13	2
1	21–23	28–33		24–26	14–22	3
2	24–26	34–39		27–28	23–33	4
5	27–29	40–47		29–30	34–39	5
9	30–31	48–54	0	31–32	40–45	6
16	32–33	55–60	1	33–34	46–52	7
25	34–35	61–64	2	35–36	53–58	8
37	36	65–68	3–4	37–38	59–64	9
50	37	69–72	5–6	39	65–68	10
63	38	73–76	7–8	40	69–72	11
75	39	77–80	9–10	41	73–75	12
84	40	81–84	11–12	42	76–77	13
91	41–42	85–88	13–14	43	78–79	14
95	43–44	89–92	15–16	44	80–81	15
98	45–46	93–95	17–18	45	82–84	16
99	47	96–97	19–20	46	85–86	17
>99	48–49	98–99	21–22	47	87–89	18
>99	50–51	100–102	23–24	48	90–91	19
>99	>51	>102	>24	>48	>91	20

Table A.15
Converting Subtest Raw Scores to Percentiles and Standard Scores

Age 14 Months

Percentile Rank	PDMS–2 Subtests					Standard Scores
	Stationary	Locomotion	Object Manipulation	Grasping	Visual–Motor	
<1	<18	<28		<21	<11	1
<1	18–20	28–33		21–24	11–17	2
1	21–23	34–39		25–27	18–27	3
2	24–26	40–47		28–29	28–38	4
5	27–29	48–54	0	30–31	39–45	5
9	30–31	55–60	1	32–33	46–52	6
16	32–33	61–64	2	34–35	53–58	7
25	34–35	65–68	3–4	36–37	59–64	8
37	36	69–71	5–6	38–39	65–68	9
50	37	72–76	7–8	40	69–72	10
63	38	77–80	9–10	41	73–75	11
75	39	81–84	11–12	42	76–77	12
84	40	85–88	13–14	43	78–79	13
91	41–42	89–92	15–16	44	80–81	14
95	43–44	93–95	17–18	45	82–84	15
98	45–46	96–97	19–20	46	85–86	16
99	47	98–99	21–22	47	87–89	17
>99	48–49	100–102	23–24	48	90–91	18
>99	50–51	103–107	25–26	49	92–94	19
>99	>51	>107	>26	>49	>94	20

Table A.16
Converting Subtest Raw Scores to Percentiles and Standard Scores

Age 15 Months

Percentile Rank	PDMS–2 Subtests					Standard Scores
	Stationary	Locomotion	Object Manipulation	Grasping	Visual–Motor	
<1	<18	<34		<23	<14	1
<1	18–20	34–39		23–26	14–22	2
1	21–23	40–47		27–29	23–32	3
2	24–26	48–54		30–31	33–44	4
5	27–29	55–60	0–1	32–33	45–52	5
9	30–31	61–64	2	34–35	53–58	6
16	32–33	65–68	3–4	36–37	59–64	7
25	34–35	69–71	5	38	65–68	8
37	36	72–76	6–7	39–40	69–72	9
50	37	77–80	8–9	41	73–75	10
63	38	81–84	10–11	42	76–77	11
75	39	85–88	12–13	43	78–79	12
84	40	89–92	14–15	44	80–81	13
91	41–42	93–95	16–17	45	82–84	14
95	43–44	96–97	18–19	46	85–86	15
98	45–46	98–99	20–21	47	87–89	16
99	47	100–102	22–23	48	90–91	17
>99	48–49	103–107	24–25	49	92–94	18
>99	50–51	108–114	26–27	50	95–98	19
>99	>51	>114	>27	>50	>98	20

Table A.17
Converting Subtest Raw Scores to Percentiles and Standard Scores

Age 16 Months

Percentile Rank	PDMS–2 Subtests					Standard Scores
	Stationary	Locomotion	Object Manipulation	Grasping	Visual–Motor	
<1	<21	<40		<25	<17	1
<1	21–23	40–47		25–28	17–26	2
1	24–26	48–54		29–31	27–37	3
2	27–29	55–60		32–33	38–51	4
5	30–31	61–64	0–2	34–35	52–58	5
9	32–33	65–68	3–4	36–37	59–64	6
16	34–35	69–71	5	38	65–68	7
25	36	72–76	6–7	39	69–72	8
37	37	77–80	8–9	40–41	73–75	9
50	38	81–84	10–11	42	76–77	10
63	39	85–88	12–13	43	78–79	11
75	40	89–92	14–15	44	80–81	12
84	41–42	93–95	16–17	45	82–84	13
91	43–44	96–97	18–19	46	85–86	14
95	45–46	98–99	20–21	47	87–89	15
98	47	100–102	22–23	48	90–91	16
99	48–49	103–107	24–25	49	92–94	17
>99	50–51	108–114	26–27	50	95–98	18
>99	52	115–123	28–29	51	99–103	19
>99	>52	>123	>29	52	>103	20

Table A.18
Converting Subtest Raw Scores to Percentiles and Standard Scores

Age 17 Months

Percentile Rank	PDMS–2 Subtests					Standard Scores
	Stationary	Locomotion	Object Manipulation	Grasping	Visual–Motor	
<1	<21	<46		<25	<20	1
<1	21–23	46–54		25–28	20–31	2
1	24–26	55–60		29–31	32–42	3
2	27–29	61–64	0	32–33	43–57	4
5	30–31	65–68	1–3	34–35	58–64	5
9	32–33	69–71	4–5	36–37	65–68	6
16	34–35	72–76	6	38	69–72	7
25	36	77–80	7–8	39	73–74	8
37	37	81–84	9–10	40–41	75–76	9
50	38	85–88	11–12	42	77–78	10
63	39	89–92	13–14	43	79–81	11
75	40	93–95	15–16	44	82–84	12
84	41–42	96–97	17–18	45	85–86	13
91	43–44	98–99	19–20	46	87–89	14
95	45–46	100–102	21–22	47	90–91	15
98	47	103–107	23–24	48	92–94	16
99	48–49	108–114	25–26	49	95–98	17
>99	50–51	115–123	27–28	50	99–103	18
>99	52	124–129	29–30	51	104–109	19
>99	>52	>129	>30	52	>109	20

Table A.29
Converting Subtest Raw Scores to Percentiles and Standard Scores

Age 36–38 Months

Percentile Rank	PDMS–2 Subtests					Standard Scores
	Stationary	Locomotion	Object Manipulation	Grasping	Visual–Motor	
<1	<26	<58	<4	<32	<47	1
<1	26–28	58–73	4–6	32–35	47–59	2
1	29–31	74–90	7–9	36–38	60–71	3
2	32–34	91–98	10–12	39	72–85	4
5	35–36	99–107	13–17	40	86–94	5
9	37–38	108–114	18–19	41	95–98	6
16	39	115–122	20–24	42	99–103	7
25	40	123–129	25–26	43	104–108	8
37	41–42	130–136	27–29	44	109–112	9
50	43–44	137–143	30–32	45	113–116	10
63	45–46	144–148	33–35	46	117–122	11
75	47	149–152	36–38	47	123–125	12
84	48–49	153–156	39–40	48	126–128	13
91	50–51	157–161	41–42	49	129–130	14
95	52	162–166	43	50	131–133	15
98	53–54	167–170	44	51	134–136	16
99	55–56	171–173	45	52	137–138	17
>99	57–58	174–175	46		139	18
>99	59–60	176	47		140	19
>99		>176	48		>140	20

Table A.30
Converting Subtest Raw Scores to Percentiles and Standard Scores

Age 39–41 Months

Percentile Rank	PDMS–2 Subtests					Standard Scores
	Stationary	Locomotion	Object Manipulation	Grasping	Visual–Motor	
<1	<27	<59	<5	<33	<49	1
<1	27–29	59–74	5–7	33–36	49–61	2
1	30–32	75–92	8–10	37–39	62–74	3
2	33–35	93–101	11–13	40	75–87	4
5	36–37	102–114	14–19	41	88–95	5
9	38–39	115–122	20–21	42	96–103	6
16	40	123–129	22–26	43	104–108	7
25	41–42	130–136	27–29	44	109–112	8
37	43–44	137–143	30–32	45	113–116	9
50	45–46	144–148	33–35	46	117–122	10
63	47	149–152	36–38	47	123–125	11
75	48–49	153–156	39–40	48	126–128	12
84	50–51	157–161	41–42	49	129–130	13
91	52	162–166	43	50	131–133	14
95	53–54	167–170	44	51	134–136	15
98	55–56	171–173	45	52	137–138	16
99	57–58	174–175	46		139	17
>99	59–60	176	47		140	18
>99		177	48		141	19
>99		178			>141	20

Table A.31
Converting Subtest Raw Scores to Percentiles and Standard Scores

Age 42–44 Months

Percentile Rank	PDMS-2 Subtests					Standard Scores
	Stationary	Locomotion	Object Manipulation	Grasping	Visual-Motor	
<1	<28	<60	<6	<34	<51	1
<1	28–30	60–75	6–8	34–37	51–64	2
1	31–33	76–93	9–11	38–40	65–77	3
2	34–36	94–109	12–14	41	78–91	4
5	37–38	110–120	15–20	42	92–101	5
9	39–40	121–129	21–25	43	102–108	6
16	41–42	130–136	26–29	44	109–112	7
25	43–44	137–142	30–32	45	113–116	8
37	45–46	143–147	33–35	46	117–122	9
50	47	148–152	36–38	47	123–125	10
63	48	153–156	39–40	48	126–128	11
75	49–50	157–161	41–42	49	129–130	12
84	51–52	162–166	43	50	131–133	13
91	53–54	167–170	44	51	134–136	14
95	55–56	171–173	45	52	137–138	15
98	57–58	174–175	46		139	16
99	59–60	176	47		140	17
>99		177	48		141	18
>99		178			142	19
>99					>142	20

Table A.32
Converting Subtest Raw Scores to Percentiles and Standard Scores

Age 45–47 Months

Percentile Rank	PDMS–2 Subtests					Standard Scores
	Stationary	Locomotion	Object Manipulation	Grasping	Visual–Motor	
<1	<29	<61	<7	<35	<54	1
<1	29–31	61–76	7–9	35–38	54–67	2
1	32–34	77–94	10–12	39–41	68–80	3
2	35–37	95–112	13–15	42	81–94	4
5	38–40	113–123	16–23	43	95–107	5
9	41–42	124–136	24–28	44	108–112	6
16	43–44	137–141	29–32	45	113–116	7
25	45–46	142–145	33–35	46	117–122	8
37	47	146–150	36–37	47	123–125	9
50	48	151–155	38–39	48	126–128	10
63	49–50	156–161	40–41	49	129–130	11
75	51–52	162–166	42–43	50	131–133	12
84	53–54	167–170	44	51	134–136	13
91	55–56	171–173	45	52	137–138	14
95	57–58	174–175	46		139	15
98	59–60	176	47		140	16
99		177	48		141	17
>99		178			142	18
>99					143	19
>99					144	20

Table A.34
Converting Subtest Raw Scores to Percentiles and Standard Scores

Age 51–53 Months

Percentile Rank	PDMS–2 Subtests					Standard Scores
	Stationary	Locomotion	Object Manipulation	Grasping	Visual–Motor	
<1	<31	<63	<9	<37	<60	1
<1	31–33	63–78	9–11	37–40	60–73	2
1	34–36	79–98	12–14	41–43	74–87	3
2	37–39	99–120	15–17	44	88–102	4
5	40–42	121–133	18–26	45	103–114	5
9	43–44	134–145	27–32	46	115–121	6
16	45–47	146–150	33–36	47	122–125	7
25	48	151–155	37–38	48	126–127	8
37	49–50	156–161	39–40	49	128–130	9
50	51–52	162–166	41–42	50	131–133	10
63	53–54	167–170	43–44	51	134–136	11
75	55–56	171–173	45	52	137–138	12
84	57–58	174–175	46		139	13
91	59–60	176	47		140	14
95		177	48		141	15
98		178			142	16
99					143	17
>99					144	18
>99						19
>99						20

Table A.35
Converting Subtest Raw Scores to Percentiles and Standard Scores

Age 54–59 Months

Percentile Rank	PDMS-2 Subtests					Standard Scores
	Stationary	Locomotion	Object Manipulation	Grasping	Visual-Motor	
<1	<32	<64	<10	<37	<63	1
<1	32–34	64–80	10–12	37–40	63–76	2
1	35–37	81–102	13–15	41–43	77–91	3
2	38–40	103–123	16–18	44	92–106	4
5	41–43	124–138	19–27	45	107–118	5
9	44–45	139–150	28–34	46	119–123	6
16	46–48	151–155	35–38	47	124–127	7
25	49–50	156–161	39–40	48	128–130	8
37	51–52	162–166	41–42	49	131–133	9
50	53–54	167–170	43–44	50	134–136	10
63	55–56	171–173	45	51	137–138	11
75	57–58	174–175	46	52	139	12
84	59–60	176	47		140	13
91		177	48		141	14
95		178			142	15
98					143	16
99					144	17
>99						18
>99						19
>99						20

Table A.36
Converting Subtest Raw Scores to Percentiles and Standard Scores

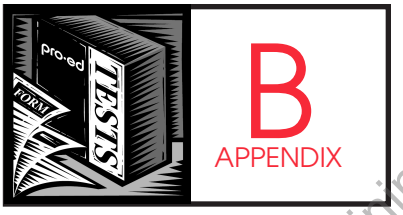
Age 60–65 Months

Percentile Rank	PDMS–2 Subtests					Standard Scores
	Stationary	Locomotion	Object Manipulation	Grasping	Visual–Motor	
<1	<33	<65	<11	<38	<66	1
<1	33–35	65–81	11–13	38–41	66–79	2
1	36–38	82–105	14–16	42–44	80–94	3
2	39–41	106–125	17–19	45	95–110	4
5	42–44	126–141	20–28	46	111–120	5
9	45–47	142–155	29–35	47	121–126	6
16	48–50	156–161	36–39	48	127–130	7
25	51–52	162–166	40–41	49	131–133	8
37	53–54	167–170	42–43	50	134–136	9
50	55–56	171–173	44–45	51	137–138	10
63	57–58	174–175	46	52	139	11
75	59–60	176	47		140	12
84		177	48		141	13
91		178			142	14
95					143	15
98					144	16
99						17
>99						18
>99						19
>99						20

Table A.37
Converting Subtest Raw Scores to Percentiles and Standard Scores

Age 66–71 Months

Percentile Rank	PDMS–2 Subtests					Standard Scores
	Stationary	Locomotion	Object Manipulation	Grasping	Visual–Motor	
<1	<34	<66	<12	<38	<68	1
<1	34–36	66–82	12–14	38–41	68–82	2
1	37–39	83–108	15–17	42–44	83–97	3
2	40–42	109–127	18–20	45	98–112	4
5	43–45	128–145	21–29	46	113–121	5
9	46–48	146–161	30–36	47	122–129	6
16	49–52	162–166	37–40	48	130–133	7
25	53–54	167–170	41–42	49	134–136	8
37	55–56	171–173	43–44	50	137–138	9
50	57–58	174–175	45–46	51	139	10
63	59–60	176	47	52	140	11
75		177	48		141	12
84		178			142	13
91					143	14
95					144	15
98						16
99						17
>99						18
>99						19
>99						20



B
APPENDIX

Converting Sums of Standard Scores to Percentiles and Quotients

Table B.1
Converting Sums of Subtest Standard Scores to Percentiles and Quotients

Percentile Rank	Total Motor (5 Subtests)	Gross Motor (3 Subtests)	Fine Motor (2 Subtests)	Quotient
>99	>95	—	—	165
>99	—	60	—	164
>99	—	59	—	162
>99	95	—	—	161
>99	94	58	40	160
>99	93	57	—	158
>99	92	—	39	157
>99	91	56	—	156
>99	90	55	38	154
>99	89	—	—	153
>99	88	—	—	152
>99	—	54	37	151
>99	87	—	—	150
>99	86	53	—	149
>99	85	—	36	148
>99	—	52	—	147
>99	84	—	—	146
>99	83	51	35	145
>99	82	50	—	143
>99	81	—	34	142
>99	80	49	—	141
>99	79	48	33	139
>99	78	—	—	138
>99	77	—	—	137
>99	—	47	32	136
99	76	—	—	135
99	75	46	—	134
99	74	—	31	133
99	—	45	—	132
98	73	—	—	131

(*continues*)

Table B.1 *Continued.*

Percentile Rank	Total Motor (5 Subtests)	Gross Motor (3 Subtests)	Fine Motor (2 Subtests)	Quotient
98	72	44	30	130
97	71	43	—	128
97	70	—	29	127
96	69	42	—	126
95	68	41	28	124
94	67	—	—	123
93	66	—	—	122
92	—	40	27	121
91	65	—	—	120
90	64	39	—	119
89	—	—	26	118
87	63	38	—	117
86	62	—	—	116
84	61	37	25	115
81	60	36	—	113
79	59	—	24	112
77	58	35	—	111
73	57	34	23	109
70	56	—	—	108
68	55	—	—	107
65	—	33	22	106
63	54	—	—	105
61	53	32	—	104
58	52	—	21	103
55	—	31	—	102
53	51	—	—	101
50	50	30	20	100
45	49	29	—	98
42	48	—	19	97
39	47	28	—	96
35	46	27	18	94
32	45	—	—	93

(*continues*)

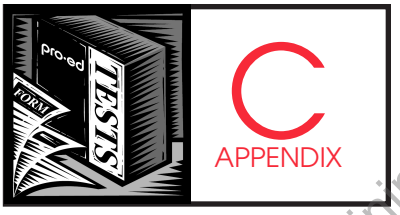
Table B.1 *Continued.*

Percentile Rank	Total Motor (5 Subtests)	Gross Motor (3 Subtests)	Fine Motor (2 Subtests)	Quotient
30	44	—	—	92
27	—	26	17	91
25	43	—	—	90
23	42	25	—	89
21	41	—	16	88
19	—	24	—	87
18	40	—	—	86
16	39	23	15	85
13	38	22	—	83
12	37	—	14	82
10	36	21	—	81
8	35	20	13	79
7	34	—	—	78
6	33	—	—	77
5	—	19	12	76
5	32	—	—	75
4	31	18	—	74
3	30	—	11	73
3	—	17	—	72
3	29	—	—	71
2	28	16	10	70
1	27	15	—	68
1	26	—	9	67
1	25	14	—	66
<1	24	13	8	64
<1	23	—	—	63
<1	22	—	—	62
<1	—	12	7	61
<1	21	—	—	60
<1	20	11	—	59
<1	19	—	6	58
<1	—	10	—	57
<1	18	—	—	56

(*continues*)

Table B.1 *Continued.*

Percentile Rank	Total Motor (5 Subtests)	Gross Motor (3 Subtests)	Fine Motor (2 Subtests)	Quotient
<1	17	9	5	55
<1	16	8	—	53
<1	15	—	4	52
<1	14	7	—	51
<1	13	—	3	49
<1	12	6	—	48
<1	11	—	—	47
<1	—	—	2	46
<1	10	5	—	45
<1	9	—	—	44
<1	8	4	—	43
<1	7	3	—	41
<1	6	—	—	40
<1	5	—	—	38



Converting Raw Scores to Age Equivalents

St = Stationary
Lo = Locomotion
Re = Reflexes
Ob = Object Manipulation
Gr = Grasping
Vi = Visual–Motor Integration

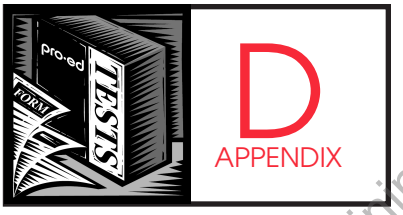
Table C.1
Converting Raw Scores to Age Equivalents

Age Equivalent in Months	PDMS–2 Subtests						Age Equivalent in Months
	Re	St	Lo	Ob	Gr	Vi	
1	1	1-12	1-7	—	1-8	1-7	1
2	2	13-15	8-11	—	9-11	8-12	2
3	3	16-18	12-16	—	12-14	13-16	3
4	4	19-21	17-22	—	15-19	17-19	4
5	5-6	22-24	23-27	—	20-24	20-22	5
6	7-10	25-26	28-33	—	25-28	23-28	6
7	11-12	27-29	34-39	—	29-31	29-34	7
8	13	30-31	40-47	—	32-33	35-39	8
9	14	32-33	48-54	—	34-35	40-45	9
10	15	34-35	55-60	—	36	46-52	10
11	16	36	61-64	—	37	53-58	11
12	—	—	65-68	1-4	38	59-64	12
13	—	—	69-71	5-6	39	65-68	13
14	—	37	72-76	7	40	69-72	14
15	—	—	77-80	8-9	41	73-75	15
16	—	—	81-84	10	—	76	16
17	—	—	85-88	11	—	77-78	17
18	—	38	89-91	12	—	79-81	18
19	—	—	92-93	13	—	82-84	19
20	—	—	94-96	14	42	85-86	20
21	—	39	97-98	15	—	87-88	21
22	—	—	99-102	16-17	—	89-90	22
23	—	—	103-107	18-19	—	91-94	23
24	—	—	108-109	20	—	95	24
25	—	—	110–112	21	—	96–97	25
26	—	—	113–114	22	—	98	26
27	—	—	115–116	23	—	99–100	27
28	—	40	117–119	24	43	101–102	28
29	—	—	120–122	25	—	103	29
30	—	—	123–124	26	—	104–105	30
31	—	—	125–127	—	—	106–107	31
32	—	—	128–129	27	—	108	32
33	—	41	130–131	28	—	109	33
34	—	—	132–134	29	44	110–111	34
35	—	42	135–136	—	—	112	35
36	—	—	137–138	30	—	113	36

(*continues*)

Table C.1 *Continued.*

Age Equivalent in Months	PDMS-2 Subtests						Age Equivalent in Months
	Re	St	Lo	Ob	Gr	Vi	
37	—	43	139–141	31	45	114–115	37
38	—	44	142–143	32	—	116	38
39	—	—	144	33	—	117–118	39
40	—	45	145–146	34	46	119–120	40
41	—	46	147	35	—	121–122	41
42	—	—	148	—	—	123	42
43	—	47	149	36	47	124	43
44	—	—	150	37	—	125	44
45	—	—	151–152	—	—	—	45
46	—	48	153–154	38	48	126	46
47	—	—	155	39	—	127	47
48	—	49	156–157	40	—	128	48
49	—	—	158–159	—	49	129	49
50	—	50	160–161	41	—	130	50
51	—	51	162	—	—	131	51
52	—	—	163–164	42	—	132	52
53	—	52	165–166	—	—	133	53
54	—	—	167	—	—	—	54
55	—	53	—	—	50	134	55
56	—	—	168	43	—	—	56
57	—	—	169	—	—	135	57
58	—	54	—	—	—	—	58
59	—	—	170	—	—	136	59
60	—	—	—	44	—	—	60
61	—	55	171	—	—	—	61
62	—	—	—	—	—	137	62
63	—	—	172	—	51	—	63
64	—	56	—	—	—	—	64
65	—	—	173	—	—	138	65
66	—	—	—	45	—	—	66
67	—	57	174	—	—	—	67
68	—	—	—	—	—	139	68
69	—	—	175	—	—	—	69
70	—	58	—	—	—	—	70
71	—	—	—	46	52	140	71
>71	—	>58	>175	>46	—	>140	>71



APPENDIX D

Converting Standard Scores and Percentiles to z-Scores

Table D.1
Converting Standard Scores and Percentiles to z-Scores

Percentile	z-Score	PDMS–2 Quotient	PDMS–2 Subtest
99	4.33	165	
99	4.27	164	
99	4.20	163	
99	4.13	162	
99	4.07	161	
99	4.00	160	
99	3.93	159	
99	3.87	158	
99	3.80	157	
99	3.73	156	
99	3.67	155	
99	3.60	154	
99	3.53	153	
99	3.47	152	
99	3.40	151	
99	3.33	150	20
99	3.27	149	
99	3.20	148	
99	3.13	147	
99	3.07	146	
99	3.00	145	19
99	2.93	144	
99	2.87	143	
99	2.80	142	
99	2.73	141	
99	2.67	140	18
99	2.60	139	
99	2.53	138	
99	2.47	137	
99	2.40	136	
99	2.33	135	17
99	2.27	134	
99	2.20	133	

(*continues*)

Table D.1 *Continued.*

Percentile	z-Score	PDMS–2 Quotient	PDMS–2 Subtest
99	2.13	132	
98	2.07	131	
98	2.00	130	16
97	1.93	129	
97	1.87	128	
97	1.80	127	
96	1.73	126	
95	1.67	125	15
95	1.60	124	
94	1.53	123	
93	1.47	122	
92	1.40	121	
91	1.33	120	14
90	1.27	119	
89	1.20	118	
87	1.13	117	
86	1.07	116	
84	1.00	115	13
82	0.93	114	
81	0.87	113	
79	0.80	112	
77	0.73	111	
75	0.67	110	12
73	0.60	109	
70	0.53	108	
68	0.47	107	
65	0.40	106	
63	0.33	105	11
61	0.27	104	
58	0.20	103	
55	0.13	102	
53	0.07	101	
50	0.00	100	10
47	−0.07	99	

(*continues*)

Table D.1 *Continued.*

Percentile	z-Score	PDMS-2 Quotient	PDMS-2 Subtest
45	−0.13	98	
42	−0.20	97	
39	−0.27	96	
37	−0.33	95	9
35	−0.40	94	
32	−0.47	93	
30	−0.53	92	
27	−0.60	91	
25	−0.67	90	8
23	−0.73	89	
21	−0.80	88	
19	−0.87	87	
18	−0.93	86	
16	−1.00	85	7
14	−1.07	84	
13	−1.13	83	
12	−1.20	82	
10	−1.27	81	
9	−1.33	80	6
8	−1.40	79	
7	−1.47	78	
6	−1.53	77	
5	−1.60	76	
5	−1.67	75	5
4	−1.73	74	
3	−1.80	73	
3	−1.87	72	
3	−1.93	71	
2	−2.00	70	4
1	−2.07	69	
1	−2.13	68	
1	−2.20	67	
1	−2.27	66	
1	−2.33	65	3

(*continues*)

Table D.1 *Continued.*

Percentile	z-Score	PDMS–2 Quotient	PDMS–2 Subtest
1	−2.40	64	
1	−2.47	63	
1	−2.53	62	
1	−2.60	61	
1	−2.67	60	2
1	−2.73	59	
1	−2.80	58	
1	−2.87	57	
1	−2.93	56	
1	−3.00	55	1
1	−3.07	54	
1	−3.13	53	
1	−3.20	52	
1	−3.27	51	
1	−3.33	50	
1	−3.40	49	
1	−3.47	48	
1	−3.53	47	
1	−3.60	46	
1	−3.67	45	
1	−3.73	44	
1	−3.80	43	
1	−3.87	42	
1	−3.93	41	
1	−4.00	40	
1	−4.07	39	
1	−4.13	38	