University of Alberta

The Development of a Movement Competence Assessment Instrument for Playground Skills

by

Andreea Ingrid Mohora ©

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ABSTRACT

The purpose of this study was to create a movement competence assessment tool based on grade that would provide useful information to assist teachers and parents in instructing the essential skills needed by children to participate in recess activities. For this, the movement competence assessment was based on an ecological task analysis approach that was shown to better apply to playground activities. After determining the most common pieces of apparatus on the playground that provided us with the playground task goals, we established the skills with social relevance for children on the playground through observations. Following that, over 85 illustrations representing the movement solutions observed were created and tested. The results of the assessment of 147 children from K-3 displayed an overall progressive increase between the children's performances in each grade, confirming an enhancement in skill repertoire as children mature. The data obtained throughout this study led us to conclude that we developed a valid playground movement competence assessment protocol for K-3.

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CHAPTER 1
INTRODUCTION

Recess is an important time in children's early school years, when they are given the opportunity to participate in activities without the normal teacher influences. During this free time, many of them engage in dynamic activities, which require a certain level of movement competence. If this competence is lacking for various reasons, children are at risk of becoming isolated by their peers, being teased and bullied, or voluntarily withdrawing from the activities because they cannot do what the others do. It is important for parents and teachers to understand if the children have the necessary skills to engage in the playground activities, as well as it is essential to know which these skills are. It is the nature of these issues that prompted the current study.

1.1 Purpose

While other studies look at the performer's psychological characteristics and involvement in the playground activities, the current study tries to determine which are the most common skills used by children from kindergarten to grade 3, on four chosen categories of playground equipment. We assume that the movement skills repertoire needed on the playgrounds expands as children mature, based on ecological theories (Burton & Davis, 1996; Watkinson & Causgrove-Dunn, 2003). Therefore, the purpose of the present research was to create a movement competence assessment tool based on grade that would provide useful information to assist teachers and parents in instructing the essential skills needed by children to participate in recess activities. As Watkinson (personal communication, September 2006) stated: "if parents can teach their children how to read before they go to school, they should also teach them the movement skills needed on the playground."

To accomplish the above goal, the movement competence assessment was based on an ecological task analysis (ETA) approach, which is considered an informal assessment approach as opposed to the standardized or formal

approaches (Burton & Miller, 1998), and will complement the screening protocol (ADL-PP) already developed by Watkinson, Causgrove-Dunn, Cavaliere, Canzonetti, Wilhelm, Dwyer, (2001a). The ADL-PP screens for children who are at risk of not participating fully on the playground. The proposed assessment instrument will eventually be used to test the movement competence of children at such risk and provide direction for parents and teachers.

1.2 Significance

Playgrounds represent an important place where children spend an important amount of time during and after school. Currently, little attention is paid to the assessment of children's physical activity on the playground. Reduced physical activity increases childhood obesity with significant socio-emotional costs of not being involved. The present study developed an assessment instrument that can assist people in closest contact with children (parents and teachers) to help them be active.

The instrument was developed using an ETA approach, an informal assessment procedure, which, as Burton and Miller (1998) state, offers "more flexibility in determining the actual skills of the persons being tested" (p. 101). Furthermore, the instrument focuses on skills with social relevance for the children and, consistent with ETA, the tool will provide many movement solutions rather than one prescribed movement solution.

ETA implies a constant interaction between individual, task and environment, which means that if one factor changes, there will be a change in the other two as well. That is why, using an ETA approach, our instrument will allow further changes depending on factors such as: the improvement of the playgrounds over time, the specific equipment available on a local school playground, or what apparatus or skills are more popular among children at a certain time. In other words, the instrument has the great advantage of allowing to be updated anytime or adapted to present conditions, populations, equipment, or other situations. For example, if children create or develop new skills at a certain time, or if new playground equipment is constructed, the researchers can easily

include a new illustration in the assessment instrument to accommodate for the change.

1.3 Delimitations

The present study is delimited to four pieces of equipment (slides, swings, horizontal bars, and climbing apparatus) which were found to be the most relevant on 97% of the playgrounds surveyed in Edmonton, Saskatoon and Regina, as of January 2006. In addition, the study is delimited to children from kindergarten to grade 3 because children in these grades use the playground equipment for recess, while starting in grade 4, it has been observed that games and other activities are more frequently played in open fields and spaces.

1.4 Limitations

The present study was conducted by research assistants with background in physical education which might have limited the research, since the goal is to have the parents or teachers use the outcome. Further, only one particular school was used to collect data, which did not allow us to assess different types of populations. In addition, collecting data from only one school means we were not able to observe different playgrounds with different playing equipment.

CHAPTER 2
REVIEW OF LITERATURE

Historically, assessment tools have been created and developed to measure a variety of characteristics (e.g., psychological, physical, mental etc.). With time, they have been improved and have taken different forms, with some of them being more formal than others. The standardized assessment instruments are employed more often during appraisals compared to the non standardized tools. The following sections will introduce both standardized and non standardized assessment devices and will discuss the advantages and disadvantages of both approaches to assessment, with an emphasis on ecological task analysis approach.

2.1 Assessment instruments

2.1.1 Definitions

In order to collect information regarding a characteristic or a certain parameter, one needs to make use of tests or assessment instruments. Both Bouffard (2003) and Burton and Miller (1998) make a distinction between tests and assessments. Bouffard (2003) explains that tests are "standardized procedures conducted for examining some characteristics of people" (p. 164) which generate a measure. Following the same note, Burton and Miller (1998) define tests as "procedure or set of procedures used to obtain measurements or data" (p. 63).

Assessments, in Bouffard's (2003) view, engage more techniques (that sometimes could be tests), rely on observations as major means to collect the data, and imply a summary of the findings. Burton and Miller (1998) define assessments as "assignment of numbers to attributes or characteristics of persons, objects or events according to explicit formulations or rules" (p. 62).

Both tests and assessments have been employed considerably in collecting data for a long time. Researchers have always tried to create and develop newer and more efficient ways to examine different aspects of life. Further, a short history of the roots and development of different movement-related assessment instruments will be reviewed, as addressed by Burton & Miller (1998).

2.1.2 History of Movement Related Assessment Instruments

As Burton and Miller (1998) state, the assessment of movement skills has shifted directions throughout the years. Early evidence indicates that movement assessment tools were used for military service or other requirements well before the 17th century. Further, the authors affirm that the period between 1850 and 1899 was dominated by assessments in the areas of neurology and medicine, while the area of physical education was just emerging. During this time, the assessments used in physical education focused on physical efficiency through anthropometric measurement and strength testing, with diverse usage in occupations and businesses such as police, fire departments, or railroad corporations (Burton & Miller, 1998).

Between 1900 and 1920, Burton and Miller (1998) explain that psychologists and physical educators were the ones interested in movement assessment. More specifically they were interested in studying the relationship between cognition and movement. At the beginning, these ability tests had an emphasis on fine-motor, manual dexterity such as tapping (Burton & Miller, 1998). Later on, speed and endurance started to be tested, as well as other physical achievement tests such as: run, low hurdles, high and long jump, shot put, rope climb, baseball throw, swim, tumbling and posture (Burton & Miller, 1998). The authors state that these physical achievement tests were an indicator of physical efficiency.

The period 1920-1944 seems to be the most prolific for the development of assessment instruments, instruments that constitute the base for more recent assessment tools. During this time, more interest in movement assessment was shown by psychologists, neuropsychologists, occupational and physical therapists. According to Burton and Miller (1998), in physical education two categories of tests were published during this period: "tests of motor capacity, efficiency, or ability, usually involving a single index or composite score" (p. 19), and "tests of movement skill achievement, with each item interpreted separately" (p. 19). In the first category, one of the most known tests developed during this time is Brace Scale of Motor Ability Tests which, among other applications, was used to

examine native ability rather than acquired ability (Burton & Miller, 1998). Many other tests were developed during the following years, looking at different aspects such as physical capacity, neuro-muscular skill capacity, general motor capacity, motor educability, however all seem to have their foundation in Brace Scale (Burton & Miller, 1998).

In the second category of tests (tests of movement skill achievement), Burton and Miller (1998) mention that tests developed between 1920 and 1944 evaluated students' achievement in activities specified in the physical education curricula at that time, measuring items related to strength, individual athletic events, and team sport skills. Towards 1940s, Burton and Miller (1998) acknowledge Gutteridge, who developed a scale for the assessment of the quality of movement skills, combined with documented environmental features that might affect a person's performance, such as weather, location and social context. The skills included were: hopping, jumping, skipping, climbing, tricycling, throwing and catching (Burton & Miller, 1998). In this way, Gutteridge acknowledged, as ETA does today, the interaction of the child, the task, and the environment in the product of a movement.

In the area of child development, Burton and Miller (1998) acknowledge Gesell and Bayley who "laid the foundation for the assessment of motor skills in infants and young children" (p. 24), developing tests that assessed infant motor abilities (Burton & Miller, 1998). Burton and Miller mention 'Bayley Scales of Infant Development' as one of the most used test at that time and up to 1980s. Later on, researchers started to develop scales and measure gross motor coordination and motor development in children (Burton & Miller, 1998).

In occupational therapy and physical therapy, the assessment tools developed between 1920 and 1944 were used to evaluate the application of therapies, record the behaviors, as well as assess the activities of daily living for persons with disabilities (Burton & Miller, 1998). Further, Burton and Miller (1998) acknowledge the publication of 'Oseretsky Tests of Motor Proficiency' in the area of neuropsychology, which constituted another foundation for later motor ability tests. Oseretsky Test was "designed to measure the degree of clumsiness

or awkwardness in children" (Burton & Miller, 1998, p. 28).

Burton and Miller (1998) state that between 1945 and 1959 new assessment instruments were developed in the areas of occupational and physical therapy, while less and less interest was shown in physical education. The authors argue that a shift from the sport skills toward physical training and fitness was noticed during that time (Burton & Miller, 1998). Further, Oseretsky Test was translated and modified all over the world, and one of the still popular adaptations published during that period, according to Burton and Miller, is 'Bruininks-Oseretsky Test of Motor Proficiency'. In occupational and physical therapy, new assessment instruments were developed, instruments focused on daily living functional movements/activities and as well as on the "application of standard motor development assessment methods to children with physical disabilities" (Burton & Miller, 1998, p. 32). However, the tests developed during this period were based on previous assessment instruments such as Gesell's studies (Burton & Miller, 1998).

After 1960, as Burton and Miller (1998) notice, the occupational and physical therapy focus shifted toward a more preventive medical point of view with a provision of comprehensive health care services. The change increased the demand for movement assessment instruments with a focus on the nature of disability and the range and level of functioning abilities (Burton & Miller, 1998). Further, Burton and Miller categorize the new assessment instruments developed in occupational and physical therapy area into: motor development tests, functional movements tests, and tests for sensory integration.

Special education during that period (1960-1974) encountered an increase in the area of motor development due to the fact that researchers saw an enhanced connection between intellectual aptitude and movement skills (Burton & Miller, 1998). Some of the most known instruments developed during this period, as stated by Burton and Miller, were: Purdue Perceptual-Motor Survey (teacher tool aimed to identify children with perceptual-motor inabilities who needed different than the usual instructional methods to acquire the academic skills), and other modifications of the Oseretsky tests: Test of Motor Impairment (TOMI), which

later became Movement Assessment Battery for Children Test (MABC), a Short Form of the Oseretsky Test of Motor Proficiency, Modified Lincoln-Oseretsky Motor Development Scale, K.D.K.-Oseretsky Tests of Motor Development (Burton & Miller, 1998).

In the area of pediatrics/child development/neurology a few assessment instruments were developed between 1960-1974 among which there was Denver Developmental Screening Test (Burton & Miller, 1998). This test, which became the most popular developmental screening instrument according to Burton and Miller (1998), was employed for diagnosing delayed development in children from birth to 6 years in four areas: gross motor, language, fine motor-adaptive, and personal-social (Burton & Miller, 1998). Later on, the test was revised and became Denver II. Burton & Miller (1998) mention other tests developed during this period, such as: Bayley Scales of Infant Development (later revised as Bayley-II), with roots in Bayley's California Infant Scale of Motor Development from 1935.

The assessment tools developed after 1975 had their roots in the tests developed before that year, e.g., Denver II, Bayley II, or Bruininks-Oseretsky Test of Motor Proficiency (Burton & Miller, 1998).

All the above assessment instruments, and many others, were created and conducted for different purposes. The following section reviews some of these reasons.

2.1.3 Reasons for conducting assessment

Bouffard (2003) provides six reasons for carrying out assessments: knowing a subject, screening, placing people into groups, determining progress, diagnosing, and comparing with others or against a norm. The reasons provided by Bouffard (2003) are very similar to the five motives presented by Burton and Miller (1998): "categorize or identify, plan treatment or instructional strategies, evaluate change over time, provide feedback to the performer" (p. 6) or other party, and predict.

Bouffard (2003) explains that getting to know the subject/participant/ learner is important for the purpose of decision-making in regards to his/her future intervention, which Burton and Miller (1998) refer to as planning the treatment or the instructional strategies (e.g., limitations, foundation, objectives). Similarly, the assessment tools used for screening, according to Bouffard (2003), offer fast and efficient means to collect data, and they are also employed for the purpose of decision-making such as: verify the positive effectiveness of the program used (in other words evaluate the change over time), or determine (categorize or identify) the groups or the developmental activities one should participate in (Bouffard, 2003; Burton & Miller, 1998).

In addition, according to Bouffard (2003), the assessment instruments having diagnosis as a purpose, imply an exhaustive and methodical collection of data with the purpose of determining, with precision, an individual's potential, limit, or specific needs. Further, Bouffard (2003) states that diagnosis is not always medical and it does not necessarily suggest a syndrome. Once a diagnosis is decided upon, feedback can be provided to the individual personally, to the parents or other parties interested (Burton & Miller, 1998).

A further reason for conducting assessments in Bouffard's (2003) view is to compare against other individuals (norm-referenced measurement) or against a criterion (criterion-referenced measurement), comparisons that can lead to predictions of later outcomes (Burton & Miller, 1998). These two concepts will be discussed in the next section.

Independent of the fact that assessment instruments have different reasons for being employed and different professionals applying them, they can also be classified as standardized and non-standardized instruments. The following sections review these two types and comment on the underlying assumptions.

2.2 Standardized assessment approaches

2.2.1 Types

Many areas of research (e.g., education, psychology, physical activity, occupational and physical therapy) use traditional/standardized categories of

assessment. Bouffard (2003) defines the standardized tests as "instruments administered under controlled conditions" (p. 166), in other words "developed following a careful standardization procedure" (p. 166). Traditional standardized instruments, according to Burton and Miller (1998) include norm-referenced and criterion-referenced tests, and formal and informal tests.

According to Burton and Miller (1998), in norm-referenced assessment an individual's performance is compared to the performance of a norm or a normative group, while in criterion-referenced assessments an individual's performance is compared to a predetermined criterion or, as Bouffard (2003) states, with "a desired level of mastery" (p. 166). Norm-referenced tests permit the determination of an individual's position relative to his/her peers, and the raw performance scores are usually converted into relative scores (e.g., Z-scores, standardized scores, or percentiles) (Burton & Miller, 1998). On the other hand, criterion-referenced tests, as stated by Burton & Miller (1998), provide a more individualized approach to assessment by indicating what an individual is able or not able to do, using absolute rather than relative scores (e.g., yes/maybe/no, or pass with consistency/pass with inconsistency/not pass) (Burton & Miller, 1998). However, Burton and Miller argue that a criterion-referenced test could serve the same purpose of a norm-referenced test if the criterion-referenced scores are expressed in terms of means, standard deviations, percentiles, or other types of normative scores.

Burton and Miller (1998) emphasize that norm-referenced assessment instruments are product or outcome oriented, versus process-oriented as are criterion-referenced instruments. In other words, in norm-referenced assessment tools the scores are obtained from performing the skill and focus on elements such as time, distance, or number of repetitions, while in contrast, the criterion-referenced assessment instruments are process-oriented examining the way the skill was performed, while providing information regarding poor performance (Burton & Miller, 1998).

Burton and Miller argue that while norm-referenced assessment instruments are used for the purpose of screening, determining eligibility and

placement, or evaluating programs, the criterion-referenced measurements are employed to assist with the execution of individualized instructional programs, certify competency, plan instruction/ therapy, or evaluate progress (Burton & Miller, 1998).

According to Burton and Miller, norm-referenced movement skill instruments have their roots in Gesell's work on developmental milestones (as related to concept of the "normal" child) and Bruininks-Oseretsky Test of Motor Proficiency is one example of norm-referenced tests, as it requires standard scores. Burton and Miller give I CAN program as an example of criterion-referenced assessment tools, where the scoring criteria are: X = achieved, 0 = not achieved for the assessment, and Ø = achieved, Ø = not achieved for the reassessment.

Further, Burton and Miller (1998) make a distinction between formal and informal assessment tools. The formal instruments are defined by the authors as "tests with standardized or uniform conditions and directions" (Burton & Miller, 1998, p. 99). In the authors' opinion, the administration under uniform conditions increases their reliability, which allows for consistent comparisons between individuals. Unlike the formal tests, the informal instruments do not involve standardized or uniform conditions, having the advantage of allowing for data collection in more natural settings, as well as for an examination of the influence of the environment on movement performance (Burton & Miller, 1998). Yet, the validity and reliability of the informal tests, according to the authors, makes it difficult to compare results across individuals or those obtained by different examiners.

Burton and Miller (1998) emphasize the fact that any formal test which does not follow the specified administering circumstances becomes an informal test. All norm-referenced tests are, in the authors' opinion, considered formal tests, while criterion-referenced tests may be either formal or informal (**Figure 1**). Burton and Miller list several types of informal tests such as: checklists, interviews, inventories, observations, questionnaires, rating scales and teacher-made tests.

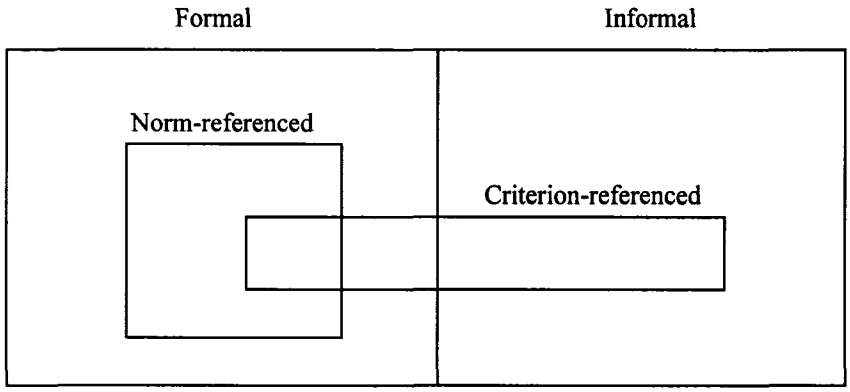


Figure 1. Relationships between formal and informal tests and norm- and criterion-referenced tests (from Burton & Miller, 1998, p. 100)

2.2.2 Implicit assumptions of standardized tests

Choosing a particular assessment instrument implies choosing the assumptions that underlie it (Watkinson & Causgrove-Dunn, 2003). Over the years, a number of assumptions have been made regarding the traditional/ standardized assessment approaches.

As Watkinson and Causgrove-Dunn (2003) state, stage theorists believe that genetics has an important influence in the developing of movement patterns and the performance of many tasks. It is assumed that, if the child is genetically normally developed, the movement patterns are universal, which means that everyone achieves them at some time, in the same order, and they are used consistently once accomplished (Watkinson & Causgrove-Dunn, 2003). Further, stage theorists see certain skills, such as running, jumping, hopping, skipping, throwing, catching, as "fundamental to overall motor development, because they are assumed to be the foundation on which other skills are built" (Watkinson & Causgrove-Dunn, 2003, p. 233) and suggest the genetic programming as the reason for the similarities in movement patterns across people (Watkinson & Causgrove-Dunn, 2003). Many of the current movement competence standardized tests are built on these assumptions, such as the TGMD, which measures children on gross motor abilities that develop between 3 and 10 years of age, and specifically assesses the patterns of performance that change with development. Wiart and Darrah (2001) argue that previous studies found that the scores for

children between five and seven years old increased significantly with age. On the same note, Burton and Rodgerson (2001) assert that skills become less generalized as the particularities of movement skills increase with age during childhood. For example, MABC Performance Test, according to Wiart and Darrah (2001), consists of 32 tasks divided into three sections: manual dexterity, ball skills, static or dynamic balance. These tasks are similar across different ages, but become more difficult as children grow (Wiart & Darrah, 2001).

Further, as Ulrich and Sanford (2000) affirm, the skills assessed by TGMD are related to locomotion such as: run, gallop, hop, leap, horizontal jump, skip and slide, as well as object control such as: striking a stationary ball, stationary dribble, catch, kick, overhand throw, and underhand roll. However, some of these skills (e.g., striking, dribbling), as Watkinson and Causgrove-Dunn (2003) suggest, have not been found to be fundamental in a child's early life. Children up until grade three spend most of their time on the playgrounds (at recess or after school), where they require different skills. In other words, the TGMD may focus on skills with minimal social relevance for some individuals.

A second assumption regarding the standardized assessment instruments, in Watkinson and Causgrove-Dunn's (2003) opinion, is the relatively small number of performance items included in these tools, tools which either reflect developmental milestones (e.g., TGMD) or indicate the fundamental abilities that assist with the performance of all childhood motor skills (e.g., MABC or Bruininks-Oseretsky Test of Motor Proficiency). Burton and Rodgerson (2001) state that the standardized assessment instruments are designed to use the interpretations of their composite scores beyond the specific skills included in the assessment tool. That means the interpretations are generalized beyond the skills assessed. These ideas of reduction in test items and the generalization of the results are explained by Watkinson and Causgrove-Dunn (2003) through the belief that "the performance on one task is predictive of performance on other similar tasks" (p. 234). Furthermore, Burton and Miller (1998) argue that the desired range of behaviors might not be met through the specific conditions and criteria for the tasks in the criterion-referenced assessment instruments. For

instance, throwing a ball at a 36 in. diameter target from 10 ft may not adequately represent all throwing behavior. This could apply equally to norm-based tests.

Watkinson and Causgrove-Dunn (2003) give TGMD as an example of the first type of instruments which reflect developmental milestones and where the assessor records if specific observed aspects of the child's performance are present or not. TGMD consists of twelve fundamental movement skills, known as phylogenetic or developmental milestones, with three to four observable criteria. According to Wiart and Darrah (2001), the child has to perform each skill three times and receives a score of 0 or 1 on each item. 0 is accorded if the criterion is observed on fewer than two of the three trials (Wiart & Darrah, 2001).

MABC Checklist is an example of the latter case, where the instruments indicate the fundamental abilities that assist to the performance of all childhood motor skills and, as Watkinson and Causgrove-Dunn (2003) state, the items measure performance outcomes that are assumed to be a reflection of abilities. According to Burton and Rodgerson (2001), MABC Checklist, compared to most standardized instruments, offers a rough estimate of the general motor abilities, due to the fact that it includes many skills that involve complex performer-environment interactions. The test contains forty eight skills grouped in four person-environment categories of twelve tasks. The four categories include: child stationary – environment stable, child moving – environment stable, child stationary – environment changing, and child moving – environment changing (Burton & Rodgerson, 2001). Thus, in the authors' opinion, composite scores of MABC Checklist might offer the best estimate of general motor abilities among the currently used tests.

Another assumption employed when using standardized tests, according to Watkinson and Causgrove-Dunn (2003), is that even if the environment changes, the individual performance on a task is relatively constant, due to the fact that each person carries stable characteristics such as talents, abilities, or accomplishments. In order to reduce the variance during assessments and only assess the motor skill, the researchers dedicated an increased amount of work to control the environment/context in which the assessments are conducted. That

way any influence on the performance is eliminated. As examples, both MABC and Bruininsky-Oseretsky tests are based on individual assessments in a controlled environment, with the intention of providing uniform testing conditions. However, in day-to-day life the child does not play in that experimental environment, and does not use those skills in the presence of just one person. The child interacts with the environment where he/she plays, interacts with the other children, as well as brings in his/her own emotions.

One last assumption illustrated by Watkinson and Causgrove-Dunn (2003) refers to the data achieved through standardized assessment instruments. An individual's performance is compared to others' performance or to a criterion, both being based on norms that have previously been established. However, this approach does not give any information about a person's specific capabilities, or what are the favorable circumstances that allow the performance (Watkinson & Causgrove-Dunn, 2003). Moreover, Burton and Miller (1998) state that "valid results depend upon appropriateness of the normative group for the individuals being tested" (p. 93).

On the same note, Burton and Miller (1998) state that the type of scores obtained through standardized instruments (e.g., yes/no, or yes/maybe/no) does not allow for insightful information concerning performance differences between individuals, or performance changes within an individual. Furthermore, both Burton and Miller (1998) and Burton and Rodgerson (2001) question the use of raw or relative scores as well as composite scores obtained with these instruments, arguing that they do not offer extensive information regarding the reason for a poor performance or lack of proficiency on one ore more tasks.

Burton and Miller (1998) present another assumption concerning standardized instruments. The authors state that the criteria against which the raw scores are compared are based on the assumption that particular movement patterns are optimal for all persons and the task achievement is more important than the specific movement pattern used to accomplish it. Stated differently, the outcome, rather than the process, defines the movement function. In other words, "persons with physical impairments may be able to successfully perform a task

but use movement patterns considered by some to be abnormal" (Burton & Miller, 1998, p. 99). As an example, ball skills are assessed by both MABC and TGMD tests. While the TGMD is among the few tests that do actually take in consideration the movement pattern and measure it according to movement components (e.g., weight transfer) that are determined by developmental norms, the MABC measures whether the target is hit regardless of the movement pattern (Henderson & Sugden 1992; Ulrich & Sanford, 2000). In addition, if the performance is not executed in a definitive manner, for instance if the target is not hit, the item is 'fouled', potentially putting the performer in a category of movement impairment (Henderson & Sugden 1992; Ulrich & Sanford, 2000). Put differently, the child who can do the task, but does not do it proficiently, is not differentiated from the child who cannot perform it at all. However, in most unstructured settings a child must simply be able to do the task to take part. Movement proficiency may determine the quality of the participation (how well he or she plays) but not whether he or she plays.

As a conclusion, Burton and Miller (1998) assert that these standardized methods "can yield misleading information or fail to provide information about the client's interpretation of the events and the meaning of his or her performance deficits" (p. 329). The author further suggests other approaches, such as ethnography, interviews, and document reviews that would be more useful to obtain extensive information as concerns the performer. In addition, these assessment instruments have not been demonstrated to predict playground participation yet. As Watkinson and Causgrove-Dunn (2003) argue, the playground is the most common activity time for elementary school children in North America. The standardized tests assess so-called "fundamental skills" (e.g., ball skills) that may have minimal or limited relevance on the playgrounds.

2.3 Non-traditional assessment approaches

2.3.1 Ecological task analysis (ETA)

As previously mentioned, unlike the formal tests, the informal instruments do not involve standardized or uniform conditions, having the advantage of

allowing for data collection in more natural settings, as well as for an examination of the influence of the environment on movement performance (Burton & Miller, 1998). Besides the types of informal tests listed by Burton and Miller (1998) (checklists, interviews, inventories, observations, questionnaires, rating scales and teacher-made tests), a more recently developed non-traditional approach is ecological task analysis.

ETA is considered by Balan and Davis (1993) an alternative approach to both teaching and assessing physical education that can be applied to people with or without disabilities. Allowing more choices, ETA is different from the traditional approaches, providing a more individualized form of assessment and subsequent instructional decisions.

According to Davis and van Emmerik (1995), in contrast with the standardized approaches which try to explain, predict and control, ETA is aimed to inform or explain different factors, such as behavior or movement (Davis & van Emmerik, 1995). Similarly, Burton and Davis (1996) argue that in adapted physical education, ETA was designed to connect the theoretical part with the application of research in order to understand the dynamics of movement. Further, both articles argue that ETA is based on "Reed's action theory, Newell and his colleagues' work in the area of skill acquisition, [...] Lee and Warren's work in operationalizing higher-order variables and affordances as applied to the analysis of sport skills and other practical tasks" (Davis & van Emmerik, 1995, p. 11), as well as on Gibson's ecological psychology (where a dynamical system approach is employed to understand and describe the context in which human movement occurs) and theory of affordance (Burton & Davis, 1996; Davis & van Emmerik, 1995). This notion of dynamical systems appears frequently in the literature, and Burton and Davis (1996) explain it as: "the stability and change and the nonlinearity of movement form as a function of the interaction between performer attributes, environmental context, and the intended task goal" (p. 286).

In contrast with the traditional/standardized approaches, ETA theorists, as acknowledged by Balan and Davis (1993), Burton and Davis (1996), Davis and van Emmerik (1995), and Watkinson and Causgrove-Dunn (2003), argue that

motor skills, movement form and performance outcomes are a consequence of the continuous and dynamic interaction of performer, environment, and task. In other words, as Davis and van Emmerik (1995) explain, ETA examines real-world tasks rather than isolated movements, attempting to identify the constraints (limitations and enablements) of the social structure that are related to changes in movement form and outcome. Watkinson and Causgrove-Dunn (2003) define ETA as "a method of assessment and instruction that encourages teachers and others to think about movement performance in terms of the independent and interactive influences of the task goal, the environment in which the goal is to be achieved, and the characteristics and predispositions of the learner/performer." (p. 231). Therefore the movement patterns and performance outcomes are directly affected if one of the constraints regarding the performer (intentions, feelings, physical capacities), the environment (physical and social), or the task, changes (Burton & Davis, 1996; Watkinson and Causgrove-Dunn, 2003). Supporting this idea, Davis and van Emmerik (1995) state that previous studies showed that affect has an important role in the control of action.

Besides the informal, more natural conditions of administration and use, ETA also differs from most approaches in regards to data collection and what it assesses. Burton and Davis (1993) state that the task goal (performance outcome) is the criterion for measuring performance, compared to the traditional approaches, where the task gets confused with the solution and are both assessed as one. Further, the skills assessed using ecological task analysis are common skills that are frequently used to solve movement problems in situations that arise with some regularity in a particular environment (Watkinson & Causgrove-Dunn, 2003). Furthermore, ETA does not employ the use of composite or relative scores, because one's performance is not compared to a norm or a criterion. Rather the ecological approach looks at if an individual can or cannot perform a task, and the constraints under which the task can be executed, compared to can he/she do it as well as another person. This approach has the potential to allow for a more efficient pattern to be developed for a person in a particular task and environmental context (Burton & Davis, 1996)

2.3.2 Implicit assumptions of ETA

As previously mentioned, each assessment approach comes with underlying assumptions, which is also the case for ETA. Contrasting standardized approaches, ETA offers information about the conditions and the variety of movement patterns used to accomplish a task or a range of tasks (Burton & Miller, 1998). The circumstances (physical, social and emotional) in which the movement is performed are fundamental, supplying both limitations and enablements for the actions (Watkinson & Causgrove-Dunn, 2003). 'Doing' the task is determined by the context and what it affords. In throwing at a target, the social context may demand that the target is hit directly and with a proficient style of performance, like a pitcher, while in another social context throwing and missing the target may be socially acceptable.

In addition, while the traditional tools support the idea that changes in the environment should have no effect on the movement outcomes, the ETA approach sees movement patterns as a result of the interaction between social, emotional, and environmental constraints (Watkinson & Causgrove-Dunn, 2003). Using the ETA approach one can manipulate the environmental constraints to observe the degree of success in completing a task. That could offer valuable information regarding the circumstances in which a person can always, sometimes or never accomplish the task (Burton & Davis, 1996). One typical environmental constraint, for instance, may be the amount of physical support provided by a parent when a child tries to ride a bicycle. Burton and Davis (1996) argue that manipulating performer or environmental variables can also provide important information about what limits certain movement forms which may limit person's movement outcomes.

A second assumption embraced by the ETA supporters refers to the different ways to approach the same task based on the supposition that there is no one best movement form for all individuals. Burton and Davis (1996) argue that a task can have multiple solutions that are determined by the interaction between the performer and the environmental constraints. Davis and van Emmerik (1995) explain this notion through the concept of ecological physics, where "multiple

solutions are required for nonlinear dynamics. In open, dissipative, nonlinear systems, a small perturbation in the system may lead to major changes in the system's behavior" (p. 21).

Allowing for more solutions to a task, ETA theorists presume that there is no one optimal movement form for all persons with or without disabilities (Balan & Davis, 1993; Davis & van Emmerik, 1995). In other words, as Burton and Davis (1996) and Burton and Miller (1998) explain, ETA allows for variation in movement from a standard or 'normal' pattern, variations that are seen as adaptive solutions that should not be corrected. Burton and Davis (1996) consider these variations or adaptations as "a window into the dynamics of a person-action system" (p. 287). This nonprescriptive view is in contrast with the traditional education and therapeutic approaches where, as Burton and Davis (1996) affirm, "variations from normative patterns are considered defective, abnormal or pathological, something to be modified or changed" (p. 293). Stated differently, the ETA approach cannot predict the performance on one task based on the performance of another task (Burton & Davis, 1996).

Another assumption implied by the ETA approach refers to the role genetics plays in movement tasks. In contrast with standardized tests, where it is believed that genetics plays an important role in the developing of movement patterns and performance, ETA implies that capacities and predispositions are not heritable, rather they emerge from previous interactions with tasks and environments (Watkinson & Causgrove-Dunn, 2003). Certainly the child's genetic potential and other acquired characteristics play a role in each of these interactions, however, Burton and Rodgerson (2001) argue that genetics have an influence more on movement skill foundations (such as strength, balance, flexibility, coordination (Burton & Miller, 1998)) and not directly on the movement skills. According to Burton and Rodgerson (2001), these movement skill foundations may both enable or limit different movement skills. The authors explain that in ETA approach, as opposed to the traditional approaches, "motor abilities are generalized across skills, while movement skill foundations are skill specific" (Burton & Rodgerson, 2001, p. 358). For instance, the authors use

balance as an example of movement skill foundation, which in one case can be a limiting factor (e.g., while rollerblading) but not in a different situation (e.g., riding a bicycle) (Burton & Rodgerson, 2001). Thus the movement skill foundation balance, in Burton and Rodgerson's opinion, is not generalized as an attribute across many skills, rather it is a fundamental feature of a specific skill.

In addition, Burton and Rodgerson (2001) argue that both the environment and genetics could influence movement skill foundations during childhood and adolescence, so they could be responsible for variations in movement performance. The authors explain that "if individuals are found to converge in scores with practice, the theoretical inference is that the skill is environmentally determined (with sufficient task practice, all individuals could perform at similar levels); if individuals are found to diverge in scores with practice, the inference is that the skill is determined by heredity (with respect to performance, the more able show greater improvement than the less able)" (Burton & Rodgerson, 2001, p. 359-360).

In conclusion, ETA, as a non-traditional approach, differs from the traditional methods of assessment and instruction. It provides informal, more natural conditions of administration and use, for data collection and instruction, conditions that invite participation providing more solutions to a task, resulting in goal achievement. It also allows users to examine the influence of the environment on movement performance, as it is a result of the interaction between person, task and environment.

2.3.3 ETA basic steps

Balan and Davis (1993), Burton and Davis (1996), as well as Watkinson and Causgrove-Dunn (2003) describe four steps in the ETA approach to assessment and instruction. These steps are: (a) establishing task goals to be assessed by structuring the physical and social environments, (b) allowing choices of movement solutions, (c) manipulating performer, environmental, or task variables that may influence performance in order to determine the conditions under which goals can be and cannot be met, and (d) providing instruction. This

section will focus mainly on the first two steps (e.g., the task goals, the environment, and the movement solutions) because they played a very important role in creating the assessment instrument for the playground skills. Further, the other steps have been previously discussed.

2.3.3.1 Task goals

In the ETA approach, different from the teacher-directed traditional approaches, the task goal is identified by structuring the physical and social environments, rather than through written, verbal, or demonstrated instructions (Burton & Davis, 1996). This approach minimizes the difficulty of understanding the task goal, creates a more attractive task goal, and presents more possibilities to achieve it, enhancing intrinsic motivation to participate (Burton & Davis, 1996). In Davis and van Emmerik's (1995) opinion, the physical environment refers to objects, surfaces and events, while the social environment is represented by people's actions and the structures that result form them (e.g., social structures, social systems, institutions). The authors state that "the physical environment can exist without a social environment, but the reverse is not true" (Davis & van Emmerik, 1995, p. 12). "All human activities are social and they occur in and are thus dependent upon a physical environment" (Davis & van Emmerik, 1995, p. 12).

According to Watkinson and Causgrove-Dunn (2003), a task goal represents "what we are trying to do", "what is to be accomplished", and "the functional outcome the child wants to perform" (p. 238). Similarly, Burton and Miller (1998) define movement task as the task that "the performer attempts to accomplish" (p. 45).

Burton and Miller (1998) classify task goals in seven categories focused on movement outcomes, different from the five previously described by Burton and Davis (1996). These categories include: *locomotion* (moving from one place to another), *locomotion on an object* (moving on a self-propelled object from one place to another), *propulsion* (propelling a stationary or moving object or person), *reception* (taking or receiving a stationary or moving object or person),

orientation (changing position of body or body part relative to an object, person, terrain, or event, or changing position of object or person relative to body or body part), *machine control* (guiding/regulating an object that produces its own operating energy, e.g., motorcycle), and *play* (movement not as a means or an end function, but as an end in itself) (Burton & Miller, 1998).

In regards to the playground activities, Watkinson and Causgrove-Dunn (2003) found that the categories previously described by Burton and Miller (1998) are not applicable on the playgrounds. Further, Watkinson and Causgrove-Dunn (2003) argue that on a playground, children select the task goals which are made apparent by the physical and social environment. For example, choosing a task goal may be implied or made explicit by the playground equipment as well as it can be influenced by the performer's self interest or by the social relevance of the task goal. In addition, following the idea supported by Burton and Davis (1996) that a task can have multiple solutions determined by the interaction between the performer and the environmental constraints (limitations and enablements), Watkinson and Causgrove-Dunn (2003) state that the playground equipment may afford or constrain the task goal. In other words, affordances and constraints influence task solutions and the choice of task solutions.

Affordances are defined by Watkinson and Causgrove-Dunn (2003) as "what an environment offers to a person in terms of action" (p. 231), while the constraints, either temporary or enduring, do not cause a choice, but "limit the options perceived to be available" (Watkinson & Causgrove-Dunn, 2003, p. 231). Davis and van Emmerik (1995) explain how elements from the physical and social environment have relevant properties that can afford or constrain movement, in relation to the performer's characteristics. For example, surfaces afford support and locomotion, and objects afford manipulation, while social structures can enable or constrain human actions in the same time (Davis & van Emmerik, 1995). In other words, a child might perceive what the playground equipment affords, but the social and affective constraints can influence the choice of task solution. In the same time, ETA theorists (Burton & Davis (1996); Davis & van Emmerik, 1995; Watkinson & Causgrove-Dunn, 2003) argue that a

constraint may be viewed as both limitation and enablement. Davis and van Emmerik (1995) give the example of a flat surface, which can afford walking and running, but limit coasting in a wagon, and eliminate mountain climbing. The author emphasizes the fact that the limitation is related to the individual's traits, which means that if a child can run and hop on the wagon, he/she can ride on that flat surface, while someone who cannot push the wagon would not be able to perform the task (Davis & van Emmerik, 1995). However, even if personal affordances dictate the choice within the ETA approach how the child accomplishes the task does not matter, what matters is if he/she accomplishes it. For example, in hitting a target it is important if the child hits the target, in other words the outcome. What is less important is what the child does to hit the target, that is the movement process or the form.

In conclusion, using the ETA approach the task goals are influenced by the affordances and constraints from the physical and social environments. In addition the playground goals are found to be different from the task goals presented by Burton and Miller (1998), as they are made apparent by the playground equipment and the individual characteristics of the child.

2.3.3.2 Movement solutions

The second step in the ETA approach, as previously mentioned, is represented by allowing choices of movement solutions. Watkinson and Causgrove-Dunn (2003) define 'solutions' as "the skill or form that will be used to meet the goal" (p. 241) and state that "they arise from the child in response to a movement 'problem'" (p. 241).

For example, on the playground the task goals are revealed by the playground equipment (physical environment), that is swings afford the task goal 'play on swings', slides afford 'play on slides'. However, children choose their own way to go down the slide, or their own way to swing depending on the social environment (e.g., what skill is relevant on that playground, or what is important or valued for them). They might choose to go down the slide on knees, or backwards, they might choose to swing alone or with a partner, sitting or

standing. By allowing choices, children do not have only one specific way to accomplish the task goal, rather they focus on reaching the goal.

This concept is different from other assessment tools with a teacher-directed approach where the solutions are suggested through written, verbal, or demonstrated instructions (Burton & Davis, 1996; Watkinson & Causgrove-Dunn, 2003). ETA approach allows children to choose their own means to accomplish a task goal, choices that have a positive impact on the children's motivation and decision making, promoting inclusion. In this way, as Watkinson and Causgrove-Dunn (2003) state, by allowing choices children do not become dependent on an instructor to show them what to do all the time and improves children's attitude toward physical education (Balan & Davis, 1993). Burton and Davis (1996) also argue that "students perform at higher rates and feel better about themselves when given choices" (p. 294).

Another point made by ETA theorists is that, by allowing choices, the assessor or the instructor can identify what children value as well as what the constraints / enablements of their movement option are (Burton & Davis, 1996; Watkinson & Causgrove-Dunn, 2003). In other words which are the circumstances under which the task goal can be achieved, rarely achieved or never achieved (Watkinson & Causgrove-Dunn, 2003).

In conclusion, the ETA approach allows children to select their own solutions to a task goal, based on the assumption that all solutions are equally acceptable. In addition, these choices offer information regarding the circumstances under which the child can or cannot perform a task.

2.4 Summary

Early evidence indicates the use of movement assessment instruments before the 17th century. During the 20th century these assessment instruments have been employed for different reasons in a variety of areas such as: neurology, medicine, psychology, occupational and physical therapy, education, physical education, etc. These reasons include: knowing a subject, screening, placing into

groups, determining progress, diagnosing, plan treatment or instructional goals, and comparing with others or against a norm.

The literature presents two types of assessment approaches: standardized assessment approaches (e.g., norm-referenced and criterion-referenced, and formal and informal tests) and non-standardized assessment approaches (e.g., ETA), each of them coming with their own underlying assumptions.

ETA is a more recent developed approach to assessment and instruction where the motor skills, movement form and performance outcomes are a consequence of the dynamical interaction of performer, environment, and task. This approach involves four steps: (a) establishing task goals to be assessed by structuring the physical and social environments, (b) allowing choices of movement solutions, (c) manipulating performer, environmental, or task variables that may influence performance in order to determine the conditions under which goals can be and cannot be met, and (d) providing instruction. Determining the task goals and considering different choices of movement solutions played a very important role in creating the assessment instrument for the playground skills.

CHAPTER 3
METHODS AND PROCEDURES

Movement theorists argue that movement outcomes "emerge from the collective interaction of many subsystems, both intrinsic to the organism (e.g., biomechanical and neurophysiological characteristics) and extrinsic (including the context and task-specific constraints)" and they "do not preexist as templates in the brain that impose structure on muscle and joint organization" (Ulrich & Ulrich, 1995, p. 1844). An ETA approach would suggest that, consistent with most developmental theories, children's number of skills, range of skills as well as complexity of skills, should increase with age. This increase is based on the accumulation of many experiences from many environments in which the child interacts with the task. As more and more problems are solved and the constraints and affordances change with age and size, children find more solutions (Watkinson & Causgrove-Dunn, 2003).

The current study, as stated in *Chapter 1*, tries to determine which are the most common skills used by children from kindergarten to grade 3, on four chosen categories of playground equipment (swings, horizontal bars, slides, and climber), categories defined as playground task goals. Put differently, the study is designed to determine which specific movement solutions tend to emerge as children experience recess activities after they enter school. While ETA theorists reject a normative approach to movement skill assessment and instruction, it is assumed here that knowing the range of possible movement solutions should help teachers guide or present movement choices, especially for those youngsters who have a limited skill repertoire. These movement solutions are assumed to have social currency for children, as well as important physical and physiological attributes for optimal child development. Further, they are fun to do!

Therefore, the purpose of the present research is to create a movement competence assessment tool based on grade that would provide useful information to assist teachers and parents in instructing the essential skills needed by children to participate in recess activities. Based on the ETA approach, the present tool can

be adapted to any environment and will allow for the selection of task goals and movement solutions to those goals. Consistent with ETA, the tool will provide many movement solutions rather than one prescribed movement solution.

3.1 Methods and participants

The ADL-PP (Watkinson & Causgrove-Dunn, 2001a) provides a protocol for screening children at risk of not participating at recess. The ADL-PP identifies approximately 30 task goals for traditional playgrounds. These task goals are represented by illustrations (line drawings) that are intended to convey an 'abstract' of task goals on the playground.

The purpose of this study is to develop the 'diagnostic' (see Bouffard, 2003) part of the ETA assessment protocol. This requires that all possible movement solutions for each task goal be identified so that a child's movement repertoire can be assessed. For the purposes of this study only a sample of the task goals has been developed. The most common task goals were selected, and movement solutions were developed for each. The following five steps have been pursued in order to accomplish the above objective:

- Step 1 – Identify the most common pieces of apparatus found on the playgrounds (i.e. identify the playground goals)
- Step 2 – Identify all possible task solutions for the playground apparatus selected (i.e. the movement solutions to the task goals)
- Step 3 – Creating illustrations and defining the critical features of the task solutions found; testing with adults
- Step 4 – Verifying the legitimacy of the illustrations – testing with children
- Step 5 – Testing the movement competence assessment protocol for recess skills

Step 1 – Identify the most common pieces of apparatus found on the playgrounds (i.e. identify the playground goals):

In order to identify which are the most frequent/representative pieces of equipment found on the Canadian school-based or city-owned playgrounds, a random visit to approximately thirty playing areas in Edmonton, Saskatoon, and Regina was conducted. Playing on these pieces of equipment was assumed to be the goal of playground participants.

Step 2 – Identify all possible task solutions for the playground apparatus selected (i.e. the movement solutions to the task goals):

To identify all possible task solutions on the playground apparatus selected in Step 1 (slides, swings, horizontal bars, and composite climber) a research team, including under-graduate and graduate physical education students, generated a list of all possible movement solutions for each playground goal. Following this, children were observed on playgrounds, to verify the lists and add more solutions as warranted.

Participants

A group of children from a local school (grades 1-4) was taken out to the playground with the intention of obtaining visual information about potential task solutions. Children attended a free play period with their teachers and students who had previously worked with them in a University lab-based course. Students and teachers interacted as usual with the children on the playground, asking them to show all possible solutions they can do on each piece of equipment. This was a regular educational activity for this group and no *Informed Consent* from the children's parents/guardians was required, since the observers did not interact directly with the children. Children included those from regular classes as well as those from opportunity classes (classes that support children with mild special needs).

Observation conditions

The research team, consisting of nine graduate and undergraduate students and two professors, was distributed around the playground with lists of Task Goals (see **Appendix A**) and possible movement solutions. The observers noted all the activities demonstrated and recorded any additional activities not already on the list. Following the observation period, the students who regularly work with the children from the school were asked if they had observed any additional task solutions that had not already been identified. The supplementary solutions were added to the list. The principal and the teachers from the school had been informed about the observations conducted (see **Appendix B2**) and had given permission for this to occur (see **Appendix B3**). No further interaction took place between the children and the observers.

In summary the following tasks were performed by the research team: create the movement solutions lists, take the children to the playground and observe them, ask the undergraduate students who interact with the children if there were other solutions that they might have seen done but are not on the list, and record the new solutions observed or suggested.

Step 3 – Creating illustrations and defining the critical features of the task solutions found; testing with adults:

Once all possible solutions on the chosen apparatus were known, illustrations that represented the solutions found were created. The illustrations were intended to represent the movement solution without being unnecessarily prescriptive. They were considered to be 'abstracts' that captured the critical features of the skill intended, while communicating that individual children might perform the skill with more or less efficiency or proficiency. The illustrator and the research team worked together to produce black and white drawings that show children in action doing all relevant skills on each piece of apparatus. This study employed the same illustrator who had created similar types of illustrations that had been used successfully in previous studies (see Watkinson et al., 2001; Watkinson & Causgrove-Dunn, 2003). The research team listed the critical

features for each task solution to distinguish one from another. For example, **Figure** 2 represents a task solution for moving forward on a horizontal bar:

The critical features are:

- support weight
- move forward
- hands to different rungs;

Irrelevant features that might be 'read' for this

- knees/elbow bent

Figure 2. Critical features of 'moving forward on horizontal bar'

Once the illustrations were created and the critical features for each of them defined, interviews with adults were conducted. The purpose of these interviews was to ensure that the illustrations were explicit and adults perceived them the same way as the researchers. This is because the ultimate goal of the study is to develop an assessment instrument based on these illustrations, an instrument that would help parents and teachers to provide the appropriate guidance regarding movement solutions on the playground, while requiring little formal preparation. The intent was to have a tool that quickly suggested movement solutions to both teachers and students so that the tool itself could be taken to playgrounds and shared with children there.

Participants and Interview conditions

Three teachers and six parents were selected and the research team conducted the interviews. To recruit parents and teachers, a description of the process was circulated by email (see **Appendix C2**) to individuals in the Faculty of Physical Education and Recreation at the University of Alberta, who were asked to forward it to parents and teachers they knew. The participants had no training in physical activity/education because, as previously stated, the outcome of the current study was to create an assessment instrument that would be used by

adults in different fields. The selection was based on voluntary participation in the study, after signing the *Informed Consent Form* (see **Appendix C4**). The interviews took place in a small interview room in the Adapted Lab (GB-06, Education Building South) at the University of Alberta, or at different locations convenient for the participants. There was no remuneration of any kind for participation in the interviews. The interviews followed an iterative process whereby the chosen parents and teachers were asked to view a selection of illustrations.

The list of illustrations was shown to the participants with the intention of testing whether or not the illustrations communicated what was intended. The participants were further asked to identify the critical features of the movement solutions, and to verify if the movement solution conveyed by the research team was indeed understood. The participants wrote down their answers on the list provided by the researcher.

The following questions were asked: "What is the child doing in this illustration?" "How would you describe what the child is doing in the illustration?"

Due to the fact that the first interviewee described how the skill was performed, including information that preceded or followed the task, the questions were changed for the following participants to: "What is the child doing in this illustration?" "Can you describe the characteristics of this skill?"

Once the interviews were completed, the illustrations were modified as needed, to ensure that they communicate what was intended by the research team. A criterion of 80% agreement across participants was set as the criterion to be accepted as evidence that the illustrations communicated what was intended by the test developer (this issue is addressed in the next step).

Step 4 – Verifying the legitimacy of the illustrations – testing with children:

Once the illustrations used in Step 3 had been modified accordingly, they were tested with children to ensure that they communicated what was intended. The specific purpose of this step was to verify the legitimacy of the illustrations,

in other words to ensure that the illustrations created were perceived by children the same way as they were perceived by adults. Children's perceptions are important because the intended protocol for assessment skills by teachers includes the opportunity for children to demonstrate what they could do simply by looking at the illustrations.

Participants and Procedures

A description of the process was circulated by email (see **Appendix C5**) among selected individuals in the Faculty of Physical Education and Recreation as well as in the Faculty of Education at the University of Alberta. The observations were conducted by the research team (graduate and undergraduate students).

Two children in grade 4, from whom the *Informed Consent Form* (see **Appendix C7**) was received, were selected and taken out to a local playground to demonstrate their interpretations of the movement solutions in the illustrations. Children had the procedures explained to them by a research assistant to be sure they understood what they would be doing during the study. The research assistant checked for understanding and made sure the children understood they were free to withdraw at any time (see **Appendix C8**). The participants had the option of voluntary withdrawal at any time, without any questions asked, and children were free to demonstrate only those skills they wanted to do. There was no remuneration of any kind for participation in the study. Children could withdraw by simply telling the researcher or a student that he or she did not want to take part, or by indicating through any other means that he or she did not want to continue. Personal information would have been removed from the study upon request. The observations took place at the local playground and required approximately 45 minutes. Parents were free to attend the sessions.

Children were taken to the playground and asked if they could tell what the boy/girl in the illustration was doing and then asked if they could perform the skill. Observers recorded whether the child did or did not do the skill as

illustrated. In addition, notes were taken about any responses that reflected a lack of understanding of the skill being illustrated.

Once the observations were completed, the illustrations were modified as needed, to ensure that they communicated what was intended by the research team. A criterion of 80% agreement across all movement solutions and all children was accepted as evidence that children perceived the illustrations the same way as the adults. That level of agreement was consistent with that used for other observational studies of children's behavior in physical tasks (see Watkinson & al., 2001). In concert with the parents' and teachers' agreement it represented an acceptable degree of consensus among children and was consistent with an ecological approach which suggested that individual choices of task solutions should be acceptable when a selected task goal was to be reached.

Step 5 – Testing the movement competence assessment protocol for recess skills:

The final step was to test the resulting comprehensive set of illustrations using an assessment protocol that is comfortable and useful for teachers of children in grades K to 3, establishing which movement solutions were most typically adopted by children in each grade, having in mind the assumption that as children mature, their movement skills repertoires expand (Ulrich & Ulrich, 1995; Watkinson & Causgrove-Dunn, 2003).

Procedures

Using the illustrations created, over one hundred children (boys and girls, grades K-3) were asked to demonstrate as many tasks shown in the illustrations for each piece of apparatus as they were capable of doing. The testing was performed by the research team (professors, graduate and undergraduate students) and the data collection took place on the school playground at times convenient for the teachers. Out of the extensive set of illustrations, only seventy five of them were used because that particular playground did not contain all the pieces of apparatus on the list (e.g., baby swings or tire swings).

Depending on the teachers, either all children in the class were taken to the playground but only those for whom *Informed Consent* (see **Appendix D3**) had been received were assessed, OR only those children for whom *Informed Consent* had been received were taken to the playground, while the rest would remain in the classroom with the teacher. A label system was used to differentiate between the children for whom we received *Informed Consent* and those for whom we did not. Those tested wore identification numbers on their shirts, while those without *Informed Consent* wore a smiley face.

Before starting the assessment, the research coordinator and an assistant went into the classrooms, verified the *Informed Consents* and assigned the appropriate tag to each child. In addition, the research coordinator explained the procedures to be sure the children understood what they were supposed to be doing during the study. The children were told they had the option of voluntary withdrawal at any time, without any questions asked, and they would be free to demonstrate only those skills they wanted to do or they could do. No remuneration of any kind for participation in the study was offered.

Only one class was assessed at one time, and each assessment took approximately one hour. Children from one class were divided into small groups (3-4) with one research assistant for each group. Each research assistant was assigned to one piece of equipment and went to that 'station' with the small group. Once everybody in the group was assessed, groups moved to a different station in a predetermined order.

On the playground, children were asked to look at one illustration at a time, and, if they recognized the task shown, they were asked to demonstrate what the boy/girl in the picture was doing. If a child said he/she did not want or could not demonstrate the movement solution, the research assistant would move to the next illustration, after recording the performance of the other children in the group.

All researchers had extensive experience working with children and were competent to make decisions about asking children to demonstrate skills that were within their capacity. Notes were taken about any support, such as physical help

or further verbal instructions, given for the performance of the task, as well as if the child said he/she could perform the task but did not demonstrate it.

3.2 Data analysis

The data collected during the pilot studies (**Steps 3** and **4**) were analyzed using tables and percentages to illustrate the proportion of agreement between the research team and the participants. The features added by parents/teachers that were not on the research team's list were recorded on the bottom of the corresponding column.

For **Step 4**, a similar table was used to illustrate the percentages of tasks performed by the two children assessed.

The data collected during the final assessment (**Step 5**) was grouped into the following playground task goals: curly slide, straight slide, regular swings, horizontal bars, poles, and climbing equipment. For each task goal we computed an overall percentage of children who demonstrated the task solution with or without help, as well as an overall percentage of children who did not perform the task solution. Within each goal, each skill was evaluated separately using histograms, to illustrate the percentages of movement solutions performed by children in different grades, on different apparatus, with or without help, as well as the percentages of tasks that were not executed.

CHAPTER 4

RESULTS

The results will be presented maintaining the same step-by-step format as in the previous chapter.

Step 1 – Identify the most common pieces of apparatus found on the playgrounds (i.e. identify the playground goals):

The random visit to approximately 30 playing areas in Edmonton, Saskatoon, and Regina demonstrated that the following apparatus are most common: slides, swings, horizontal bars or ladders ('monkey bars'), and composite climber (including vertical or inclined ladders, poles, cargo net/ladder, and ramps with ropes). The difference between playgrounds was represented by the variety of the same apparatus. For example, some large playgrounds had as many as five different slides. However, on approximately 97% of the playgrounds in these cities, the four pieces of equipment above were found. According to Watkinson and Causgrove-Dunn (2003) this equipment affords or offers explicit task goals for the children who play on it. For the development of the assessment protocol the goal was stated as 'play on the swings', 'play on the pole', play on the slide' and so on. This approach is inconsistent with the goals identified by Burton and Miller (1998) and Burton and Rodgerson (1996). A discussion of this inconsistency was presented in **Chapter 2.**

Step 2 – Identify all possible task solutions for the playground apparatus selected (that is the task goals):

The initial list generated by the research team included approximately one hundred and six movement solutions (see **Appendix A**). After the observations pursued at the local playground, the following new tasks were added:

- climbing with partner
- climbing up/down apparatus that has inside and outside possibilities (see **Figure 3**)
- hang and drop from different heights

- moving across suspended apparatus (on feet, on hands and feet, bouncing, using both or one rail, or with no assistance)
- 'getting air' on regular swing
- spin on stomach/back on tire swing
- tire swing, body through middle, legs straddle
- climb on top of baby swing
- jumping over partner

Figure 3. Climbing apparatus with inside and outside possibilities

Step 3 – Creating illustrations and defining the critical features of the task solutions; testing with adults:

Eighty seven illustrated skills underwent examination during this step (see **Appendix E**). The first interviewee described how the child was performing the task rather than defining the critical features. For example, for the task solution 'walking/standing on horizontal bar', the interviewee described how the child crawls up on the bar: "one hand and foot on the rail, the other on the other rail, stand up". As a result, this data was omitted from analysis and the instructions to the following eight participants were made clearer.

The interviews conducted revealed that the critical features agreements ranged from 0% to 100% with an average agreement of 54.67% (see **Table 1**). For a summary of the raw data refer to **Appendix F**. The data do not include the climbing equipment because we did not have illustrations created at the time of testing.

Table 1. Average percentage agreements

Playground equipment	Average percentage agreements
Horizontal bars	60%
Slides	55%
Swings	49%
Average Agreement	**54.67%**

Within person, the descriptions of the illustrations were accurate, with the exception of 1.27%, when one participant gave a second different alternative to the illustration shown, besides the first correct description. For the task solution "moving forward skipping rung" the participant suggested both "swinging forward" as well as "carrying a ladder while running".

Once the interviews were completed, the research team revised the illustrations and modified them as needed. For example, the following illustrations were modified: hanging from one and two hands, hanging from 2 knees, "skin the cat", and spiral pole. The modifications refer to changing the position of a body part, adding moving lines or a second illustration to show the direction of movement or the progress of a task. For example, the illustration 'hanging from one hand' (**Figures 4 and** 5) was changed from this:

Figure 4. Initial 'hanging from one hand'

to this:

Figure 5. Modified 'hanging from one hand'

<u>Step 4</u> – Verifying the legitimacy of the illustrations – testing with children:

Eighty six skills underwent examination during this step. For a summary of the raw data refer to **Appendix G**. The assessments conducted revealed that the children were able to recognize and perform the shown tasks in a proportion of 97.3% (see **Table 2**). Similar with the previous step, the data does not include the climbing equipment because we did not have illustrations created at the time of testing.

Table 2. Average performance percentage

Playground goals	Average performance percentage
Horizontal bars	95%
Slides	100%
Swings	97%
Average Percentage	**97.3%**

Due to the high performance percentage, it was assumed that the illustrations did not need any further modifications, and that further testing with children at this stage was unnecessary. Two of the illustrations shown (5% and respectively 3%) were recognized but not performed by the two children. The task solutions 'skin-the-cat' and 'back-flip off swing' were easily identified, however the two children said they could not demonstrate them. A few other task solutions were recognized but not performed because the playground did not have that particular piece of equipment. However, they were considered demonstrated based on the children's response that they could have performed them.

The following tasks were initially observed as being performed on the playground however, they were not included in further analysis.

- slide down on seat feet over edges, facing backwards on straight slide
- slide down switching from knees to sitting
- slide down backwards on seat, no other contact
- climbing up the slide on seat, hands in contact
- climbing up the slide on feet, no hands in contact
- going down suspended under slide with 2 hands, on curly/tube slide
- walking up and down on the outside edge of curly slide
- two swings wrapped around

The above tasks were either not allowed by the teachers to be performed on their playground, or the equipment used for the assessment did not afford the tasks due to weather conditions or the size of the apparatus. For example, the initial assessment was performed during the winter, when children wore protective thick pants and mitts which helped with the performance of sliding down on knees. During the summer children wore shorts and their legs got

scratched while trying to slide down on knees. In addition, the size of the playground equipment is not constant on every playground, which makes it difficult to perform the same task on every playground.

Step 5 – Testing the movement competence assessment protocol for recess skills:

Initially, one hundred and fifty four (n=154) children were selected to participate in the study (K: n=31, Gr. 1: n=34, Gr. 2: n=46, Gr. 3: n=43). The selection criterion was based on the *Informed Consent* forms. In other words, if the child had the consent form, he/she would participate in the study. However, three children in grade two were absent during the assessment day, and one kindergarten class of four children was not assessed due to time constraints. Further, the number of children included in the testing of seventy five movement solutions varied for each movement solution task, due to time restrictions as well.

The data revealed that overall, between 66.90% and 99.42% (with an average of 79.44%) of the participants performed the skills without any help, between 0.35% and 13.55% (with an average of 5.65%) executed the movement solutions with physical help, and an average of 14.91% (with a range between 0.22% and 25.12%) were not able to perform the indicated tasks. **Table 3** and **Figure 6** illustrate these results.

Table 3. Total average percentages per playground goal

Total average percentages per playground goal

	Did it	Did it with help	Did not do
Straight slide	66.90%	7.98%	25.12%
Curly slide	79.87%	0.61%	19.52%
Horizontal bars	68.25%	13.55%	18.20%
Regular swings	90.94%	0.35%	8.72%
Poles	71.24%	11.05%	17.71%
Climbing equipment	99.42%	0.35%	0.22%
Average:	**79.44%**	**5.65%**	**14.91%**

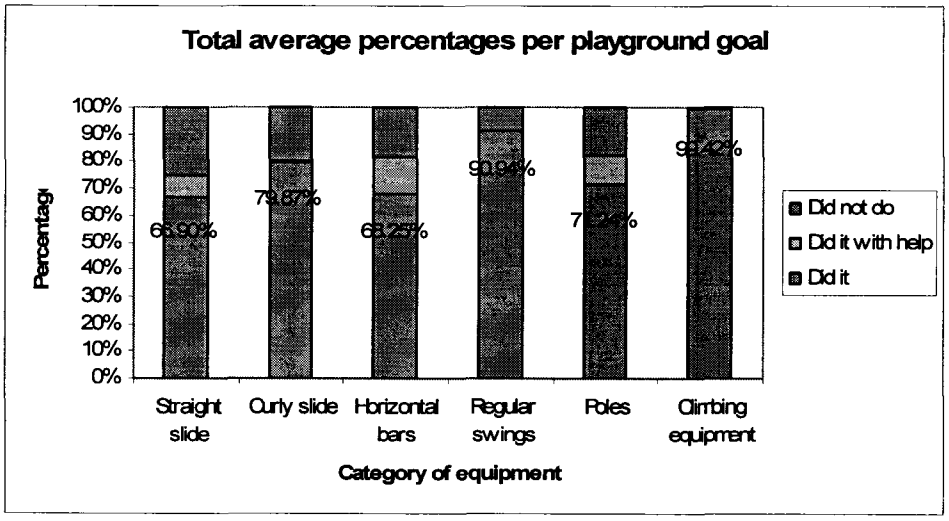


Figure 6. Total average percentages per playground goal

Within each playground goal, the differences between kindergarten and grades 1 to 3 are illustrated in **Table 4** and **Figure 7**. As the data reveal, with the exception of climbing equipment, for all of the other playground goals (slides, swings, poles, horizontal bars) there is an obvious progression in the number of movement skills executed by children in grade 3 compared to those in kindergarten. For the climbing equipment, the data show a very slight variation between the grades. Climbing equipment movement solutions included skills for using an unsteady bridge. On this playground the bridge was steady, wide, and easily accessed by all the children, including those in kindergarten. For a clearer view of the data, **Graph 2** looks only at the average percentage range between 55 and 100.

To better capture and understand what children were able to perform at each grade level, we looked at individual skills versus average performance for each grade. Therefore we graphed the percentages of children who demonstrated the skills with and without help, as well as the percentages of children who did not perform the tasks. Following are the histograms for each movement solution of each playground goal, presented in order of difficulty:

Table 4. Percentage of children in each grade demonstrating all movement solutions for the six playground goals

Percentage of children in each grade demonstrating all movement solutions for the six playground goals (%)

	Did it				Did it with help				Did not do			
	K	Gr. 1	Gr. 2	Gr. 3	K	Gr. 1	Gr. 2	Gr. 3	K	Gr. 1	Gr. 2	Gr. 3
Straight slide	61.69%	69.69%	66.62%	69.59%	10.05%	9.37%	7.18%	5.34%	28.25%	20.94%	26.20%	28.13%
Curly slide	69.05%	70.49%	88.26%	91.69%	0.00%	2.04%	0.00%	0.40%	7.91%	27.47%	11.74%	7.91%
Horizontal bars	56.57%	62.79%	75.11%	75.74%	21.50%	18.94%	9.63%	16.23%	21.94%	18.27%	14.72%	17.69%
Regular swings	85.70%	90.09%	95.81%	92.15%	0.43%	0.00%	0.36%	0.60%	13.88%	9.91%	3.83%	7.25%
Poles	61.20%	70.19%	70.91%	82.66%	5.26%	5.77%	20.31%	12.85%	33.54%	24.04%	8.78%	4.49%
Climbing equipment	99.35%	99.28%	100.00%	99.05%	0.37%	0.72%	0.00%	0.33%	0.28%	0.00%	0.00%	0.62%
Average:	**72.26%**	**77.09%**	**82.78%**	**85.15%**	**6.27%**	**6.14%**	**6.25%**	**5.96%**	**17.63%**	**16.77%**	**10.88%**	**11.01%**

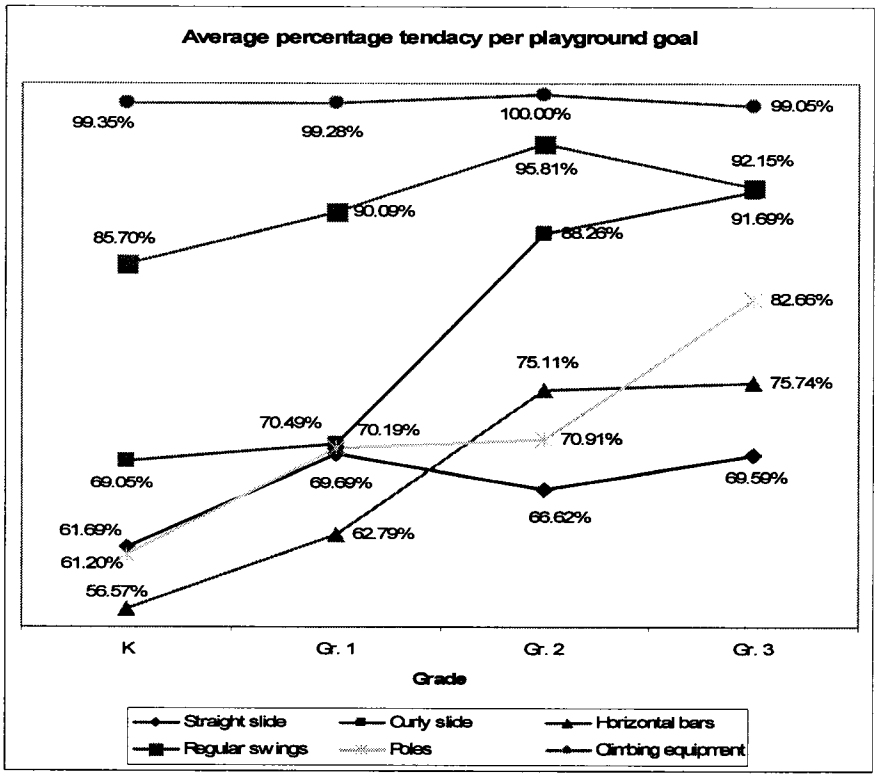
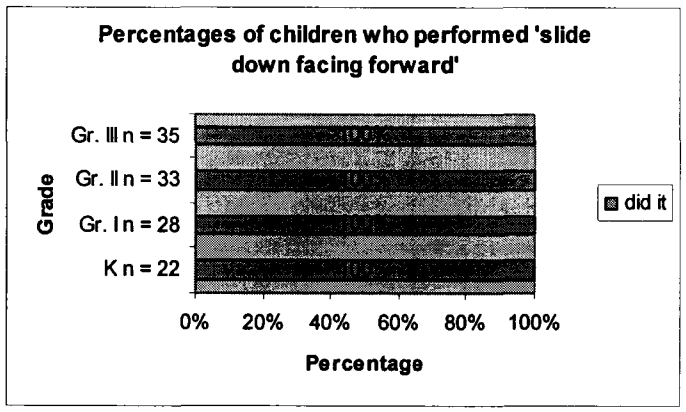
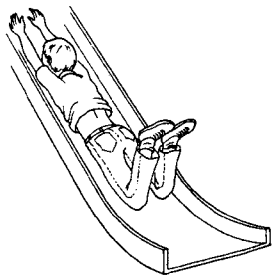
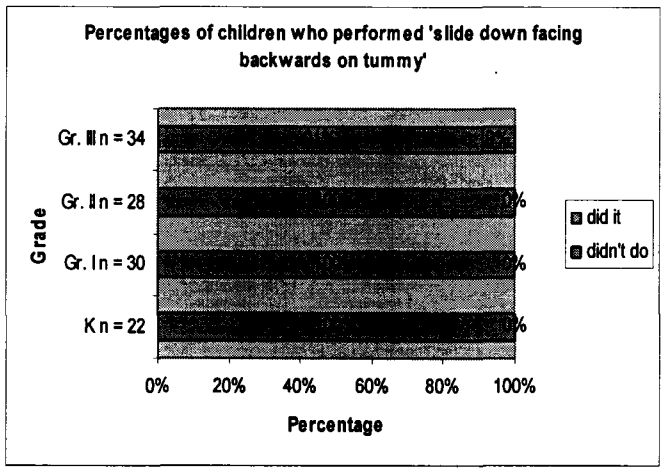


Figure 7. Percentage of children in each grade demonstrating all movement solutions for the six playground goals

Descriptive data for children K-3







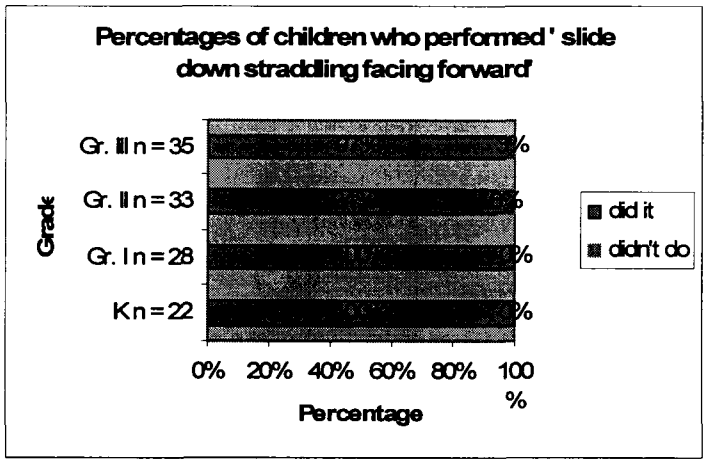
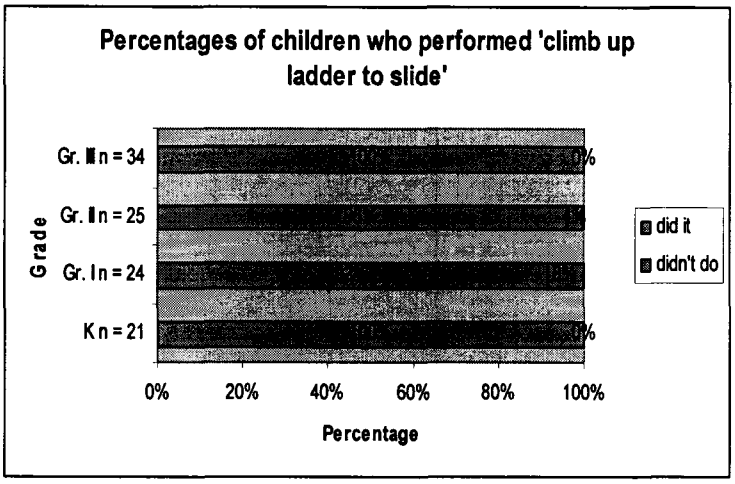
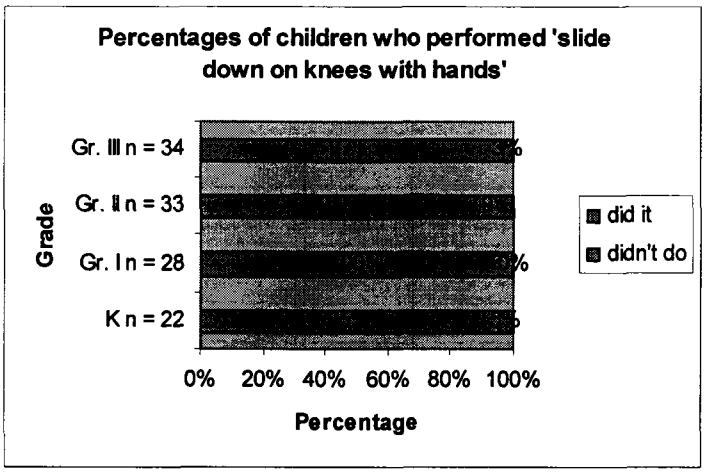
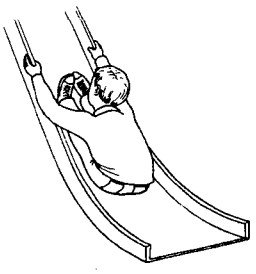


Figure 8. **Descriptive data for children K-3 for 'playing on the straight slide'**







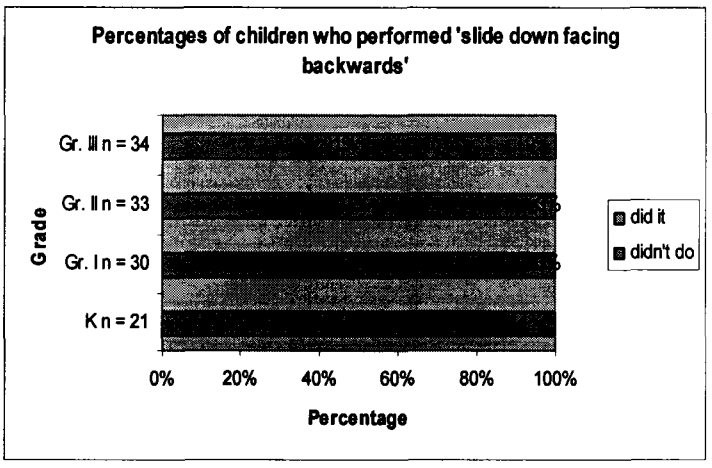
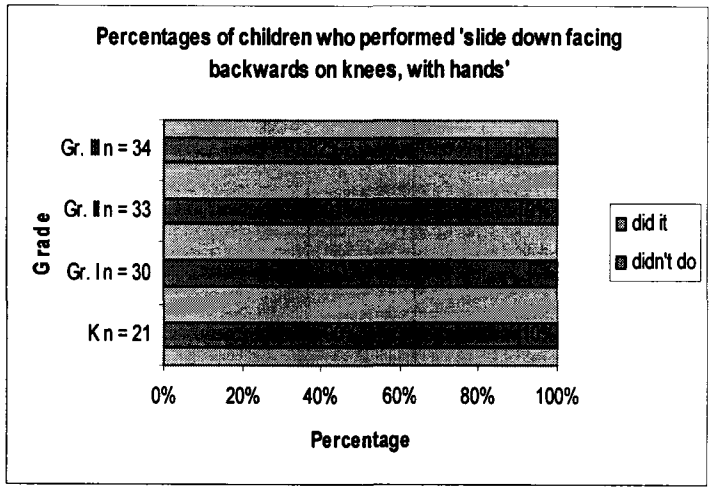
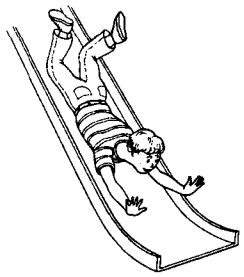
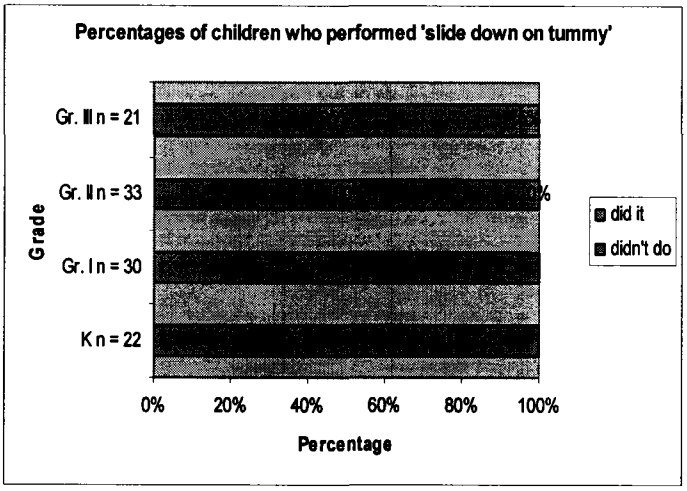


Figure 8. Descriptive data for children K-3 for 'playing on the straight slide' (cont. ..)







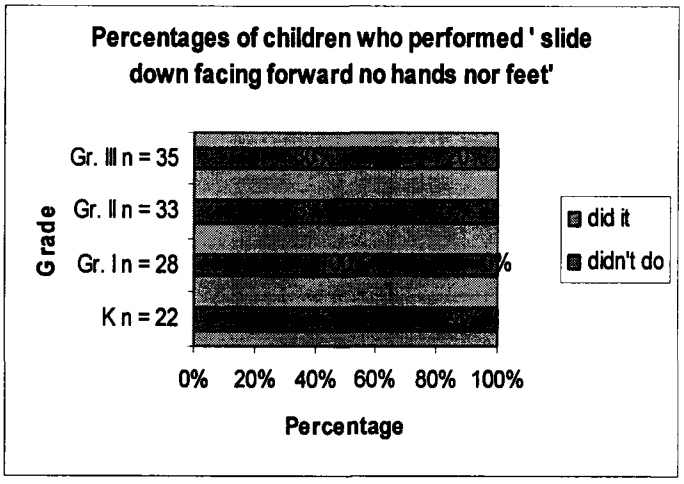
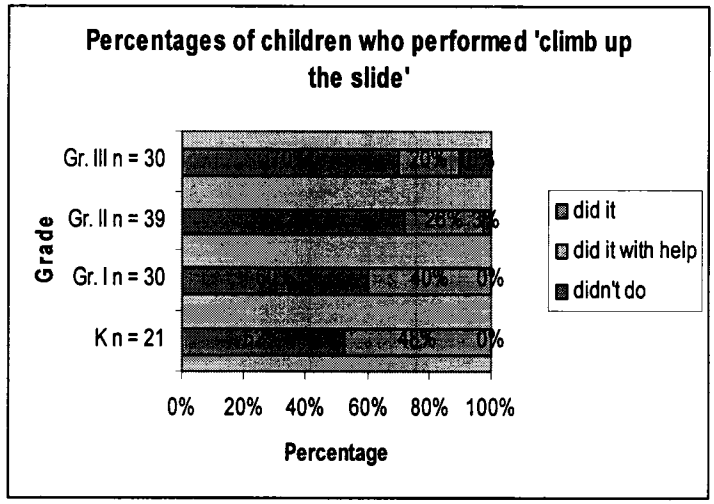
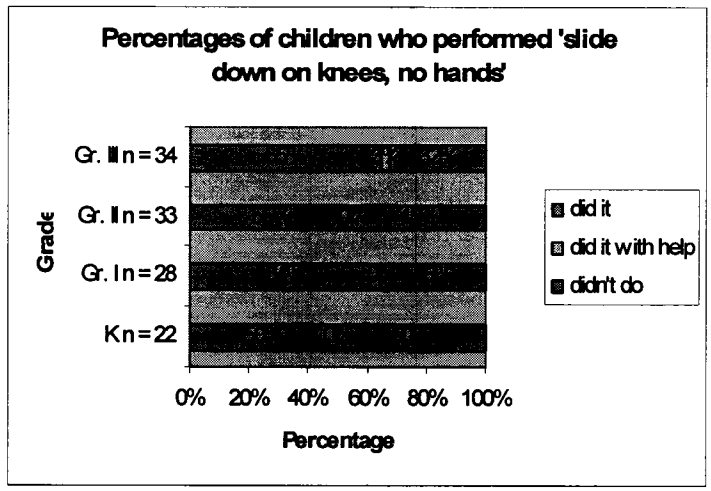


Figure 8. Descriptive data for children K-3 for 'playing on the straight slide' (cont. ..)





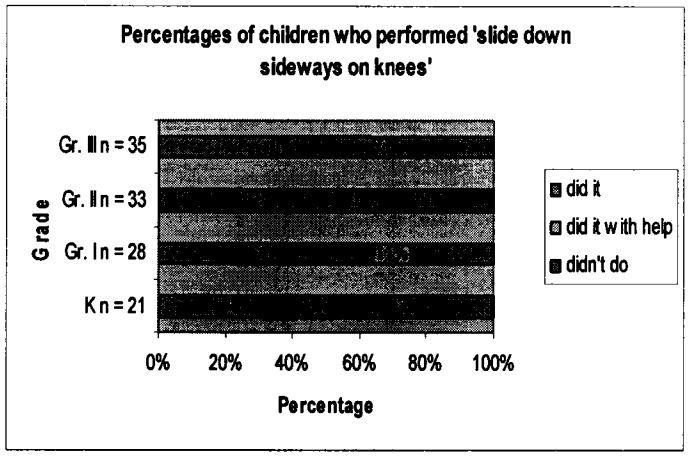
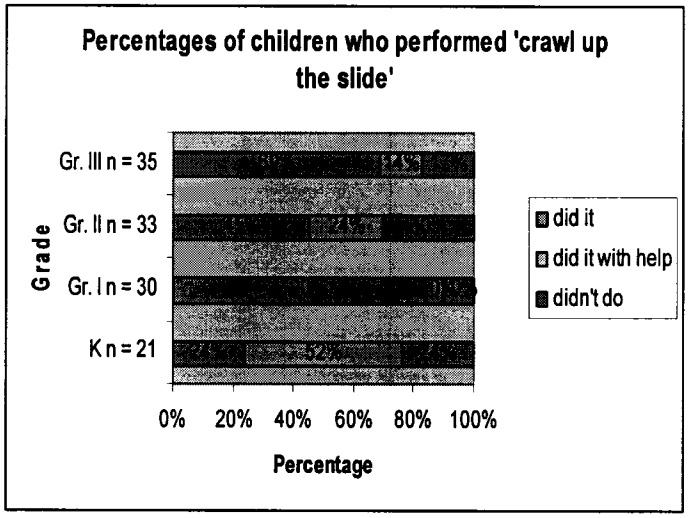
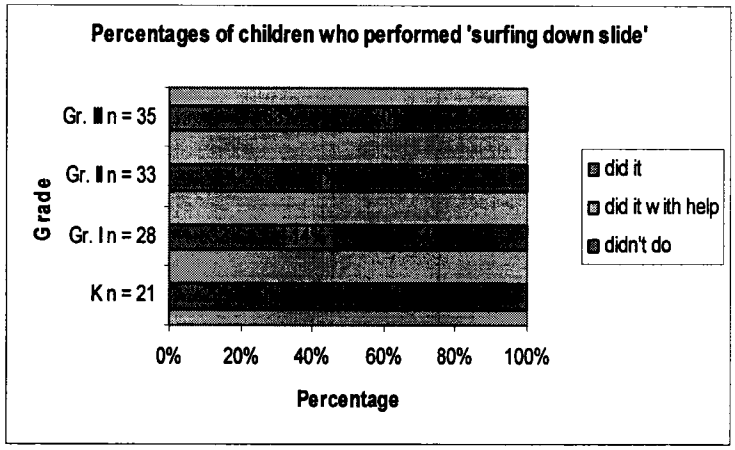


Figure 8. Descriptive data for children K-3 for 'playing on the straight slide' (cont. ..)





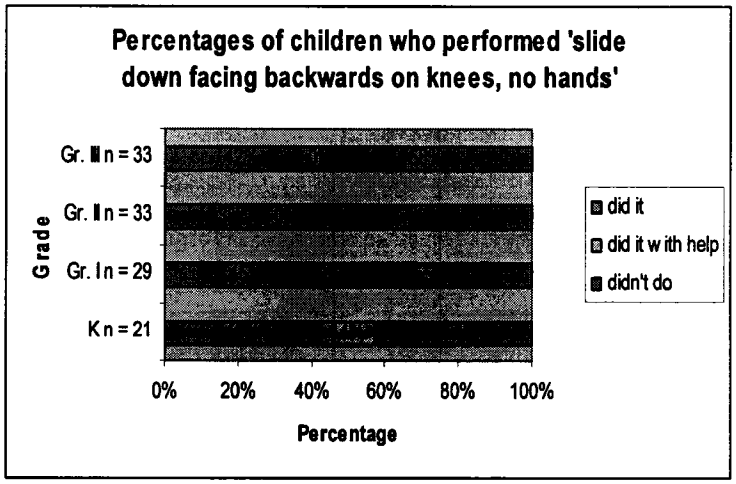
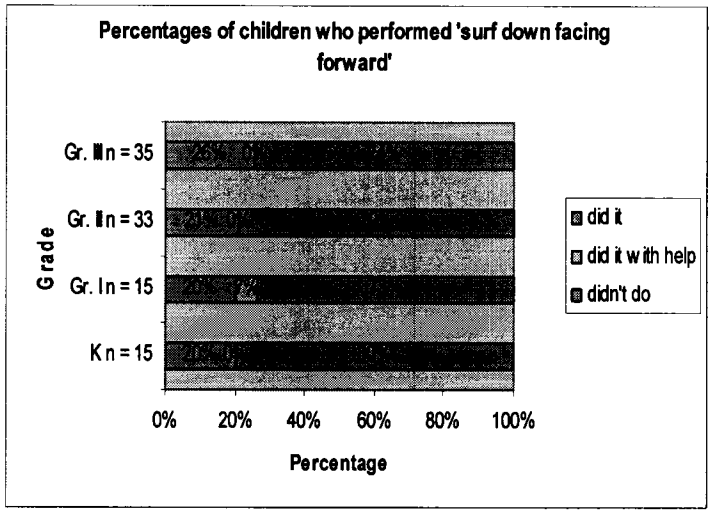
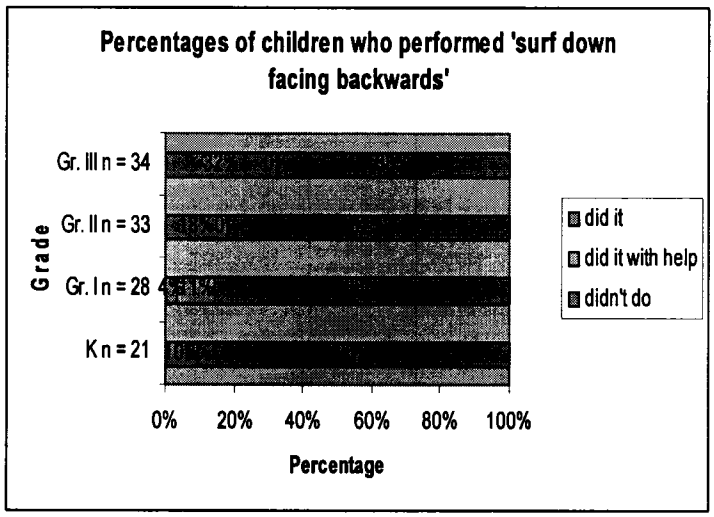


Figure 8. Descriptive data for children K-3 for 'playing on the straight slide' (cont. ..)





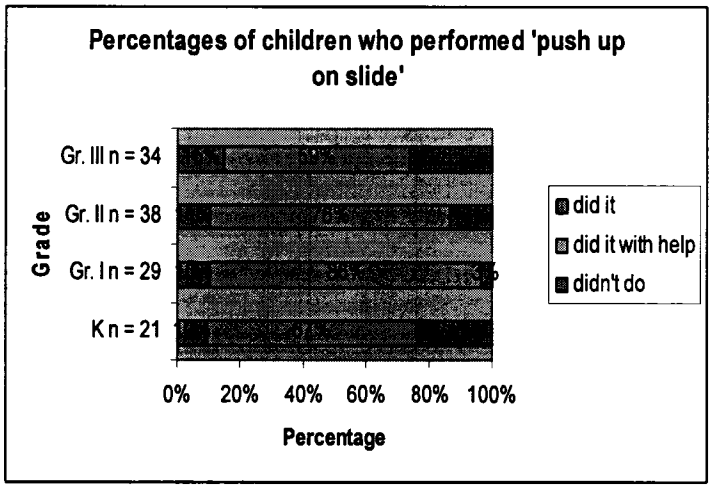
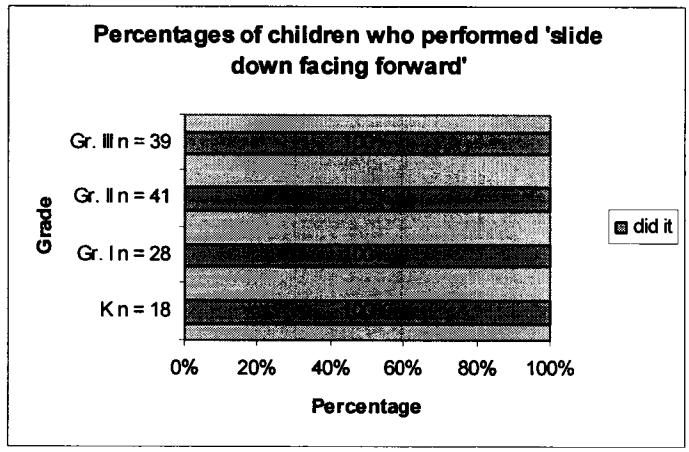
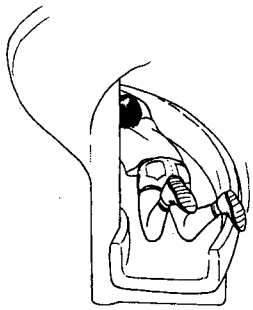
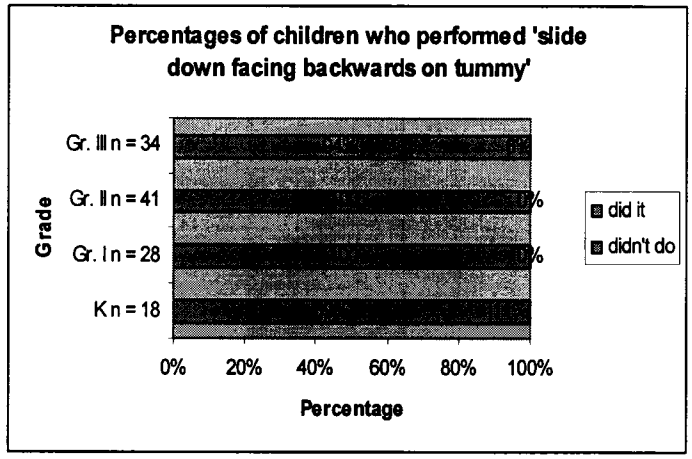
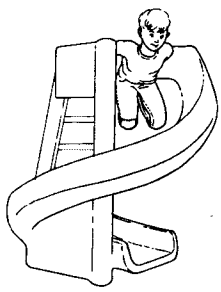


Figure 8. Descriptive data for children K-3 for 'playing on the straight slide' (cont. ..)









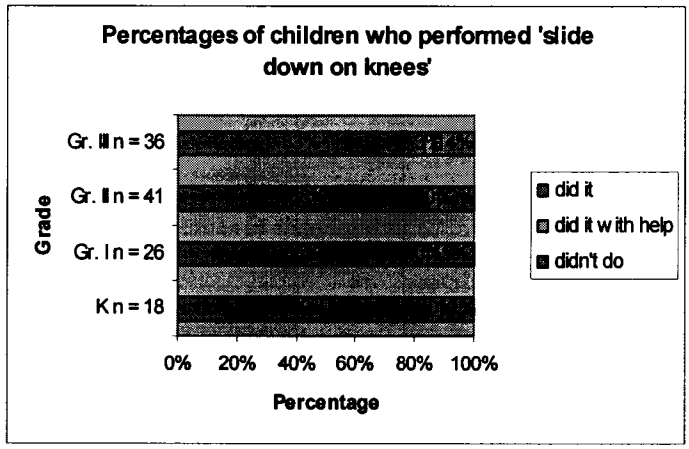
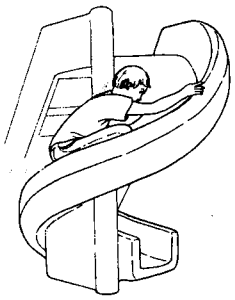
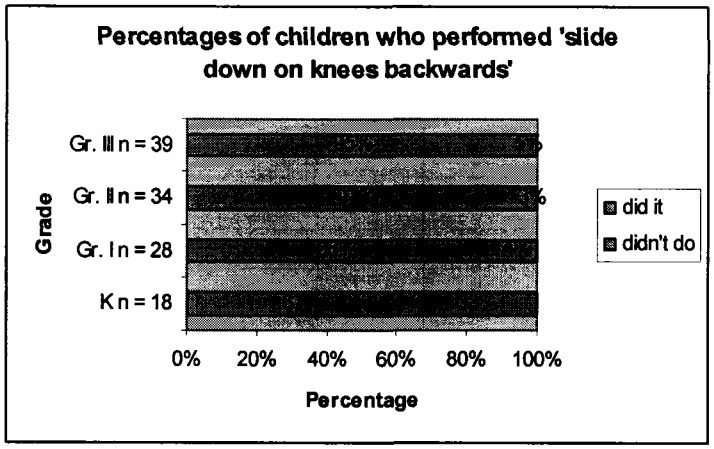
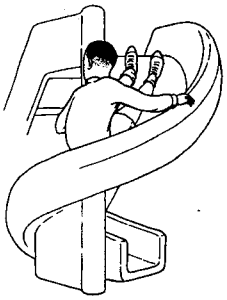
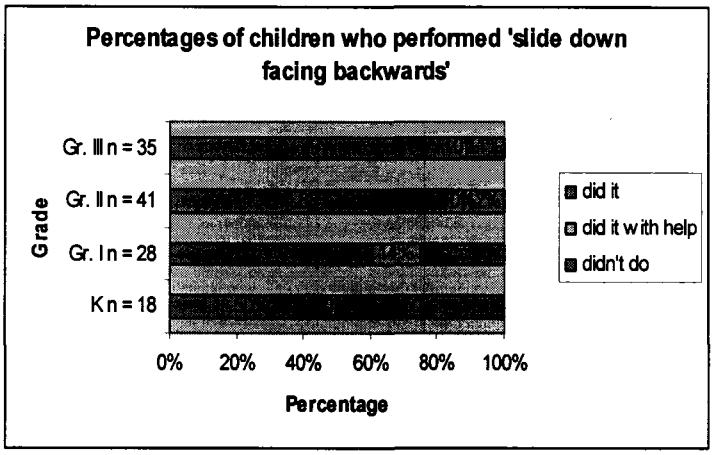


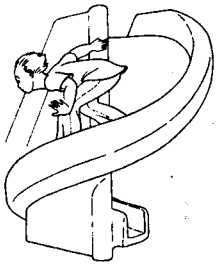
Figure 9. Descriptive data for children K-3 for 'playing on curly slide'











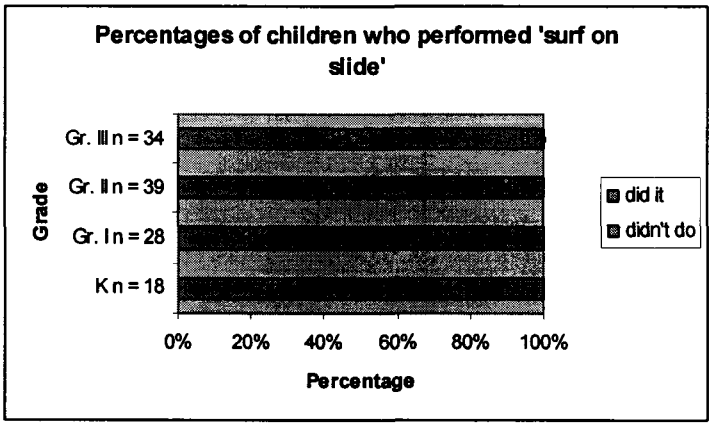
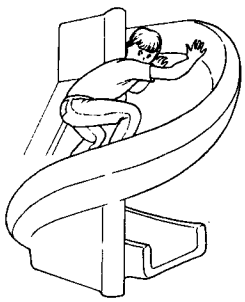


Figure 9. Descriptive data for children K-3 for 'playing on curly slide' (cont. ..)



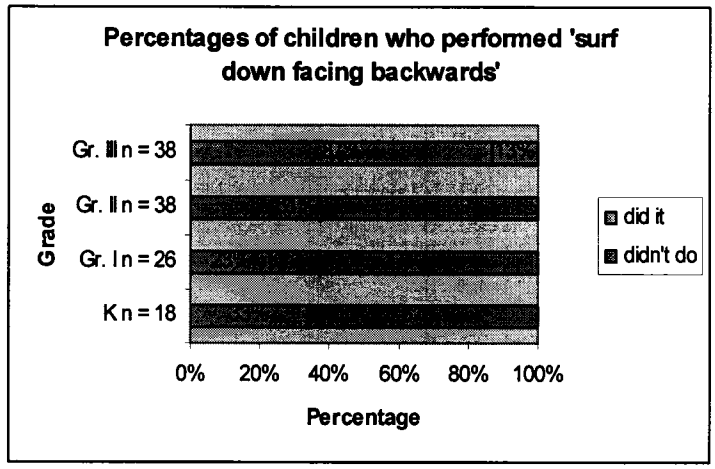
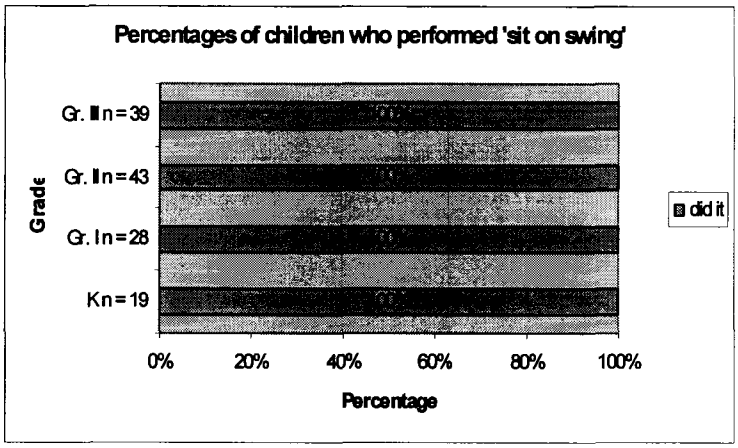
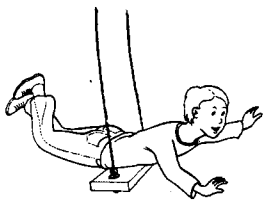
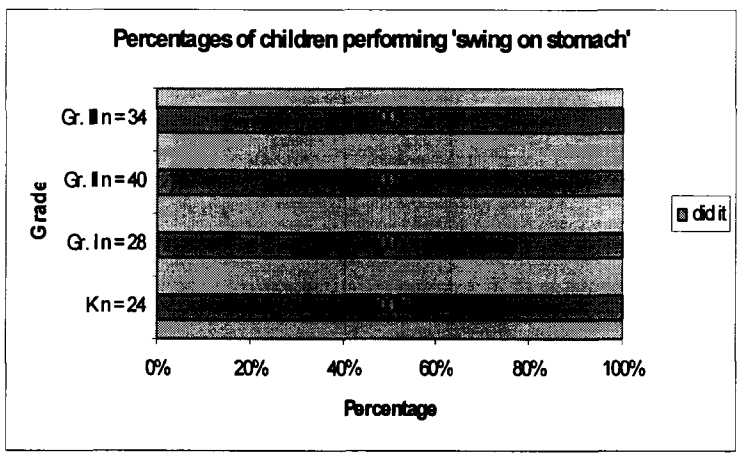
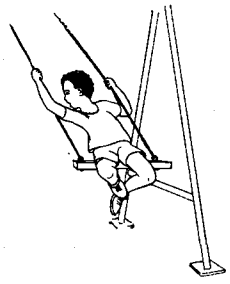


Figure 9. Descriptive data for children K-3 for 'playing on curly slide' (cont. ..)









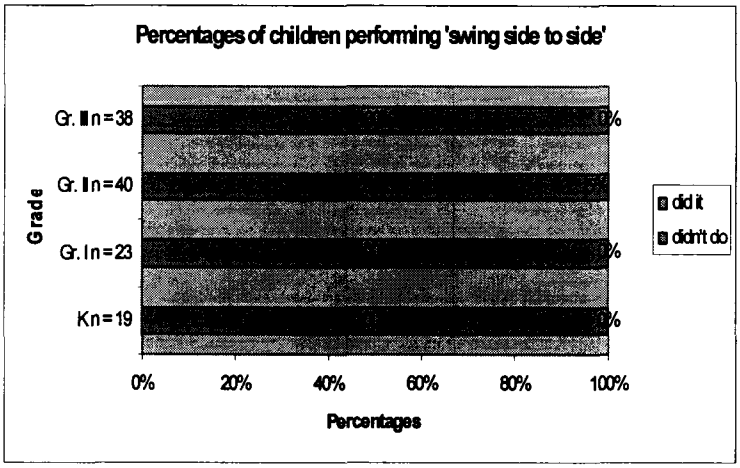
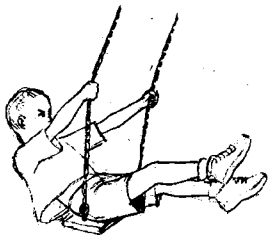
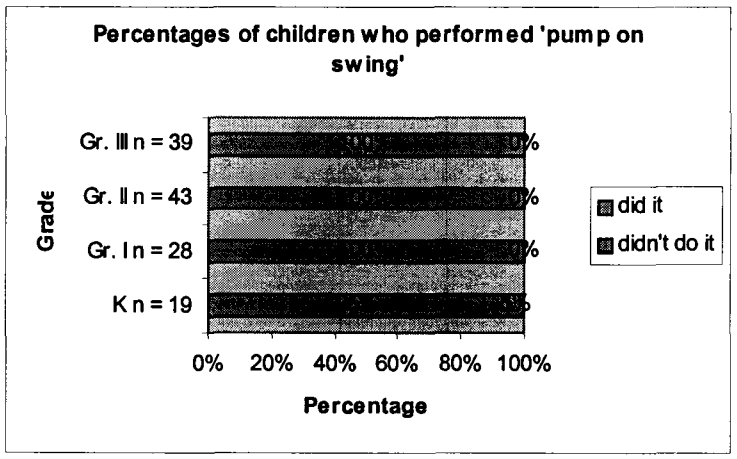
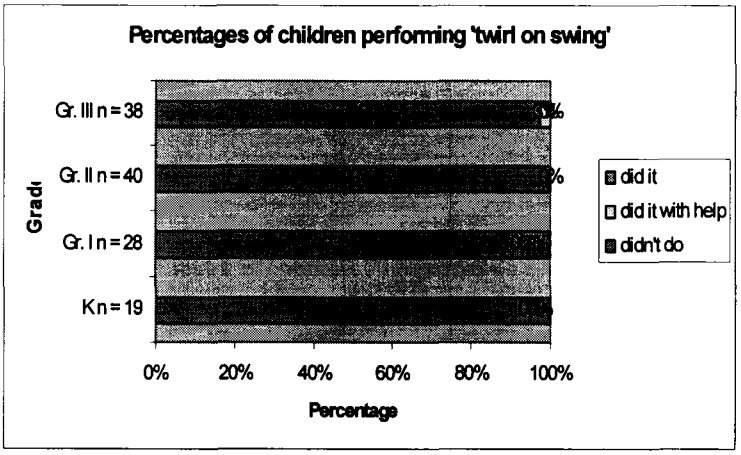
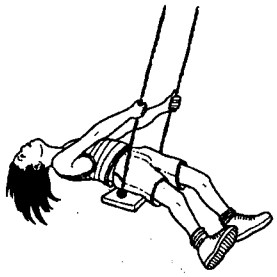


Figure 10. Descriptive data for children K-3 for 'playing on regular swings'









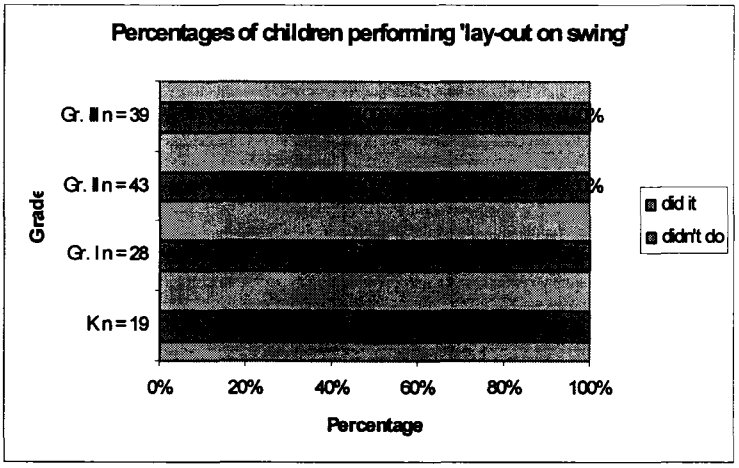
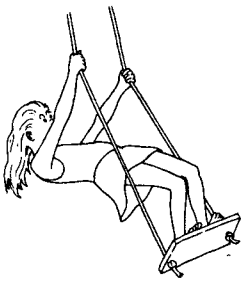
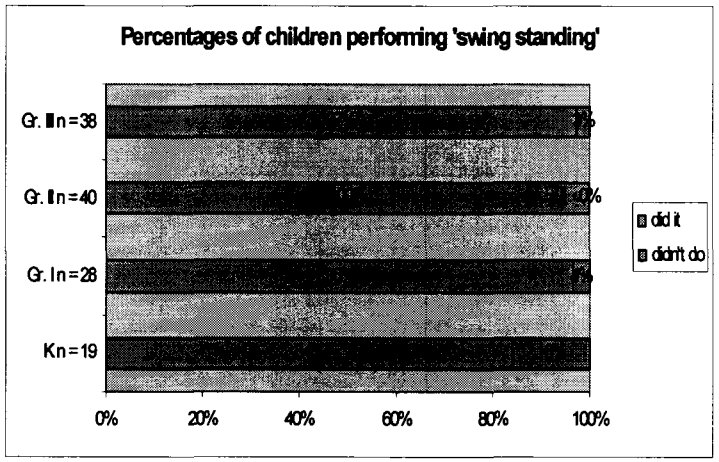
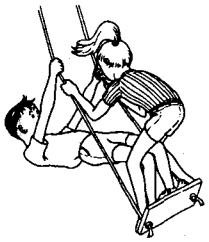
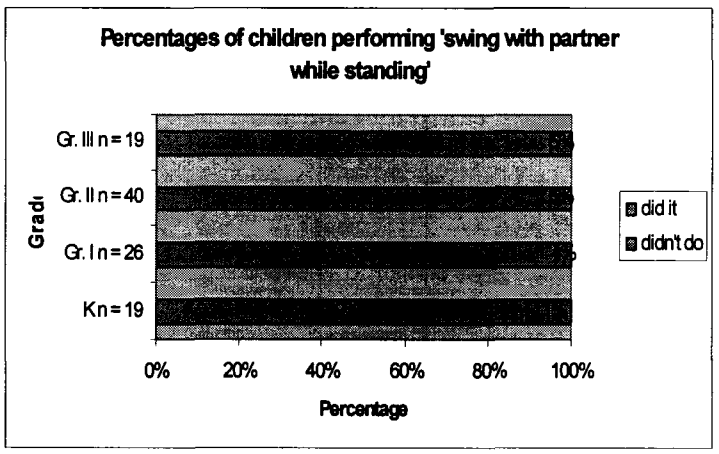


Figure 10. Descriptive data for children K-3 for 'playing on regular swings' (cont. ..)









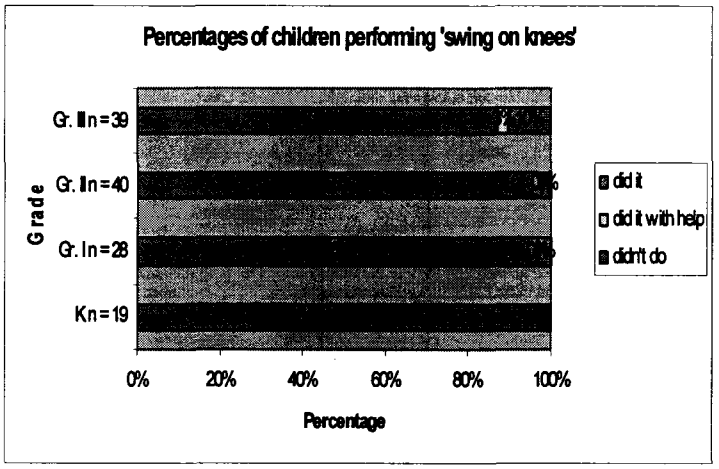
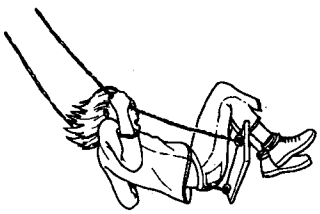
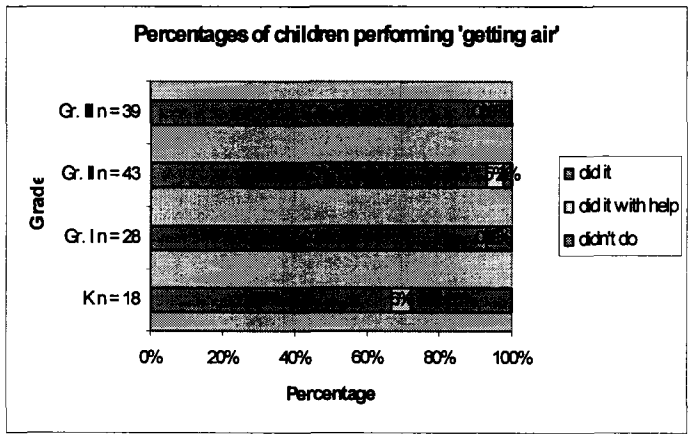
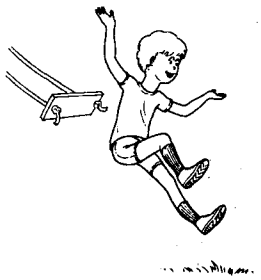
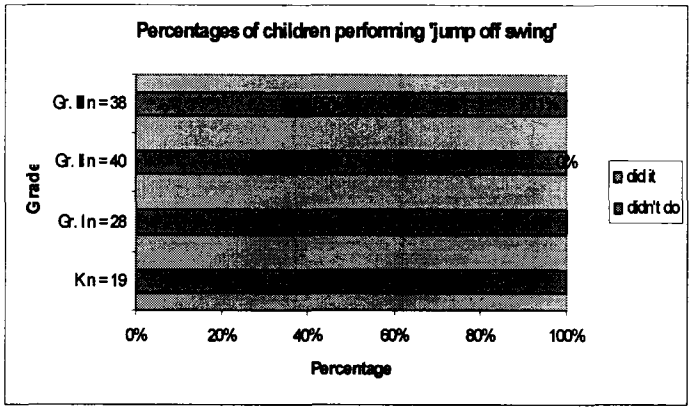


Figure 10. Descriptive data for children K-3 for 'playing on regular swings' (cont. ..)









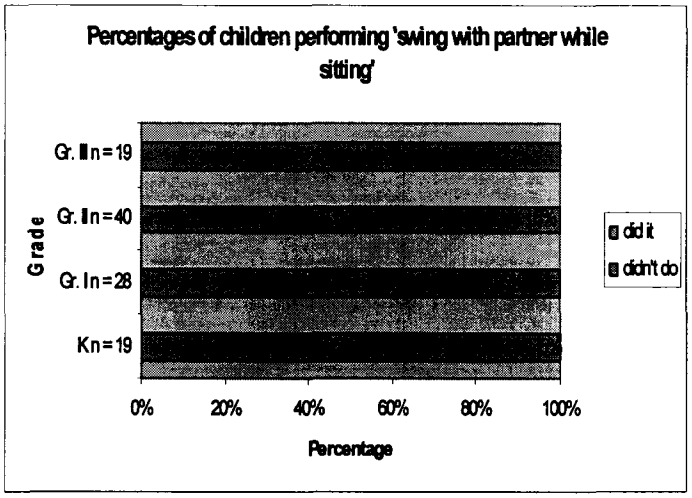
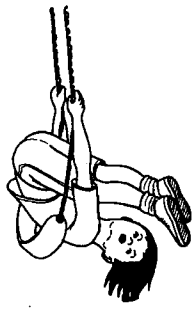


Figure 10. Descriptive data for children K-3 for 'playing on regular swings' (cont. ..)



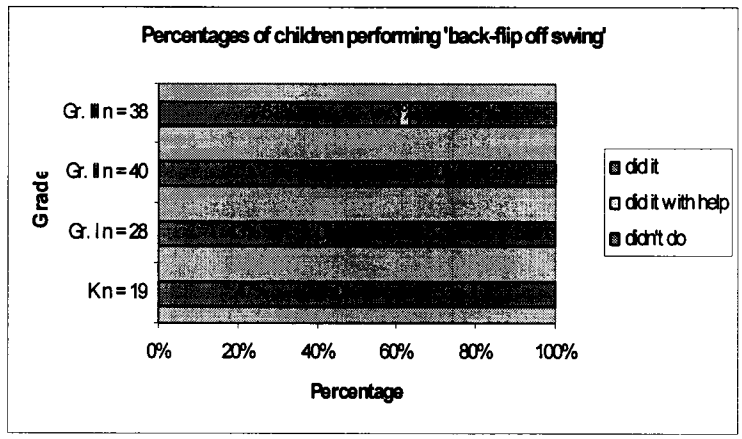
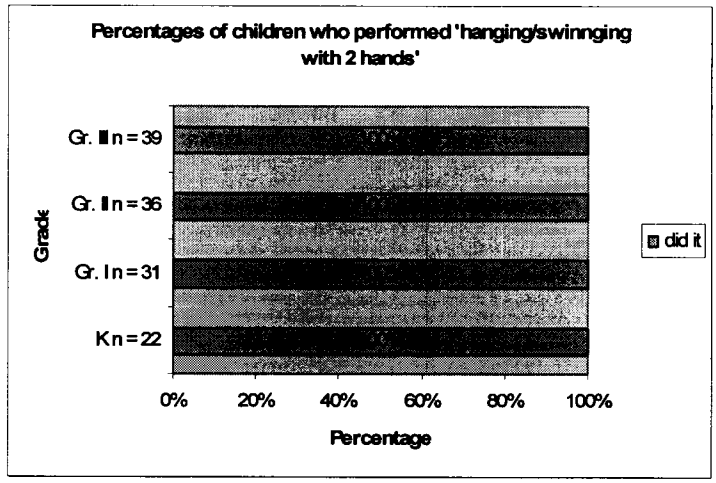
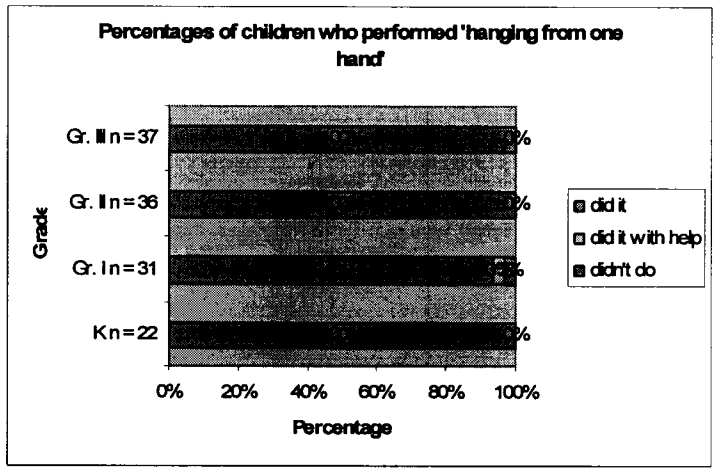
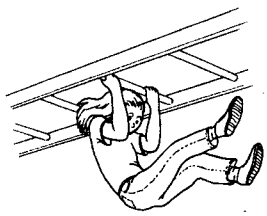


Figure 10. Descriptive data for children K-3 for 'playing on regular swings' (cont. ..)







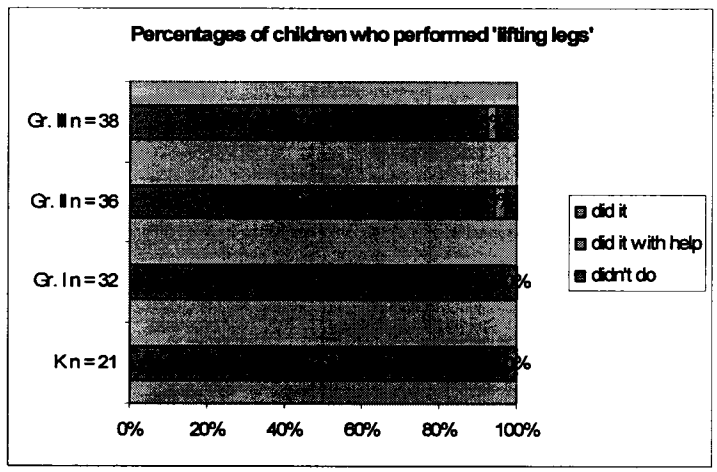
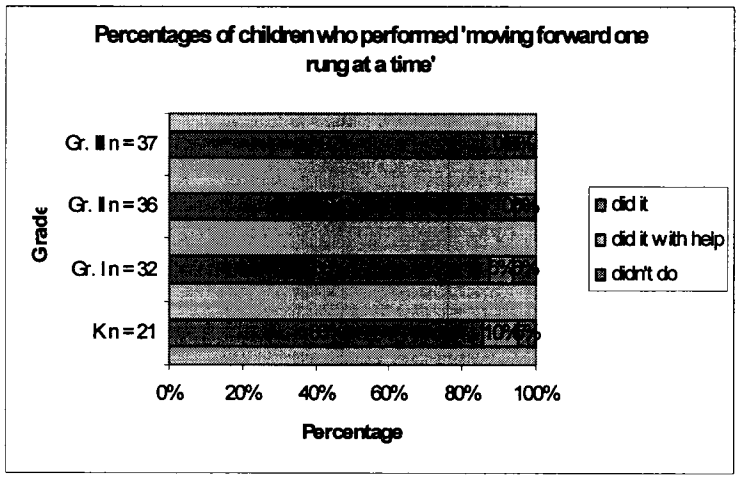
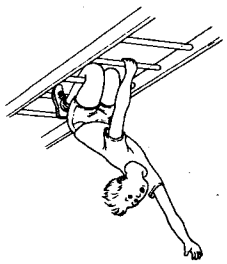
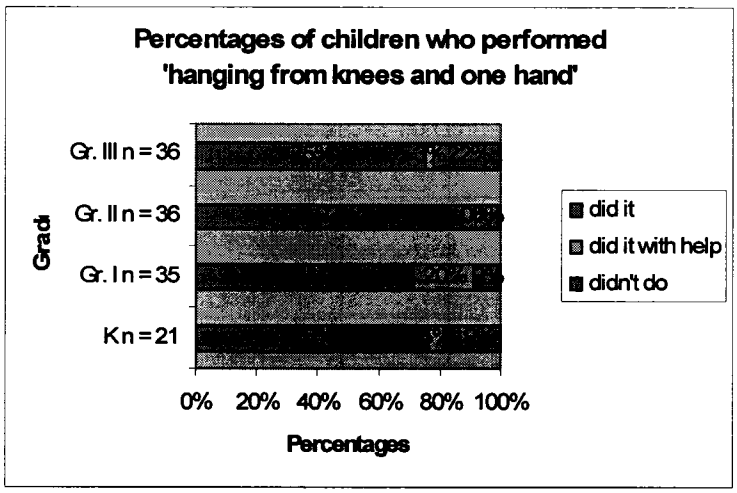


Figure 11. Descriptive data for children K-3 for 'playing on the horizontal bars'







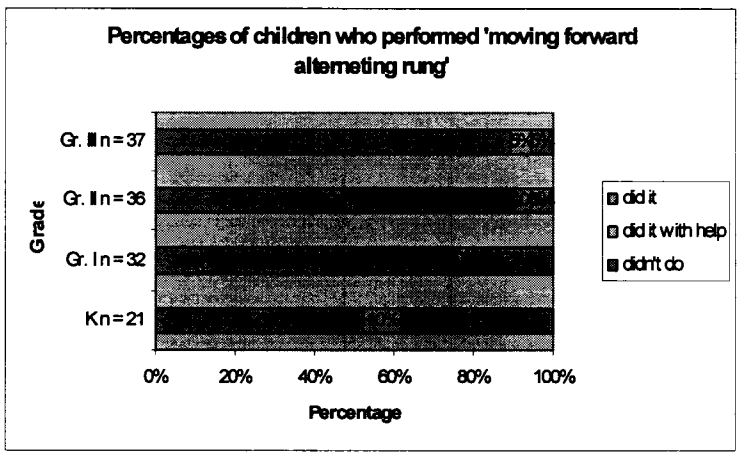
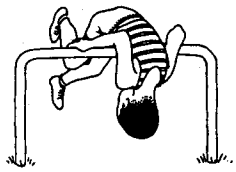
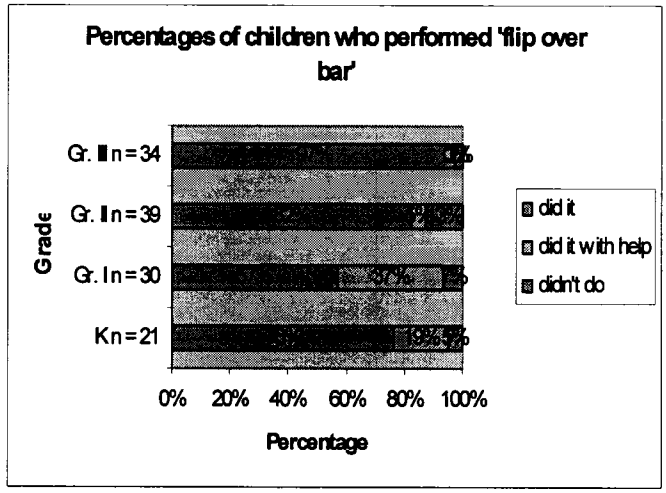
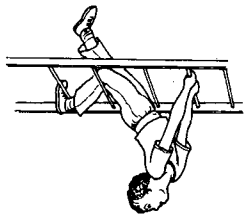
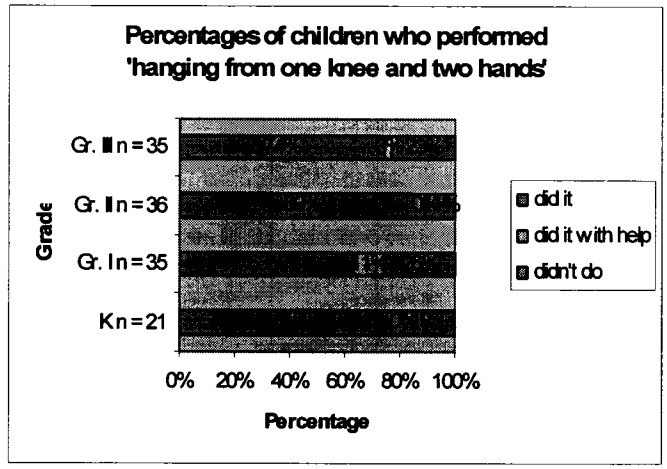


Figure 11. Descriptive data for children K-3 for 'playing on the horizontal bars' (cont. ..)









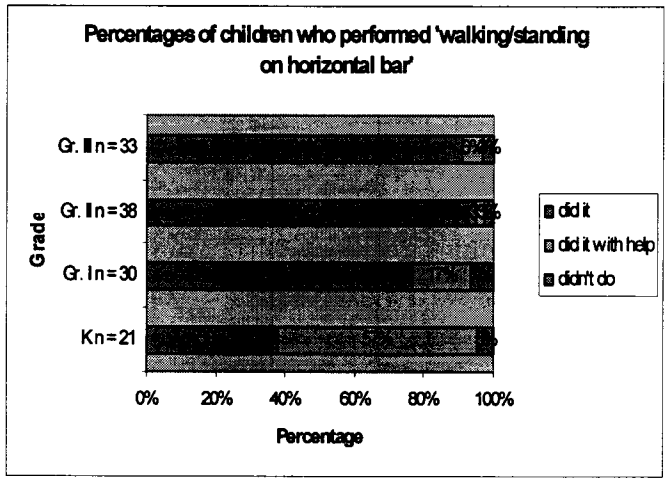
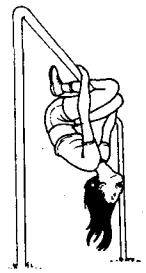
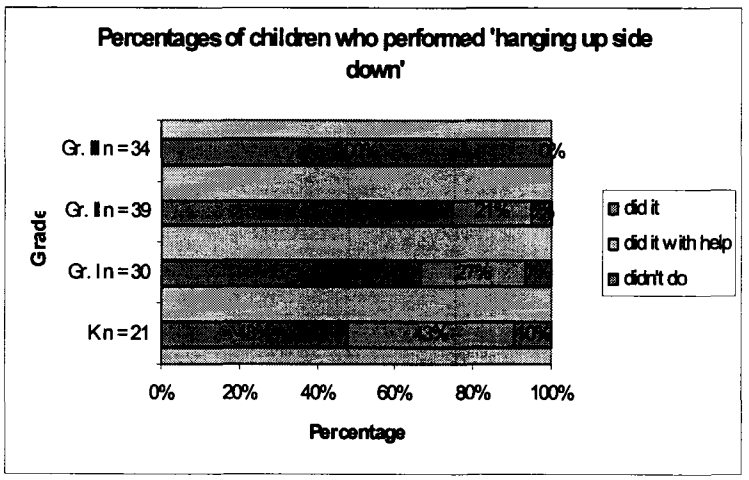
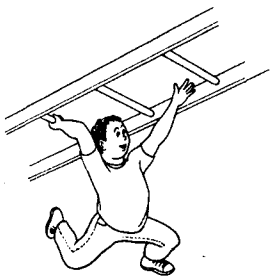
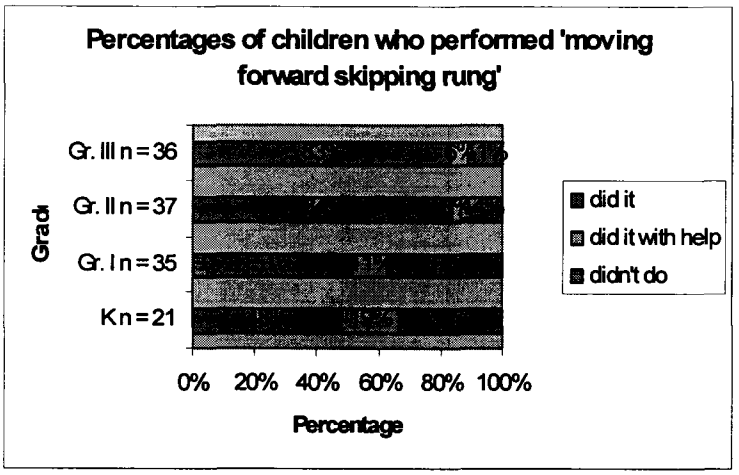


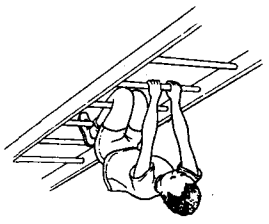
Figure 11. Descriptive data for children K-3 for 'playing on the horizontal bars' (cont. ..)











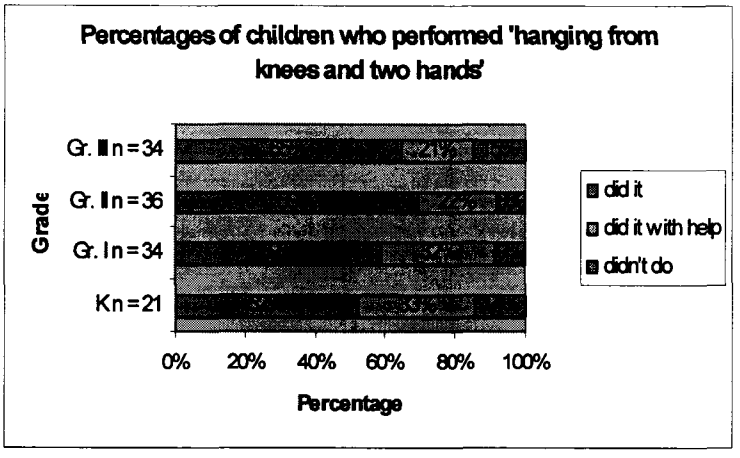
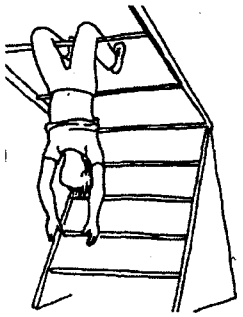
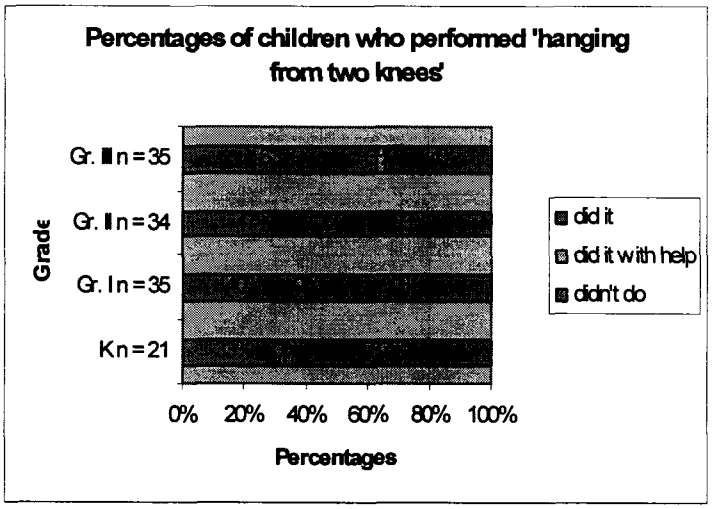
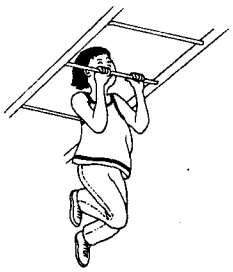
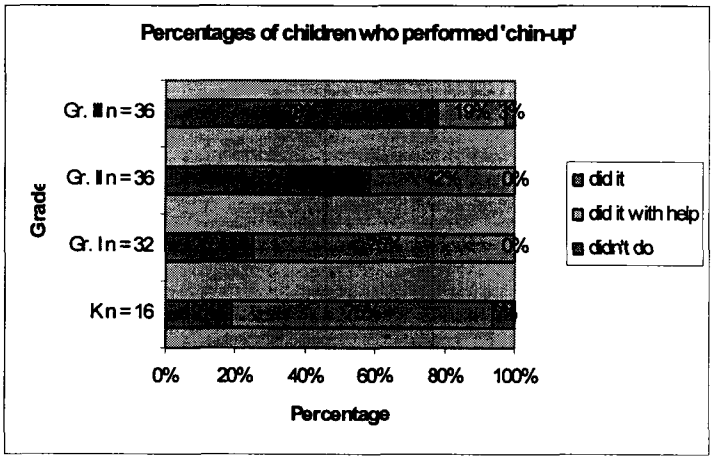


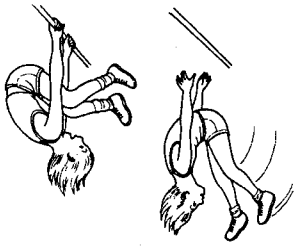
Figure 11. Descriptive data for children K-3 for 'playing on the horizontal bars' (cont. ..)











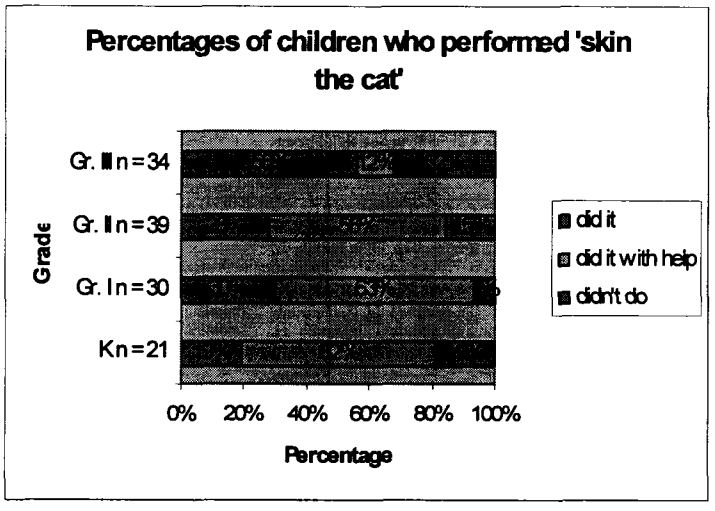
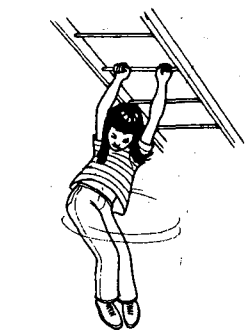
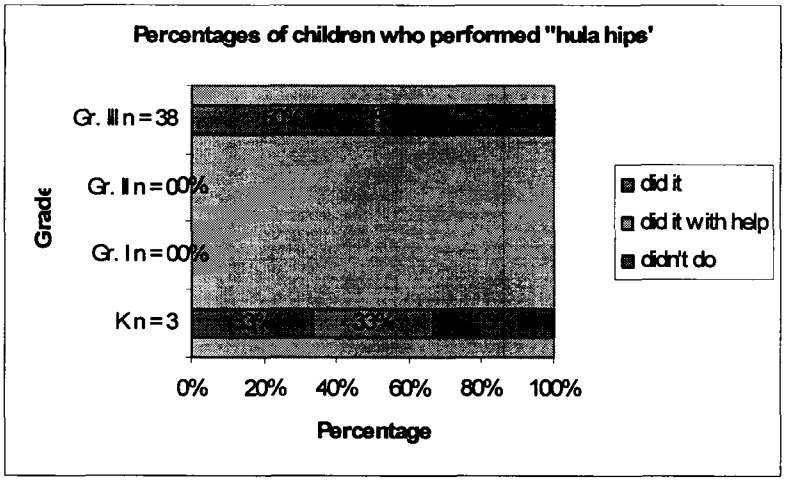
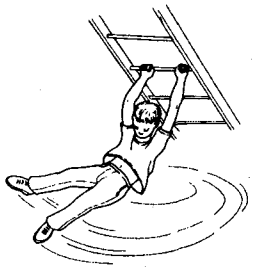
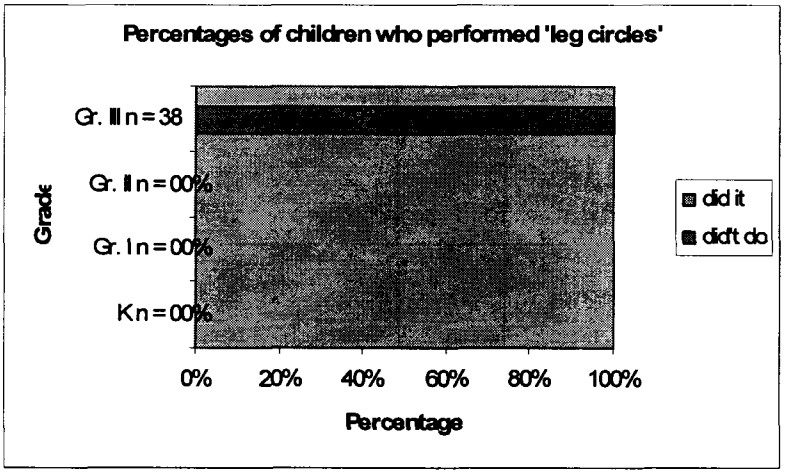


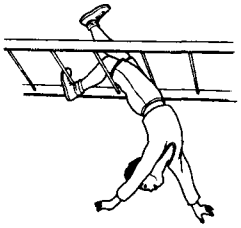
Figure 11. Descriptive data for children K-3 for 'playing on the horizontal bars' (cont. ..)











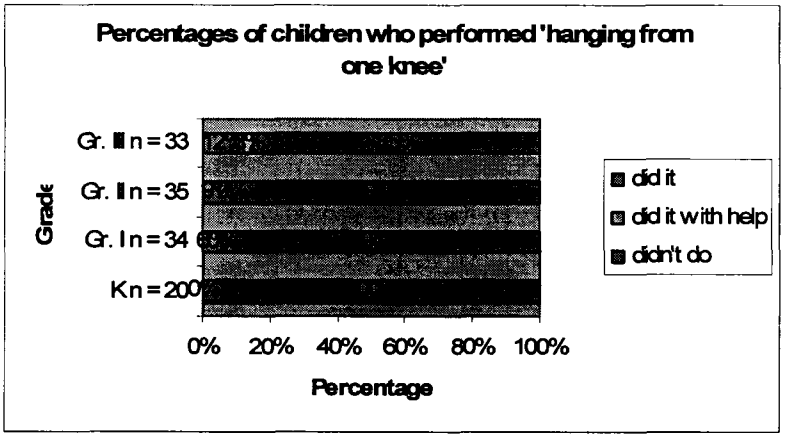
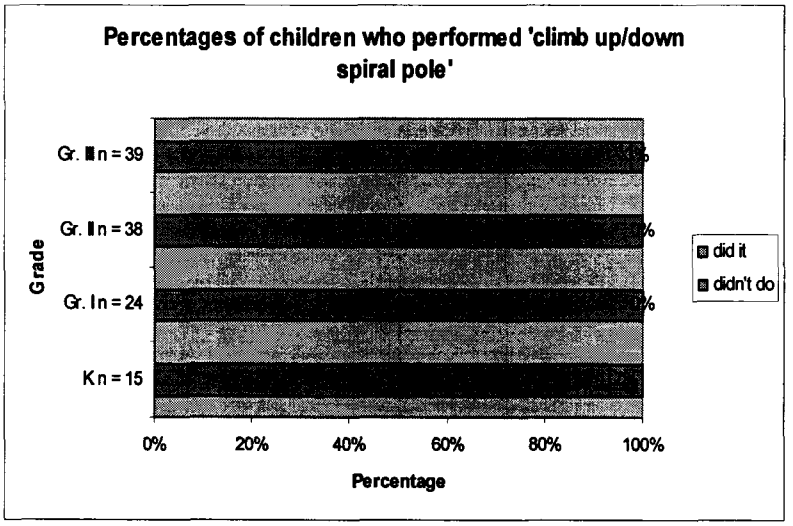


Figure 11. Descriptive data for children K-3 for 'playing on the horizontal bars' (cont. ..)



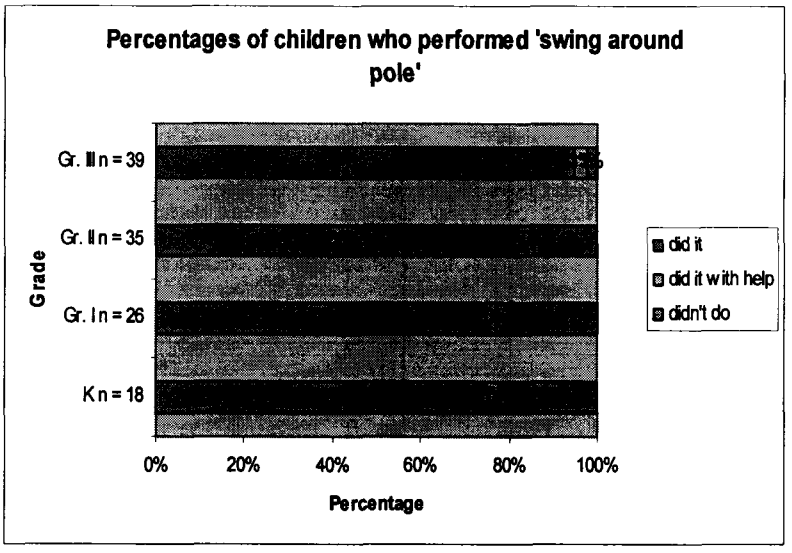
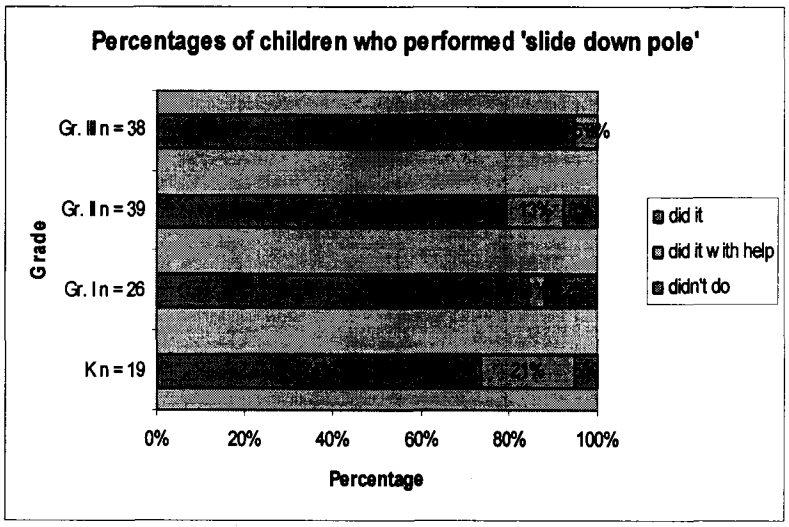


Figure 12. Descriptive data for children K-3 for 'playing on the poles'



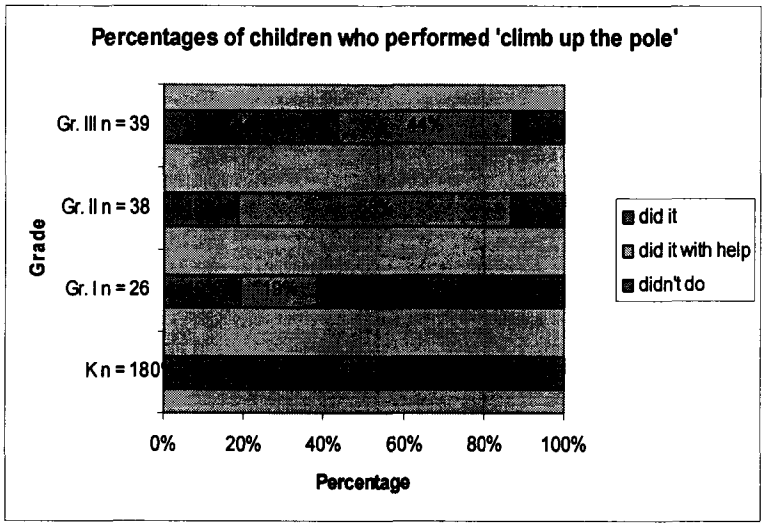
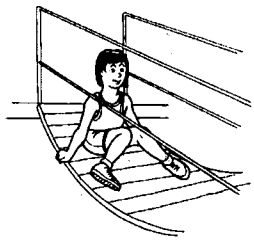
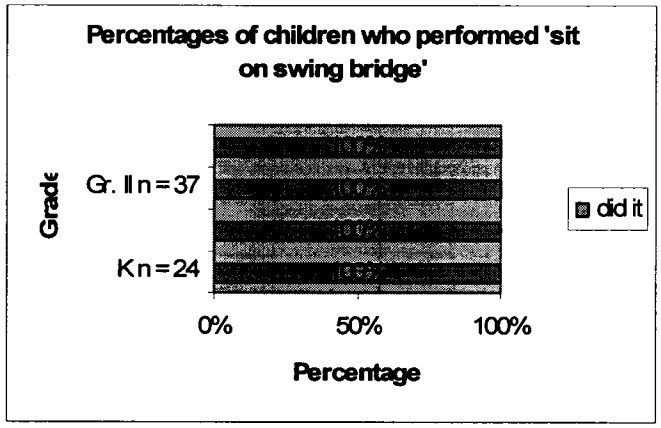
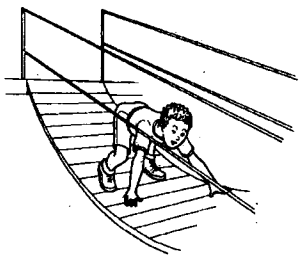
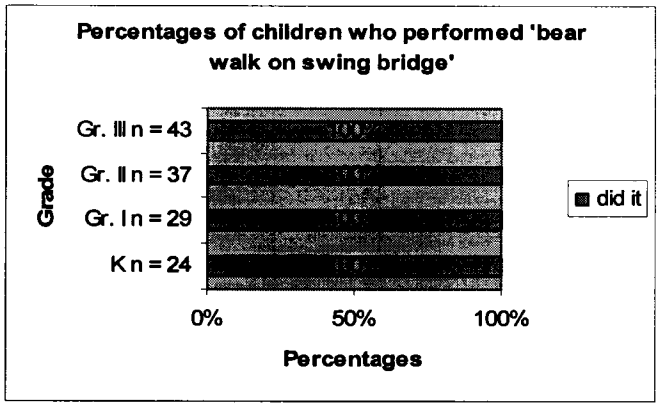


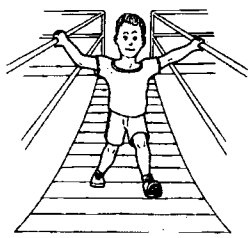
Figure 12. Descriptive data for children K-3 for 'playing on the poles' (cont. ..)











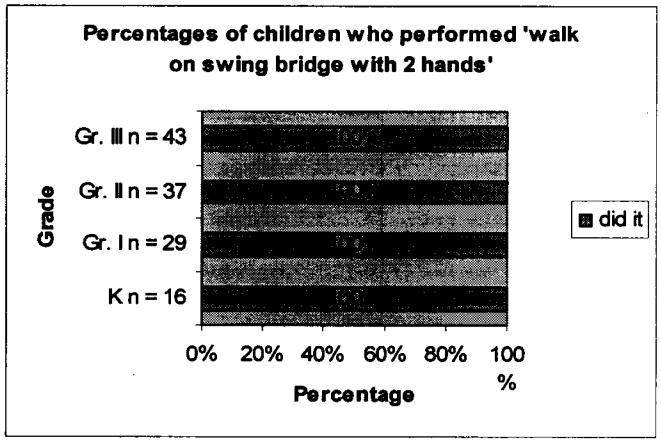
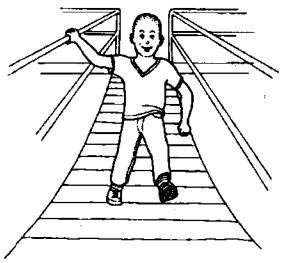
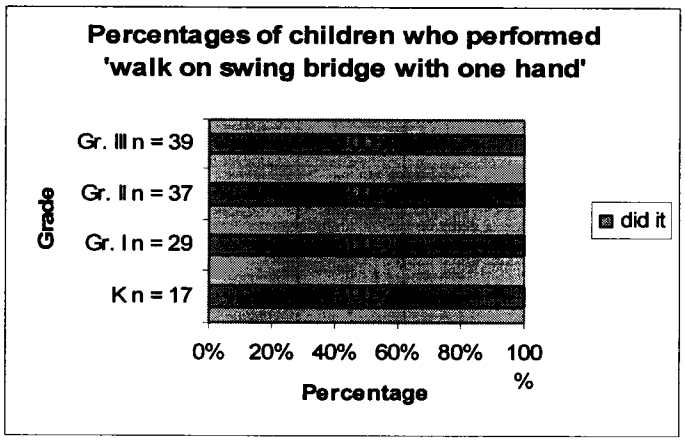
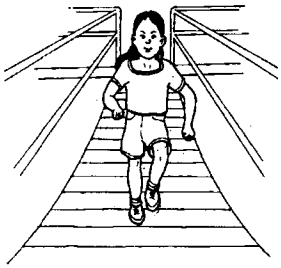
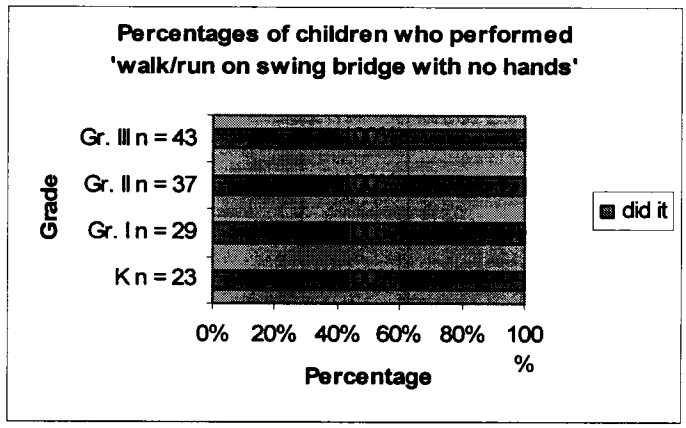


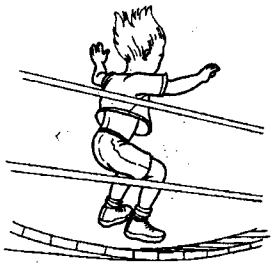
Figure 13. Descriptive data for children K-3 for 'playing on climbing equipment'











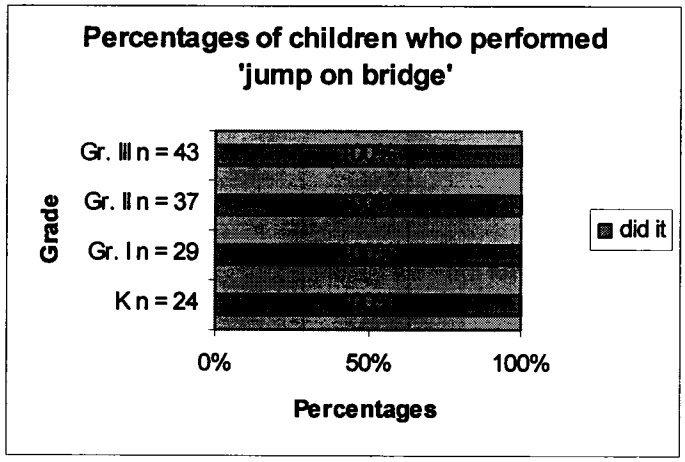
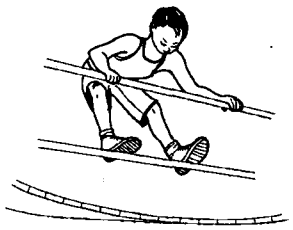
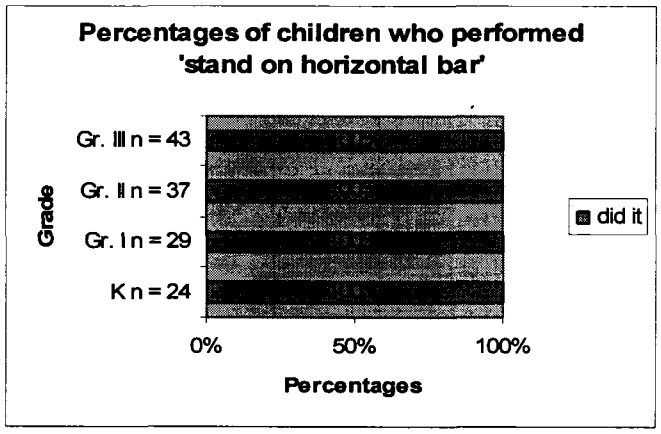
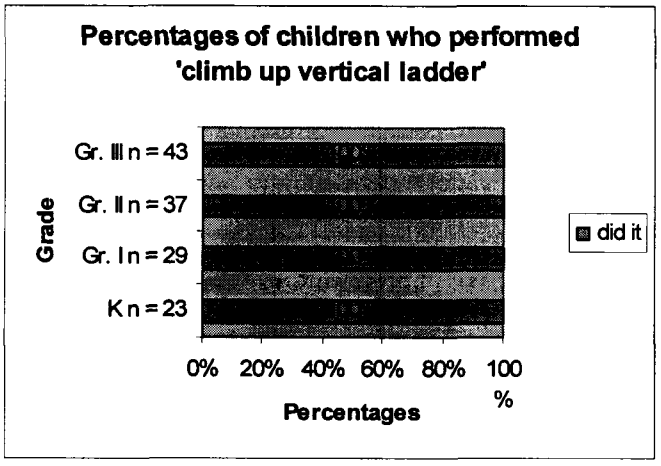
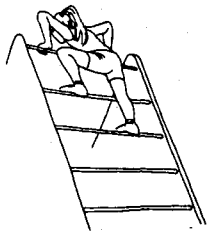


Figure 13. Descriptive data for children K-3 for 'playing on climbing equipment' (cont. ..)









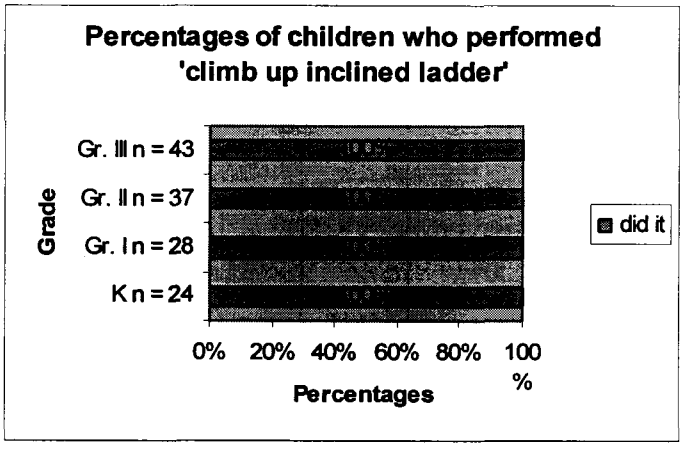
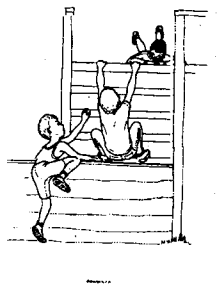
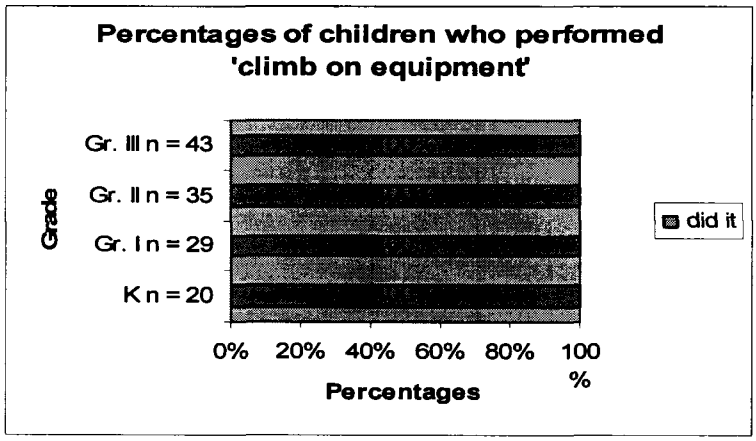
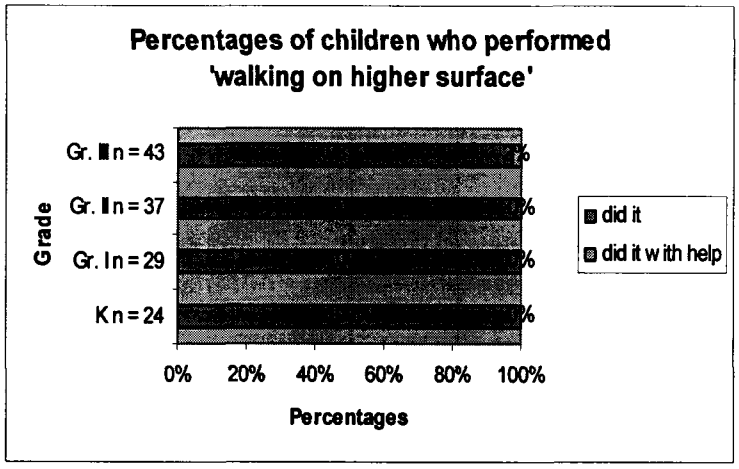


Figure 13. Descriptive data for children K-3 for 'playing on climbing equipment' (cont. ..)







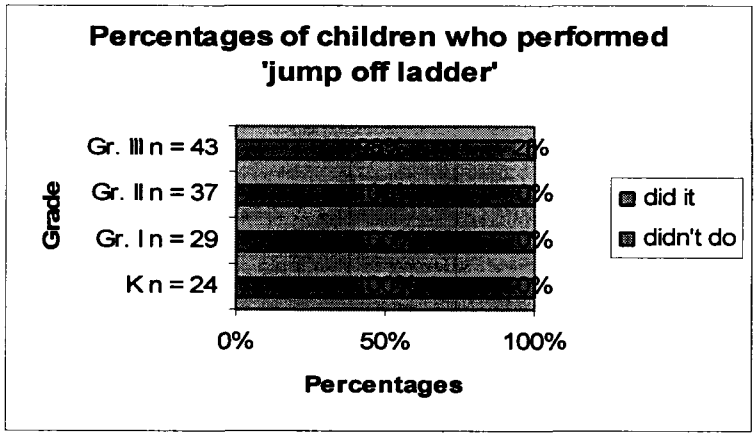
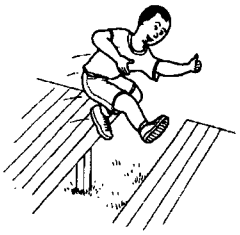
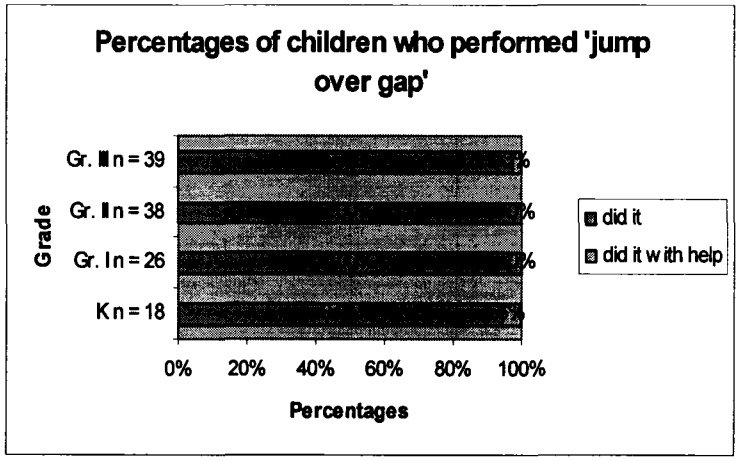
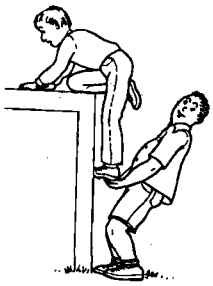
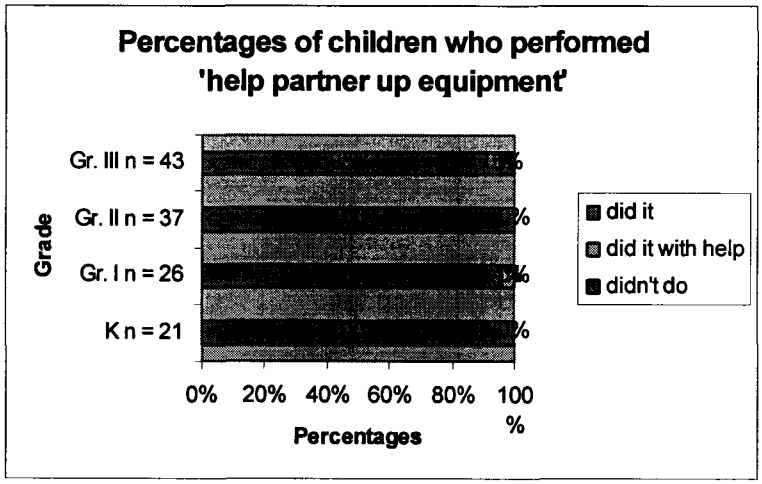


Figure 13. Descriptive data for children K-3 for 'playing on climbing equipment' (cont. ..)









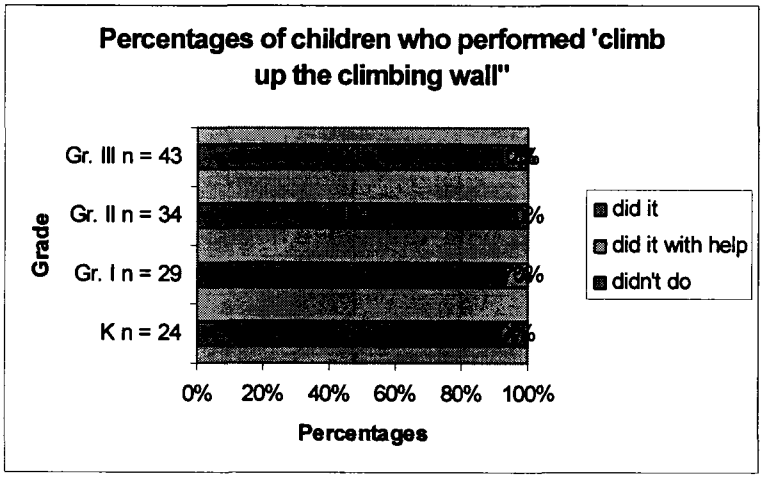


Figure 13. Descriptive data for children K-3 for 'playing on climbing equipment' (cont. ..)

CHAPTER 5
DISCUSSION

As previously stated, currently little attention is paid to the assessment of children's physical activity on the playground, an important place where children spend a significant amount of time during and after school. Different from other studies, which looked at the performer's psychological characteristics and involvement in the playground activities, the current research determined which are the most common skills used by children from kindergarten to grade 3, on four chosen categories of playground equipment: swings, slides, horizontal bars/ladder, and climbing apparatus. Further, the study developed a movement competence assessment tool based on grade that provides useful information to assist people in closest contact with children (parents and teachers) in instructing the essential skills needed by children to participate in recess activities. Participating in recess activities children are active, reducing the occurrence of childhood obesity, which may have significant socio-emotional costs of not being involved.

Using an ETA approach, the instrument focuses on skills with social relevance for children, providing many movement solutions to the playground goals, in other words offering a movement skill repertoire based on grade. In addition, the movement competence assessment tool complements the screening protocol (ADL-PP) already developed by Watkinson & al. (2001) and could eventually be used to test the movement competence of children at risk of not participating fully on the playground activities and provide direction for parents and teachers.

As Watkinson and Causgrove-Dunn (2003) state "in the assessment of playground activities, the task goals are determined by what children are actively doing on the playground. These goals have 'social relevance' because these are the activities that children want to be included in when there is free time on the playground" (p. 241). To determine which task goals and movement solutions are relevant for children, this study started by determining which are the most

important categories of equipment found on the playground at this time. For that, the random visit at approximately thirty playing areas in three cities in Canada revealed the following pieces of apparatus: swings, slides, horizontal bars, and composite climbing equipment, as the most common equipment at this time. These categories determined the playground goals: 'play on swings', 'play on slides', 'play on horizontal bars', and 'play on climbing equipment'. If I think back at my childhood, the same types of playground equipment could be found on the old playgrounds. The differences between then and now are: the material used to build them (plastic versus steel) as well as the variety of the same type (e.g., straight slide – curly slide – tube slide – wide slide – baby slide).

Further, to identify the most meaningful and most employed task goals and movement solutions, we generated a list of possible movement solutions and we observed the children during free play on the playground, which gave us valuable data regarding what children currently do during free play. Research assistants captured the information and we identified the task goals (e.g., 'playing on the slide', 'playing on the horizontal bars', 'playing on the swing') and the task solutions (e.g., 'going down the slide on seat', 'going down the slide on knees'), solutions that later were translated into illustrations. Consistent with the ETA approach (more precisely the ETA first step), these task goals and movement solutions are considered to have social relevance and to be meaningful for children, since they are the ones who provided the solutions in a natural setting (free play on the playground), without being shown what to do (Balan & Davis, 1993; Burton & Davis, 1996; Watkinson & Causgrove-Dunn, 2003). In addition, we seem to have captured the full domain of movement solutions, as we did not have items observed that weren't part of the domain (e.g., never seen or done). However, there were some settings where we encountered both social constraints (e.g., school rules) and physical constraints (e.g., size of equipment) that limited the extent to which we can be sure we captured them all. Yet, we can conclude that the task goals and the movement solutions identified, both by adults and children, are fundamental for playground activities, in other words they have social relevance, or they are meaningful for children. As Watkinson and

Causgrove-Dunn (2003) state, these task goals and movement solutions were made apparent to children by the physical and social environments, that means the playground afforded these task goals and children chose the task solutions based on their own constraints.

Another important step in the process of developing the movement assessment instrument was to ensure that the illustrations representing the task solutions were created accurately. That was accomplished by testing them with both adults and children. Initially (**Step 3**), we asked adults to recognize the movement task in the illustrations and then to identify its critical features. In **Step 4**, children were shown the illustrations and they had to perform the actual task solution.

The data obtained during **Step 3** revealed a low percentage of agreements (54.67%), which may have occurred for a few reasons including: the way we tested (by asking them), the limitations of verbal description of an action, different task focus, and the fact that some of the critical features were too 'obvious' to be noticed. While in **Step 4** the same illustrations were recognized and the task was performed, as expected, without hesitations by children with 97.3% accuracy, in **Step 3** the parents had more difficulties employing the words to describe the action indicated in the illustrations. However, this may be explained by Davis and van Emmerik (1995): "skilled athletes accomplish their feats without necessarily being able to describe their performance in a discursive way" (p. 6). Maybe, instead of asking the adults to describe and identify the critical features, we should have asked them to observe children demonstrating the solutions and then check on a list which solution was performed. That way we would have avoided the use of verbal description.

In spite of the low percent of agreements regarding the critical features, in general, the adults' descriptions were fairly precise, yet sometimes focused on different aspects of the performance (e.g., landing, preparing for that particular task, etc.). The description of the different aspects could have resulted from the fact that the research team did not specifically ask for observable features, so additional "non-observable" details about the performance were added (e.g., core

strength, balance, or coordination). Going beyond the illustration the interviewees addressed issues such as landing or the process of getting onto the equipment.

Further, some of the critical features may simply have been too obvious to be noticed by the verbal descriptors. For instance, for the task goals of sliding down, the majority of the participants (78.91%) did not mention the critical features of 'face forward'. However, when the body direction changed (e.g., 'face sideways' or 'backwards'), we noticed that more participants (71% and 77% respectively) mentioned it. This difference led us to believe that the features were too obvious to be noticed. The interviewees did mention unobservable features (movement skill foundations) such as balance, strength, coordination, or speed.

During **Step 4**, the two children who were assessed recognized all the tasks illustrated and performed 97.3% of them, sometimes including fine details (e.g., holding partner around shoulders while swinging and not around the waist). The two children had absolutely no difficulties in recognizing and performing the tasks shown. To be sure, sometimes the children were asked why they thought the illustration was showing a certain direction and their answer was in tune with the researcher (e.g., "Why do you think this boy goes down the slide, instead of up the slide?" "Because he faces towards the bottom of the slide.").

There was one incident when one adult could not accurately describe the critical features. As mentioned in *Chapter 4* this data was omitted from analysis and the instructions to the following eight participants were made clearer. The other interviewees provided accurate descriptions of the illustrations with the exception of one case (1.27%), when the participant gave a second different alternative to the illustration shown, besides the first correct description ('run with a ladder' – meaning the child was holding the ladder, for the task solution 'moving forward skipping rung'). This may be explained by the fact that the illustration was not clear enough and as a consequence it was modified to make it clearer. The 1.27% shows that there are very few cases (in fact only one) when the description did not fit. Even in this case, the interviewee did give the correct description, mentioning only a similarity between two totally different movement tasks.

After adults and children tested the accuracy of the illustrations, before the last step (**Step** 5) of the study we modified the final play lists by adding a name to each skill for clarity (e.g., going up pole, going down pole). Following this, one hundred and forty seven (n=147) children were assessed on the movement solutions, using the play lists developed. During this step we did not encounter any confusion in regards to the illustrations, all being very evident and self explanatory.

Even if the total percentage agreement was low (54.67%), considering all the factors above (modality of testing, limitations of verbal descriptions, different focus, features too 'obvious'), the fact that the adults did indeed recognize the movement skills shown, as well as the fact that over one hundred children performed the exact tasks illustrated, suggest good support for the fidelity of the illustrations (the assessment tool).

The data obtained during the assessment of the one hundred and forty seven (n=147) children on the playground confirmed our assumption that children expand their skill repertoire as they mature, which is consistent with previous literature (Burton & Davis, 1996; Davis & van Emmerik, 1995; Ulrich, 1997). Overall, the results show a progressive increase between the children's performances in each grade, for the categories of equipment curly slide, horizontal bars, and poles. In my opinion, this increase could have different reasons such as: as children grow older, they acquire more strength to support their weight to either climb on the poles or to move and support their weight on the horizontal bars; once they develop the strength, they develop more courage to perform different skills on the curly slide (e.g., slide down backwards on curly slide on knees) or horizontal bars (e.g., "skin the cat"); or as children grow older, they have spent more time on the playground equipment, which means they get to practice the skills more. This last reason is in accordance with Watkinson & Causgrove-Dunn's (2003) statement that movement skills emerge from previous interactions with tasks and environments.

The results for straight slide display an 8% and a 7.9% (respectively) average increase between the kindergarten performances and grade I and III

performances (respectively), however only a 4.93% difference between the kindergarten and grade II performances. This could be explained by the fact that there might have been more children who wore skirts or shorts in grade II compared to the other grades. That might have impeded the children to perform some of the tasks such as sliding or climbing on knees. In addition, the results illustrate that task difficulty was related to the stability of the child on the apparatus. Fewer children were able to perform the movement solutions in skills in which the center of gravity was high. For example: 100% of all the children in all grades performed "slide down facing forward on seat" compared to only 16% on average of all children who performed "surf down facing backwards". Further, the direction of travel seemed to have an influence on the performance as well. In this matter, for "surfing down the slide facing forward" the percentages of children who performed the task are as follows: 29% for kindergarten, 32% for grade I, 42% for grade II, and 63% for grade III, compared to those for "surf down facing backwards": 10% for kindergarten, 4% for grade I, 18% for grade II, and 32% for grade III.

Similar results were obtained for the curly slide category, where the difficulty increased with raising the center of gravity and changing the direction of movement. Overall, there was a progressive increase of performance between kindergarten (69.05%) and grade III (91.69%).

Within the regular swings category, the results present an average increase of 5.2% for grade I compared to kindergarten, and a 10.11% increase for grade II. Children in grade III might have been more reserved to perform some of the skills that involved different partner tasks or other skills that involved standing or jumping off. That may be why the average difference between kindergarten and grade III performances is only 6.45%. This could be explained by the fact that as children grow older, they become more conscious about the differences between boys and girls. That means that some of the partner skills were not performed if the partners were of different genders. In addition, some of the girls wore skirts and did not feel comfortable demonstrating several of these tasks. These interpretations are based on the children's responses and the researcher assistants'

notes. In addition, in some cases the teachers did not allow partner swinging. Within this category, it seems as well that the center of gravity had an influence upon the results, the higher the center of gravity, the fewer children were able to perform the skill and the more partners on the swing, the fewer performances noted.

The data for horizontal bars and the poles also displayed a progressive increase in performance between kindergarten and grade III. The difficulty within these categories seems to depend on the stationary versus non stationary skills (100% of all children assessed performed "hanging with 2 hands" and only an average of 78.25% performed "moving forward alternating rung"), on how many limbs were used (100 % for "hanging with 2 hands" versus 98.5% for "hanging with one hand"), or hanging straight or upside down (100% for "hanging with 2 hands" versus 72.25% for "hanging upside down"). Also, combining hanging with a different skill increased the difficulty and fewer children were able to perform the task (e.g., an average of 45% of the children assessed performed "chin-up"). There were two instances ("hula hips" and leg circles") where the research team did not have time to finish testing all the groups, that is why there is no data for kindergarten and grades I and II.

The results for climbing equipment do not show substantial differences between grades (less than 1%), due to the fact that the assessment took place on a playground which did not have demanding enough equipment. In other words, instead of an instable bridge, the playground had a fixed bridge, so all children were able to perform all the tasks shown.

Conclusion

In conclusion, we believe that we developed a valid playground movement competence assessment protocol for kindergarten to grade III. Following an ETA approach, we assessed one hundred and forty seven children on seventy five movement solutions, using nine assessors, over approximately 12 hours. Children were able to look at the illustrations and, either perform the task, or say they could not do it. Further, children's performances overall on each category of playground

equipment were influenced by different factors consistent with the ecological task analysis. Individual characteristics (strength, motivation, courage), physical environment (time of day or weather – morning or afternoon, cooler or hot – which determined children to wear different outfits (skirts, shorts) that might have influenced their performance), social environment (teacher's regulations, as some teachers did not allow all the tasks to be performed), all appeared to have a substantial influence on children's movement solutions. Despite these factors, the results displayed an overall progressive increase between the children's performances in each grade, and our assumption that, on average, children's skill repertoire expands as they mature was confirmed. As a note, this current study did not look at the reasons for the increase, rather it looked at if the skill repertoire increased. Further studies could address these issues.

In addition, even if not all the illustrations have been tested individually, the fact that the adults did recognize the movement skills and the children had no problem performing the tasks, leads us to believe that the any further illustration created in the same conditions can be used in similar studies. Furthermore, using an ETA approach allows changes in the assessment tool developed (other similar illustrations), depending on factors such as: the improvement of the playgrounds over time, the specific equipment available on a local school playground, or what apparatus or skills are more popular among children at a certain time. In other words, the instrument has the great advantage of allowing to be updated anytime based on the present conditions.

Implications for practice

As previously stated, the present study developed a movement competence assessment instrument based on grade that could provide useful information to assist teachers and parents in instructing the essential skills needed by children to participate in recess activities. The instrument developed focuses on skills with social relevance for children from kindergarten to grade three, on four chosen categories of playground equipment. Further, this assessment tool can be modified

to be used in different settings, providing many movement solutions to frequently employed playground task goals.

In addition, we consider that the assessment instrument created is teacher-friendly. That means that the current device could be employed by teachers who are looking for easy and understandable means of getting information (e.g., check off things that they can easily see) versus ways that infer abilities or ages, for example. In other words, teachers would be able to follow the subsequent pattern: screen –> assessment –> prescription.

Limitations to the findings

The data obtained throughout this study provided important information regarding each step involved in the development of the movement competence assessment instrument for the playground activities. However, there might be some limitations to these findings as follows:

- The testing of the illustrations created was performed by physical educators versus non-physical educators. We do not know if the instrument will work with teachers with no background in physical education.
- The assessment took place on a typical school playground, and was not tested on other playgrounds (e.g., inner-city school playground or more remote communities). This means that the equipment used did not include a range of all the possible task goals (e.g.,, we only assessed children on regular swings, because the playground had only this type of swings). In addition, the climbing equipment found at the school was not challenging enough and did not differentiate the performances among the different grades.

Recommendations for future research

Some recommendations for future studies include:

- Test the assessment device created with non-physical educators, in order to observe if they will/can use the instrument, if they like it, and if they use it accurately as intended.

- Verify if teachers can detect children who can or cannot perform the task goals.
- Determine if or if not this assessment device can predict which children take part in recess activities and which ones don't.
- Determine the relation between a child skill repertoire and the degree he/she is taking part in recess activities.
- Develop a similar assessment instrument for preschool children.
- Enlarge the list of playground goals to games and other equipment (e.g., balls, scooter, or racquets) used on the playground.

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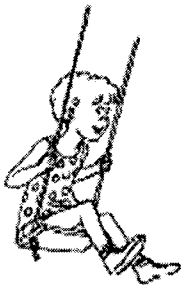
Appendix A – List of Task Goals

Sample of List of task goals followed by the list

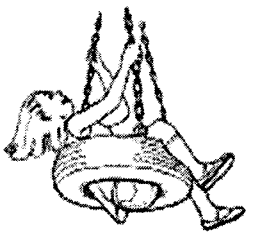
MOVEMENT SOLUTIONS - SWINGS



1) regular

Check

- ☐ on bum
- ☐ on knees
- ☐ on belly
- ☐ standing
- ☐ with a partner standing
- ☐ with a partner sitting
- ☐ underduck
- ☐ jump off swing
- ☐ spin swing
- ☐ swing side to side
- ☐ pumping sitting
- ☐ pumping standing



2) horizontal tire

Check

- ☐ on bum
- ☐ on knees
- ☐ on belly
- ☐ standing
- ☐ with a partner standing
- ☐ with a partner sitting
- ☐ underduck
- ☐ jump off swing
- ☐ spin swing
- ☐ swing side to side
- ☐ in circles
- ☐ pumping sitting
- ☐ pumping standing
- ☐ suspended underneath the swing

3) baby

Check

- ☐ on bum
- ☐ on knees
- ☐ spin in swing
- ☐ standing
- ☐ pumping sitting
- ☐ pumping standing

Extreme movement solutions

- ☐ back flip
- ☐ 2 swings twist
- ☐ bumper swings
- ☐ 2 partners, 2 swings, wrapped around each other

MOVEMENT SOLUTIONS – MONKEY BARS

Specific movement solutions – with knees

two knees alone

two knees and hands

stationary

swinging

Extreme movement solutions

one knee alone

one knee and hands

flip

straddle both bars and rotating – flip over

flip with legs crossed

standing on top

climb on top

Common movement solutions – with arms

Hanging	*Locomotion forwards*	*Locomotion backwards*
one hand	alternating grasp	alternating grasp
two hands	marking time	marking time
stationary	skipping a bar	skipping a bar
Swinging		
'hula'		
getting the legs up		
'skin the cat'		
pull up/chin up		

MOVEMENT SOLUTIONS – SLIDES

Slide down		**Climb up**		
		The slide		The ladder
Facing forwards	*Facing backwards*	*Facing up the slide*	*Facing down the slide*	
on seat, hands in contact	on seat, with hands	on seat, hands in contact	on seat	other
on seat, with feet	on seat, with feet	on knees and hands	on feet	climbing
on seat, no contact	on seat, no contact	on feet		equipment
on knees, hands in contact	on knees, hands in contact			
on knees, no hands contact	on knees, no hands contact			
on belly	on belly			
on feet, crouched	on feet, crouched			
on feet, surfing position	on feet, surfing position			
on seat, sitting on hands	on the side			
laying on side / hip, with hands				
on back, legs crossed				
on back, no legs in contact, hands in contact				
on back, facing sideways				
on knees, facing sideways				
one knee,				

one foot, hands in contact
one foot, other foot extended straight out in front, hands in contact
switching from on knees to sitting, hands in contact
on seat, both legs over the side, hands in contact
on the side
on tray

Specific movement solutions

Straight	Wavy	Wide	Curly	Tube
Facing backwards, slide down on seat, feet over edges *Facing up the slide*, climb up on seat, feet over edges			Walking up and down on the outside edge	On top of tube – walking up and down
Vertical log roll			Going down suspended under slide with 2 hands	Going down suspended under slide with 2 hands

MOVEMENT SOLUTIONS – CLIMBING EQUIPMENT

Climbing				**Jumping**
Climb up		*Climb down*		
Suspended apparatus	*Fixed apparatus*	*Suspended apparatus*	*Fixed apparatus*	
on a tire	a pole	on a tire	a pole	jumping off
cargo net	on a ladder	cargo net	straight	jumping over
marking time	marking time	marking time	spinning around	
alternating grasp	alternating grasp	alternating grasp	spiralling	
blocks and chains	ramp with rope/chain		on a ladder	
marking time			marking time	
alternating grasp			alternating grasp	
tires and chains				
marking time				

Appendix B2 – Information Letter for school principal and teachers

Faculty of Physical Education and Recreation

INFORMATION LETTER

Observation of children on the playground

The general purpose of the present research is to create a movement competence assessment tool based on grade that would provide useful information to assist teachers and parents in instructing the essential skills needed by children to participate in recess activities.

To identify the eventual skill assessment items on the selected playground apparatus (slides, swings, horizontal bars, and climbing equipment) a research team, including undergraduate and graduate physical education students, will generate a list of all possible skills for each piece of equipment selected. Following this, observations of children on playgrounds will be conducted. The specific purpose of the observation step is to verify the lists and add more skills as warranted.

The following investigators will perform the observations:

Andreea Mohora, graduate student, University of Alberta, 492-2679
Jane Watkinson, professor, University of Alberta, 492-2163
Brian Nielsen, professor, University of Alberta, 492-3839
Christina Lau, graduate student, University of Alberta, 492-2679
Nancy Cavaliere, graduate student, University of Alberta, 492-2679
Maryann Rintoul, graduate student, University of Alberta, 492-2679
Katie McGillivray, graduate student, University of Alberta, 492-2679
Bobbijo Acheson, undergraduate student, University of Alberta, 492-2679

Ali Jonzon, undergraduate student, University of Alberta, 492-2679
Sarah Nychka, undergraduate student, University of Alberta, 492-2679
Heather Craig, undergraduate student, University of Alberta, 492-2679
Caley Mcelwain, undergraduate student, University of Alberta, 492-2679

Observation conditions

Children from Eastwood School will attend a free play period with their teachers and students from PEDS 471. Students and teachers will interact as usual with the students on the playground, asking them to show all possible things they can do on each piece of equipment. This is a regular educational activity for this group following their participation in PEDS 471 in the Fall of 2005.

The research team will be distributed around the playground with lists of apparatus and possible skills. The observers will take note of all activities demonstrated and record any additional activities not already on the list. Following the observation period, the students who regularly work with the children from Eastwood School will be asked if they have observed any additional skills that have not already been identified. Additional skills will be added to the list. Data collected will be used as a preliminary step in developing the movement competence assessment tool based on grade.

If children approach members of the research team, the researcher will encourage them to return to active play on the playground. The most likely question that will be directed to the observers is "Why are you here?", in which case the researcher will respond "We are watching you play" and will direct any further questions to the teachers. There are no foreseeable risks associated with the observation step. The names of individual children will not be recorded.

If you have concerns about this study, you may contact Dr. Brian Maraj, Chair of the Faculty Research Ethics Board, at 492-5910. Dr. Maraj has no direct involvement with this project.

Appendix B3 – Informed Consent from for school principal and teachers

Faculty of Physical Education and Recreation

INFORMED CONSENT FORM

Part 1 (to be completed by the Principal Investigator)

Title of Project: **Observation of children on the playground**

Principal Investigator(s): ANDREEA MOHORA, graduate student, University of Alberta, 492-2679

JANE WATKINSON, professor, University of Alberta, 492-2163

Part 2 (to be completed by the research participant)

I have been informed about the observations that will take place during free play at the playground for children from Eastwood School. I have read and understand the *Information Letter*.

This study was explained to me by: _____

I agree to take part in this study:

_____	_____	_____
Signature of Research Participant	Date	Witness
_____		_____
Printed Name		Printed Name

I believe that the person signing this form understands what is involved in the study and voluntarily agrees to participate.

_____	_____
Signature of Investigator or Designee	Date

The information sheet must be attached to this consent form and a copy of both forms given to the participant.

Appendix C2 – Script email

Script – email

We are seeking a small number of adult participants for a pilot project about children's activities on the playground. If you know any parent or teacher who has **NO** background in the field of Physical Education or Kinesiology, please forward this email to them. Attached is an *Information Letter* describing the procedures.

Please let them know that if they are interested in helping with our project or have any questions they are free to contact me or Dr. Watkinson directly:

Andreea Mohora, grad. student, University of Alberta, amohora@ualberta.ca; Phone #: 492-2679
Jane Watkinson, prof., University of Alberta, jane.watkinson@ualberta.ca; Phone #: 492-2163

Thank you for helping.
Andreea

Appendix C3 – Information Letter for adults

Faculty of Physical Education and Recreation

INFORMATION LETTER

Interpreting illustrations of movement skills: Interviews with parents/teachers

Background information

The general purpose of the present research is to create a movement competence assessment tool based on grade that would provide useful information to assist teachers and parents in instructing the essential skills needed by children to participate in recess activities. Unlike other standard assessment tools, this will be illustrated and comprehensive so it reflects most of the skills that children typically do on playgrounds.

To identify the eventual skill assessment items on the selected playground apparatus (slides, swings, horizontal bars, and climbing equipment) a research team, including undergraduate and graduate physical education students, generated a list of all possible skills for each piece of equipment selected. Following this, illustrations that represent the movement skills were created, based on observations of children on playgrounds. To test whether or not the illustrations communicate what we intend, interviews with classroom teachers and parents will be conducted. The participants should have no background in the field of Physical Education or Kinesiology. The selection is based on voluntary participation in the study, after signing the *Informed Consent Form*.

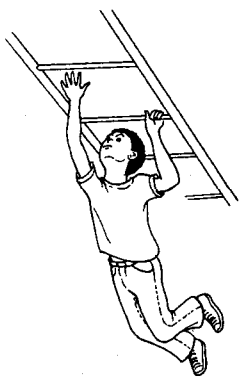
Interview conditions

The interviews will take place in the Adapted Lab (GB-06, Education Building) at the University of Alberta, at an agreed-upon time and will take approximately 45

minutes. You have the option of withdrawing at any time, without any questions asked. If you decline to continue or you wish to withdraw from the study, please indicate to the researcher either verbally or in writing your intention to withdraw. Your information will be removed from the study upon your request.

You will be shown 20 to 50 illustrations and you will be asked: "Can you describe what the child is doing in this illustration?" Further, you will be asked to identify the important features of the skill. The purpose of this interview is to verify that what you see in the illustration corresponds with what is intended by the research team.

For example, the following illustration represents: "moving forward on a horizontal bar".



The important features of this 'task solution' are:

- alternating hands on the bars;
- supporting weight.

Irrelevant features that might be 'read' for this illustration are:

- knees/elbow bent.

There will be no physical or psychological risks involved in the interviews, as the questions are not of personal matters in any ways, they are related to the illustrations that represent children on different pieces of equipment on the playgrounds.

Data collected will be used as a preliminary step in developing the movement competence assessment tool based on grade. All the information will

be kept confidential and access to data will be limited to the research team. The data will be kept in a locked cabinet, in the Adapted Lab (GB-06, Education Building) at the University of Alberta and will be shredded after five years.

If you have concerns about this study, you may contact Dr. Brian Maraj, Chair of the Faculty Research Ethics Board, at 492-5910. Dr. Maraj has no direct involvement with this project.

Appendix C3 – Informed Consent Form for adults

Faculty of Physical Education and Recreation

INFORMED CONSENT FORM

Part 1 (to be completed by the Principal Investigator)

Title of Project: **Interpreting illustrations of movement skills**

Principal Investigator(s): ANDREEA MOHORA, graduate student, University of Alberta, 492-2679

JANE WATKINSON, professor, University of Alberta, 492-2163

Part 2 (to be completed by the research participant)

Do you understand that you have been asked to be in a research study?	Yes	No
Have you read and received a copy of the attached Information Sheet	Yes	No
Do you understand the benefits and risks involved in taking part in this research study?	Yes	No
Have you had an opportunity to ask questions and discuss this study?	Yes	No
Do you understand that you are free to refuse to participate, or to withdraw from the study at any time, without consequence, and that your information will be withdrawn at your request?	Yes	No
Has the issue of confidentiality been explained to you? Do you understand who will have access to your information?	Yes	No

This study was explained to me by: _____

I agree to take part in this study:

_____ _____ _____

Signature of Research Participant Date Witness

Printed Name Printed Name

I believe that the person signing this form understands what is involved in the study and voluntarily agrees to participate.

Signature of Investigator or Designee Date

The information sheet must be attached to this consent form and a copy of both forms given to the participant.

Appendix C5 – Script Email

Script – email

If you are a parent of children in grades 2 and 4, please take a moment to read the *Information Letter* attached. If you know parents of children in grades 2 and 4, please forward this message to them. We are looking for 8 to 10 children to do some activities on the playground for us. We want them to show us some skills on the swings, the climbers, the slides and the monkey bars.

If you are interested in having your child participate in the study, or if you have any questions, feel free to contact me or Dr. Watkinson directly at:

Andreea Mohora, grad. student, University of Alberta, amohora@ualberta.ca; Phone #: 492-2679
Jane Watkinson, prof., University of Alberta, jane.watkinson@ualberta.ca; Phone #: 492-2163

Thank you for helping us in this small study for our research project.
Andreea

Appendix C6 – Information Letter for parents/guardians

Faculty of Physical Education and Recreation

INFORMATION LETTER

Interpreting illustrations of movement skills with participants who are children

Background information

The general purpose of the present research is to create a playground skills assessment tool that would provide useful information to assist teachers and parents in instructing the essential skills needed by children to participate in recess activities. Unlike other standard assessment tools, this will be illustrated and comprehensive so it reflects most of the skills that children typically do on playgrounds.

To identify the eventual skill assessment items on the selected playground apparatus (slides, swings, monkey bars, and climbing equipment) a research team, including undergraduate and graduate physical education students, generated a list of all possible skills for each piece of equipment. Following this, illustrations that represent the movement skills were created, based on observations of children on playgrounds and discussions with parents and teachers. A sample of these illustrations is attached. The next step is to make sure the illustrations can be understood by children.

Participation conditions

The illustrations will be tested on children, grades 2 and 4, to ensure that the illustrations are perceived by children the same way as they are perceived by adults.

The following investigators will supervise the interactions with children while undergraduate and graduate Physical Education and Recreation students carry out the activity:

Andreea Mohora, graduate student, University of Alberta, 492-2679

Jane Watkinson, professor, University of Alberta, 492-2163

Participants and their parents and guardians have the option of withdrawing at any time, without any questions asked. If you decline to continue or you wish to withdraw from the study, please indicate to the researcher either verbally or in writing your intention to withdraw. Your child can withdraw by simply telling the researcher or a student that he or she does not want to take part, or by indicating through any other means that he or she does not want to continue. Your information will be removed from the study upon your request. The data collection will take place at local playgrounds and will take approximately 30 to 45 minutes. This 30 to 45 minute of supervised time on the playground will be fun for both your child and yourself. Your child will get to perform a variety of movement tasks and you will be able to observe what can be done on different pieces of equipment.

Procedures

Your child and two students from our research team will go out to the local playgrounds. You are also welcome to attend. After a brief period of free play, your child will be asked to tell the student what he or she sees in the illustration and if he or she would like to demonstrate the skill shown. The investigators will record the answers and whether the skill demonstrated is the one intended by the illustrator. For children in grade 2, the student will begin with skills that other children this age have described as 'easy', and will stop when your child shows any hesitancy about doing the skill. For children in Grade 4 the student will begin with the 'easy' skills and then will move to skills that children in grades 2 and 3 have rated as 'harder'. Your child will be reminded frequently

that he or she does not have to do what he or she sees in the illustration and should only try skills he or she has done before.

There will be no physical or psychological risks involved beyond those for daily participation on the playground. While there are inherent risks in any playground activity, the tasks your child will be asked to perform will be normal everyday activities for children of his or her age group. Risks will be minimized through supervision and physical support should your child indicate he or she wishes it. If injury occurs, standard procedures used in the Faculty of Physical Education and Recreation will be followed and medical treatment will be available at no additional cost to you. By signing this consent form you are not releasing the investigators, the Faculty of Physical Education and Recreation, or the University of Alberta from their legal and professional responsibilities. The students conducting the activity have experience working in physical activity settings, including playgrounds, with children of this age.

All the information will be kept confidential by using code names and access to data will be limited to the research team. The data will be kept in a locked cabinet, in the Adapted Lab (GB-06, Education Building) at the University of Alberta and will be shredded after five years.

If you have concerns about this study, you may contact Dr. Brian Maraj, Chair of the Faculty Research Ethics Board, at 492-5910. Dr. Maraj has no direct involvement with this project.

Appendix C7 – Informed Consent Form for parents/guardians

Faculty of Physical Education and Recreation

PARENT/GUARDIAN INFORMED CONSENT FORM

Part 1 (to be completed by the Principal Investigator)

Title of Project: **Interpreting illustrations of movement skills**

Principal Investigator(s): ANDREEA MOHORA, graduate student, University of Alberta, 492-2679

JANE WATKINSON, professor, University of Alberta, 492-2163

Part 2 (to be completed by the parent/legal guardian of the research participant)

Do you understand that your child has been asked to be in a research study?	Yes	No
Have you and your child read and received a copy of the attached Information Sheet	Yes	No
Do you and your child understand the benefits and risks involved in taking part in this research study?	Yes	No
Have you and your child had an opportunity to ask questions and discuss this study?	Yes	No
Do you understand that your child is free to refuse to participate, or to withdraw from the study at any time, without consequence, and that your child's information will be withdrawn at your request?	Yes	No
Has the issue of confidentiality been explained to you and your child? Do you understand who will have access to your child's information?	Yes	No

This study was explained to us by: _____

I agree to take part in this study:

Signature of Research Participant	Date	Witness
Printed Name	Date	Printed Name

I give my permission for my child to participate in this study:

Signature of Parent/Guardian	Date	Printed Name

I believe that the person signing this form understands what is involved in the study and voluntarily agrees to participate.

Signature of Investigator or Designee	Date

The information sheet must be attached to this consent form and a copy of both forms given to the participant.

Appendix C8 – Script Children

Script – children

The reason why I'm here with you is that I'm interested in what kinds of things kids your age can do at recess. I will show you some illustrations of children doing activities on the playground. After you take a look at them I will ask you to tell me, and then show me what you see. I will ask you these questions:

Can you tell me what the boy/girl in this illustration is doing?

Can you do this?

Do you want to show me what the boy/girl in this picture is doing?

I need to let you know that you can stop answering my questions whenever you want to, and if you decide you don't feel like doing anything any more that's ok, you won't get in trouble with me or anyone else, ok? If there are any activities that you think you can do but you don't want to do them that is ok. You just have to tell me. I won't ask you to show me any of the activities that you think you can't do. If you want me to help you by … (holding your hand ..) I can do that too.

Do you remember what I said I was interested in learning?(check) I also want you to know, that you haven't been singled out from the other kids for any reason, I'm asking questions about recess from children your age to learn more about what kids like you can do. The other person on the playground is watching to see if I remember all the moves you show me.

Appendix D2 – Information Letter for parents/guardians

Faculty of Physical Education and Recreation

INFORMATION LETTER

Testing of a movement competence assessment protocol for recess skills

Background information

The general purpose of the present research is to create a playground skills assessment tool that would provide useful information to assist teachers and parents in instructing the essential skills needed by children to participate in recess activities. Unlike other standard assessment tools, this will be illustrated and comprehensive so it reflects most of the skills that children typically do on playgrounds.

To identify the eventual skill assessment items on the selected playground apparatus (slides, swings, horizontal bars, and climbing equipment) a research team, including undergraduate and graduate physical education students, generated a list of all possible skills for each piece of equipment. Following this, illustrations that represent the movement skills were created, based on observations of children on playgrounds and discussions with parents and teachers (see attached illustrations). The next step is to test what skills are typically performed by children in different grades, particularly kindergarten to grade 3.

Participation conditions

The illustrations will be tested on children in kindergarten to grade 3, to identify the most common skills used on playgrounds for those ages. The following investigators will supervise the interactions with children while

undergraduate and graduate Physical Education and Recreation students carry out the activity:

Andreea Mohora, graduate student, University of Alberta, 492-2679

Jane Watkinson, professor, University of Alberta, 492-2163

Participants and their parents and guardians have the option of withdrawing at any time, without any questions asked. If you decline to continue or you wish to withdraw from the study, please indicate to the researcher either verbally or in writing your intention to withdraw. Your child can withdraw by simply telling the researcher or a student that he or she does not want to take part, or by indicating through any other means that he or she does not want to continue. Your information will be removed from the study upon your request. The data collection will take place at local playgrounds and will take approximately 30 to 45 minutes. This 30 to 45 minute period of supervised time on the playground will be fun for both your child and yourself. Your child will get to perform a variety of movement tasks and you will be able to observe what can be done on different pieces of equipment.

Procedures

Your child and two research assistants will go out to the school playgrounds. You are also welcome to attend. After a brief period of free play, your child will be asked to tell the assistant whether or not he or she can do the skill in the illustration and whether or not he or she would like to demonstrate the skill shown (see attachment). Some of these skills are for older, and some are for younger children. The investigators will record the answers and whether or not the skill is demonstrated. For children in kindergarten, the assistant will begin

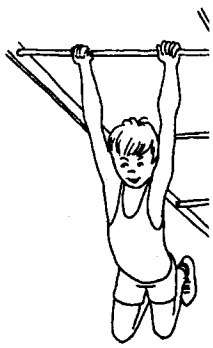
with skills that other children this age have described as 'easy', and will stop when your child shows any hesitancy about doing the skill. For older children the student will begin with the 'easy' skills and then will move to skills that children in grades 2 and 3 have rated as 'harder'. Your child will be reminded frequently that he or she does not have to do what is in the illustration and should only try skills he or she has done before.

There will be no physical or psychological risks involved beyond those for daily participation on the playground. While there are inherent risks in any playground activity, the tasks your child will be asked to perform will be normal everyday activities for children of his or her age group. Risks will be minimized through supervision and physical support should your child indicate he or she wishes it. If injury occurs, standard procedures used in the Faculty of Physical Education and Recreation will be followed and medical treatment will be available at no additional cost to you. By signing this consent form you are not releasing the investigators, the Faculty of Physical Education and Recreation, or the University of Alberta from their legal and professional responsibilities. The researchers conducting the activity have experience working in physical activity settings, including playgrounds, with children of this age.

All the information will be kept anonymous and confidential by using code names and access to data will be limited to the research team. The data will be kept in a locked cabinet, in the Adapted Lab (GB-06, Education Building) at the University of Alberta and will be shredded after five years.

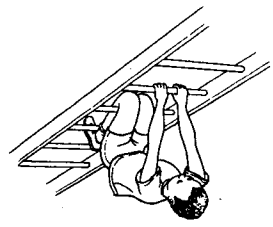
If you have concerns about this study, you may contact Dr. Brian Maraj, Chair of the Faculty Research Ethics Board, at 492-5910. Dr. Maraj has no direct involvement with this project.

Movement solutions

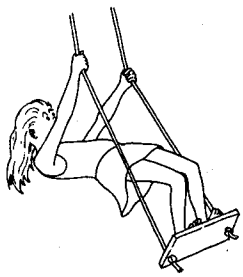


hang with two hands

alternating grasp

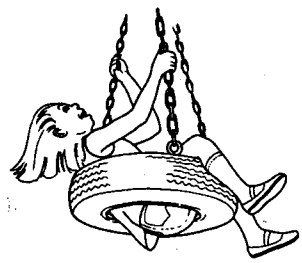


two knees and hands

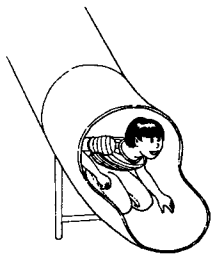


standing / pumping standing

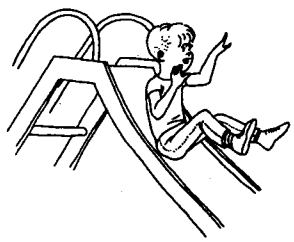
with a partner sitting



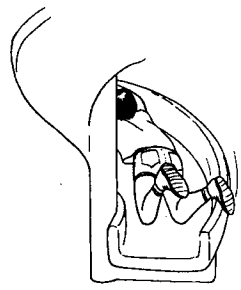
on bum



on knees, no hands contact



on seat, no contact



on belly

Appendix D3 – Informed Consent Form for parents/guardians

Faculty of Physical Education and Recreation

PARENT/GUARDIAN INFORMED CONSENT FORM

Part 1 (to be completed by the Principal Investigator)

Title of Project: **Testing of a movement competence assessment protocol for recess skills**

Principal Investigator(s): ANDREEA MOHORA, graduate student, University of Alberta, 492-2679

JANE WATKINSON, professor, University of Alberta, 492-2163

Part 2 (to be completed by the parent/legal guardian of the research participant)

Do you understand that your child has been asked to be in a research study?	Yes	No
Have you and your child read and received a copy of the attached Information Sheet	Yes	No
Do you and your child understand the benefits and risks involved in taking part in this research study?	Yes	No
Have you and your child had an opportunity to ask questions and discuss this study?	Yes	No
Do you understand that your child is free to refuse to participate, or to withdraw from the study at any time, without consequence, and that your child's information will be withdrawn at your request?	Yes	No
Has the issue of confidentiality been explained to you and your child? Do you understand who will have access to your child's information?	Yes	No

This study was explained to us by: _____

I agree to take part in this study:

Signature of Research Participant	Date	Witness

Printed Name	Date	Printed Name

I give my permission for my child to participate in this study:

Signature of Parent/Guardian	Date	Printed Name

I believe that the person signing this form understands what is involved in the study and voluntarily agrees to participate.

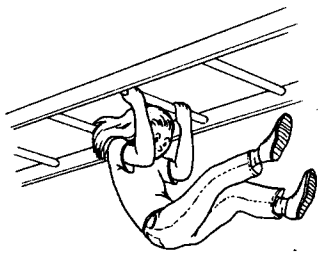
Signature of Investigator or Designee	Date

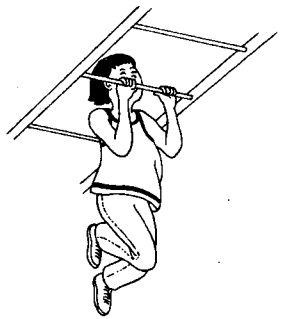
The information sheet must be attached to this consent form and a copy of both forms given to the participant.

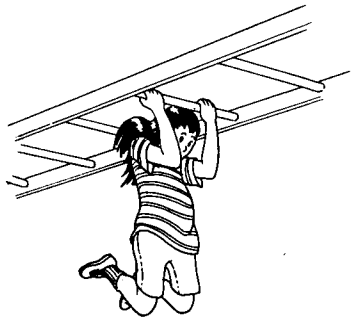
Appendix E – Movement Solutions List

Sample of Movement Solutions List followed by the illustrations presented during the interviews with adults:

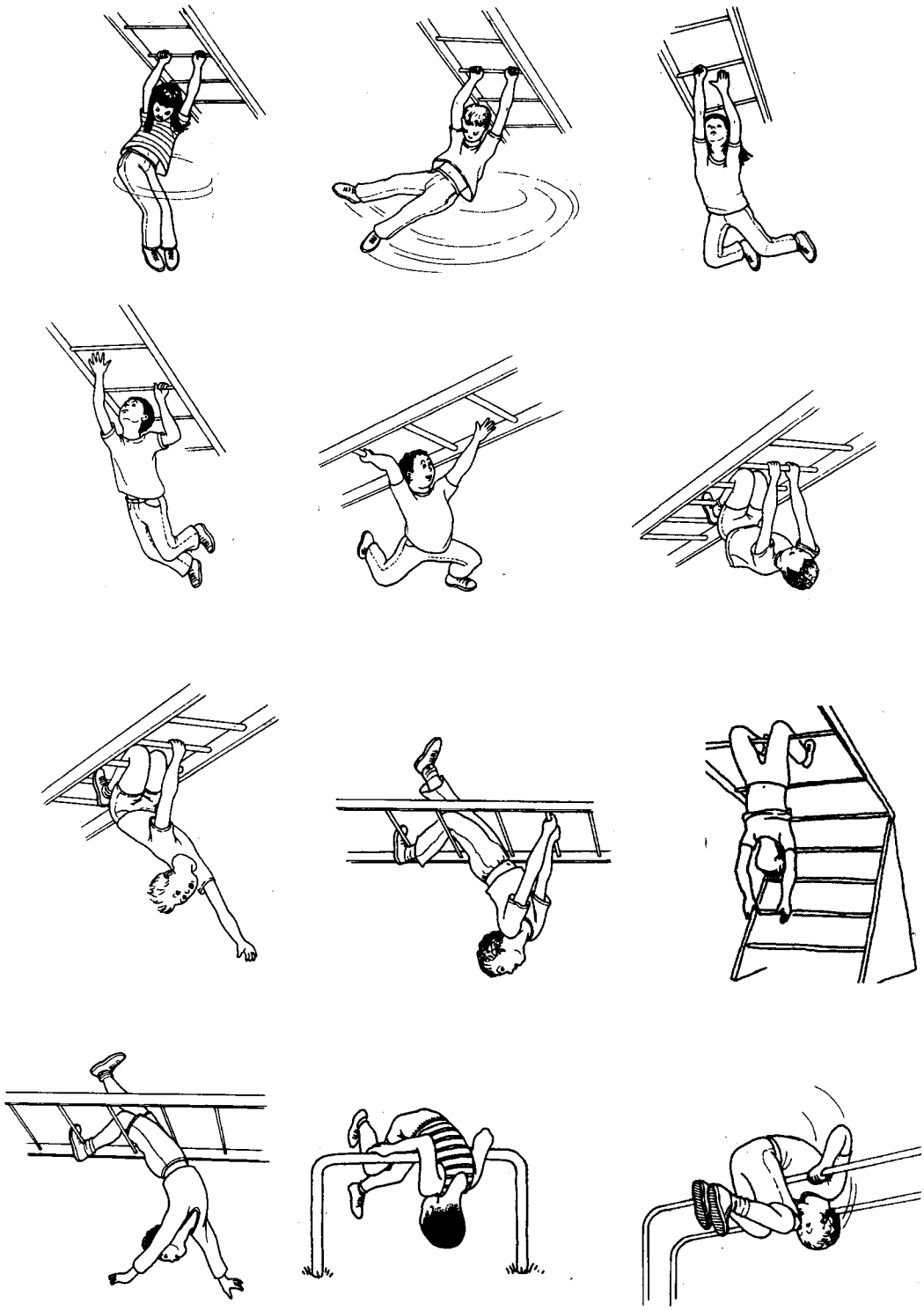
Horizontal bars

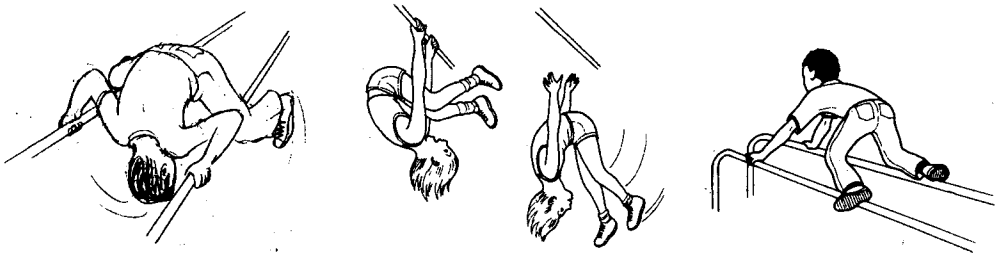


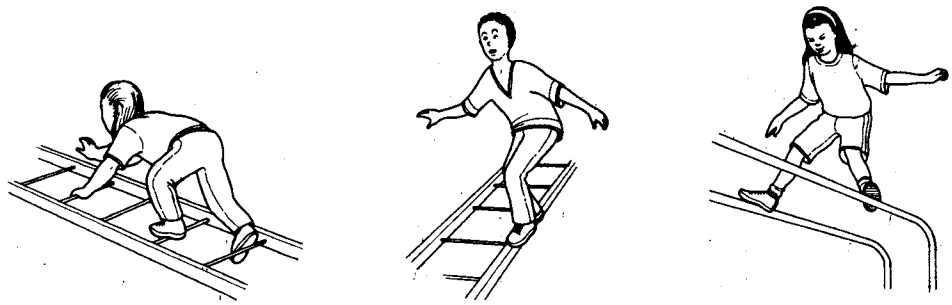




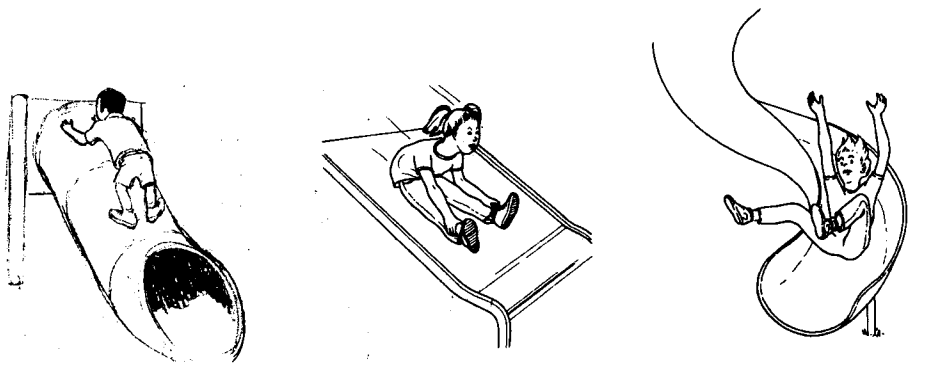
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

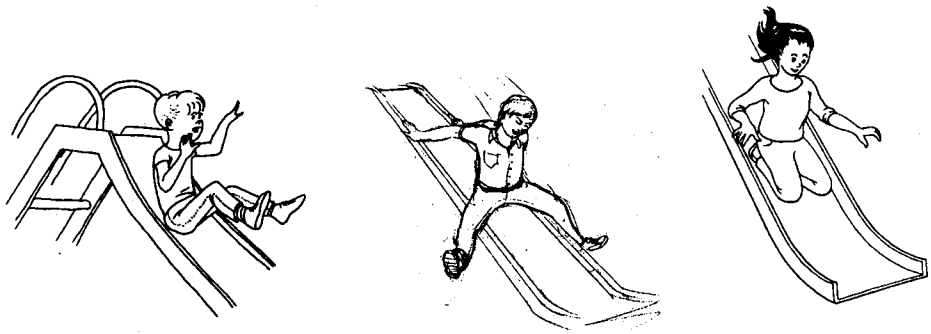


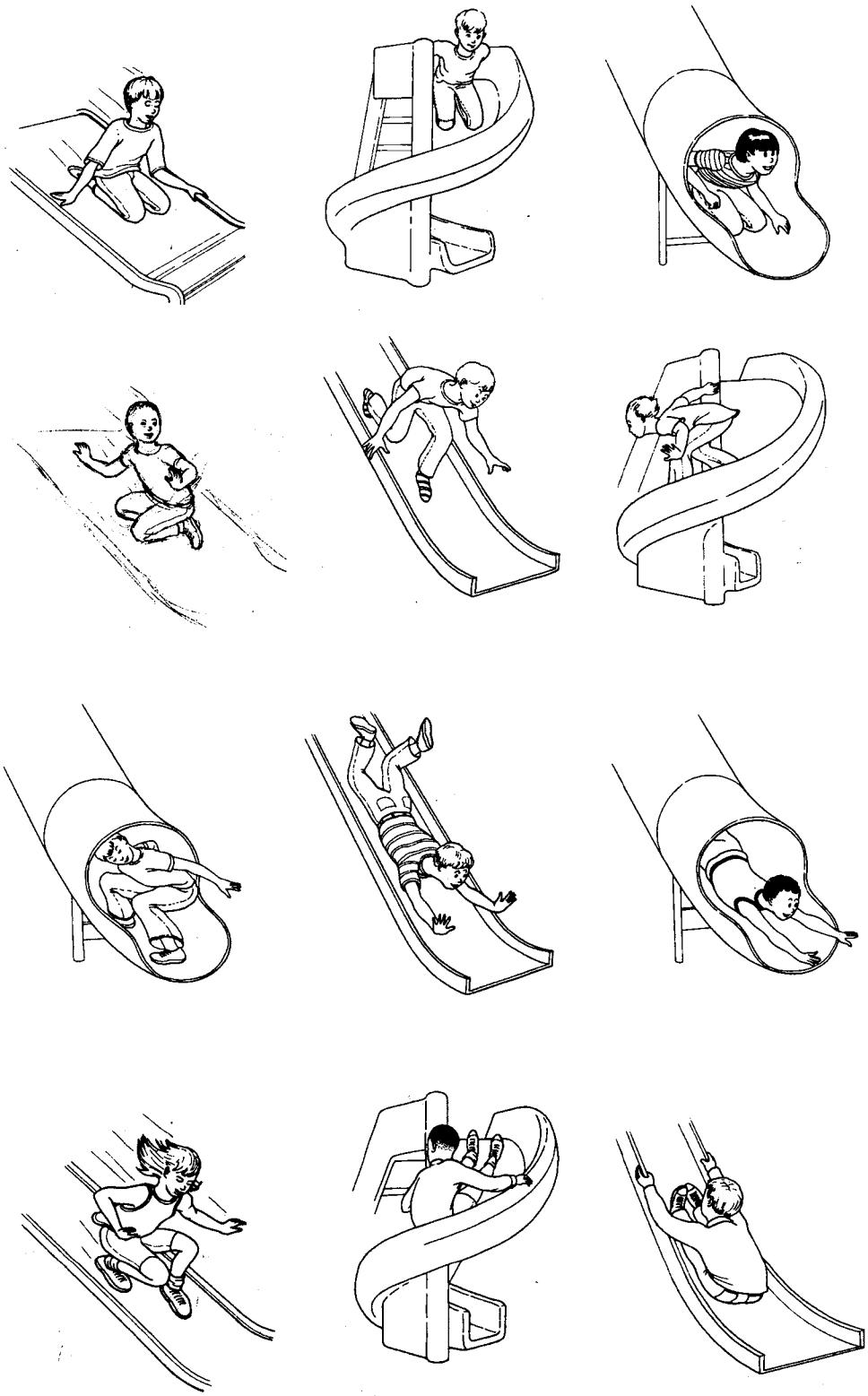


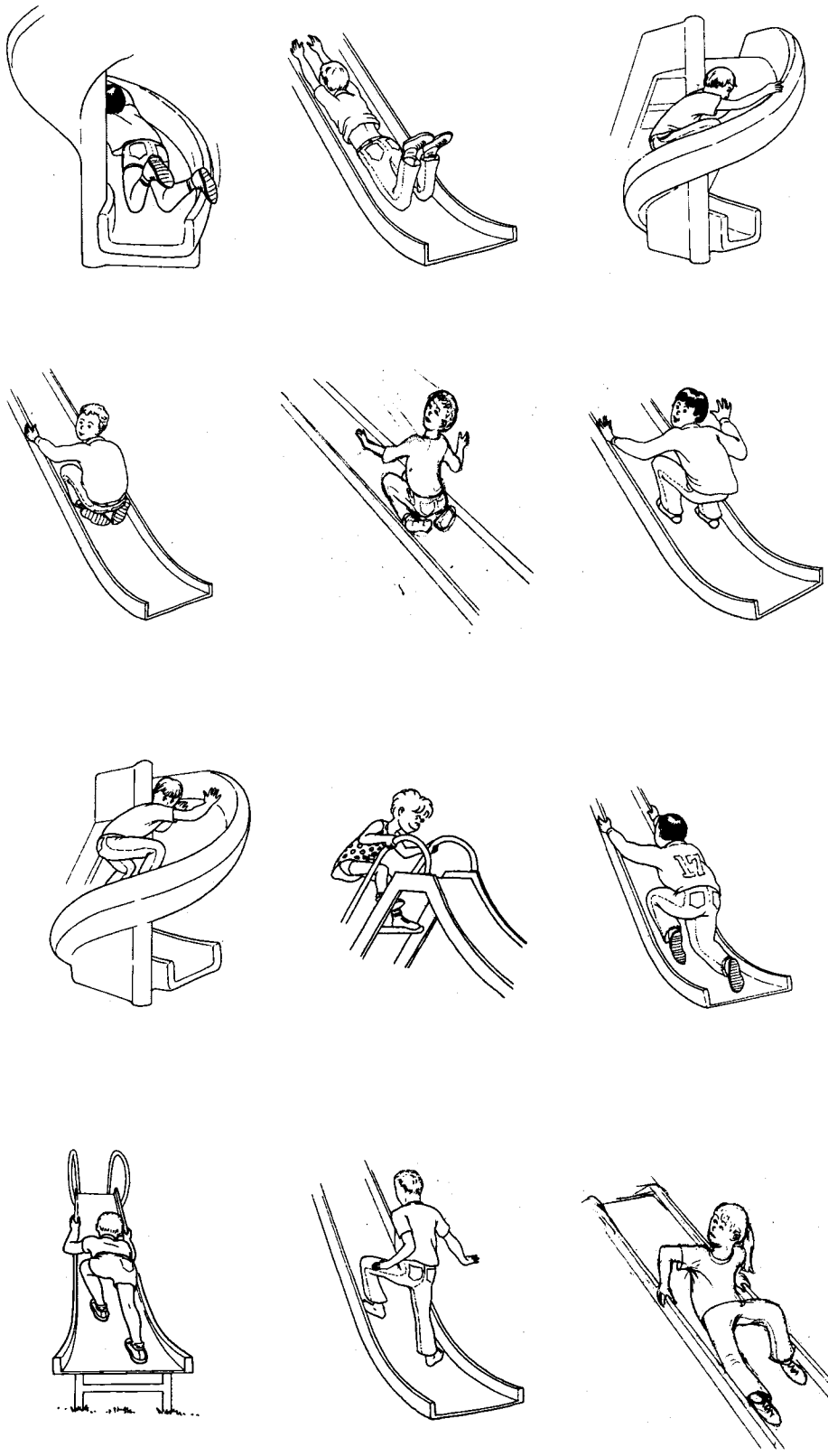


Slides

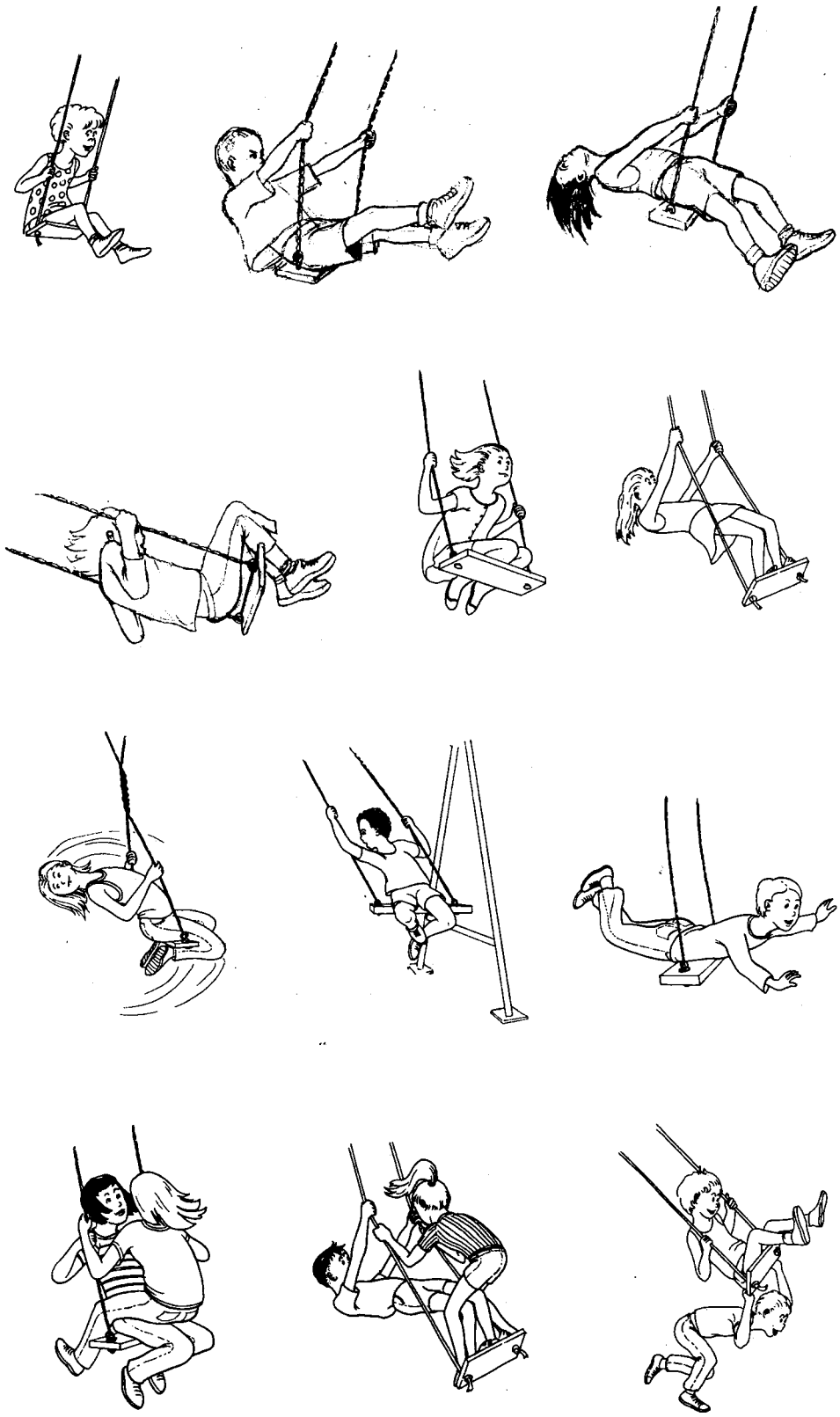


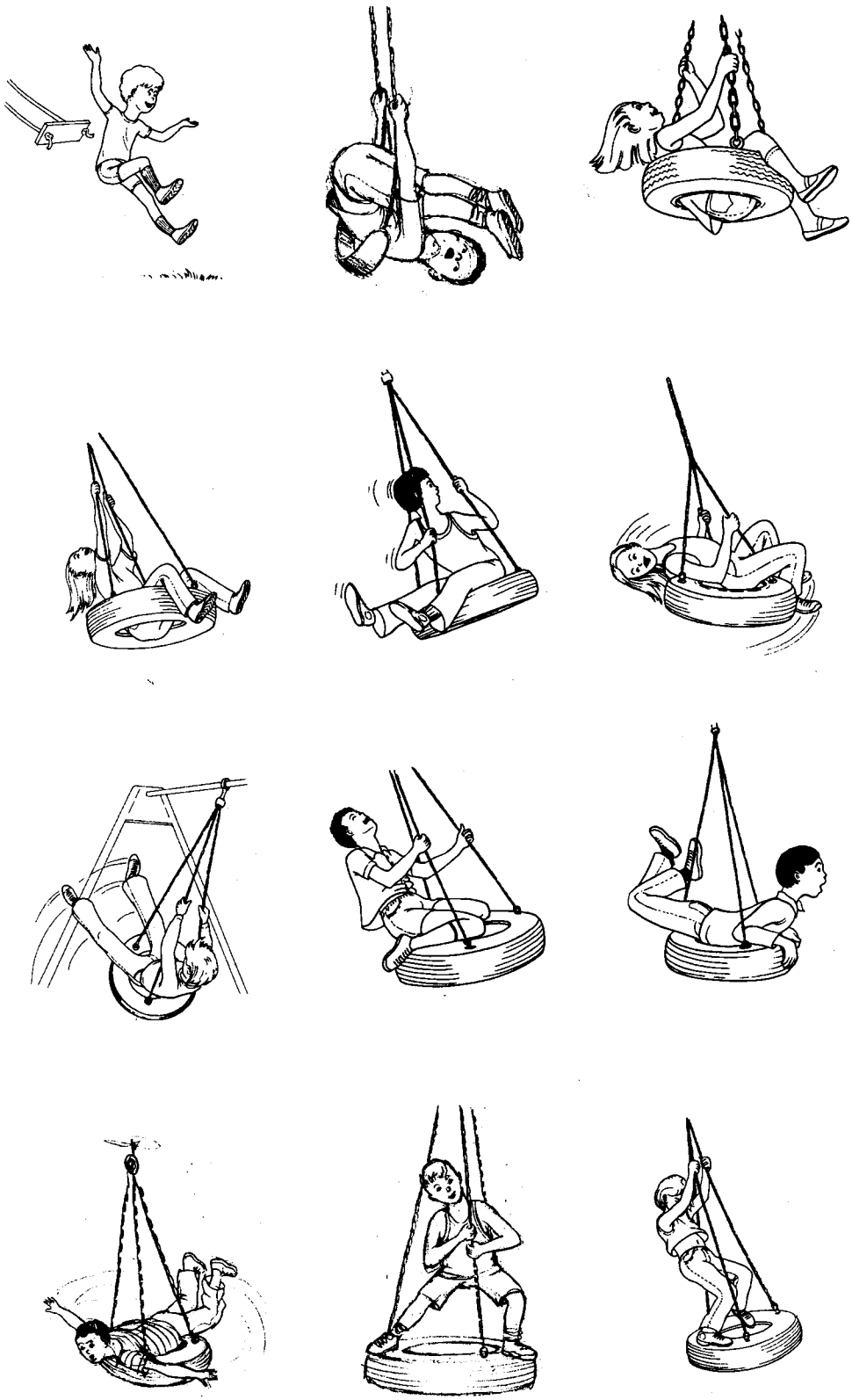


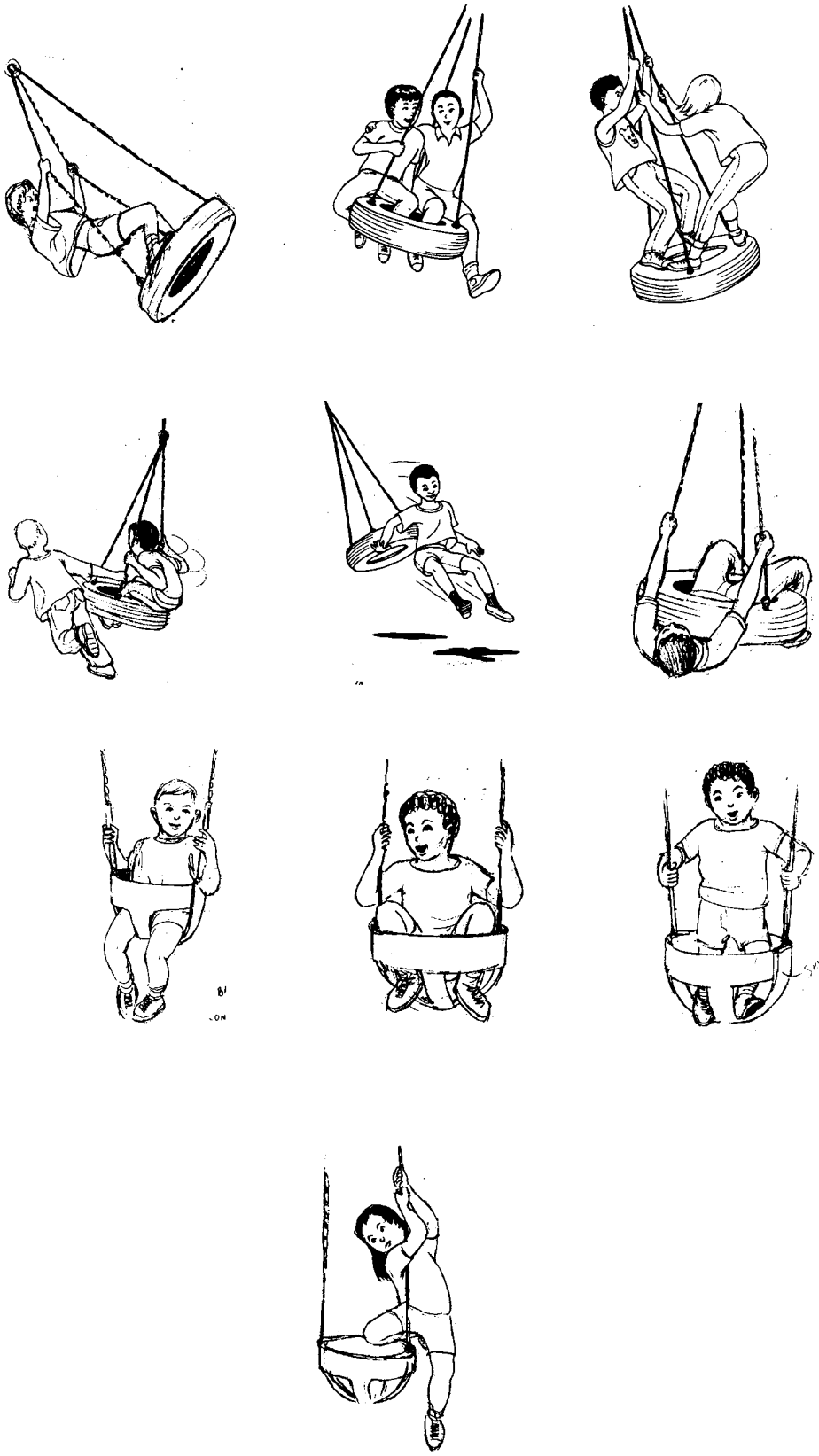




Swings





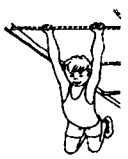


Appendix F - Summary data Step 3

Parent/teacher vs. Research team - Critical Features of Movement Solutions

Legend:

x	parent/teacher mentioned this critical feature
~	parent/teacher did not have the picture at all
(blank)	parent/teacher did not mention this critical feature to this picture



Hanging with two hands

Research Team	1	2	3	4	5	6	7	8	Total	
2 hands	x	x	x	~		x	x		5/7	71%
support weight	x	x		~	x	x		x	5/7	71%
	swinging motion		arms extended		swing on horizontal bar	possibly swinging	move whole body weight forward	grip		
							swinging			

Hanging from one hand

Research Team	1	2	3	4	5	6	7	8	Total	
support weight	x	x		~	x	x			4/7	57%
one hand	x	x	x	~		x			4/7	57%
	swing forward		strong grip forward		swing on horizontal bar	possibly alternating hands	swing from one bar to another	swinging across monkey bars		
			flexible shoulders				alternate arms	rhythm		
								arm strength		
								balance		

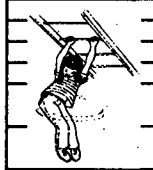
Lifting legs

Research Team	1	2	3	4	5	6	7	8	Total	
support weight	x	x	x	~	x	x		x	6/7	86%
lift legs up		x		~			x	x	3/7	43%
2 hands	x		x	~					2/7	29%
	grip	maintain grip	strong grip backward	pump legs	swing on horizontal bar	about to hook legs onto the structure	seems to be wanting to jump down	arm strength		
	pull self up		bent elbows		hang			back strength		
			swinging			core strength		leg strength		

Chin-up

Research Team	1	2	3	4	5	6	7	8	Total	
support weight	x	x	x	~	x	x		x	6/7	86%
pull up weight	x	x	x	~	x	x	x		6/7	86%
2 hands	x		x	~					2/7	29%
	drop down and move forward	maintain grip	forward strong grip		hang	arm strength	let go of the body weight on the bars	upper body strength		
							move forward			

Hula hips

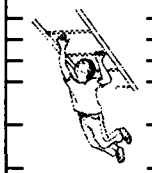


Research Team	1	2	3	4	5	6	7	8	Total	
support weight	x	~	x	~	~	x	~	~	3/3	100%
hip circles	x	~		~	~	x	~	~	2/3	67%
2 hands	x	~	x	~	~		~	~	2/3	67%
		strong grip forward				alternating hands				
		flexible shoulder								
		arms extended								
		abdominal strength								

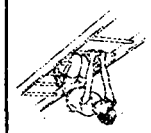
Leg circles

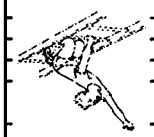
Research Team	1	2	3	4	5	6	7	8	Total	
support weight	x	~		~	~	x	~	~	2/3	67%
leg circles	x	~		~	~	x	~	~	2/3	67%
2 hands	x	~		~	~		~	~	1/3	33%
			arms extended							
			strong grip forward							
			flexible shoulder							
			abdominal strength							

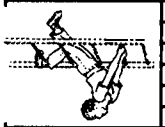
Moving forward, marking time											
	**Research Team**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total**	
	support weight	x	~	x	~	~		~	~	2/3	67%
	moving forward	x	~	x	~	~	x	~	~	3/3	100%
	hands to same rung		~		~	~		~	~	0/3	0%
				forward strong grip			alternate hands				
				abdominal strength			use center of gravity to help propel forward				
				eye hand coordination							

Moving forward, alternating grasp											
	**Research Team**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total**	
	support weight		x	x	~	x				3/7	43%
	moving forward	x	x	x	~		x	x		5/7	71%
	hands to different rungs	x			~	x	x			3/7	43%
						swing	in sequence before the previous one	going from bar to bar a bit faster than an average player	shoulder/arm strength		
									balance		
								swinging back the whole body with one hand then with the other			

Moving forward, skipping bar											
	**Research Team**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total**	
	support weight		x		~	x				2/7	29%
	alternating hands, skipping rung	x	x	x	~		x			4/7	57%
	move forward	x		x	~		x	x		4/7	57%
			good grasp	eye hand coordination		carrying a ladder while running?	more arm strength	use strength of legs	dangling/hanging across bars		
				strong grip					arm strength		
						alternate rungs			leg moves		
						swing					

Hang from knees and two hands											
	Research Team	1	2	3	4	5	6	7	8		
	hang upside down	x	x		~	x				3/7	43%
	2 knees support	x	x	x	~	x	x	x	x	7/7	100%
	2 hand support	x	x	x	~	x	x			5/7	71%
			support weight	eye hand coordination			arm/hand strength	lock knees and feet	shoulder strength		
			knees bent	strong grip			feet locked		balance		
							leg strength		curling from bars		

Hang from knees and one hand											
	Research Team	1	2	3	4	5	6	7	8	Total	
	hang upside down	x	x	x	~	x				4/7	57%
	2 knees support	x		x	~	x	x	x	x	6/7	86%
	1 hand support	x		x	~		x	x	x	5/7	71%
		getting ready to let go with other hand	upper body strength	flexible knees		support weight with arms	arm/hand strength	make a hook with knees	shoulder strength		
			knees bent	strong grip			leg strength	let go of one hand at a time			
			support weight								

Hang from one knee and two hands											
	Research Team	1	2	3	4	5	6	7	8	Total	
	hang upside down	x	~	x	~	~		~	~	2/3	67%
	one knee support	x	~		~	~	x	~	~	2/3	67%
	two hands	x	~	x	~	~	x	~	~	3/3	100%
		1 leg extended upward		flexible knees			arm/hand strength				
				strong grip							
				flexible neck			leg strength				

Hanging from two knees											
	Research Team	1	2	3	4	5	6	7	8	Total	
	hang upside down	x	x	x	~	x				3/7	43%
	2 knees support	x	x	x	~	x	x	x	x	7/7	100%
	no hands	x			~			x		2/7	29%
			abdominal strength	flexible knees			no locking feet	swing back and forth	leg strength		
							strong legs				

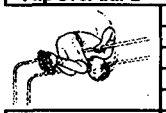
Hanging from one knee

Research Team	1	2	3	4	5	6	7	8	Total	
hang upside down	x	~		~	~		~	~	1/3	33%
one knee support	x	~		~	~	x	~	~	2/3	67%
no hands	x	~		~	~	x	~	~	2/3	67%
			swing from knees			very strong legs				
			flexible knees							

Flip over bar 1

Research Team	1	2	3	4	5	6	7	8	Total	
both hands holding	x	x		~	x			x	4/7	57%
roll around top of bar	x	x		~	x	x	x	x	6/7	86%
	rest on stomach	tuck body into ball	hanging by waist		kicking off ground	core strength		upper body strength		
		bend knees	balance			hands strength		balance		

Flip over bar 2



Research Team	1	2	3	4	5	6	7	8	Total	
both hands holding	x	x		~	~		~	~	2/4	50%
roll around top of bar	x	x	x	~	~	x	~	~	4/4	100%
tuck				~	~	x	~	~	1/4	25%
	rest on stomach		balance			hands strength				
						core strength				
	not much room					more hip flexor				

Skin-the-Cat'

Research Team	1	2	3	4	5	6	7	8	Total	
hang from 2 hands	x	x		~	x	x			4/7	57%
bring legs through hands to upside down				~		x	x		2/7	29%
let go to land on feet	x		x	~		x			3/7	43%
	forward flip	support weight	abdominal strength		push off from ground	hand strength		hanging from bars with legs		
		jump up and down	flexible shoulders		shoulder rotation	core strength		shoulder/upper arm strength		
		arms extended	arms extended		raise body high enough to rotate	balance		leg/knee support		
		bent knees	strong grip							
		good grip	balance							

Bear walk on parallel bars											
	**Research Team**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total**	
	support by 4 limbs	x	~		~	~	x	~	~	2/3	67%
	move forward or backward	x	~	x	~	~		~	~	2/3	67%
		crawling		crawling			upright position				
				balance			core strength				
				eye hand coordination			hand/arm strength				
							leg strength				

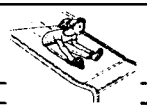
Bear walk on horizontal bars											
	**Research Team**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total**	
	support on hands and feet	x	~		~	~	x	~	~	2/3	67%
	move forward	x	~	x	~	~	x	~	~	3/3	100%
				balance			coordination				
				eye hand coordination			hand/arm strength				
							core strength				
							leg strength				

Walking/standing on horizontal bar											
	**Research Team**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total**	
	2 feet on same bar	x	~		~	~		~	~	1/3	33%
	no hands		~		~	~		~	~	0/3	0%
	shuffle or step forward	x	~	x	~	~		~	~	2/3	67%
				balance			stand				
				eye hand coordination			core strength				
							leg strength				

Standing on parallel bars											
	**Research Team**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total**	
	2 feet on different bars	x	~	x	~	~	x	~	~	3/3	100%
	no hands	x	~		~	~		~	~	1/3	33%
	shuffle or step forward		~		~	~		~	~	0/3	0%
		balancing		standing			core strength				
				balance			leg strength				

Average: 60%

Slide down wide slide, facing forward



Research Team	1	2	3	4	5	6	7	8	total	
face forward	x	~		~	~	x	~	~	2/3	67%
on butt	x	~		~	~	x	~	~	2/3	67%
no hands	x	~	x	~	~		~	~	2/3	67%
			hands on ankles			leaning forward				
						core strength				
						leg contact				

Slide down curly slide, facing forward

Research Team	1	2	3	4	5	6	7	8	Total	
face forward				~					0/7	0%
on butt	x	x		~	x				3/7	43%
no contact (hand / feet)	x	x	x	~		x			4/7	57%
		balance upper body	abdominal strength		controlling speed	leaning back	coming down very fast	lower body balance		
		sit upright			safety	core strength		no hands		
		stand to land			proper landing			leg support		

Slide down straight slide, facing forward

Research Team	1	2	3	4	5	6	7	8	total	
face forward	x			~					1/7	14%
on butt	x			~	x				2/7	29%
no contact (hand / feet)		x		~		x			2/7	29%
		balance upper body	abdominal strength		pushing off from top	no back contact	jumping down smooth surface slide	lower body balance		
		sit upright	feet up		controlling speed		coming down with high speed	no hands		
		stand to land			safety			leg support		

Slide down straight slide facing forward, while straddling

Research Team	1	2	3	4	5	6	7	8	total	
face forward	x	~		~	~		~	~	1/3	33%
legs over side edges	x	~	x	~	~	x	~	~	3/3	100%
hands on edges	x	~		~	~	x	~	~	2/3	67%
			arms behind			core strength				
			balance			leg strength				
						arm strength				

Slide down wide slide on knees

Research Team	1	2	3	4	5	6	7	8	total	
face forwards	x	~		~	~		~	~	1/3	33%
on knees	x	~	x	~	~	x	~	~	3/3	100%
hand support	x	~	x	~	~	x	~	~	3/3	100%
						balance				
						core strength				
						arm strength				

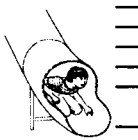
Slide down straight slide on knees

Research Team	1	2	3	4	5	6	7	8	total	
face forward	x			~					1/7	14%
on knees	x	x	x	~	x	x		x	6/7	86%
no hands	x		x	~		x	x		4/7	57%
		flexible knees	flexible knees		balance	balance	bend knees	leg support		
		balance upper body	balance		controlling speed	increased core strength	going relatively fast	upper body balance		
					safety					

Slide down curly slide on knees

Research Team	1	2	3	4	5	6	7	8	total	
face forward	x			~					1/7	14/%
on knees	x	x	x	~	x	x		x	6/7	86%
no hands	x			~			x		2/7	29%
	body leans forward	balance upper body	balance		pushing off from top	trunk raised up and forward	bend knees	leg support		
		flex knees	flexible knees		controlling speed	ability to shift weight	slide down slowly	upper body balance		
					balance	arm use when turn corners	hands behind			
					safety	balance				

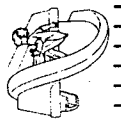
Slide down tube slide on knees

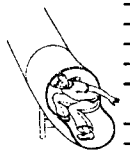


Research Team	1	2	3	4	5	6	7	8	total	
face forward	x			~					1/7	14/%
on knees	x	x	x	~	x	x		x	6/7	86%
no hand support	x			~					1/7	14%
	ducking	flex knees	balance		exits slide	leaning forward	lowering down	leg support		
		balance upper body	flexible knees		controlling speed	core and hip flexors	bend knees	upper body balance		
					proper landing	balance				
					safety					

Slide down wide slide sideways on knees											
	Research Team	1	2	3	4	5	6	7	8	total	
	face sideways	x	~	x	~	~	x	~	~	3/3	100%
	on knees	x	~	x	~	~	x	~	~	3/3	100%
	no hands	x	~		~	~		~	~	1/3	33%
		feet grip slide		balance			balance				
				flexible knees			core strength				
							leg strength				
							upper body strength				

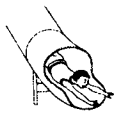
Surf down straight slide										
OUT	Research Team	1	2	3	4	5	6	7	8	Total
	face forward				~					
	no hand support				~		x			
	on feet (staggered)	x			~	x	x		x	
	bent knees					balance				
	hand grip					controlling speed				
						safety				

Surf down curly slide										
	Research Team	1	2	3	4	5	6	7	8	Total
	face forward	x			~					1/7
	no hand support	x			~		x		x	3/7
	on feet (staggered)	x	x	x	~	x	x	x	x	7/7
	crouched	x			~					1/7
			balance	balance		balance	balance	use hands to balance body weight	balance	
			jump to land	flexible knees		controlling speed	coordination		good leg strength	
				leg strength		safety				

Surf down tube slide										
	Research Team	1	2	3	4	5	6	7	8	Total
	face sideways	x		x	~		x			3/7
	no hand support				~				x	1/7
	on feet	x	x	x	~	x			x	5/7
	crouched									
		head ducked	jump to land	leg strength		controlling speed	balance	trying to go up the tunnel	good leg strength	
			knee strength	flexible knees		safe landing	coordination		balance	
			balance	balance		balance				
						safety				

Slide down straight slide on tummy										
	Research Team	1	2	3	4	5	6	7	8	Total
	face forward	x			-					1/7
	on stomach	x	x	x	-	x	x	x	x	7/7
		arms in front		back strength		controlling speed	head first	both feet and hands up	landing smarts	
		legs up				safe landing	strong back		hand first	
						safety				

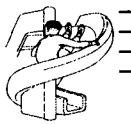
14%
100%

Slide down tube slide on tummy										
	Research Team	1	2	3	4	5	6	7	8	Total
	face forward	x			-		x			2/7
	on stomach	x	x	x	-	x	x		x	6/7
		arms in front				safe landing	strong back	crawling down	landing smarts	
						controlling speed			hand first	
						safety				

29%
86%

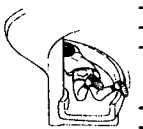
Surf down straight slide facing forward										
	Research Team	1	2	3	4	5	6	7	8	Total
	face forward									0/8
	no hand support				x					1/8
	on feet (staggered)	x	x	x	x	x	x		x	7/8
	crouched	x								1/8
		hand grip	jump to land	leg strength	forward motion	controlling speed	strong legs	walking down slide	hand support	
			balance	flexible knees		safety	core strength	hold on to one side	balance	
				balance		balance	balance			

0%
13%
88%
13%

Slide down curly slide facing backwards										
	Research Team	1	2	3	4	5	6	7	8	Total
	face backwards	~	x	x	x	x	x	x	x	7/7
	hand support	~		x	x		x		x	4/7
	on butt	~				x				1/7
			feet to land	abdominal strength	legs extended in front	knowing where you are on the slide	core/abdominal strength	slow speed	lower back support	
						speed control	hands strength		leg support	
						safe landing	coordination			

100%
57%
14%

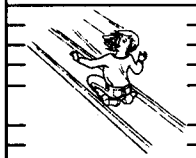
Slide down straight slide facing backwards											
	Research Team	1	2	3	4	5	6	7	8	Total	
	face backwards	~	x	x	x	x	x		x	6/7	86%
	hand support	~	x	x	x		x	x	x	6/7	86%
	on butt	~				x				1/7	14%
				abdominal strength	legs extended in front	knowing where you are on the slide	core/abdominal strength	feet first	lower back support		
						speed control	hands strength	joined toes	leg support		
						safe landing	coordination		arm strength		

Slide down curly slide, facing backwards, on tummy										
	Research Team	1	2	3	4	5	6	7	8	Total	
	face backwards	~	x	x	x	x			x	5/7	71%
	on stomach	~	x	x	x	x	x		x	6/7	86%
			bent knees for speed	back strength	hands extended in front	knowing where you are on the slide	leg strength	lying down	lower body support		
			use feet to land		knees apart	speed control			arm strength		
			bent ankles			safe landing					

Slide down straight slide, facing backwards, on tummy										
	Research Team	1	2	3	4	5	6	7	8	Total	
	face backwards	~	x	x	x	x			x	5/7	71%
	on stomach	~	x	x		x	x	x	x	6/7	86%
			knees bent for speed		arms extended in front	knowing where you are on the slide	leg strength		lower body support		
				back strength		speed control			arm strength		
						safe landing					

Slide down curly slide on knees										
	Research Team	1	2	3	4	5	6	7	8	Total	
	on knees	~		x			x		x	3/7	43%
	hand support	~	x				x	x		3/7	43%
	face backwards	~	x	x		x			x	4/7	57%
			on feet	abdominal strength	pulling up slide	pulling with arms	hands strength	bending down, almost walking	arm/upper body strength		
			support weight	flexible knees			balance	help from hands for balancing	leg strength		
			jump to land				core strength				
			knees bent								

Slide down straight slide, facing backwards, on knees with hands											
	Research Team	1	2	3	4	5	6	7	8	Total	
	on knees	~	x	x		x	x	x	x	6/7	86%
	hand support	~	x		x	x	x	x		5/7	71%
	face backwards (over shoulder)	~	x	x		x			x	4/7	57%
			jump to land	abdominal strength	legs supporting weight		hands strength	bend knees	arm/upper body strength		
			knees bent	flexible neck			balance	slide slowly	leg strength		
				flexible knees			core strength				

Slide down straight slide, facing backwards, on knees no hands											
	Research Team	1	2	3	4	5	6	7	8	Total	
	on knees	~	~	x		~	x	~	~	2/3	67%
	no hand support	~	~		x	~	x	~	~	2/3	67%
	face backwards	~	~	x	x	~		~	~	2/3	67%
				arched back			sit more upright				
				abdominal strength	legs supporting weight		stronger core muscles				
				leg strength			increase speed				
				flexible knees			higher center of gravity				

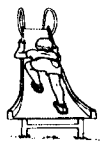
Surf down straight slide facing backwards											
	Research Team	1	2	3	4	5	6	7	8	Total	
	on feet (staggered)	~	x	x			x		x	4/7	57%
	no hand support	~	x				x	x	x	4/7	57%
	face back (over shoulder)	~	x	x		x			x	4/7	57%
	crouched	~				x		x		2/7	29%
			arms up for balance	abdominal strength	one hand contact	speed control	use hands for balance	speed sliding	great balance		
				flexible knees	going upwards	balance	legs strength				
				leg strength		safe landing	core strength				
				flexible neck		or climbing up					

Surf down curly slide facing backwards											
	Research Team	1	2	3	4	5	6	7	8	Total	
	on feet (staggered)	~	x	x	x		x	x	x	6/7	86%
	no hand support	~	x		x		x		x	4/7	57%
	face backwards	~	x	x		x		x	x	5/7	71%
	crouched	~		x		x				2/7	29%
			more balance	flexible knees	climbing up	balance	balance	body slightly bent forward	great balance		
				abdominal strength		speed control	increased contraction in lower side of body				
				flexible neck		or climbing up					
				leg strength			core strength				
							legs strength				

Climb up / down ladder to slide											
	Research Team	1	2	3	4	5	6	7	8	Total	
	face forward	~								0/7	0%
	feet support	~	x							1/7	14%
	hands on bars	~	x		x					2/7	29%
	climb up / down					x	x	x	x	4/7	57%
			lift feet	leg strength			coordination		arm strength		
			shift weight	balance			core strength		hand/eye/feet		
				arm strength			legs strength		coordination		
							arm strength		balance		

Crawl up straight slide											
	Research Team	1	2	3	4	5	6	7	8	Total	
	face forward	~								0/7	0%
	on knees	~	x	x	x		x		x	5/7	71%
	hands on edges	~	x		x	x		x	x	5/7	71%
	climb up	~	x	x	x	x	x	x	x	7/7	100%
				abdominal strength	slide lower part of leg	safety	strong hands	feet facing up	shoulder support		
				arm strength			core strength		leg strength		
				flexible knees			leg strength		arm strength		
							coordination				

Climb up straight slide on feet



Research Team	1	2	3	4	5	6	7	8	Total	
face forward	~								0/7	0%
on feet	~	x	x	x		x	x	x	6/7	86%
hands support	~	x		x				x	3/7	43%
climb up	~	x	x	x	x	x	x	x	7/7	100%
			abdominal strength		safety	strong hands	feet stuck to surface	shoulder support		
						core strength				
			flexible knees			leg strength		leg strength		
			arm strength			coordination		arm strength		

Walk up straight slide

Research Team	1	2	3	4	5	6	7	8	Total	
face forward	~								0/7	0%
on feet	~	x	x	x		x	x	x	6/7	86%
no hands	~	x		x		x		x	4/7	57%
climb up	~	x	x	x	x	x	x	x	7/7	100%
		balance	balance	foot in contact with edge of slide for stability and momentum	safety	strong legs	shoes off to make friction	upper body support		
			legs strength			core muscles		balance		
			abdominal strength	toes out to provide strength		balance		leg strength		
						coordination				

Climb up straight slide on bum, backwards

Research Team	1	2	3	4	5	6	7	8	Total	
look up the slide	~	~	x	x	~	x	~	~	3/3	100%
on butt	~	~	x		~	x	~	~	2/3	67%
hand support	~	~		x	~	x	~	~	2/3	67%
push up with hands and feet	~	~		x	~	x	~	~	2/3	67%
			legs strength			strong arms				
			abdominal strength			strong legs				
			balance			coordination				

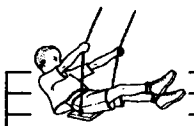
Climb on top of tube slide

Research Team	1	2	3	4	5	6	7	8	total	
support by 4 limbs	x	~		~	~		~	~	1/3	33%
climb up on top of tube slide	x	~	x	~	~	x	~	~	3/3	100%
			balance			arm strength				
						core strength				
						leg strength				

Sit on swing

Research Team	1	2	3	4	5	6	7	8	Total	
sit on swing	~	x	x			x			3/7	43%
hands on chains	~	x				x			2/7	29%
		balance upper body	abdominal strength	move swing forward	swing	use hands for stability	body not having a good balance being pushed by somebody	arm/shoulder strength		
			balance		holding on	strong core		balance		
			flexible hips			strong arms		leg strength		
			flexible legs					swinging		

Pump on swing

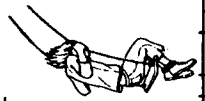


Research Team	1	2	3	4	5	6	7	8	Total	
sit on swing	~	~	x		~	x	~	~	2/3	67%
hands on chains	~	~			~	x	~	~	1/3	33%
pump	~	~	x	x	~	x	~	~	3/3	100%
			balance	legs out		coordination				
			arm strength			strong core				
			abdominal strength			strong arms				
			flexible legs							
			flexible hips							

Pump or lay out on swing

Research Team	1	2	3	4	5	6	7	8	Total	
sit on swing	~	~			~	x	~	~	1/3	33%
hands on chains	~	~			~	x	~	~	1/3	33%
pump	~	~			~	x	~	~	1/3	33%
lay back	~	~	x		~	x	~	~	2/3	67%
			abdominal strength	not trying to increase momentum/ height		coordination				
			legs extended			strong core				
			balance			strong arms				
			arm strength	body rests up in the air						
			flexible legs							
			flexible hips							

Getting air



Research Team	1	2	3	4	5	6	7	8	Total	
sit on swing	~	~			~		~	~	0/2	0%
hands on chains	~	~			~	x	~	~	1/3	33%
butt off seat for short time	~	~			~		~	~	0/3	0%
			pump	legs tucked		strong arms				
			abdominal strength	backward motion		end of forward momentum				
			arm strength	arms tucked in		core strength				
			balance	decrease resistance		to avoid flying off swing				
			flexible legs							
			flexible hips							

Swing on knees

Research Team	1	2	3	4	5	6	7	8	Total	
on knees	~	x	x	x	x	x		x	6/7	86%
hands on chains	~	x				x			2/7	29%
	bent knees	abdominal strength	backward motion	holding on	higher center of gravity	feeling comfortable	arm/shoulder strength			
	balance	balance		safety	increase core strength	self speed swinging	balance			
		arm strength					leg strength			
		flexible legs			increase arm strength		swinging			
		flexible hips								

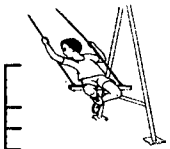
Swing standing

Research Team	1	2	3	4	5	6	7	8	Total	
on feet	~	x	x	x	x	x	x	x	7/7	100%
hands on chains	~	x						x	2/7	29%
pump	~	x		x	x	x	x		5/7	71%
	extend arms	balance	forward motion	holding on	lean back		balance			
	support upper weight	abdominal strength	bend knees and extend arms	supporting weight in arms	increase forward momentum		shoulder support			
		flexible hips		safety						
		arm strength			arm strength					
		flexible legs			core strength					
		leg strength			leg strength					

Twirl on swing

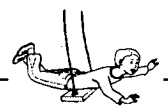
Research Team	1	2	3	4	5	6	7	8	Total	
sit on swing	~	x	x			x			3/7	43%
hands on chains	~	x							1/7	14%
twist entire swing	~	x	x	x	x	x	x	x	7/7	100%
		balance	abdominal strength	upper body leans back		strong rotational muscles		arm/leg strength		
		weight on feet	flexible legs	legs tucked				good balance		
			flexible hips							
			arm strength							
			balance							

Swing side to side



Research Team	1	2	3	4	5	6	7	8	Total	
sit on swing	~	x					x		2/7	29%
hands on chains	~	x							1/7	14%
move side to side	~	x	x	x	x	x		x	6/7	86%
		balance upper body	abdominal strength	hips provide momentum	distance judgment	strong lateral muscles	going round and round	upper body support		
		balance legs	balance		hanging on			arm strength		
			flexible legs		safety					
			flexible hips							

Swing on stomach



Research Team	1	2	3	4	5	6	7	8	Total	
on stomach	~	x	x	x	x	x	x	x	7/7	100%
no hand support	~			x		x		x	3/7	43%
feet off ground	~			x					1/7	14%
		balance at center	abdominal strength	relaxing	pumping	hip contraction	swing back and forth	core strength		
		extend arms and legs for balance	balance		balance	strong back	laying down	balance		
			back strength		safety	core muscles				
			flexible legs							
			flexible hips							

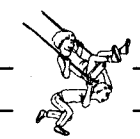
Swing with partner while sitting

Research Team	1	2	3	4	5	6	7	8	Total	
sit on swing	~		x			x		x	3/7	43%
face partner	~		x		x				2/7	29%
hands on chains	~	x			x	x			3/7	43%
one sits on the other one's laps	~					x			1/7	14%
		flexible elbows and knees	abdominal strength	backwards motion	pump	full body strength	double swinging	arm strength		
		balance	balance		safety			core muscles		
		communicate	flexible legs							
		bear weight	flexible hips							
			arm strength							

Swing with partner while standing

Research Team	1	2	3	4	5	6	7	8	Total	
on feet	~	x	x			x		x	4/7	57%
face partner	~		x			x			2/7	29%
hands on chains	~	x			x			x	3/7	43%
pump	~	x		x	x	x	x		5/7	71%
		support upper body weight	abdominal strength	increase height of swing	balance		both moving back and forth	shoulder support		
		extend arms	arm strength	2 partners	safety		coordination	balance		
		communication	flexible hips							
			back strength							
			balance							

Under-duck'

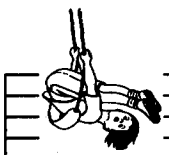


Research Team	1	2	3	4	5	6	7	8	Total	
with partner	~	x	x			x	x		4/7	57%
push and run under partner	~	x	x	x	x	x	x	x	7/7	100%
	swinger: grip and balance	balance	lets go to increase height	push with hands	legs and arms strength		arm/leg strength			
	pusher: stand body strength, bend at waist		one pushes up	safety	coordination		shoulder strength			
							full body support			

Jump off swing

Research Team	1	2	3	4	5	6	7	8	Total	
from sitting, let go of chains	~	x							1/7	14%
swings forward to jump off	~		x	x	x	x	x	x	6/7	86%
		be able to land on feet and stand	abdominal strength		timing	land on feet		arm/shoulder strength		
			flexible leg/hip		balance	balance		leg support		
			leg strength		safety	coordination		balance		
		use arms and legs to balance	balance			strong core				
						strong legs				

Back-flip off swing

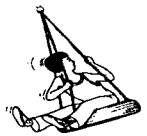


Research Team	1	2	3	4	5	6	7	8	Total	
from sitting, hold on to chains	~	~	x	x	~		~	~	2/3	67%
lift legs up	~	~	x		~		~	~	1/3	33%
flip off swing	~	~		x	~	x	~	~	2/3	67%
			balance			strong core				
			arm strength			strong arms				
			back strength							
			abdominal strength							
			flexible leg/hip							

Sit in tire swing

Research Team	1	2	3	4	5	6	7	8	Total	
sit with butt in hole	~	x	x		x	x		x	5/7	71%
legs over side	~								0/7	0%
hands on chains	~	x							1/7	14%
		head up right	balance	getting in position	laying down	laying down	laying down	arm strength		
					swing	strong core	swing evenly	shoulder		
						strong arms	back and forth	strength		

Swing side to side on tire swing



Research Team	1	2	3	4	5	6	7	8	Total	
sit on swing	~	x			x	x		x	4/7	57%
legs across swing	~								0/7	0%
hands on chains	~	x							1/7	14%
swing side to side	~								0/7	0%
			twirling	twist swing	swing	strong rotational trunk muscles	swing up and down while going around	swing in circles		
			balance					leg strength		
			flexible leg/hip					arm support		
			abdominal strength			lean to twist body		lower back strength		
			arm strength					balance		

Twirl on tire swing

Research Team	1	2	3	4	5	6	7	8	Total	
sit on tire swing	~	x	x		x	x			4/7	57%
hands on chains	~	x							1/7	14%
twirl	~				x		x	x	3/7	43%
		butt in whole	abdominal strength	swing right to left	safety	strong arms	swing side to side	pulling up with arms		
		side to side	balance			strong core		shoulder/arm strength		
			leg strength							
			arm strength					hip/torso strength		
			rotate legs							
			flexible leg/hip					leg strength		

Swing on tire swing on knees

Research Team	1	2	3	4	5	6	7	8	Total	
on knees	~	x	x		x	x		x	5/7	71%
hands on chains	~	x				x			2/7	29%
		balance upper body	abdominal strength	move swing forward	safety	strength	sitting on one side, pushing down like the child is going to stand on it	shoulder strength		
		bend knees	arm strength	on legs				arm strength		
			flexible leg/hip							
			balance							
							bent knees			

Swing on tire swing on stomach, with hands

Research Team	1	2	3	4	5	6	7	8	Total	
on stomach	-	x	x		x	x	x	x	6/7	86%
hands on edges	-	x				x			2/7	29%
		balance body weight	flexible leg/hip	resting position	swing	less strength required	does not seem to be moving	shoulder strength		
		bend knees	balance				legs up	arm strength		
		hands to balance	leg strength				may be balancing by arching whole body			
		twirl								

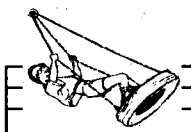
Swing on tire swing on stomach, no hands

Research Team	1	2	3	4	5	6	7	8	Total	
on stomach	-	-	x	x	-	x	-	-	3/3	100%
no hands support	-	-			-	x	-	-	1/3	33%
			twirl	turn		less strength				
			balance							
			flexible leg/hip							
			abdominal strength							
			back strength							

Swing on tire swing while standing

Research Team	1	2	3	4	5	6	7	8	Total	
on feet	-	x	x	x	x	x	x	x	7/7	100%
hands on chains	-	x				x		x	3/7	43%
		arms extended	balance	use arms and legs to move swing	safety	arm strength	press one foot at a time	leg strength		
		support weight	leg strength			core strength	leaning to the right and to the left	balance		
						leg strength		thighs support		

Pump on tire swing while standing



Research Team	1	2	3	4	5	6	7	8	Total	
on feet	~	~	x		x	x	~	~	3/4	75%
hands on chains	~	~					~	~	0/4	0%
pump	~	~	x	x		x	~	~	3/4	75%
			balance	use arms and legs for power		arm strength				
			flexible leg/hip			core strength				
			abdominal strength			leg strength				
			back strength							
			arm strength							
			leg strength							

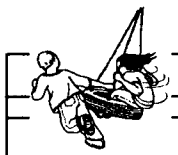
Swing with partner while sitting on tire swing

Research Team	1	2	3	4	5	6	7	8	Total	
sitting side by side	~	x	x		x	x		x	5/7	71%
hands on chains	~	x				x		x	3/7	43%
straddle edge of tire	~					x			1/7	14%
		support upper body weight	abdominal strength	each uses one leg to power swing movement	push with legs	hold on to each other	double swinging	leg strength		
		balance	balance		safety	coordination	twirling around	balance		
		body weight from side to side				arm strength		thigh support		
						core strength				

Swing with partner while standing

Research Team	1	2	3	4	5	6	7	8	Total	
on feet	~	x	x		x	x		x	5/7	71%
hands on chains	~						x	x	2/7	29%
pump together	~	x	x	x	x	x	x		6/7	86%
		balance	abdominal strength	use legs for power	use body motion	face each other		leg strength		
		communicate	flexible leg/hip	side to side				balance		
			balance					thigh support		
			back strength							
			arm strength							
			leg strength							

Twirl partner



Research Team	1	2	3	4	5	6	7	8	Total	
sit on edge	~	~	x		~	x	~	~	2/3	67%
hands on chains	~	~			~		~	~	0/3	0%
partner runs around and rotates swing	~	~	x	x	~	x	~	~	3/3	100%
			balance							
			abdominal strength	use one arm						
			arm strength							

Jump off tire swing

Research Team	1	2	3	4	5	6	7	8	Total	
jump off	~	x	x	x	x	x	x	x	7/7	100%
		stand	balance	jump forward	safety	land on feet		balance		
		support own weight	flexible leg/hip	forward motion of swing	timing	strong legs		leg strength		
			leg strength			coordination		core muscles		
						strong core				

Swing from under tire

Research Team	1	2	3	4	5	6	7	8	Total	
legs up over edge	~	~			~	x	~	~	1/3	33%
torso under tire	~	~	x	x	~		~	~	2/3	67%
hands on chains	~	~		x	~	x	~	~	2/3	67%
			balance	use arms significantly		strong core				
			flexible leg/hip			strong legs				
			leg strength			strong arms				
			abdominal strength			strong neck muscles				
			arm strength							
			back strength							
			neck strength							

Sit in baby swing

Research Team	1	2	3	4	5	6	7	8	Total	
sit in swing	~	~	x	x	~	x	~	~	3/3	100%
legs through holes	~	~			~		~	~	0/3	0%
hands on chains	~	~			~	x	~	~	1/3	67%
				resting position		arms strength				
						core strength				

Squat in baby swing

Research Team	1	2	3	4	5	6	7	8	Total	
squat in swing	~	~	x	x	~	x	~	~	3/3	100%
hands on chains	~	~			~		~	~	0/3	0%
			flexible leg/hip	little use of arms		less core strength				
			leg strength							

Stand in baby swing

Research Team	1	2	3	4	5	6	7	8	Total	
stand on swing	~	~	x	x	~	x	~	~	3/3	100%
hands on chains	~	~			~		~	~	0/3	0%
			abdominal strength	more use of arms for stability		more core due to higher center of gravity				
			leg strength							
			balance							
			arm strength			increase hand strength				

Climb in baby swing

Research Team	1	2	3	4	5	6	7	8	Total	
hands on chains	~	~			~	x	~	~	1/3	33%
climb up	~	~			~	x	~		1/3	33%
			balance	climb out						
			leg strength			or climb out				
			abdominal strength			core strength				
			arm strength			arm strength				
			flexible leg/hip			leg strength				
			crawl from swing			coordination				

Average: **49%**

Appendix G - Summary data for children pilot test

Legend:	x	child recognized and performed the task
	~	child did not have the illustration at all
	(blank)	child did not recognize/perform the task

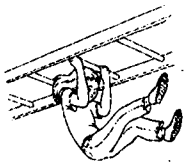
Hanging with two hands		
1	**2**	**Total**
x	x	2/2

100%

Hanging from one hand		
1	**2**	**Total**
x	x	2/2

100%

zip line?



Lifting legs		
1	**2**	**Total**
x	x	2/2

100%

Chin-up		
1	**2**	**Total**
x	x	2/2

100%

Hula hips		
1	**2**	**Total**
x	x	2/2

100%

Leg circles		
1	**2**	**Total**
x	x	2/2

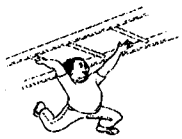
100%

Moving forward, marking time		
1	2	Total
x	x	2/2

100%

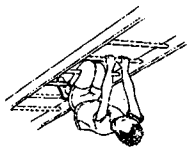
Moving forward, alternating grasp		
1	2	Total
x	x	2/2

100%



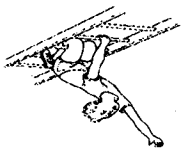
Moving forward, skipping bar		
1	2	Total
x	x	2/2

100%



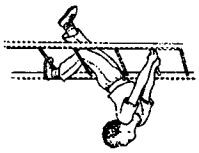
Hang from knees and two hands		
1	2	Total
x	x	2/2

100%



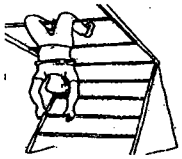
Hang from knees and one hand		
1	2	Total
x	x	2/2

100%



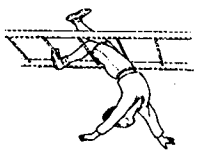
Hang from one knee and two hands		
1	2	Total
x	x	2/2

100%



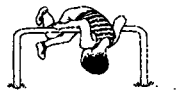
Hanging from two knees		
1	2	Total
x	x	2/2

100%



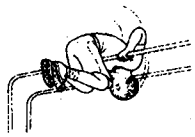
Hanging from one knee		
1	2	Total
x	x	2/2
sort of	almost	

100%



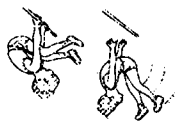
Flip over bar 1		
1	2	Total
x	x	2/2

100%



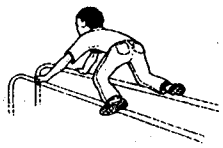
Flip over bar 2		
1	2	Total
x	x	

100%



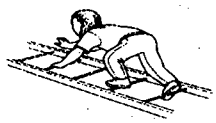
Skin-the-Cat'		
1	2	Total
recognized	not seen	

0%



Bear walk on parallel bars		
1	2	Total
x	x	2/2

100%



Bear walk on horizontal bars		
1	2	Total
recognized	recognized	
y	y	

100%

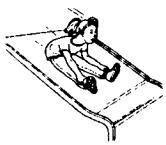
Walking/standing on horizontal bar		
1	2	Total
recognized	recognized	
y	y	

100%

Standing on parallel bars		
1	2	Total
x	x	2/2

100%

Average: 95.24%



Slide down wide slide, facing forward		
1	2	Total
x	x	2/2

100%

Slide down curly slide, facing forward		
1	2	Total
recognized	recognized	
y	y	

100%

Slide down straight slide, facing forward		
1	2	Total
x	x	2/2

100%

Slide down straight slide facing forward, while straddling		
1	2	Total
recognized	recognized	
y	y	

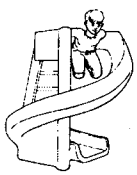
100%

Slide down wide slide on knees		
1	2	Total
x	x	2/2

100%

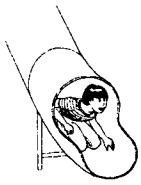
Slide down straight slide on knees		
1	2	Total
x	x	2/2

100%



Slide down curly slide on knees		
1	2	Total
recognized	recognized	
y	y	

100%



Slide down tube slide on knees		
1	2	Total
recognized	recognized	
y	y	

100%

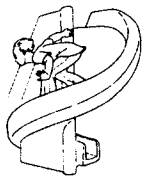
Slide down wide slide sideways on knees		
1	2	Total
x	x	2/2

100%

Surf down straight slide		
1	2	Total
x	x	2/2

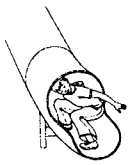
not staggerd

100%



Surf down curly slide		
1	2	Total
recognized	recognized	
y	y	

100%

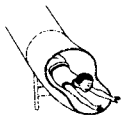


Surf down tube slide		
1	2	Total
recognized	recognized	
y	y	

100%

Slide down straight slide on tummy		
1	2	Total
x	x	2/2

100%

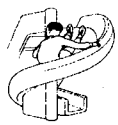


Slide down tube slide on tummy		
1	2	Total
recognized	recognized	
y	y	

100%

Surf down straight slide facing forward		
1	2	Total
x	x	2/2

100%



Slide down curly slide facing backwards		
1	2	Total
recognized	recognized	
y	y	

100%

Slide down straight slide facing backwards		
1	2	Total
x	x	2/2

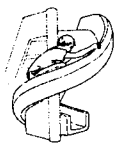
100%

Slide down curly slide, facing backwards, on tummy		
1	2	Total
recognized	recognized	
y	y	

100%

Slide down straight slide, facing backwards, on tummy		
1	2	Total
x	x	2/2

100%



Slide down curly slide on knees		
1	2	Total
recognized	recognized	
y	y	

100%

Slide down straight slide, facing backwards, on knees with hands		
1	2	Total
x	x	2/2

100%

Slide down straight slide, facing backwards, on knees no hands		
1	2	Total
x	x	

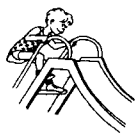
100%

Surf down straight slide facing backwards		
1	2	Total
x	x	2/2

100%

Surf down curly slide facing backwards		
1	2	Total
recognized y	recognized y	

100%



Climb up / down ladder to slide		
1	2	Total
x	x	2/2

100%

Crawl up straight slide		
1	2	Total
x	x	2/2

100%

Climb up straight slide on feet		
1	2	Total
x	x	2/2

100%

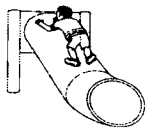
Walk up straight slide		
1	2	Total
recognized	recognized	

imposible

Climb up straight slide on bum, backwards		
1	2	Total
recognized	recognized	

must be narrow slide

100%

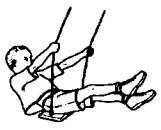


Climb on top of tube slide		
1	2	Total
recognized	reognized	
?	?	

Average: **100%**

Sit on swing		
1	2	Total
x	x	2/2

100%

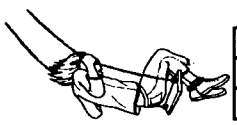


Pump on swing		
1	2	Total
x	x	2/2

100%

Pump or lay out on swing		
1	2	Total
x	x	2/2

100%

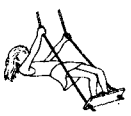


Getting air'		
1	2	Total
x	x	2/2

100%

Swing on knees		
1	2	Total
x	x	2/2

100%

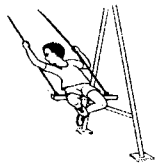


Swing standing		
1	2	Total
x	x	2/2

100%

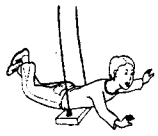
Twirl on swing		
1	2	Total
x	x	2/2

100%



Swing side to side		
1	2	Total
x	x	2/2

100%



Swing on stomach		
1	2	Total
x	x	2/2

100%

Swing with partner while sitting		
1	2	Total
x	x	2/2

100%

Swing with partner while standing		
1	2	Total
x	x	2/2

100%

Under-duck'		
1	2	Total
recognized	recognized	

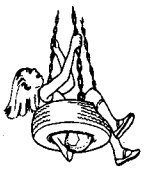
not possible bending swing

Jump off swing		
1	2	Total
x	x	2/2

100%

Back-flip off swing		
1	2	Total
recognized	recognized	

0%

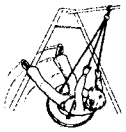


Sit in tire swing		
1	2	Total
x	x	2/2

100%

Swing side to side on tire swing		
1	2	Total
x	x	2/2

100%

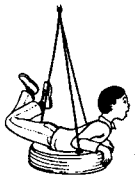


Twirl on tire swing		
1	2	Total
x	x	2/2

100%

Swing on tire swing on knees		
1	2	Total
x	x	2/2

100%



Swing on tire swing on stomach, with hands		
1	2	Total
x	x	2/2

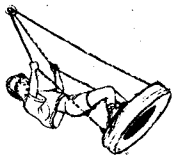
100%

Swing on tire swing on stomach, no hands		
1	2	Total
x	x	2/2

100%

Swing on tire swing while standing		
1	2	Total
x	x	2/2

100%



Pump on tire swing while standing		
1	2	Total
x	x	2/2

100%

Swing with partner while sitting on tire swing		
1	2	Total
x	x	2/2

100%

Swing with partner while standing		
1	2	Total
x	x	2/2

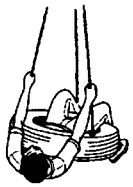
100%

Twirl partner		
1	2	Total
x	x	2/2

100%

Jump off tire swing		
1	2	Total
x	x	2/2

100%



Swing from under tire		
1	2	Total
x	x	2/2

100%

Sit in baby swing		
1	2	Total
recognized	recognized	
y	y	

100%

Squat in baby swing		
1	2	Total
recognized	recognized	
y	y	

100%

Stand in baby swing		
1	2	Total
recognized	recognized	
y	y	

100%

Climb in baby swing		
1	2	Total
recognized	recognized	
y	y	

100%

Average: 96.67%