A Practical Method for Assessing Locomotor Skills in Elementary Children

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Abstract

Locomotor skills such as galloping, skipping, hopping and sliding should be learned at an early age to ensure that more complex skills can be progressively developed. Educators and coaches should be able to provide evidence that teaching or coaching methods are resulting in improvements in these basic skills. A helpful way to provide this evidence is through statistical evidence. The purpose of this article is to explain why locomotor skills are important to a child’s development and what specific locomotor skills can be used. In addition, a specific example of how data can be analyzed using statistics is provided. An understanding of locomotor skill importance, how to assess it, and how to determine whether instruction is resulting in improvements will allow educators and coaches to apply these methods and improve instruction.
Introduction

When children are born they quickly begin to use their bodies by grabbing a bottle, crawling, walking, skipping, running, etc. This is the maturation of locomotor skills and is a very important part of development. Pica (2009) asserts that the development of basic motor skills is as important as teaching language skills, as without them a plethora of health risks including obesity, heart disease, are diabetes are likely to develop. Furthermore, according to Henniger (2009),

Movement is at the very center of young children’s lives. It is an important facet of all aspects of their development, whether in the motor, cognitive, or affective domains of human behavior. To deny children the opportunity to reap the many benefits of regular, vigorous physical activity is to deny them the opportunity to experience the joy of efficient movement, the health effects of movement, and a lifetime as confident, competent movers. (p. 24)

People who are physically active on a regular basis continue to be physically active throughout life (Sanders, 2002). Lack of interest in physical activity is high because of “the lack of exposure at an early age to physical skill development activities” (Sanders, 2002; p. 1). For example, if an individual is not skilled in a certain area, he or she may take no interest in that activity; which, in return means they did not develop those skills for that activity.

Children develop at different times with different strengths, depending on their interests. Referring to Boyer’s (2009) example, children who are more interested in art will develop those skills faster than someone interested in building. Many people believe that children automatically develop locomotor skills through maturation. Although maturation is a part of the development process, Pica (2008) describes that, at this point, children have not yet developed the part of the
skill where technique is the main focus. For example, when children begin running they have not yet developed the technique of moving their arms and legs in opposition. Without practice and the correct technique, children do not fully develop the muscles for strength needed for proper development of those skills. Boyer (2009) explains that as children grow older they reach a variety of milestones that demonstrate whether or not proper development is taking place. These indicators are a great way to know what steps need to be taken to assure that children's growth is moving in a continuous upwards motion”. (p. 1)

Some examples of the milestones a baby goes through include: “discovering body parts, grasping objects, feeding themselves, [and] tying shoes” (p. 1). Making an assessment that includes these skills identifies progress made and areas for improvement.

According to Henniger (2009), activity levels of children have received a large amount of attention because of increasing obesity rates among youth, whereby obesity among two to five year olds has doubled in the past 30 years. This can be attributed to eating excessively and a general lack of exercise. It is well known that obesity is an issue for not only children, but adults as well. As Henniger (2009) mentioned, society is not physically active enough to avoid obesity.

In physical education, it is the teacher’s duty to make learning and being physically active as fun as possible. One way teachers make exercising fun is by teaching a skill and implementing it into a game. For example, if a teacher wants to implement all of the skills taught in a unit plan, students should be spread throughout the gym in a circle and move to music using the different locomotor skills they have learned. Using music in the activity makes for a fun way for the students to practice their skills while they are being assessed. Thus, they engage in activity while simultaneously being assessed. Skills can be reinforced by encouraging such
movement at home. Physical education should be fun for everyone. If students are having fun, it makes them want to come back to class with smiles ready to learn something new that helps them to be physically fit and active, which will ultimately assist in reducing the increasing rate of obesity. Sanders (2002) states that,

if children do not learn to throw, catch, jump and kick when they are young they will not possess the skills needed to participate in physical activities as adults and thus most will not get appropriate amounts of physical activity. These types of skills are what makes being physically active, and fun (p. 1).

The challenge of a teacher, therefore, is to accurately assess locomotor skills in order to provide an understanding of what each student does and does not perform well. An understanding of whether students are making improvements will allow for individual instruction that directly targets areas of skill development. Therefore, the purpose of this article is to provide a practical guide for teachers to conduct a statistical test to determine whether locomotor skills are improving. By using statistical measures, teachers are able to determine whether teaching modalities and strategies designed to foster locomotor skills are successful or need modification.

Testing Locomotor Skills

For this sample assessment, four different locomotor skills are assessed: galloping, skipping, hopping and sliding. Part of correct assessment is selecting skills that are developmentally appropriate for students. These locomotor skills are developmentally appropriate for students in the first grade according to the Oklahoma Priority Academic Student Skills (PASS; Oklahoma State Department of Education, 2013).

Ratzlaff (2010) states “a locomotor skill is a skill using the feet that moves you from one place to another” (p. 2). A gallop is “a form of locomotion which is a combination of an open
step by the leading foot and a closed step by the trailing foot” (Ratzlaff, 2010, p. 2). The same foot leads throughout with an uneven rhythm. A skip is a skill that combines a hop and a skip with an uneven rhythm while a hop is a “form of locomotion in which the body is projected from one foot to the same foot” (Ratzlaff, 2010, p. 2). A slide is the same combination as a gallop, except the travel direction is sideways with an uneven rhythm.

Students will be tested on their locomotor skills at the beginning and end of the school year during their regular class time. The first grade class consists of four classes with twenty-five students including girls and boys in each class with a total of 100 students. Students will need to wear athletic attire including: gym shorts, a t-shirt and tennis shoes. Students will be very active in the gym and safety is an issue. Wearing tennis shoes is not only safe but gives better support for student’s feet.

Four assistants will be needed for the locomotor skills assessment. A meeting prior to the assessment should be conducted with assistants to make sure they are competent in understanding what each of the locomotor skills entail. Assistants will be given the rubrics that will be used to assess the first grade students as well as the student’s class list, which will be a part of the rubric. As part of the meeting, each assistant will demonstrate each of the locomotor skills so that any corrections of the performed skills can be made and ensure that there is no misunderstanding of what is expected of the students. Assistants need to wear athletic attire and their name tag while assessing the students, which will be given to them at the meeting.

Half a dozen cones are needed for the layout of the assessment. The cones will mark the spots in which students will stand and wait to be assessed. Music will be playing during this assessment at a level that will not distract the students, but will give them pleasant background noise. A compact disc of age appropriate songs will be used.
Before the assessment takes place, students will be notified of expectations during the assessment day. This will include what they will be tested on and how the gymnasium will be set up for that day. This will help to eliminate chaos or confusion the day of the assessment. The students will be split up into groups, according to their class list and will be given their station number before assessment day.

On the day of the assessment students will come into the gymnasium and sit in their squad spots. Roll will be taken and then students will proceed to their testing station. All students will stay at their designated stations to complete the four locomotor skills. Students will perform each of the locomotor skills for their assigned instructor and then back to the cone where they started.

Data from the first assessment can be used as part of progress reports made to parents. This serves as an opportunity for parents to work with their child on skills they may have trouble with at home. After the second assessment, parents will have a better understanding of progress made on each locomotor skill and identify where improvements have been made and where future development is necessary.

**The Problem with Averages**

Typically, a mean or average score is a frequently used measure to determine whether improvement has occurred. However, means fail to consider an outlier such as someone who does something that greatly impacts a score. For example, if a student does 20 pushups at the beginning of the semester but only 1 in a later test because he or she was sick, this is lost in the mean. Therefore, other statistical tests may be better suited to recognize any outliers and show the significance improvements. One such test, demonstrated in this article, is a *t-test*. 
Finding Significance

A paired sample \( t \)-test is relevant to use when testing and recording data for locomotor skills. It is used when members of a group are related or when comparing a pretest and posttest. In a paired sample \( t \)-test participation among the groups are “matched” by characteristics such as siblings, age or IQ. An example of two matched groups is pair of twins who are randomly assigned to two different groups. Another example is matching students on prior knowledge level and randomly assigning the members of the pairs to the two different groups.

Analyzing data statistically can be done using a variety of computer programs. When inputting data there are several things to look at that are important; a value score \((T = 3.22)\), degrees of freedom \((df = 10)\) and significance level \((p \text{ value})\). The \( p \) value determines whether the results are by chance or have occurred through some deliberate manner. Usually, in the physical education field, if a \( p \) value is less than .05 then the findings are significant, meaning that there is 95% confidence that the results were not random.

In order to evaluate the data in this example, SPSS (Statistical Package for the Social Sciences) will be used. SPSS is one of several statistical software packages which can be purchased to calculate both simple and complex mathematical equations. Participants were a first grade class of 49 females and 51 males with a mean age of 6.29 years \((SD = 0.55)\). They averaged 48.41 inches in height \((SD = .28)\) and weighed 63.90 lbs. \((SD = 4.34)\). Height and weight allowed for Body Mass Index to be calculated \((M = 16.65; SD = 1.98)\).

The first step in using SPSS is plugging in the data as seen in Figure 1. Each individual row from left to right is the data of one student. Next, select the “analyze” tab. Then, from the drop down menu, place the cursor over “compare means” and select “Paired Sample T-Test”. Once those have been selected, a box will appear as seen in Figure 2. Use the mouse and click on “Pre” to
highlight it. Then, click the arrow in the middle of the box to transfer “Pre” to the “Paired Variables”. Do the same for “post”. Click “OK on the bottom left of the box. This will bring up the analysis (Figure 3).

**Analyzing the Output**

To analyze and interpret the output in Figure 3, look at the bottom right where it says “Sig. (2-tailed)”. As previously stated, anything under .05 is significant. Figure 3 shows the “Sig. (2-tailed)”, or p-value, at .000, which shows there is a significant difference between the pre- and post-test. The findings are displayed with the $T$ score and the degrees of freedom ($t = 10.85, df = 99, p = .000$) with scores higher in the posttest ($M = 3.14; SD = 0.87$) than the pretest ($M = 2.36; SD = .87$). Therefore, because the $p$ value was less than .05, there was a significant difference. Observing the means it can be determined that improvement was significantly better from the first test. Because of the statistical significance, it can be concluded that improvement was not caused by chance.

**Conclusion and Additional Application**

Locomotor skills are only one of many different types of skills that can be tested and interpreted. For example, it is possible to test the progress of jumping rope from the beginning of the year to the end by comparing how many jumps a student can complete at the start of the year and the end of the year. This would be a great way to show school administrators student progress. Another example is tossing and catching. How many times in a row can a student toss and catch a ball from the beginning of the unit to the end? Furthermore, parents can be provided with data to indicate whether a student is achieving individual goals and whether the class as a whole is improving.
Although the use statistical software such as SPSS can be daunting, this guide has provided the groundwork for physical educators to statistically demonstrate improvements in their students. Furthermore, such use of technology can only increase the success of both teachers and students in physical education by providing informative feedback on what activities, skills, and lessons led to the most successful outcomes.
References


Figure 1