

**MOTOR SKILLS ASSESSMENT OF CANADIAN SCHOOL
BOYS AND GIRLS AGED 6 TO 12 YEARS OLD**

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MEASURE AND ASSESSMENT OF MOTOR SKILLS

In children, physical appraisal is not only determined by physical fitness (e.g. muscular strength, maximal aerobic power, flexibility...). This type of physical quality could be substantially improved even at an advanced age. Nevertheless, other physical abilities as coordination, balance and reaction time in particular, are markedly less sensible to training when adolescent or adult stage is reach. Therefore, it is very important to detect as soon as possible, any lack of motor skills that can affect the normal course of children development (e.g. in general, before 13 years old). Thus, this standardized tests battery propose to measure and quantify the level of motor skills development in children aged between 6 to 12 years old. The 5 main factors assess are:

- A. Limbs speed ;
- B. Agility ;
- C. Static and dynamic balance ;
- D. Reaction time;
- E. Coordination.

Unfortunately, no normative standards exist for the Canadian population for motor skill tests. Recently, a group of researchers from UQAC, UQAM and University of Moncton have administered this test battery to more than 3000 kids from the province of Quebec and New Brunswick. This scientific project allowed for the first time, to determine the motor skills profile of Canadian children and then, to produce normative standards based on age and gender.

THE RESEARCH GROUP

Considering the importance of this project, many partners have showed their interest to support this research. First, many researchers from the pilot (2005) have reiterated their interest to pursuit this project: D^r Mario Leone and D^r Claude Bordeleau from UQAC, and D^r Alain-Steve Comtois and D^r Émilía Kalinova from UQAM are part of the initial group who have worked to the development of this test battery. Some others have recently reached the group: D^r Michel Perron from UQAC and Director of the research Chair “Jeune, Santé et Société) as well as D^{rs} Nadine Arbour Luc Laberge and Josée Thivièrge from ÉCOBES and finally, D^r Charles Babineau from Université de Moncton (New Brunswick).

This project have been financially support by the « Fédération Québécoise du Sport Étudiant » and is director M. Alain Roy, by the Research Chair « Jeune Santé et Société » and is Director, D^r Michel Perron, and by « Le grand Défi Pierre Lavoie » and their directors Pierre Lavoie and Germain Thibault.

GOAL AND CHARACTERISTICS OF THE RESEARCH PROJECT

Essentially, the goal of this research is to provide a standardized test battery that allows physical educators, kinesiologists, coaches, or any health professionals who are interested by the monitoring of the motor skill development of children aged 6 to 12 years old. Normative data will allow detecting precociously children who present some motor skill deficits and than introducing an early intervention plan. At the other end of the spectrum, this test battery may also be used to identify talented children. Indeed, it is well know that children with a particular motor skill gift are more susceptible to obtain success in sports.

Over than 15 elementary schools from the provinces of Quebec and New Brunswick have been visited. In Quebec, 4 different areas were investigated: Montreal, Quebec City, Sherbrooke and Chicoutimi. In New Brunswick, 2 elementary schools from Moncton were visited. A total of 3047 children were assessing on 13 motor skill tests and one physical fitness test. Also, 3 questionnaires were administered (self-esteem, body image and sleeping habits). It is the first time that specific motor skill profile based on age and gender for Canadian children is available.

MOTOR SKILLS ASSESSMENT PROTOCOL

A. ANTHROPOMETRIC MEASUREMENT

1. Weight

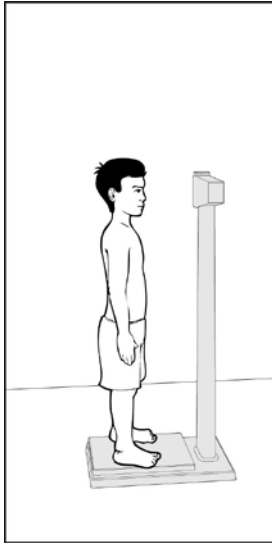


Figure 1.

The participant stands upright on the center of the scale with is weight evenly distributed between each foot which are slightly split apart. The participant must wear light clothing, excluding shoes, long trousers and sweater (Fig. 1). Weight is recorded to the nearest 0.1kg.

2. Stature (height)

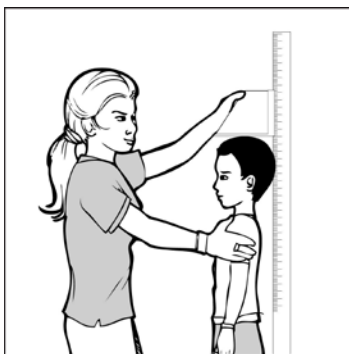


Figure 2.

The measurement of height requires a stadiometer. The participant stands upright, facing the evaluator. The measurement of stature must be recorded while the child is barefoot. The participant has is back and head well centred on the stadiometer. The arms hang freely by the side with the palms facing the thighs (Fig. 2). From this position, the participant is asked to take a deep breath and maintain a fully erect position. The head and the chin must be straight in the Franckfort Horizontal Plane. The headboard is than applied onto the vertex (top) of the skull (Fig. 3). The

reading of the stature must be taken directly onto the rule of the stadiometer, immediately under the headboard. Stature is recorded to the nearest 0.1cm.



Figure 3.

MOTOR SKILLS ASSESSMENT PROTOCOL

B. LIMBS SPEED

1. Upper limbs speed

This test allows to measure the speed with which the participant can horizontally abduct and adduct his dominant arm. The participant is sitting at a table on which two 20 cm circles spaced by 60 cm (center to center) are drawn (Fig. 4). The non dominant hand is immobile and placed midway between the two circles. At the signal, the participant using his preferred hand, taps the circle on his right and then immediately taps the left circle. This is counted as one cycle. The goal of this test is to realize the maximum cycle in 20 seconds. The final score is the number of single tapping done (cycle X 2). The best of two trials is recorded.



Figure 4.

2. Lower limbs speed

This test allows to measure the speed with which the participant can flex and extend his hip joint as fast as possible. The participant stands facing a 30 cm² kick board, which is attached to the wall. The kick board should be set in order to obtain a 90° angle between the thigh and the calf (Fig. 5). From this position the participant must tap the kick board twice with his right foot before returning it to the ground and then repeat the same pattern with the left foot (one cycle = 2 double taps by each foot). The goal of this test is to realize the maximum cycle of double taps in 20 seconds. The final score is the number of double taps done by each foot (cycle X 2). The best of two trials is recorded.



Figure 5.

MOTOR SKILLS ASSESSMENT PROTOCOL

C. AGILITY TESTS

1. The 5 meter shuttle run test

This test allows to measure the speed to which the participant can abruptly and completely change his body direction as fast as possible. Two parallel lines 5 meters apart are drawn on the floor. The participant stands behind one line with his two feet placed apart pointed forward. At the signal, the participant must run as fast as possible and cross completely the other line (both feet must cross completely the line each time), makes a 180° sharp turn and then go back to the starting line (Fig.6). A total of 25 meters must be completed (5 X 5 meters). The time required to complete five rounds (25 meters) is recorded at the nearest 0.1 second. The best time of two trials is recorded.

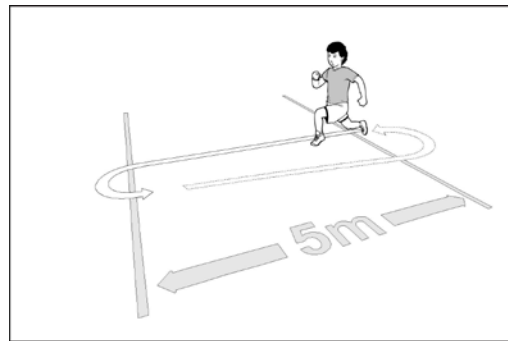


Figure 6.

2. Circle run test

This test allows to measure the speed to which the participant could change his direction of body movement continuously. A circle 3.5 meters in diameter must be drawn on the floor. A starting line is marked on the circumference of the circle (Fig. 7). The participant stands behind the line with his two feet placed apart pointed forward. At the signal, the participant must run clockwise around the circle as fast as possible 5 consecutive times without touching the cones or the circle line. The time required to complete five rounds is recorded at the nearest 0.1 second. The best time of two trials is recorded.

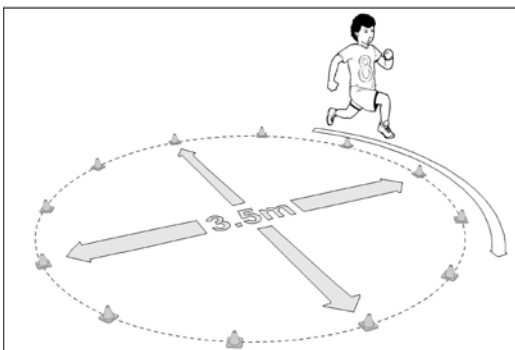


Figure 7.

MOTOR SKILLS ASSESSMENT PROTOCOL

C. AGILITY TESTS

3. Side step run test

This test allows to measure the speed to which the participant can move his body laterally as fast as possible. Two parallel lines 4 meters apart are drawn on the floor. The participant stands behind one line with his two feet placed together and pointed forward as showed as below (Fig. 8). At the signal, the participant must run sidestep as fast as possible to the other line. When the line is reach, the participant must touch it with his nearest foot and then change direction to the starting line. The full course must be repeated 5 consecutive times (20 meters). Legs cross over are not allowed at anytime during the course of the test and the body must face the evaluator at all time. The time required to complete five rounds is recorded at the nearest 0.1 second. The best time of two trials is recorded.

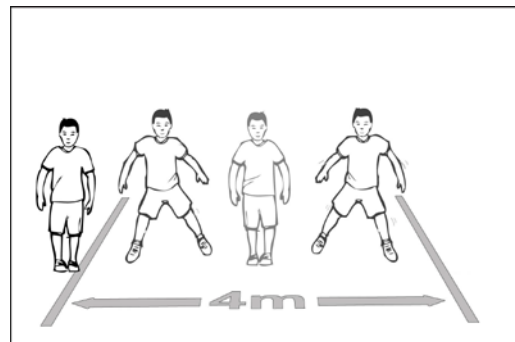


Figure 8.

4. Slalom run test

This test allows to measure the speed to which the participant can move his body position while running as fast as possible in different directions. The participant stands behind the starting line with his two feet place together and pointed forward. Six cones are set up as shown in Figure 9. Thus, two rows of cones are place at 2 meters apart. At the signal, the participant must run in slalom as fast as possible around each cone as illustrated on the diagram. Upon arriving at cone number 6 the participant did not go back to the starting line, but go directly around cone number one again and repeat the path a second time. When the participant arrive at cone 6 the second time, he go directly to the starting line. The time required to complete two rounds is recorded at the nearest 0.1 second. The best time of two trials is recorded.

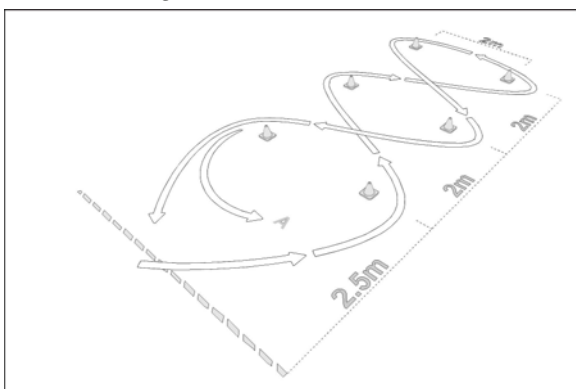


Figure 9.

MOTOR SKILLS ASSESSMENT PROTOCOL

D. BALANCE TESTS

1. One foot balance eyes opened and closed

This test allows to measure the ability to maintain static body balance. The participant stands on a wood balance rail of 9 cm high, 4 cm wide and 75 cm long. The task consists in maintaining balance on the rail as long as possible, with both hands on hips and using the preferred foot places parallel with the long axis of the rail as shown in Figure 10. The test ends if the participant touches the floor or the rail with any part of his body including his free leg, or if either hand leaves his hips. The same procedure can be done with eyes closed but directly on the floor (without the balance rail). The score is the length of time during which the participant hold is balance (maximum of 60 seconds). The best time of two trials is recorded at the nearest 0.1 second.

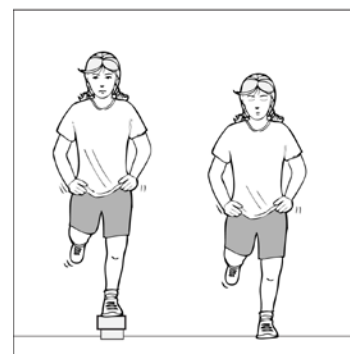


Figure 10.

4. Board balance test



Figure 11.

This test allows to measure the ability to maintain body balance on an unstable surface. The participant stands on a teeter board of 46 cm long, 46 cm wide and 3 cm thick. Under the board, two half-moon wood rails of 21 cm length, 3 cm wide and 10 cm high are placed parallel at a distance of 35 cm apart. With the help of the tester, the participant must first find his balance. Then, the participant must maintain his balance as long as possible (Fig. 11). The test ends if either edge of the teeter board touches the floor. The score is the length of time during which the participant hold is balance (maximum of 60 seconds). The best time of two trials is recorded at the nearest 0.1 second.

MOTOR SKILLS ASSESSMENT PROTOCOL

E. RESPONSE TIME

1. Simple reaction time (computer)

This test allows to measure the ability to respond as fast as possible to a visual signal. Using computer software, the participant must react as fast as possible to a visual signal (a triangle appears on the screen) by pressing the computer space bar. The participant must succeed to realize 25 trails (reaction time between 100 and 350 ms). The result represents the average of the 25 trails.

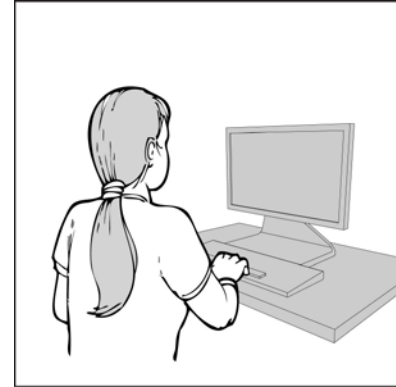


Figure 12.

F. COORDINATION AND PRECISION TEST

1. Eye-hand coordination test

This test allows to measure the ability to move alternatively the upper and lower body segments as fast as possible with synchrony. The sequence goes as follow (Fig. 13): 1. The right hand touches the left foot t by a flexion of the leg in the front (A); 2. Then, the left hand touches the right foot in the front (B); 3. The right hand touches the left foot by a flexion on the leg behind (C); 4. Finally, the left hand touches the right foot behind (D). All four movements represents one cycle (A to D). The test consist to realize 4 consecutive cycles. The time required to complete 4 consecutive cycles is recorded at the nearest 0.1 second. The best time of two trials is recorded.

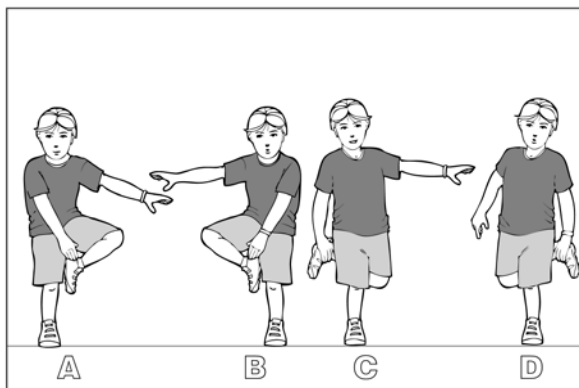


Figure 13.

MOTOR SKILLS ASSESSMENT PROTOCOL

2. Eye-hand coordination (precision)

This test allows to measure the ability to execute a ballistic movement with the dominant hand in using eye-hand coordination during an overhand throw (precision). The participant stands behind a 5 meters restraining line facing a target placed on the wall at 120 cm from the floor (from the center of the target to the floor) which is 60 cm of diameter (center of the target is 20 cm of diameter). The participant must shoot 10 tennis balls by an overhand throw (Fig. 14). One point is given when the target is hit. One bonus point is given when the throw hit the center of the target. The participant is not allowed to cross the restraining line during the throws. The maximum score is 20 points. The tester must record the final score.

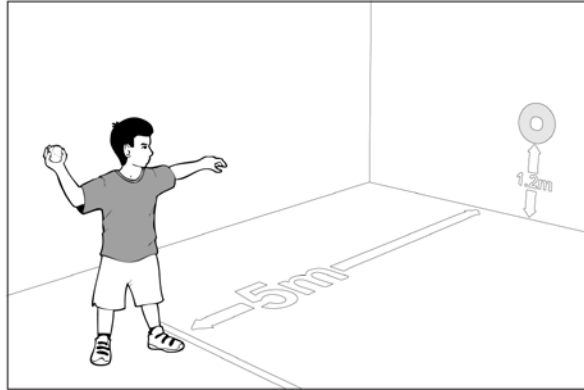


Figure 14.

3. Eye-hand dribbling coordination



Figure 15.

This test allows to measure the ability to dribble a volleyball with the dominant hand. The participant stands with his knees slightly bend, legs apart to shoulder width. The goal of the test is to realize the maximum number of dribble in 20 seconds. The ball must be dribble in front of the participant, between his two feet (Fig. 15). Indeed, the rebound must reach the hip heights. The final score represents the total number of dribble realize in 20 seconds. The best of two trials is recorded.

PHYSICAL FITNESS TEST

1. The 20 meters shuttle run test (Luc Léger running test)

The 20 meters shuttle run is a test that assesses the maximal aerobic power (MAP). Two parallel lines must be drawn on the floor, 20 meters apart. The participants are brought into alignment behind the restraining line. The goal of the test consists of realizing the maximum of back and forth while following a running pace indicated by an audio CD. Each participant must run while reaching the opposite line in synchrony with the audible sound. Thus, the participants must stop and go to the opposite direction, always in synchrony with the next audible sound (Fig. 2). The speed is gradually increased at every minute. The test ends when the participants can no longer follow the imposed running pace. The score represents the number of the last one minute stage completed. A chart allows to transform the stage number into $VO_2\text{max}$ in ml/kg/min.

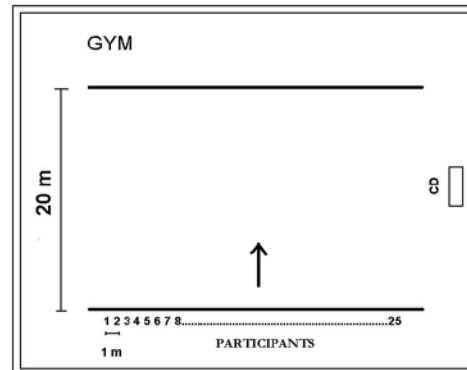


Figure 16.

RESULTS FORM

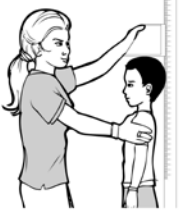


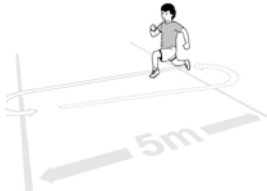
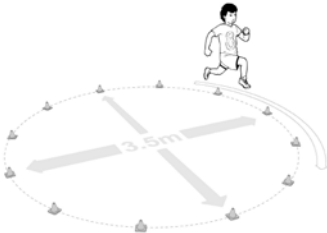
Last name: _____

First name: _____

Age: _____

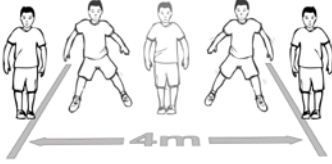

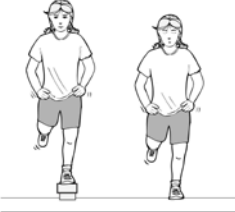


Date of birth: _____

Sex: _____

	Body weight (kg) :	
	Height (cm) :	
	Upper limbs speed (nb) :	Trial 1
		Trial 2
	Lower limbs speed (nb) :	Trial 1
		Trial 2
	5m shuttle run (sec) :	Trial 1
		Trial 2
	Circle run (sec) :	Trial 1
		Trial 2

RÉSULTATS DES TESTS



	Side step run (sec) :	Trial 1
	Slalom run (sec) :	Trial 1
	Balance eyes opened (sec) :	Trial 1
	Balance eyes closed (sec) :	Trial 2
	Board balance (sec) :	Trial 1
	Simple reaction time (ms) :	Trial 2

RÉSULTATS DES TESTS



	<p>Precision (points) :</p>	
	<p>Eye-hand coordination (sec) :</p>	<p>Trial 1</p>
	<p>Dribbling coordination (nb) :</p>	<p>Trial 2</p>
	<p>20m shuttle run (stages) :</p>	