POSSIBILITY OF FUNCTIONAL MOVEMENT SCREENING IN PHYSICAL EDUCATION

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Abstract:
It is very important that pupils have appropriate level of basic movement patterns in order to deal with motor tasks properly. Proper movement patterns can be affected by overweight, obesity, physical inactivity, injury or clinical pathologies. The Functional Movement Screen (FMS) is one of the most popular injury risk and movement proficiency assessment tools. This tool is composed of 7 movement tests that rely on mobility, stability and balance. There are a number of well-designed interventions that enhance motor skills, motor control, stability, and mobility and usually they are prescribed as individualized programs. However, since this problem is widespread it might be more effective if it is addressed within the school setting on a larger scale. FMS is reliable, affordable and practical tool that could be an answer to many functional movement deficiencies that plague our children and youth. Implementing FMS program instead of the traditional dynamic warm-up in preparation for physical education class might be an effective solution for improving movement imbalances in primary school pupils. Furthermore, data collected from a large number of schools may be a base for establishing National database for children and youth functional movement proficiency standards.

Keywords:
Movement proficiency, Physical inactivity, Movement dysfunctions, Pupils..

INTRODUCTION

Physical Education (PE) programs in primary schools in Serbia contain diverse contents [1], including sports fundamentals, motor ability conditioning, school sport competitions, activities in nature, etc. All of these activities require that students have a basic level of physical fitness and physical literacy in order to successfully complete the PE as a school subject. The PE programs become increasingly complex and more demanding as school years increase. Consequently, it is very important that pupils have appropriate level of basic movement patterns in order to deal with them properly. Proper movement patterns can be affected by obesity.

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It is well-known fact that overweight and obesity in childhood persist as a huge health problem throughout the world. It has been confirmed that children show adjustments in their movement patterns because of the overweight [2]. That can affect every day physical activity routines and significantly restrict functional performance [3]. Improper functional movements due to excessive weight and obesity problem in early life may be the cause of a postural imbalance in later life and inefficiency to perform everyday tasks. Hence, it has been indicated that minimizing improper movement patterns observed in overweight and obese children should be addresses as soon as possible [4].

PE is a context where injuries occur quite often [5, 6]. To minimize the risk of injuries, it is necessary to identify physical dysfunctions exposing to injury and to create an injury prevention program. Several movement oriented tests have been established to assess injury risk during various physical activities [7–10]. One of the most popular injury risk assessments is the Functional Movement Screen (FMS).

Although movement dysfunctions are often associated with injury or clinical pathologies, functional movement limitations can affect the youth. A recent research with the FMS testing of the seven functional movements, conducted on adolescent population confirmed that more than 45% of respondents scored ≤ 14. The score of 14 is considered as a cutoff score that indicates higher chances for suffering an injury due to the improper movement patterns [11].

Considering the simplicity and practicality of FMS, authors think that it has a significant potential to be applied in the school setting as a tool in the efforts for improvement of movement proficiency.

1. FUNCTIONAL MOVEMENT ASSESSMENT

A numerous studies have been published in recent years about Functional Movement Screen (FMS) and its benefits and reliability in diverse populations and with different purposes [12-14]. The FMS screening tool is consisted of seven movement tests that rely on mobility, stability and balance. These tests are: Deep Squat, Hurdle Step, In-line Lunge, Shoulder Mobility, Active Straight-Leg Raise, Trunk Stability Push-Up, and Rotary Stability.

Findings of very recent reliability study suggested that the FMS overall score had moderate to good inter-rater and intrarater reliability, including sufficient levels of measurement error [15].

The movement patterns used for the FMS give a fitness professional observable performance of basic functional movements by positioning the clients in required stances and movements where imbalances, asymmetries and weaknesses can be noted. The FMS was not designed to be a training tool but an instrument for movement assessment. The usefulness of the FMS lays in its practicality, simplicity, and ability to complete the toolbox used to estimate a performance. The FMS does not detect the cause of a dysfunctional movement pattern but discovers which patterns are making a problem [16].

General screening guidelines

To execute the FMS properly, an examiner needs to know about the following anatomical landmarks.

- The most distal wrist crease
- Anterior superior iliac spine (ASIS)
- Lateral and medial malleolus
- The joint line of the knee/Mid-Patella
- Tibial tuberosity

It is essential to remember that the FMS screen should be performed without any kind of prior warm-up. Reason for that is because it is of vital importance to know what a client's normal state of functional movement is when he approaches the test. In that way we get the best picture of the client's current level of movement competency in everyday activity. An examiner should make enough space between himself and the client in order to see the whole picture of the entire movement. Each test can be performed three times, and the examiner should move around the client during the test to get the best view. Typical order of the FMS screen is when client goes from the standing positions to the ground-based positions. The order that clients move from one test to another should not affect the results and it can be made in any sequence.

Seven fundamental movement tests are incorporated in the FMS screen, and the score is registered on a scale from 0 to 3. The sum all scores creates an overall score that ranges from 0 to 21 points. A score of 3 is indication that the movement was properly performed in a functional way. A score of 2 is given when a functional movement is executed in acceptable way but with compensation. A score of 1 is assigned in case when a client is unable to execute the movement. There are three variables of interest: (1) the FMS overall score, (2) the number of asymmetries, and (3) number of dysfunctions. Previous studies indicated that individuals with an overall score ≤ to 14 on the FMS have a positive likelihood to suffer a time-loss injury [17, 18].

2. FMS TESTS

The FMS Test Kit is a tool invented to use when performing the FMS screen. Simple rating system to assess client's movement is included. The FMS Test Kit consists of measuring stick – dowel, measuring device, and hurdle (Figure 1). All of these items can be self-made and every PE teacher can easily learn and perform the FMS tests.

In the following section there will be given basic information about each FMS test, and full details regarding the FMS testing procedure can be found at www.functionalmovement.com [19].

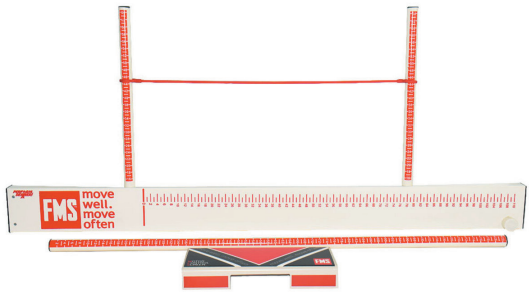

Figure 1. FMS Test Kit

• Deep Squat

The Deep Squat movement is functional movement that appears in many sports such as rugby, volleyball, American football, etc. It requires well-coordinated mobility and stability, where hips and shoulders function in a symmetrical positions (Figure 2C).

• Hurdle Step

The Hurdle Step is functional movement test that estimates compensations or asymmetries in stepping movement patterns. It should be performed slowly with controlled movement. (Figure 2B).

• In-line Lunge

The In-line Lunge test is intended to explore the movements and control of the right and left functions in the basic movement pattern. It challenges mobility and stability in the counterbalance movements of the upper and lower limbs (Figure 2A).

• Shoulder Mobility

The idea of this test is to estimate the mobility of the shoulder girdle, thoracic spine, and a rib cage during simultaneous upper limb movements. This movement pattern usually is not seen in daily activities but it gives good picture of the movement ability (Figure 2F).

• Active Straight-Leg Raise

This test was designed to explore the mobility of the flexed hip as well as constant core stability during the movement execution, and extension of the opposite hip. It is challenging for the ability to separate lower limbs without external loading (Figure 2E).

•Trunk Stability Push-Up

This test targets the reflex core stabilization (the spine and hips) when the upper limbs initiate the push-up movement (Figure 2G). The examiner should look for the compensatory movements. This test has different starting positions for men and women.

• Rotary Stability

The intention of this test is to estimate the movement stability of the shoulder girdle, the core, and pelvis while executing simultaneous upper and lower limb movements (Figure 2D). It is forbidden to manipulate set up positions manually.

Figure 2. FMS tests. (A) In-line lunge, (B) Hurdle step, (C) Deep squat, (D) Quadruped rotary stability, (E) Active straight leg raise, (F) Shoulder mobility, and (G) Trunk stability push-up [16].

3. APPLICATION IN SCHOOL SETTING

As mentioned earlier, the occurrence of the functional movement limitations is often associated with overweight and obesity, physical inactivity, injury, or clinical pathologies. These factors probably play a major role in a lack of efficiency in the fundamental motor skills of children and adolescent youth. Findings of the recent study indicate that the overall motor skill performance was rather poor among adolescents, and only

11% of the respondents in that study showed mastery or near mastery in a range of basic motor skills [20].

The motor abilities and skills of primary school pupils can also be viewed in the context of the results of recent research carried out on primary and secondary school pupils in Serbia where comparative analysis with the results of children from certain EU countries showed that the results of Serbian pupils were mostly under average [21]. The tendency of physical inactivity of children and youth has a direct impact on the level of motor abilities, which occurs not only in Serbia but also in the neighboring countries as well as in developed countries [22].

Apparently, there is an urgent need to pursue solutions and tackle fundamental motor skill weakness among children and youth populations. There are a number of well-designed interventions that enhance motor skills, motor control, stability, and mobility and usually they are prescribed in the form of individual programs. These programs usually consist of corrective exercises that are focused on an individual's "weakest link," and studies confirmed their efficiency [23, 24]. However, since this problem is widespread it might be more effective if it is addressed within the school setting on a larger scale. Despite the justified doubt whether such a program is well suited for each client's needs and deficiencies, its overall effectiveness for the class is proven [25].

The easiest way to implement a functional movement program during PE classes would be during warm-up routines since that would not interrupt regular PE curricular activities. There are several goals [26] of the warm-up exercises in PE:

- Optimizing mechanical and physiological conditions for the loco motor apparatus functioning.
- Injury prevention.
- Maintenance of the fitness and good posture.
- Compensation (activation of less active muscles).
- Cumulative effect of shaping exercises.

Many exercises in the "traditional" PE warm-up routines have a lot in common with FMS corrective exercises and PE teachers in our country would not have any difficulties to implement such a program. The warm-up of the FMS experimental group would be made of:

- Mobility exercises – These exercises include various forms of stretching or joint mobility work.
- Stability/Motor Control Exercises – The main target of these exercises is improvement of the postural control of initial and ending positions.
- Movement Pattern Retraining – These exercises should enhance stability and mobility into desired movement patterns.

Although the FMS scoring system might look complex, the authors provided a very basic scoring sheet format that every PE teacher can handle easily. The FMS scoring sheet is consisted of a Raw Score, Final Score, and a Total Score. Depending on the score, a fitness professional (or a PE teacher) determines an intervention strategy. The scores are used and interpreted differently depending on the context, whether a fitness/health professional is working individually with a client or as a PE teacher working with a group of pupils, or a strength and conditioning coach working with a sports team. When working one-on-one, a fitness professional may use the Raw Score to establish the order of intervention exercises. In a case where there are large groups (like a school class), the Final Score may be more valuable at the beginning when deciding the next steps for the whole group. The Total Score might have more importance when fitness professional makes comparisons to the other groups or other individuals [19].

Using the data

Further steps and benefits of using FMS in schools could be in setting up a National database of children and youth's functional movement proficiency standards for different age groups (grades). This might sound too ambitious, but the FMS is a practical, reliable, and affordable tool that could be an answer to many functional movement deficiencies that plague our children and youth. The majority of schools in Serbia already have esDnevnik (electronic school book) where PE teachers can add an FMS score for each pupil. Once the data are loaded into the system it would be easy to perform adequate statistics and acquire the standards.

4. CONCLUSION

As indicated earlier, the motor abilities and motor skills of primary school pupils in our country are mostly under average compare to the children from certain EU countries. Generally, the declining tendency of physical activity of children and youth has a direct impact on the level of motor abilities, and that is observed as a worldwide phenomenon.

There are a number of relevant interventions designed in an effort to tackle movement deficiency issues among children and youth. Usually, those interventions are individualized programs focused on improvement

of motor skills, mobility, stability, and motor control. However, since the widespread problem of fundamental motor skill deficiencies among children and youth population, the logical place for addressing these problems in school children and youth is within PE context, a setting that is usually well suited for group activities.

Implementing the FMS program instead of the traditional dynamic warm-up in preparation for PE activity might be a plausible solution for correcting movement deficiencies in primary school pupils. Furthermore, data collected from a large number of schools may be a base for establishing a National database for children and youth functional movement proficiency standards.

REFERENCES

[1] Gadžić, A. "Theory and method of teaching in physical and health education," Belgrade: Singidunum University, 2019.

[2] Hills, A.P., Hennig, E.M., Byrne, N.M., Steele, J.R. "The biomechanics of adiposity – structural and functional limitations of obesity and implications for movement," Obes Rev, 3, pp. 35–43, 2002.

[3] Nantel, J., Mathieu, M-E, Prince, F. "Physical activity and obesity: Biomechanical and physiological key concepts," J Obes 2011, 2011:650230.

[4] Rozendal, R.H. "Biomechanics of standing and walking," In Disorders of Gait and Posture, Bles W, Brandt T, Eds. Amsterdam: Elsevier Scientific Publishers; 1986, pp.3–18.

[5] Nationwide Children's Hospital. (2009, August 20). New National Study Finds Increase In Physical Education Class-related Injuries. ScienceDaily. Retrieved September 7, 2020 from www.sciencedaily.com/releases/2009/08/090803083640.htm

[6] Gutiérrez-Castañón, E., Martínez-de-Haro, V., Ramos-Álvarez, J.J. y Cid-Yagüe, L. "Injuries in Physical Education of High School. A Problem?", Revista Internacional de Medicina y Ciencias de la Actividad Física y el Deporte vol. 18 (72), pp. 709-722, 2018.

[7] Cook, G., Burton, L., Hoogenboom, B.J., Voight, M. "Functional movement screening: the use of fundamental movements as an assessment of function - part 1," International Journal of Sports Physical Therapy, 9(3), pp. 396–409, 2014.

[8] Gribble, P.A., Hertel, J., Plisky, P. "Using the star excursion balance test to assess dynamic postural-control deficits and outcomes in lower extremity injury: A literature and systematic review," Journal of Athletic Training. National Athletic Trainers Association, 47, pp. 339– 57, 2012.

[9] Harris-Hayes, M., Van Dillen, L.R. "The Inter-Tester Reliability of Physical Therapists Classifying Low Back Pain Problems Based on the Movement System Impairment Classification System," PM&R, 1, pp. 117–26, 2009.

[10] Kritz, M., Cronin, J., Hume, P. "The bodyweight squat: A movement screen for the squat pattern," Strength and Conditioning Journal, 31(1), pp. 76–85, 2009.

[11] Abraham, A., Sannasi, R., & Nair, R. "Normative values for the functional movement screen in adolescent school aged children," International Journal of Sports Physical Therapy, 10(1), pp. 29–36, 2015.

[12] Schneiders, A. G., Davidsson, A., Hörman, E., & Sullivan, S. J. "Functional movement screen normative values in a young, active population," International Journal of Sports Physical Therapy, 6(2), pp. 75–82, 2011.

[13] Perry, F. T., & Koehle, M. S. "Normative Data for the FunctionalMovement Screen in Middle-Aged Adults," Journal of Strength and Conditioning Research, 27(2), pp. 458–462, 2013.

[14] Gonzalo-Skok, O., Serna, J., Rhea, M. R., & Marín, P. J. "Relationships between functional movement tests and performance tests in young elite male basketball players," International Journal of Sports Physical Therapy, 10(5), pp. 628–38, 2015.

[15] García-Jaén, M., Sellés-Pérez, S., Cortell-Tormo, J. M., Férriz-Valero, A., & Cejuela, R. « Assessment of fundamental movement patterns in children: a gender comparison on Primary School students," Nuevas Perspectivas de Educación Física, Deporte y Recreación., 34, pp. 282–286, 2018.

[16] Teyhen, D.S., et al. "The Functional Movement Screen: A Reliability Study," Journal of Orthopaedic & Sports Physical Therapy, 42 (6), pp. 530-540, 2012.

[17] Kiesel, K., Plisky, P.J., Voight, M.L. "Can serious injury in professional football be predicted by a preseason functional movement screen?" North American Journal of Sports Physical Therapy, 2, pp. 147-158, 2007.

[18] O'Connor, F,G,, Deuster, P.A., Davis, J., Pappas, C.G., Knapik, J.J. "Functional movement screening: predicting injuries in officer candidates," Medicine & Science in Sports & Exercise, 43, pp. 2224-2230, 2011.

[19] Cook, G. "Functional Movement Screen: Level 1 Online version," Functional Movement Systems and Gray Cook, 2015.

[20] O' Brien, W., Belton, S., & Issartel, J. "Fundamental movement skill proficiency amongst adolescent youth," Physical Education & Sport Pedagogy, 21, pp. 557–571, 2016.

[21] Gajević, A. "Physical development and physical abilities of elementary school pupils," Belgrade: Republic Institute for Sport.

[22] Gadžić, A., Marković, M., Kraljević, R. "The correlations of certain environmental factors with motor abilities in 6th grade elementary school pupils," Sport - Science & Practise, 3 (2), pp. 5-16, 2013.

[23] Bodden, J. G., Needham, R. A., & Chockalingam, N. "The effect of an intervention program on functional movement screen test scores in mixed martial arts athletes," Journal of Strength and Conditioning Research, 29(1), pp. 219–225, 2015.

[24] Kiesel, K., Plisky, P. J., & Voight, M. L. "Can serious injury in professional football be predicted by a preseason Functional Movement Screen?," North American Journal of Sports Physical Therapy, 2, pp. 147–158, 2007.

[25] Coker, C. "Improving Functional Movement Proficiency in Middle School Physical Education," Research Quarterly for Exercise and Sport, 89 (3), pp. 367-372, 2018.

[26] Gadžić, A. "Anthropomotor and method aspects of shaping exercises," Belgrade: Singidunum University, 2016.