

## Assessment criteria of fundamental movement skills for various age groups: A Systematic Review

ABDUL JABBAR BASMAN

Edinburgh University, Institute for Sport, Physical Education and Health Sciences (ISPEHS), UK- SCOTLAND

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### Abstract:

Fundamental movement skills as a term are associated with physical activity, life active and physical programs, This term has been popularly recognized with huge interest worldwide, in recent years, The term “Fundamental Movement skills” (FMS) or Motor skills (MS) has emerged in a number of countries including Australia, Canada, America, Europe and Great Britain. This systematic review aims to find the best way to assess FMS and try to find a criterion to use as a guide for the future of PA, life active and sports excellence.

A comprehensive systematic search was conducted from MEDLINE, Physical Education Index, Science Direct, Sports Discuss, PUBMED, and Scopus. A summary of the systematic search and selection process is provided in the PRISMA flow diagram (Fig.2), records through all database searching were (2557), records, after duplication was removed, were (2340) with percentage of 91%, The record for exclusion were (2116) with 83.5% percentage, full –text studies assessed for eligibility were (224) with 8.8% percentage, the included studies were (38) with 1.8% percentage. Indeed, differences of culture, tradition and level of PA program in different stages have resulted in differences in the definition of the FMS among various countries. Accordingly, this different in understating FMS create blanks in the ways to improve FMS as very important components in physical activities, sport excellence and life active. The author suggested a future tracking study for elective samples of 5-12 years of age based on primary school pupils of 5-10 years with more studies to be done in the same direction.

**Key words:** assessment, movement skills, children, age group.

### Introduction

In recent years, the term Fundamental Movement skills (FMS) or Motor skills (MS) has emerged in a number of countries including Australia, Canada, America, Europe and Great Britain. It reflects the mobility or skill performance of an individual at different age stages of life and can be an accurate base for athletic excellence and active life.

It is important firstly to define what Fundamental Movement Skills mean as confusion in various literatures related to FMS is often used interchangeably.

A variety of such definition is easily found in relevant literature, accordingly FMS, in some cases, means fundamental movement skills, while in another it delineates fundamental motor skills and still in few more others and in few others, it means functional skills, Throughout history, terms used within motor development have evolved with emphasis shifting from the biological maturational processes of motor development to different aspects of motor behaviour over time(Logan, Ross, Chee, Stodden, & Robinson, 2018), as the two terms (FMS and MS) are reported interchangeably in the literature, it is important to define first their meaning. FMS has been linked to simple skills that help the child understand and learn and is the basis for all motor skills. It has been supported that progression is enhanced when starting with simple and continuing with more complex tasks(Lisa M. Barnett et al., 2016).

Throughout history, terms used within motor development have evolved with emphasis shifting from the biological maturational processes of motor development to different aspects of motor behavior over time.

Today, research has specifically focused on the importance and the predictive utility of motor competence on positive health outcomes((Logan et al., 2018).

Fundamental movement skills are basic abilities and skills of a child to perform an organized series of basic movements that involve various body parts and provide the basis of achieving a high level of motor competence to develop normally, maintain health, and gain athletic excellence, Fundamental movement skills are very important in the physical development of a child; when children are confident and competent with these skills, they can develop sport-specific and complex movement skills that allow them to enjoy sport and physical activity.

Most importantly, they could have a firm grasp of the fundamental movement skills and being physically literate leads a child to enjoy a long life of physical activity(Wick et al., 2017).

In other disciplines such as mathematics, the child begins to learn single numbers and then starts with simple calculations such as addition, subtraction, division and multiplication. It begins with learning the letters and then sentences, phrases and full texts, This also applies to motor skills, here the child learns jogging, walking, jumping, throwing, skiing, balancing, and stability, and then adopts skills to develop what suits his physical fitness and other factors, In teaching movements we want to exact the same thing.

Through the review of many studies and articles, with respect to FMS and Physical Activity (PA), there is an agreement that FMS is a building block for active life and sport excellent through human life with different age stages(Hulteen, Morgan, Barnett, Stodden, & Lubans, 2018), fundamental motor skills are operationally defined as the “building blocks” of more advanced, complex movements required to participate in sports, games, or other context specific physical activity((Logan et al., 2018).

The assessment of movement skill is a critical component of many disciplines and professions, Although the specific contexts and applications may vary, the basic concepts and strategies are similar in order to plan efficient and effective movement programs or to support the involvement of a child with special needs in the wider community(B. Hands, 2012).

Today, researchers have specifically focused on the importance and predictive utility of motor competence on positive health outcomes because (FMS) can be expressed as basic motor activities that underlie all complex specific, There are a several different ways to measure children’s performance of FMS, each with advantages and disadvantages. The assessor must take these into consideration when deciding what approach to take(B. Hands, 2012).

This systematic review aimed to focus on the ways to assess the FMS in different age-group additions to try to find a criteria for these skills because of the importance to start with right steps with pupils in schools and try to improve their sports skills.

The content is concerned with how these skills are chosen, as they do not necessarily include every skill that might be considered fundamental.

Different test batteries have emerged around the world, all testing slightly different forms and groups of skills, for each testing battery, the developers and/or users are required to decide how many test items to include (i.e., how many skills) in the context of the specific study aims, time, cost and participant burden, and what test items will best best represent the movement skill competence of the child(Lisa M. Barnett et al., 2016).

The Fundamental movement skills (FMS) are typically classified into object control skills (e.g., catching and throwing), locomotor skills (e.g., running and jumping), and stability skills (e.g., balancing and twisting), The main categories of (FMS) are:

- 1- Locomotor: skills involve moving the body from the point A to B, including (Walking, Running, Jumping, Leaping, Hopping, and Galloping).
- 2- Non-locomotor, involve body stability and balance; include twisting, turning, pivoting and performing balance.
- 3- Manipulative skills involve the control of objects using various body parts; include throwing, passing, striking, catching, kicking and receiving.

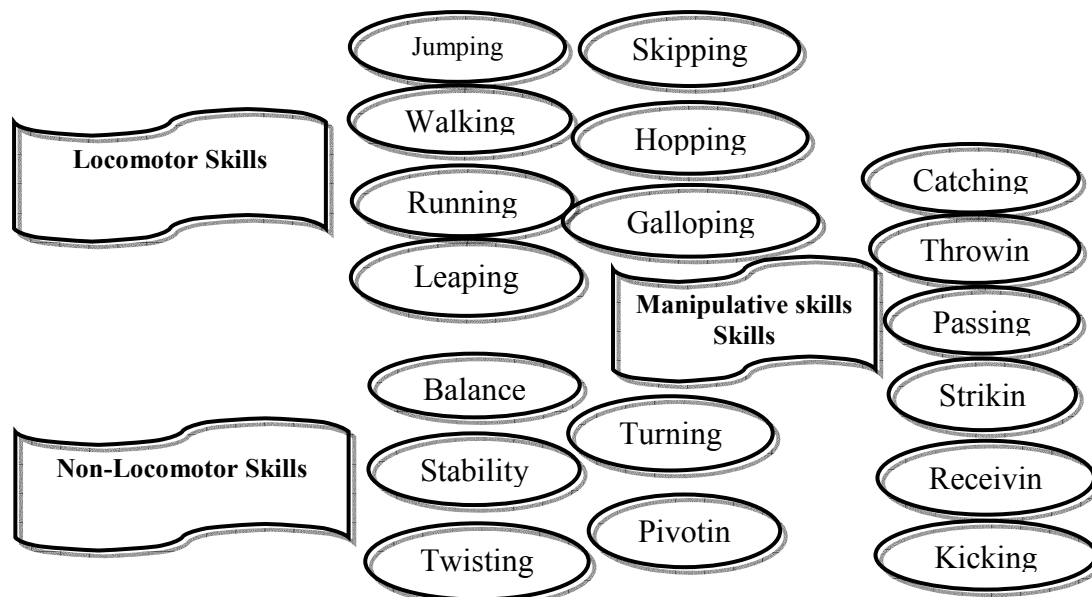


Fig 1. The main Categories for (FMS)

FMS are essential to the more specialized and complex skills used in playing, games, and sports. Mastery of these basic motor skills that predominantly evolve during the preschool years, is an essential part of pleasant participation and a lifelong interest in a physically active lifestyle(Wick et al., 2017).

Proficiency in FMS is considered critical to achieving and maintaining physical activity and physical fitness preventing obesity and developing more complex motor skills for later life(Logan, Kipling Webster, Getchell, Pfeiffer, & Robinson, 2015).

FMS in general, it include the following(Lisa M. Barnett et al., 2016)

1. FMS are not all fundamental.
2. Each FMS only leads to a limited number of sports and/or activities and therefore skill transfer is limited.
3. Skills are learnt by doing rather than being taught.
4. That a focus on FMS ignores a constraints-based approach.
5. FMS is a 'skills and drills' teaching approach.
6. There is little data supporting the association between movement competence and physical activity.

The assessment of FMS through the literature that has searched was not comprehensive and it was done partially in some of these studies to assess the locomotor skills while some other studies assess Non- locomotor skills and still some other ones assess Manipulative Skills, the reason this non-holistic assessment of (FMS) assessment is because of the differences between skills and their final outputs and also there is no standard for these skills.

So far, it has not been attempted to review the articles focusing on FMS, the assessment of FMS is acritical component and profession, although the specific contexts and applications may vary(B. P. Hands & Hands, 2002).

The arguments, which support this systematic review, are to identify and determine assessment and measure of (FMS) for age (five-twelve years) and sought to develop criteria for (FMS) in primary schools as a guide for (PA).

Therefore, the aim of the current study is to conduct a systematic review of the current literature and i) identify how FMS is assessed, ii) identify the FMS criteria used as a guide of PA and iii) identify methods employed to assess the level and development of FMS in children between the five to twelve years of age.

## Methods

- Search strategy:

The conduct and reporting of this review was guided by the preferred reporting items for systematic reviews and Meta – Analysis (PRISMA) statement (Shamseer et al., 2015).

All search were identified by means of electronic searches on:-

- MEDLINE.
- Physical Education Index.
- Science Direct.
- Sport Discuss.
- PUBMED.
- Scopus

On the informant platform of the health and education and sport, the search was individually done for each database for the period 2010 - 2018.

Search strategies used the database included a combination of Key search terms, which are divided into three concepts:

- 1- FMS or Fundamental movement skills or Fundamental motor skills.
- 2- Assessment Criteria or test or TMGD or Eurofit.
- 3- Pupil\* or Children\*or (pre-adolescent).

The search has been narrowed by using (AND) in combination with 1, 2, 3, after the initial search removed all duplicates and screened the titles and abstracts.

There was another manual search from different sources, Where the author removed all duplicates by using titles and abstract and another check had been done for the articles published or accepted in peer-reviewed journals.

- Inclusion criteria: -

- All study design included in the review.
- Population, Children (Five - twelve years) as pupils in schools.
- Interventions, Assessment and measurement (FMS) and criteria as a base for (PA).
- Outcome, the best way to assess (FMS) for this age stage, the (FMS) criteria as a guide for (PA) for children.

- Exclusion criteria: -

- If the intervention of (FMS) was in Kindergarten or High Schools or Adults.
- If the population are had special cases of disabilities or mental disorder or any similar situation.
- Any studies that do not contain an assessment for (FMS).

- They were not published in English language.

**Study Selection and data extraction**

A summary of the systematic search and selection process is provided in the PRISMA flow diagram (Fig.2), the records through all database searching were (2557), records after duplicated removed were (2340) with percentage 91% percentage, the excluded were (2116) with 83.5% percentage, full –text studies assessed for eligibility were (224) with 8.8% percentage, the included studies were (38) with 1.8% percentage..

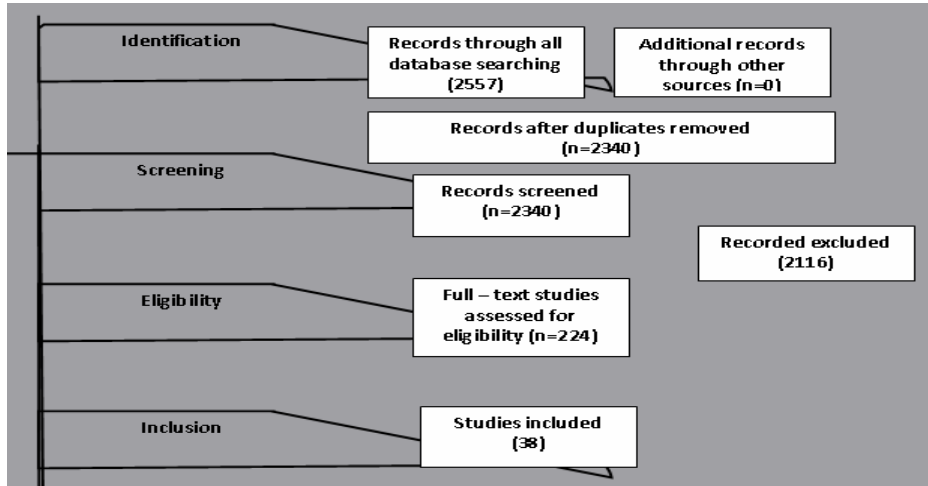


Fig 2. PRISMA flow diagram summarizing the systematic search process

In conducting the search, the author reviews the title and the full text of all articles retrieved, determined whether they met the inclusion criteria, and generated an initial list of included studies.

The author then extracted specific data from each study. These include The Study authors, publishing year, title, country, participants, intervention, and type of assessment. Table 1.

Table 1. The assessment criteria of FMS for age groups

Author	Year	Title	Country	Participants	Intervention	Type of assessment used
Lovrić, Franjo (Lovrić et al., 2015)	2015	Obstacle Polygon as an Assessment of Fundamental Movement Skills in 6-Year-Old Children	Croatia	78 six-year old pupils (39 boys and 39 girls)	Obstacle Polygon as an Assessment of Fundamental Movement Skill	Obstacle assessment of FMS
Alexander C. Engell • Carolyn R. Broderick2 • Nancy van Doorn2 • Louise L. Hardy3 • Belinda J. Parmenter2 Ó(Engell, •, •, & Ó, 2018)		Exploring the Relationship Between Fundamental Motor Skill Interventions and Physical Activity Levels in Children: A Systematic Review and Meta-analysis	Australia	Children 3-12 years old	Intervention for improving FMS & PA levels in children	systematic review
Logan, Samuel W. (Logan et al., 2018)	2018	Fundamental motor skills: A systematic review of terminology.	USA	////////	The using of terminology of FMS	systematic review
Barnett, Lisa M. (Lisa M. Barnett et al., 2016)	2016	Fundamental Movement Skills: An Important Focus	Various Countries	////////	The important of FMS as a primary pedagogical to answered a series of contentions.	Article
Sgrò, F.	2013	A Mixed-	Italy	Pupils age 11-	Using mixed	Quantitative

Schembri, R. Nicolosi, S. Manzo, G. Lipoma, M.(Sgrò, Schembri, Nicolosi, Manzo, & Lipoma, 2013)		method Approach for the Assessment of Fundamental Movement Skills in Physical Education		12 years		methods in assessment FMS	assessment
Holfelder, Benjamin Schott, Nadja(Holfelder & Schott, 2014)	2014	Relationship of fundamental movement skills and physical activity in children and adolescents: A systematic review.	Germany	//////////		The relationship of FMS and PA	systematic review
Zuvela, Frane Bozanic, Ana Miletic, Durdica(Zuvela, Bozanic, & Miletic, 2011)	2011	POLYGON – A new fundamental movement skills test for 8- year old children: construction and validation	Croatia		95 children (48 M, 47 F) 8-11 years	construction and validation	TGMD-2
Lai, Samuel K. Costigan, (Lai et al., 2014)	2014	Do School-Based Interventions Focusing on Physical Activity, Fitness, or Fundamental Movement Skill Competency Produce a Sustained Impact in These Outcomes in Children and Adolescents? A Systematic Review of Follow-Up Studies.	USA, Australia	//////////		PA, fitness, FMS	Systematic review
BURROWS, E Jean Keats, MELANIE R KOLEN, Angela M(BURROWS, Keats, & KOLEN, 2014)	2014	Contributions of After School Programs to the Development of Fundamental Movement Skills in Children.	Canada		N=40 Children 6- 10 years	The intervention of after school programs on FMS	Experimental assessment
Duncan, Michael J. Eyre, Emma L. J. Oxford, Samuel W.(Duncan, Eyre, & Oxford, 2017)	2017	The effects of 10 weeks Integrated Neuromuscular Training on fundamental movement skills and physical self-efficacy in 6-7- year-old children	UK		N=41 (6-7 years old children)	10 weeks integrated neuromuscular training on FMS	Experimental assessment
Bardid, Farid Huyben, Floris Lenoir, Matthieu Seghers, Jan De Martelaer, Kristine Goodway, Jacqueline D. Deconinck, Frederik J A(Bardid et al., 2016)	2016	Assessing fundamental motor skills in Belgian children aged 3-8 years highlights differences to US reference sample	Belgian		N= 1614 (3- 8 years old children)	understand the fundamental motor skills (FMS) of Belgian children using the process-oriented Test of Gross Motor Development	TGMD-2
Bryant, E S Duncan, M J Birch, S L(E. S. Bryant, Duncan, & Birch, 2014)	2014	Fundamental movement skills and weight status in British primary school children	UK		N=281 (2-6 years children)	Weight status and FMS in children	eight FMSs (run, hop, gallop, jump, balance, kick, throw and catch) three
Logan, Samuel W. Kipling Webster, E. Getchell, Nancy Pfeiffer, Karin A. Robinson, Leah E.(Logan et al., 2015)	2015	Relationship Between Fundamental Motor Skill Competence and Physical Activity During Childhood and Adolescence: A Systematic Review	USA	//////////		Relationship between FMS and PA	systematic review
Chan, Cecilia Ha, Amy Ng, Johan Y.Y. Y(Chan, Ha, & Ng, 2016)	2016	Improving fundamental movement skills in Hong Kong students through an assessment for learning intervention that	Hong Kong		282 students from grad 3- 10	Improving FMS throw learning assessment	Using a cluster randomized controlled trial

Gimenez, Roberto Manoel Ede, J de Oliveira, Dalton Inara(Gimenez et al., 2012)	2012	emphasizes fun, mastery, and support: The A + FMS randomized controlled trial study protocol Integrating fundamental movement skills in late childhood	Brazil	N=30 6-12 years children	The integrating of FMS in late childhood	running, overarm throwing, and the combined task	
Barnett, L M Hardy, L L Lubans, D R Cliff, D P Okely, A D Hills, A P Morgan, P J(L M Barnett et al., 2013)	2013	Australian children lack the basic movement skills to be active and healthy	Australia	children and adolescents	The lack of FMS to be active and healthy		Journal Article
Logan, Samuel W. Barnett, Lisa M. Goodway, Jacqueline D. Stodden, David F. (Logan, Barnett, Goodway, & Stodden, 2017)	2017	Comparison of performance on process- and product-oriented assessments of fundamental motor skills across childhood.	USA	170 children classified into three age groups: 4-5, 7-8 and 10-11 years old	Assessment of FMS across Childhood		TGMD-2
Hands, Beth(B. Hands, 2012)	2012	How fundamental are fundamental movement skills?	USA	Children	How fundamental are FMS?		Journal Article
Wright, M. D. (Matthew); Portas, M. D. (Matthew); Evans, V. J. (Victoria); Weston, M. (Matthew)	2015	THE EFFECTIVENESS OF 4 WEEKS OF FUNDAMENTAL MOVEMENT TRAINING ON FUNCTIONAL MOVEMENT SCREEN AND PHYSIOLOGICAL PERFORMANCE IN PHYSICALLY ACTIVE CHILDREN.	UK	22 children	FMS training on Functional movement screen		Intervention groups
Authority, Scottish Qualifications (WRIGHT, PORTAS, EVANS, & WESTON, 2015)	2017	Fundamental Principles of Multi-skills for Sport	Scotland	SCQF level 5	FMS principles		Journal Article
Morgan, Authors Philip J Barnett, Lisa M(Morgan & Barnett, 2013)	2013	Fundamental Movement Skill Interventions in youth: A Systematic Review and Meta-analysis	Australia	Youth	The effect of FMS on PA		Systematic Review and Meta-analysis
Franjko, Ivica Zuvela, Frane Kuna, Kezic, Ana(Franjko et al., 2013)	2013	Relations between Some Anthropometric Characteristics and Fundamental Movement Skills in Eight-Year-Old Children	Croatia	73 children (M, F) 8 years old	Anthropometric and FMS		TGMD-2
Almond, L Pot, N Ezzeldi, K Ayres, M(Almond, Pot, Ezzeldi, & Ayres, 2014)	2014	An alternative pedagogical framework to FMS	UK	Children	alternative pedagogical framework		Journal Article
Hulteen, Ryan M. Morgan, Philip J. Barnett, Lisa M. Stodden, David F. Lubans, David R.(Hulteen et al., 2018)	2018	Development of Foundational Movement Skills: A Conceptual Model for Physical Activity Across the Lifespan	Various Countries	Lifespan	Development of FMS		Conceptual Model
Right, M Atthew D W Ortas, M Atthew D P Vans, V ictoria J E	2015	THE EFFECTIVENESS OF 4WEEKS OF FUNDAMENTAL MOVEMENT TRAINING ON FUNCTIONAL	UK	N. 22 Children 11 years old	A 4-week school-based training intervention		Flexibility and stability and balance FMS test

Eston, M Atthew W(Right, Ortas, Vans, & Eston, 2015)		MOVEMENT SCREEN AND PHYSIOLOGICAL PERFORMANCE IN PHYSICALLY ACTIVE CHILDREN				
Submitted, Thesis Fulfillment, Postdoctoral Studiespartial(Tait, 2017)	2017	Fundamental Movement Skills Performance	Canada	8 years old - 84 individuals (23 male, 61 female)	The performance of FMS	TGMD-2
Mukherjee, Swarup Jamie, Lye Ching Ting Fong, Leong Hin Swarup, Mukherjee Lye Ching Ting, Jamie Leong Hin, Fong(Mukherjee et al., 2017)	2017	Fundamental Motor Skill Proficiency of 6- to 9-Year-Old Singaporean Children	Singapore	244 children from Primary 1 and 3 levels	Skills proficiency	TGMD-2
Bryant, Elizabeth Duncan, Michael Birch, Samantha James, Rob(E. Bryant, Duncan, Birch, & James, 2016)	2015	Can Fundamental Movement Skill Mastery Be Increased via a Six-Week Physical Activity Intervention to Have Positive Effects on Physical Activity and Physical Self-Perception?	UK	82 children mean age = SD = 8.3 = 0.4 years	Six Week Physical Activity on FMS increasing	Assessment of 8 FMS with a self-perception questionnaire
Lubans, David R Dr David R Morgan, Pj Philip J Cliff, Dylan P Dp Barnett, Lisa M Lm Okely, Ad Anthony D(Lubans, Morgan, Cliff, Barnett, & Okely, 2010)	2010	Fundamental movement skills in children and adolescents: review of associated health benefits.	Australia	Children and Adolescents	FMS associated health benefits	Review of associated health benefits
Slykerman, Sarah Ridgers, Nicola D. Stevenson, Christopher Barnett, Lisa M.(Slykerman, Ridgers, Stevenson, & Barnett, 2016)	2016	How important is young children's actual and perceived movement skill competence to their physical activity?	Australia	109 children (59 boys, 50 girls; mean age = 6.5 years	Determine the associations between young children's actual and perceived object control and locomotor skills and physical activity and whether associations differ by sex. Design:	TGMD-2
Gimenez, Roberto Manoel Ede, J de Oliveira, Dalton Lustosa Dantas, Luiz Marques, Inara Manoel, Edison De J. Dantas, Luiz Marques, Inara(Gimenez et al., 2012)	2012	Integrating fundamental movement skills in late childhood	Brazil Summary.— The	30 children 6,9,12 years	how children of different ages integrate FMS	Test for running and over arm throwing and combine skills
Tait, Tyler James(Tait, 2017)	2017	Fundamental Movement Skills Performance	Canada	84 Children 8 years old	the effect growth and maturation has on the performance of fundamental performance skills	Observational cross-sectional study design
Comeau, M E Bouchard, D R Levesque, C Jonhson, M J Rioux, B V Mayo, A(Comeau et al., 2017)	2017	Association between functional movements skills and health indicators in children aged between 9 and 12 years old	Canada	145 children between the ages of 9 to 12	The association between FMS & health indicators	Descriptive method
Sénéchal, M(Comeau et al., 2017) Slotte, Sari Sääkslahti, Arja Kukkonen-Harjula, Katriina Rintala, Pauli(Slotte, Sääkslahti, Kukkonen- Harjula, & Rintala, 2017)	2017	Fundamental movement skills and weight status in children: A systematic review	Finland	children aged 3–12 years	FMS & weight status	systematic review

Kalaja, S Jaakkola, T Liukkonen, J Watt, A(Kalaja, Jaakkola, Liukkonen, & Watt, 2010)	2010	Fundamental movement skills and motivational factors influencing engagement in physical activity	Finland	316 Children 12-13 years	FMS and motivation factors influencing in PA	Sport Motivation Scale
Johnstone, Avril Hughes, Adrienne R. Janssen, Xanne Reilly, John J.(Johnstone, Hughes, Janssen, & Reilly, 2017)	2017	Pragmatic evaluation of the Go2Play Active Play intervention on physical activity and fundamental movement skills in children	UK	172 children 7 years old	Pragmatic evaluation of go2play intervention on FMS & PA	systematic review
Foweather, Lawrence(Foweather, 2010)	2010	Fundamental movement skill competence among 10-11 year old children : Year 2 PEPASS Physical Activity Project The PEPASS Project	UK	152 children (age 9-10)	FMS competence	Six skills were assessed, included three locomotor skills, & three object control- skills
Barton, V(Barton, 2014)	2014	The effects of a school based intervention on fundamental movement skills	New Zealand	138 children 5-8 years old	School base intervention on FMS	Systematic review
Hyungmin, Park Johan, Simons(Hyungmin & Johan, 2012)	2012	The relation between basic movement skills and perceptual- motor skills in 5 to 7 years old children	Belgium	40 children years 5-7	Analyse the relation between the basic movement skills and specialized movement skill of young children	TMGD

The participants in the included studies were (4344) children aged between 5- 12 years; all the above studies use different intervention and assessment methods as shown in table 1, some of the studies used experimental procedures, others used descriptive methods. Most of the studies used TMGD test to assess FMS, yet some others used different ways to measure FMS, (8) of these studies were systematic review only and (1) was systematic review – meta analysis, also (1) journal article, other studies differ in the way of interventions or assessment FMS and they differ in using the terms of FMS. Some of the studies use Fundamental movement skills, Fundamental motor skills, or Fundamental function movement, to mean the same in all of them.

The types of assessment were varied among studies, (8) of the studies used (TMGD-2) the complete version, another (8) studies used separated test like running, jumping, catching or throwing and combined tasks, one of the studies used obstacle assessment for FMS, another study used quantitative assessment, two studies use experimental assessment and one study used cluster RCT.

(8) Of the studies were systematic review with one study was systematic review and meta-analysis, A conceptual model were used to study the development of FMS skills with PA across the lifespan.

(5) Articles focus on the importance of FMS, how FMS can be active factors to healthy life and long living, as well as it can be a guide for PA and sport excellence.

## Discussion

The main aims of this systematic review was to assess FMS as a blinding block and to reflect image for improving the quality of skills performance in age groups specially 5-12 years of pupils in primary schools. Many studies agree that the age between 5-12 years is the best time to start learning and get involved in most of the sports skills. This will focus on the importance of assessing FMS for these ages.

As FMS become very important and emerged in many countries as a building block for motor learning, sports excellence and active life, they were accordingly improved through many studies around the world. Many countries set their plans and strategies for sports and health for all.

No doubt, Fundamental movement skills are natural forms of movement and can be defined as basic movement activities, which form a basis for more advanced and more specific motor activities, such as sport-specialized skills.

It is important to emphasize that children who do not master these basic patterns of motor skills will probably be unable to successfully and effectively participate in sports and other educational activities throughout their lives(Lovrić et al., 2015).



The findings or results and data extraction from the majority of studies included in this systematic review use TMGD test as a guide to evaluate FMS as a full or part test. Other studies use different measures with different ways. Still some other studies measure locomotor skills (Ruining, Jogging, Hopping ... etc.), or measure non locomotor skills (Stability, Balance,...etc.), or Manipulative skills (Catching, Throwing, Passing,.....etc..).

The present review finds that there were many different methods about how to assess FMS. The current study with all its important arguments is considered an important step although we could not find any standard or criteria for FMS in all of the relevant studies.

Also, the different opinions about how to define the term of FMS create a serious controversy about how to assess FMS. This is believed to be the most important finding about the ways to assess FMS depending on what skills we assess.

Samples size, type of interventions differ among included studies and the largest sample was (1614 children)(Bardid et al., 2016) where use of it was thought to be not enough to find criteria for FMS, or the ways chosen to know what skills to assess because each FMS skill leads to few numbers of sports or PA. Therefore, skills transfer is rather limited(Lisa M. Barnett et al., 2016).

All the included studies have agreed that the terms of FMS are critical and it is hard to agree on a uniform method of measurement and evaluation. For this reason, there was no standard or criteria to be used as a guide for how FMS lead to sports excellence, PA and active life.

### Conclusions

The review of results and discussion leads the author to many conclusions, which match with the goals of other current systematic reviews

Because of differences among countries in culture and traditions as well as the type level of PA programs for different stages, various definitions of the term FMS have accordingly emerged, which are conducive of different understanding of FMS. Such differences have in turn created blanks in the ways to improve FMS for being very important components in physical activities, sport excellence and active life.

Through this systematic review, the main aim was to find out a way in which we can assess FMS.

Not all studies included in this review are matched one way or another to assess FMS. And since there were gaps in the ways to assess FMS, some of these studies use a full version of TMGD test, while other studies use individual tests for specific skills depending on the type of interventions of the study.

There is an indication from all included studies, that the ages rate ranging from 5-12 years is the best to assess and measure FMS and this boosts the current review.

The results of this systematic review have revealed a very important point which revolves around the existence of no criteria for FMS, and this may be considered a weak point in all studies because if we do not have criteria for FMS we can't find the ways to create future sports programs or plans for sports excellence or active life.

### Recommendations

- A possibility of implementing a future tracking study for elective 5-12 years old samples of primary school 5-10 year pupils depending on what age we start.
- A future research uses a large sample to find the criteria of FMS in group-ages of 5-12 years and doing more studies in the same direction. This will be a very important guide for all specialists in the field of sports and all athletic organizations to build an effective strategy and plan for the future of the sport.
- Provide a specific or an operational definition for FMS and this will unite the methods of how to assess or measure FMS(Logan et al., 2018).

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