Fundamental Movement Skills for Teenagers

PJ Smyth

Department of Physical Education and Sport Sciences
University of Limerick

“Learning to Move and Moving to Learn”

Mardyke Arena
University College Cork
April 20th 2013
Purpose: To review

- FMS in motor development
- Teaching of FMS (relate to workshop)
- Problems and barriers related to teaching FMS
- FMS as related to sport specific skills: evidence?
- Can FMS be taught to teenagers?
- Effects of FMS on adolescent participation in PA
- Issues to be considered with teenage motor skill development
Phases of Motor Development

APPROXIMATE AGE PERIODS OF DEVELOPMENT
- 14 years old and up
- 11 to 13 years old
- 7 to 10 years old
- 6 to 7 years old
- 4 to 5 years old
- 2 to 3 years old
- 1 to 2 years old
- Birth to 1 year old
- 4 months to 1 year old
- In utero to 4 months old

THE STAGES OF MOTOR DEVELOPMENT
- Lifelong Utilization Stage
- Application Stage
- Transitional Stage
- Mature Stage
- Elementary Stage
- Initial Stage
- Precontrol Stage
- Reflex Inhibition Stage
- Information Decoding Stage
- Information Encoding Stage
Phases of Development

**REFLEXIVE MOVEMENT PHASE**
- In utero to 4 months old

**RUDIMENTARY MOVEMENT PHASE**
- 1 to 2 years old
- Birth to 1 year old

**FUNDAMENTAL MOVEMENT PHASE**
- 2 to 3 years old
- 4 to 5 years old
- 6 to 7 years old

**SPECIALIZED MOVEMENT PHASE**
- 7 to 10 years old
- 11 to 13 years old
- 14 years old and up

**THE STAGES OF MOTOR DEVELOPMENT**
- Precontrol Stage
- Reflex Inhibition Stage
- Information Decoding Stage
- Information Encoding Stage
- Initial Stage
- Elementary Stage
- Mature Stage
- Transitional Stage
- Application Stage
- Lifelong Utilization Stage

**APPROXIMATE AGE PERIODS OF DEVELOPMENT**
- 4 months to 1 year old
- In utero to 4 months old

**Lifelong**
- Daily living utilization
- Recreational utilization
- Competitive utilization
Rudimentary skills of infancy

- Fetal posture: 0 mo
- Chin up: 1 mo
- Chest up: 2 mo
- Reach and miss: 3 mo
- Sit with support: 4 mo
- Sit on lap, grasp object: 5 mo
- Walk when led: 10 mo
- Creep: 11 mo
- Stand holding furniture: 9 mo
- Stand with help: 8 mo
- Sit alone: 7 mo
- Sit on high chair, grasp dangling object: 6 mo
- Pull to stand by furniture: 12 mo
- Climb stair steps: 13 mo
- Stand alone: 14 mo
- Walk alone: 15 mo
Fundamental Movement Phase
Development of fundamental skills

- Each individual moves through a series of developmental stages

- Examples of general outline of development (Gallahue, 1996). See next two slides
Examples of stages of development
Contrast mature stage with previous stages

- **Initial (2-3 yrs approx)**: Onset of pattern, poor control, parts of sequence missing, rhythm and co-ordination lacking

- **Elementary (4-5 yrs approx)**: More parts present, better rhythm and co-ordination

- **Mature (5-7 yrs approx)**: All parts present, good rhythm & co-ordination, mechanically efficient
Examples of stages of development
Contrast mature stage with previous stages contd.

- **Initial (2-3 yrs approx)** Onset of pattern, poor control, parts of sequence missing, rhythm and co-ordination lacking

- **Elementary (4-5 yrs approx)** More parts present, better rhythm and co-ordination

- **Mature (5-7 yrs approx)** All parts present, good rhythm & co-ordination, mechanically efficient
Developmental differences
i.e. differences in rates of development

- **Between individual differences**
  Rate of development in skills varies between individuals

- **Between skill differences**
  A child may be at mature levels in some skills and at initial or elementary in others

- **Within skill differences**
  A child may be a mature stage in leg action of a skill while at elementary level in upper body action
Fundamental Motor Skills

- Most FMS have the potential to be developed by about 6-7 yrs
- Hand-eye and foot-eye a year or two later
Moving from initial stages through elementary to mature stages

More Examples with comments
Stages of Fundamental Skills – Std LJ
Stages of fundamental skills-
Vertical Jump
Stages of Fundamental Skills - Hopping

Progression of Fundamental Skill Development
Stages of Fundamental Skills - Catching
Stages of fundamental skills - Punt
Moving from initial stages to mature stages

- Children do not develop automatically in FMS
- Need to learn and practice
- Need teaching
- Some misunderstanding re necessity for teaching and leaning
Misconceptions re role of environment in form of teaching and practice

“Unfortunately, many still have the notion that children somehow ‘automatically’ learn how to perform these fundamental movements.” (Gallahue & Ozmun, 2006, p. 56)

“Some child development experts (not in the motor development area) have written repeatedly about the ‘natural’ unfolding of the child’s movement and play skills and the idea that children develop these abilities merely by growing older…..” (Gallahue & Ozmun, 2002, p. 49)
Improving FMS

- Teachers must know component parts and key factors the of the skills

- Be able to identify stage of development for each of the components

- Know how to correct/improve

- Know appropriate tasks/practices to set e.g.

- Use combinations of different teaching styles to promote learning
Findings re non specialist PE primary school teachers (Australian study)

- Negative attitude to PE; no interest; do not value it
- Neutral or positive attitude but not confident
- Do not have sufficient knowledge or skills to teach
- Lack of appropriate facilities and equipment
- Do not have enough time

(Morgan & Hansen, 2008)
Findings re non specialist PE primary school teachers contd. (USA)

- Gagen & Getchell (2006) found that very few early childhood education programmes provide developmentally and instructionally appropriate motor skill interventions for children.
Misconception about fun and learning

- “I don’t want to teach them skills. I want them to have fun. I will just let them play”

- One of the major reasons for drop out in youth sport is that they are not competent in skills and are not learning skills

- It is fun to learn and gain competency
Skill in Sport

- Studies have found that to learn new skills and to improve on existing ones is a consistent top reason for participation in youth sport (e.g. Ewing & Seefeldt, 1996; Gill et al., 1983; Lee et al., 2000; Wankel & Kreisel, 1985; White et al., 1998)

- Lack of skill learning a major cause of dropout

- Skill learning is major part of “having fun” (Wankel & Kreisel, 1985; Garn & Cothran, 2006)
To improve children at FMS

- Children/teenagers being active is not enough.

- Teachers have to consciously work to make pupils more skilful and must know how to do it.

- Variety and combination of teaching styles can be used to promote learning
Research shows that Teaching interventions **do** work

- Meta-analysis carried out on FMS intervention studies by Logan et al (2012)

- Vast majority of teaching interventions led to improved FMS

- No improvements in control groups and in free play groups
Research evidence for the effects of teaching interventions for development of FMS

- Miller (1978) fundamental skills 3-5 yr olds
- Halverson & Roberton (1979) teaching of throwing
- Fronske (1997) teaching cues for throwing
- O’ Keeffe (1998) throwing with Irish children
- Ni Chronin (1998-2002) fundamental skills with Irish post primary and primary children
- Implications for PE programmes
FMS mastery believed to be a prerequisite for the development of sport specific skills

Fundamental motor skills provide:

- Building blocks for sport specific skills
- ABCs i.e. agility, balance, co-ordination, speed (Bayli, 2001)
- Vocabulary of movement
- Physical literacy (Stratton et al., 2002)
- A part of Coaching Ireland long term player athlete development (LPAD) programme for NGBs of sport
Relationship between fundamental skills and sport specific skills

<table>
<thead>
<tr>
<th>CATEGORIES OF FUNDAMENTAL SKILLS</th>
<th>Movement</th>
<th>Propelling &amp; Receiving</th>
<th>Balance</th>
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**SPORT SPECIFIC SKILLS**

- Track & Field
  - Hockey
  - Basketball
- Badminton
- Rugby
- Tennis
- Gymnastics
- Soccer
- Volleyball
Coaching Ireland
Development of physical literacy for participation & performance

Co-ordinated Control and Competence
Lifelong Participation
Skilled Performance

Specialised Movement Skills
Specialised Movement Skills
Fundamental Movement Skills
Fundamental Movement Skills

= Physical Literacy
Fundamental skills and sport specific skills

- FMS form building blocks for sport specific skills
- Can see FMS embedded in sport specific skills
- See examples in following slides
Fundamental overhand throw and overhead clear in badminton.
Fundamental throw & javelin tennis serve, spike in volleyball
Two handed strike
Balanced “ready” position and sliding
Leap and Hurdling & Long Jump
Hammer throw and two handed strike & axial swing
Vertical Jump & volleyball spike
Also throwing action (combining)
Forward Roll and Front Somersault
Dynamic balance: sidestep & swerve
Evasion skills
## Relationship between fundamental skills and sport specific skills

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- Soccer
- Volleyball
FMS and sport specific skills

- Is there empirical/experimental evidence for fundamental motor skills are precursors to sport specific skills?

- Is there evidence that FMS can enhance the learning of sport specific skills?
FMS and sport specific skills contd.

Two published studies have investigated this

Rose & Heath (1990)
and
O’Keeffe, Harrison & Smyth (2007)
Rose & Heath (1990)
Effect of throwing practice on learning of tennis serve

- 20 females aged 18-22 yrs in a novice tennis class
  2 x 50 min lessons for 6 weeks

- Intervention grp were taught the fundamentals of the overhead throw and practised it for 15 mins at beginning of each lesson while other grp did other tennis activities
Rose & Heath (1990)
Effect of throw practice on learning of tennis serve contd.

Findings
- Throw group improved on throw and learned serve to a higher level compared to the non throw group

Conclusion
- Support for learning of the FMS of throwing to enhance sport specific skill of tennis serve

- Weakness: No retention test to assess permanency/learning effect
Effect of throw practice on badminton overhead clear and on javelin throw

- 46 volunteers (27M & 19F; 15.8 yrs) from 4 schools
- All pretested on overhead throw with tennis ball and Badminton overhead clear and Javelin throw (one step with arm withdrawn)
- School A: practised throw in 2 x 30 min lessons per week for six weeks
  School B: practised badminton overhead clear
  School C: Control, normal PE lessons
- Post test and retention test (two weeks) for each group
Effect of throw practice on badminton overhead clear and on javelin throw contd.

Findings
- Throw grp made significant improvements on throw and also on badminton clear and javelin throw
- Badminton practice grp made significant improvements on badminton overhead clear but not on throw or javelin

Conclusion
- Support for learning relevant FMS skill (throwing) before learning sport specific skill
FMS throw improved with practice
Bad clear improved with practice on clear
Bad clear also improved with FMS throw practice
Transfer for FMS throw to Javelin (novel task)
No transfer from Bad clear to Javelin
Role of FMS in physical activity participation and health benefits

Related to teenagers
Physical activity participation and health benefits

- Many health benefits associated with participation in physical activity
  - e.g. weight, body composition, bone density, cardiovascular fitness/health; psychological benefits

- We don’t yet know how to get people to engage with PA

- Is there a role for FMS?
Role of FMS in determining participation in PA

- Large number of factors associated with why people participate in PA. They include:
  (i) Individual knowledge, beliefs & motivation
  (ii) Social support from family and friends
  (iii) Availability of facilities & equipment
  (iv) FMS, foundation of sport specific skills, which lead to participation in PA
Lubans et al (2010) review

- Title of paper “Fundamental Movement Skills in Children and Adolescents: Review of associated health benefits”
Lubans et al (2010) review
General findings

- Generally strong evidence for a positive association between FMS and PA in children and adolescence. i.e. those high in FMS competency more likely to participate in PA compared to those who have low proficiency.

- Positive relationship between FMS competency and cardiorespiratory fitness.
Lubans et al (2010) review
General findings contd

- Inverse association between FMS competency and weight status
- More longitudinal and intervention studies needed
- Examples of studies
Relationship of FMS to PA among adolescents Okely et al (2001)

- Male & female 13.3 yrs (Gr 8) & 15.3 yrs (Gr 10)

- Assessed on 6 FMS (VJ, catch, OH throw, forehand strike and kick)
  
  PA assessed by self report

- Level of FMS proficiency predicted the time spent in organised PA (basketball, tennis, swimming, cricket, soccer, dancing, touch football)

- Prediction stronger for females than males
Relationship between body comp. and FMS to PA among children and adolescents Okely et al (2004)

- 4,363 children & adolescents across grades 4 (9/10 yrs), 6 (11/12 yrs), 8 (13/14 yrs) & 10 (15/16 yrs) in NSW schools

- Assessed on Run, V. Jump, throw, Catch, Kick & Strike along with BMI and waist circumference

- Findings: Overweight boys & girls more likely to possess lower levels of FMS compared to non overweight i.e. those high in FMS proficiency less likely to be overweight
Childhood FMS proficiency as a predictor of Adolescent PA (Barnett et al, 2009)

- This was a longitudinal study conducted over seven years using the same cohort.

- In 2000, 1021 children, Mean age 10.1 yrs (7.9-11.9 yrs) from 18 primary schools in NSW tested on battery of FMS (throw, catch, kick, strike, sprint run, leap, dodge, v. jump).

- In 2006/7 461 located and 276 (52% Female, 48% Male) were assessed for levels of PA. Children now 16-17 yrs.
Findings

- Adolescent time in moderate-to-vigorous PA positively associated with childhood object control proficiency (Kick, Catch, Throw)

- See graph on next slide
Childhood FMS proficiency as a predictor of Adolescent PA (Barnett et al, 2009) contd.
Conclusions

- FMS proficiency developed in primary school significantly impacts on adolescent PA

- Object control skills, rather than locomotor skills, appear to be more crucial to
  (a) Total activity time
  (b) Activity at higher intensity
Reciprocal relationship between overweight and FMS?

- Are people overweight/obese because they cannot exercise due to poor proficiency in FMS?

  or

  are they poor at FMS because they are overweight/obese?

- Recent evidence to show that overweight people have difficulty in moving not just because of excessive fat but also because of greater difficulty in processing sensory information in relation to motor actions (e.g. D’Hondt et al, 2010)
Intervention studies with teenagers

Effect of learning FMS on teenagers
Intervention study with adolescents in Finnish schools (Kalaja et al, 2012)

**Exp Grp:** 199 pupils aged 13 yrs taught FMS by 4 teachers for 33 weeks for first 25 mins of a 90 lesson

**Control Grp:** 247 pupils taught by 6 teachers. No FMS intervention

**Results:**
Exp Grp improved significantly in FMS
Exp Grp also improved in PA outside of school
There was a decline over the year but the decline much less than usual and much less than that of the Control Grp.
Longitudinal Intervention study in a Swedish school (Ericsson, 2011)

- Two groups of pupils followed during 9 yrs in the school (i.e. from 7 yrs to 15 yrs of age)

- **Control grp** received usual PEH programme twice per week (90 mins) consisting of PA and motor skill training

- **Exp grp** received PA and motor training everyday i.e. for 5 lessons of 45 mins (225 mins) Also, if needed, an extra lesson (60 mins) in motor skill training
Findings

- After 1 year sig difference between the experimental and control grps in motor skills.

- These difference remained until year 9 (15 yrs).

- In the first year boys > girls on skills but by year 9 no differences.
Longitudinal Intervention study in a Swedish school (Ericsson, 2011) contd.

Conclusion

- The school has good potential for stimulating students’ development of motor skills but

- Two lessons of PEH not enough
FMS and Teenagers?

- Is it too late for teenagers to learn FMS?

- Experts tell us that FMS have the potential to be developed by about 6-7 yrs (e.g. Gallahue & Ozmun (2006))

- Early childhood years said to be period when FMS most easily acquired

- Critical periods or sensitive periods for acquiring FMS?
Critical and sensitive periods

- **Critical period** refers to the idea that if learning of certain skills does not take place within a certain time frame they will never be learned effectively.

- “Current views of the critical period hypothesis rejects the notion that one must develop motor skills within highly specific time frames.” (Gallahue & Ozmun, 2002, p. 62)

- The term “sensitive period” is preferred to “critical period”.

- **Sensitive Period** Refers to a broad time frame within which skills more easily acquired.

- Does not rule out possibility of skill being acquired at a later time.

- Teens & adulthood?
FMS for teenagers

Earlier in the presentation saw examples of teenagers and older people being able to acquire FMS e.g.

(i) Rose & Heath (1990) [18-22 yrs] for learning tennis serve
(ii) O’Keeffe et al (2007) Throw transferring to Badminton & Javelin. Participants had mean age of 15.8 yrs
(iii) Kalaja et al (2012) participants 13 yrs
(v) Ericsson (2011) Participants 7-15 yrs

Also, Ni Chroinin (2002) FMS intervention included secondary school pupils
Teenagers and FMS

- Issues of adolescence that may impinge on motor skill development
Growth & maturation in adolescence

- Onset of puberty and growth spurts
- Between gender differences in timing of growth spurt
  - Girls earlier
  - Boys larger gains in muscle, strength and power
- Implications for sport participation in strength & power events and contact & collision sports
Growth & maturation in adolescence

Implications

Males and females can no longer compete together especially in strength & power events and in contact and collision sports
Within gender differences in adolescence

- Within gender can be big differences in timing of growth spurt and onset of puberty

- Individuals can be same chronological age but have big differences in biological age

- Implications for sport participation
  Early developers have a big advantage

- Group/match by developmental age?
Within gender differences in adolescence contd

- Early developers, especially males, at a great advantage over late developers

Exception if adolescent awkwardness occurs
[This does not always happen, but if so usually in males and only for a short period (approx 6 months)]

- Late developers can pass out early developers in sport performances especially if they have been developing their skills and the early developers have not

- Implications for talent identification
Within gender differences in adolescence contd

- When late developers catch up in growth, early developers no longer have a physical advantage and may be discouraged if they have not developed skills.

- If late developers have developed their skills will pass out those early developers who have not developed their skills.

- **Note** skill development must be emphasised for early development. Tendency to rely on physical advantages.
Adolescent growth spurt implications contd.

Implications for teachers & coaches re sport skills

- Early developers generally at a great advantage in terms of strength, speed & power

- May rely on these aspects rather than develop skill

- Coaches tempted to put them in key positions in team sports

- Late developers feel discouraged may give up participating and practising

- Early developers will also lose out if have not developed their skills
Guidelines re Youth sport

- Development officers, coaches in children’s & youth sport
  - Teachers of physical education & sport should know about:
    - (i) Different rates of development at all ages and effects of puberty
    - (ii) Put an emphasis on skill development at all times
      - **Note:** A major motivating factor for children is skill improvement & mastery
    - (iii) Where possible group by developmental age
    - (iv) Set appropriate tasks
    - (v) Encourage late developers

- A coach who has a winning philosophy rather than a developmental philosophy does their players a great disservice
Developmental Philosophy

- Facilitates individual development by providing learning experiences appropriate to individual levels of development

- Aware of developmental changes in relation to growth & maturation

- Understands what motivates children

- Puts players first, winning second

- Puts players first, coach/teacher second

- Keeps winning in perspective
Purpose: To review

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- Teaching of FMS (relate to workshop)
- Problems and barriers related to teaching FMS
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Thank you for your attention
Age related changes in running speed (Haubenstricker & Seefeldt, 1985)

- Levelling off in females at puberty

- **Note** With training females will continue to improve but not at same rate

- But will not have same gains as boys who are in training
Throw for distance: age related changes
(Haubenstricker & Seefeldt, 1986)

- Males slightly better up to puberty and then have a large increase while females level off.

- With training females can continue to improve but not to the same degree as males who train.
Ross et al. (1985) Sit-and reach: males & females

- Females maintain superiority
- Both level off at about 18 yrs
Birth date in the selection year

- Children born at beginning of the selection year
  12 months older than those born at end of year

- They are therefore more likely on average to be at a higher level of development (bigger, stronger & faster)

- Have an advantage and get more attention from coaches

- Younger & less developed at a disadvantage due to relative age effect. Tend to be neglected

- Late developers can be missed!