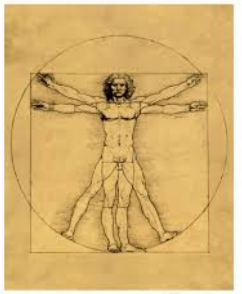
Attività motoria ed eccellenza sportiva

L’importanza delle capacità tattiche nello sviluppo del talento

Rianne Kannekens – University of Groningen

Calcio

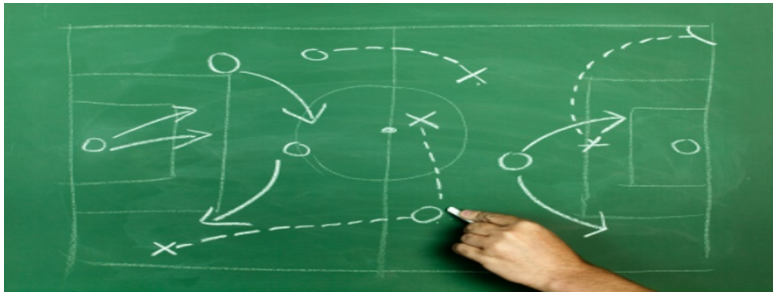
Quali sono i parametri che definiscono un talento nel gioco del calcio?



- Anthropometric measures?
- Physiological parameters?
- Psychology and behavorial characteristics?
- Neurophysiological capacity?
- Cognitive development?
- Physical capacity and motor skills?

Lo sviluppo del talento nel calcio

A livelli elevati di capacità motorie sembra che i talenti siano meno correlati a caratteristiche fisiche e fisiologiche ma più a capacità tattiche tecniche ed alla motivazione [1,2]



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Che cosa si intende per capacità tattiche?

Perform the right action at the right moment[3]

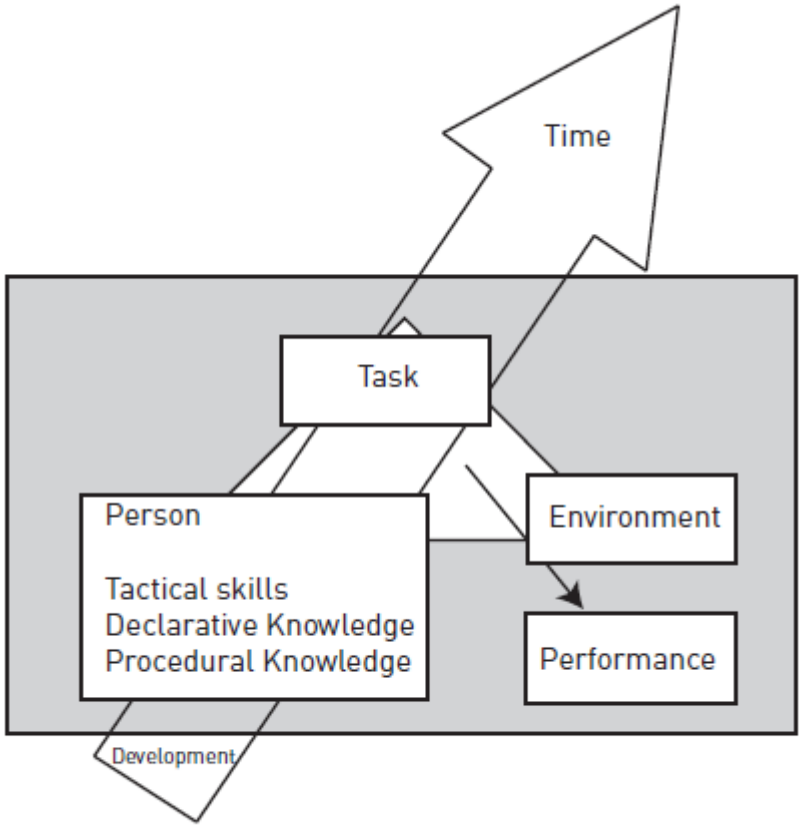

Figure 1.1. Tactical skills and their role in the performance development of youth athletes.

4. Expert performance in sport: Current perspectives and critical issues;Janelle & Hillman, 2003; Starkes, 1987
3. Development of the tactical skills inventory for sports; Elferink-Gemser et al., 2004b; Grehaigne & Godbout,1995

Are talented youth athletes that perform at a higher educational level also the ones that have the better tactical skills in their field of sport?

Two Components:

1. ‘Knowing what to do’ - Declarative Knowledge[5,6]
2. ‘Doing it’ – Procedural Knowledge[7]

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Procedural and declarative knowledge

Declarative Knowledge has been defined as the knowledge of the rules and goals of the game (French & Thomas, 1987; McPherson, 1994; Williams & Davids, 1995),

Procedural Knowledge refers to the selection of an appropriate action within the context of game play (McPherson, 1994).

Positioning and deciding: key factors for talent development in soccer

R.Kannekens, M.T. Elferink-Gemser, C. Visscher

Scandinavian journal of Medicine & Science in Sports
2009

Methods

- Longitudinal study, years from 2001 to 2008
- Age (at 2001): 16-18 years of age
- Players reach adulthood (>21 years) in 2009
- 105 players
- Two groups, based on the adult performance level:
  . 52 amateurs . 53 professionals
- Amateurs: 22 defenders 15 midfielders 16 attackers
- Professionals: 19 defenders 16 midfielders 17 attackers

	Total	
	Amateurs *n*=53	Professionals *n*=52
Age (years)	17.72 (0.96)	17.89 (0.88)
Accumulated organized soccer experience (years)	10.90 (2.54)	11.71 (2.13)
Soccer practice (hours/week)**	9.58 (1.58)	11.24 (2.33)*
Non-specific sport practice (hours/week)	2.30 (2.11)	2.78 (3.80)

* Significant difference between amateur and professional performance level ($P<0.05$)

** Soccer practice is includes soccer matches

Instruments

- Tactical Skills Inventory for Sports (TACSIS)
- Declarative Knowledge: 'Knowing about ball actions' and 'Knowing about the others' [3]
- Procedural Knowledge: 'Positioning and deciding' and 'Acting in changing situations' [3]
  - attacking situation - [3]
  - defensive situations –[3]

3. Elferink-Gemser, M. T., Visscher, C., Richart, H., & Lemmink, K. A. P. M. (2004).Development of the tactical skills inventory for sports. *Perceptual and Motor Skills, 99*, 883-895.

TACSIS

The players are
Tested across time
scoring the
items on a 6-point Likert scale, ranging from 'Very poor' to'Excellent' or from 'Almost never' to 'Always'

I giocatori che si sono giudicati da Good a Excellent sulle capacità tattiche e procedurali hanno mostrato 7 volte di più la probabilità di diventare professionisti rispetto a quelli che si erano giudicati più in basso

Table 3.2. Items of the Tactical Skills Inventory for Sports (TACSIS; Elferink-Gemser et al., 2004b)

Knowing about ball actions[1]	
1	I know exactly when to pass the ball to a teammate or when not to
2	If we receive the ball (getting ball possession), I know exactly what to do
3	While executing an action in a match, I know exactly what to do subsequently
4	If I possess the ball, I know exactly whom I have to pass to
Knowing about others[2]	
1	My judgment of the opponent's play is
2	I know quickly how the opponent is playing
3	Although I do not see my opponents, I know where they are going
4	Without seeing my teammates, I know where they are going
5	If an opponent receives the ball, I know exactly what he is going to do
Positioning and Deciding[3]	
1	Decisions I make during matches about proceeding actions are generally
2	I know how to get open during a match
3	My positioning during a match is generally
4	My overview (in ball possession or in team's ball possession) is
5	My anticipation (thinking about proceeding actions) is
6	I am good at taking the right decisions at the right moments
7	In the opinion of my trainer, my understanding of the game is
8	My getting open and choosing position is
9	In the opinion of my trainer, my positioning is
Acting in changing situations[4]	
1	My interception of the opponent's ball is
2	My interception of the ball is
3	If our team loses the ball during a match, I quickly switch to my task as defender
4	I quickly react to changes, as from not possessing the ball to ball possession

Note: items had to be answered on a 6-point scale, ranging from 1 = very poor to 6 = excellent or from 1 = almost never to 6 = always, while comparing oneself with top players in the same age category.

[1] scale for declarative knowledge in attacking situations
[2] scale for declarative knowledge in defensive situations
[3] scale for procedural knowledge in attacking situations
[4] scale for procedural knowledge in defensive situations

- For players scoring moderate (Fair-Good) the ratio indicated a 3,52 times greater chance of becoming a professional than players scoring low (Very Poor-Poor-Fair), whereas for players scoring high (Good-Very Good-Excellent),this chance is even 6,60 times greater [10]
- The difference was remarkable in the midfielders were the 67% of professionals scoring «Good» to «Excellent» and the amateurs only 28%

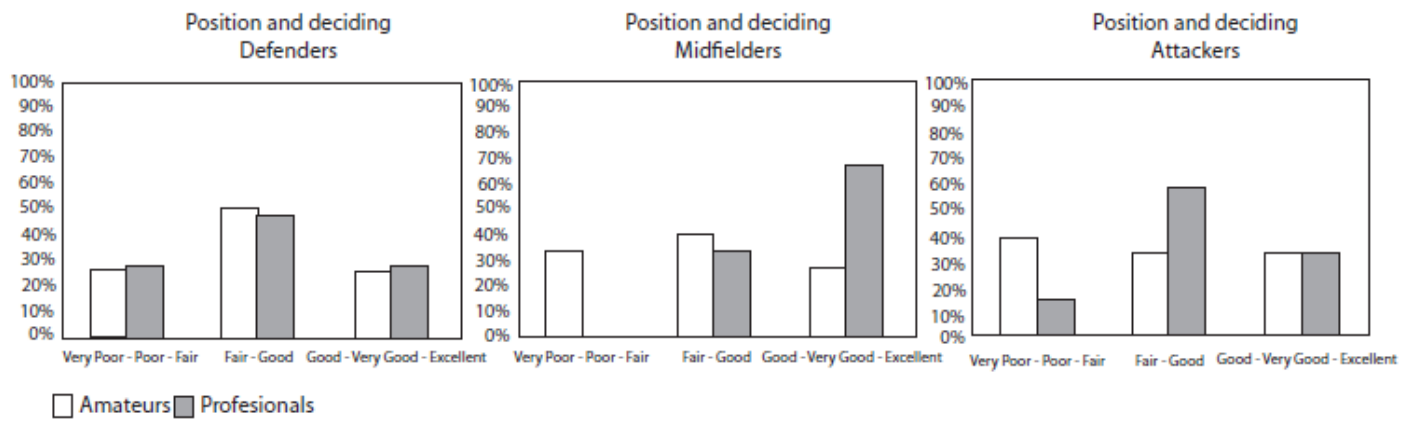


Figure 6.1. Percentage Amateurs and Professionals in different field positions for the Tactical Skills Inventory for Sports (TACSIS) subscale Positioning and deciding (N=105 elite youth soccer players).

10. Positioning and deciding: the key to professional soccer Kannekens, R. , Elferink-Gemser, M.T., Visscher, C. *Scandinavian Journal of Medicine & Science in Sports* (in press)

Results

The professional performance level was associated with the TACSIS subscale 'Positioning and Deciding' [10]

Table 6.2. Tactical skills (means, SD) of elite youth soccer players (N=105) specified per performance level in adulthood and field position

	Total		Defenders		Midfielders		Attackers	
	Amateurs *n*=53	Professionals *n*=52	Amateurs *n*=22	Professionals *n*=19	Amateurs *n*=15	Professionals *n*=16	Amateurs *n*=16	Professionals *n*=17
Declarative knowledge								
Knowing about ball actions (attack)	4.30 (0.68) [a]	4.42 (0.61)	4.39 (0.61) [a]	4.25 (0.57)	4.17 (0.81)	4.53 (0.60)	4.31 (0.65)	4.50 (0.65)
Knowing about others (defense)	4.00 (0.56)	4.08 (0.56)	4.05 (0.61)	4.09 (0.55)	4.05 (0.55)	4.25 (0.62)	3.90 (0.53)	3.89 (0.49)
Procedural knowledge								
Positioning and deciding (attack)	3.76 (0.56) [b]	4.00 (0.56)* [b]	3.80 (0.52) [b]	3.82 (0.49)	3.76 (0.66)	4.40 (0.59)* [a]	3.70 (0.54)	3.83 (0.44) [a]
Acting in changing situations (defense)	4.20 (0.73)	4.16 (0.71)	4.49 (0.64)	4.58 (0.67)	4.00 (0.90)	4.05 (0.58)	4.00 (0.56)	3.81 (0.65)

* Significant difference between amateur and professional performance level ($P<0.05$)
[a] One missing value. [b] Two missing values.

10. Positioning and deciding: the key to professional soccer Kannekens, R. , Elferink-Gemser, M.T., Visscher, C. *Scandinavian Journal of Medicine & Science in Sports* (in press)

Performance Level

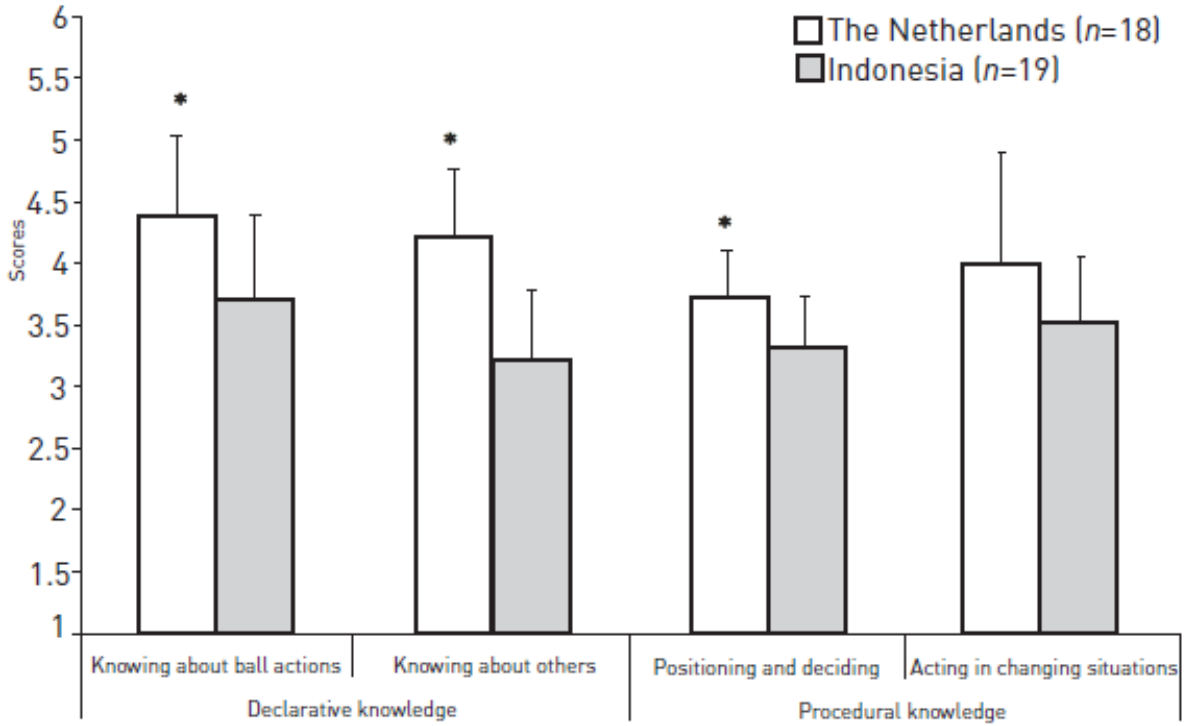


Figure 4.1. Mean scores (s) for the four TACSIS subscales for the two national youth soccer teams
** Significant difference between the Dutch and the Indonesian national team (P<0.05)*

1. Elferink-Gemser, M.T., Visscher, C., Lemmink, K.A.P.M., & Mulder, T.W. (2004a). Relation between multidimensional performance characteristics and level of performance in talented youth field hockey players. *Journal of Sports Sciences, 22*, 1053-1063.
8. Knowing what to do and doing it: Difference in selfassessed tactical skills of regional, sub-elite, and elite youth field hockey players Elferink-Gemser, M.T., Kannekens, R. , Lyons, J., Tromp, E.J.Y., Visscher, C. (2010) *Journal of Sport Sciences, 28*, 521-528
9. Tactical skills of world-class youth soccer teams Kannekens, R., Elferink-Gemser, M.T., Visscher, C. (2009) *Journal of Sport Sciences, 27*, 807-812

Positioning and Deciding

- Procedural knowledge involved in the interpretation of a specific situation and the ability to be at the right place at the right moment to make the right decision appears to be the factor that best differentiates between the more and the less successfull players in the future
- «Positioning and Deciding»: this scale contain question related to decision making about proceeding action, overview, anticipating and choosing positions

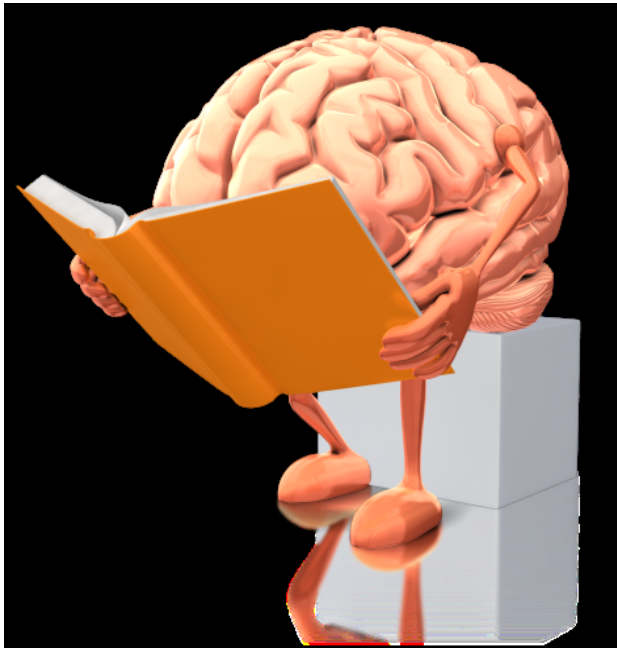
perceptual and cognitive capacity in soccer

- Visual function
- Anticipation
- Pick up information
- Attention
- Inhibition of behavior
- Working memory
- Emotion and motivation
- Positioning and decision making
- Motor learning

perceptual and cognitive capacity in soccer

- Experts in various sports perform better than non-experts on sport-specific perceptual-cognitive tasks (Mann et al.)

- Differences between talented and less talented soccer players
- Role of development
- Role of executive function



Hypothesis

Highly talented soccer players would outperform amateur soccer players on all executive function measures

- **Executive Functioning in Highly Talented Soccer Players**
- Lot Verburgh et al.

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PLOS ONE

Executive Functioning in Highly Talented Soccer Players

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Abstract

Executive functions might be important for successful performance in sports, particularly in team sports requiring quick anticipation and adaptation to continuously changing situations in the field. The executive functions motor inhibition, attention and visuospatial working memory were examined in highly talented soccer players. Eighty-four highly talented youth soccer players (mean age 11.9), and forty-two age-matched amateur soccer players (mean age 11.8) in the age range 8 to 16 years performed a Stop Signal task (motor inhibition), the Attention Network Test (alerting, orienting, and executive attention) and a visuospatial working memory task. The highly talented soccer players followed the talent development program of the youth academy of a professional soccer club and played at the highest national soccer competition for their age. The amateur soccer players played at a regular soccer club in the same geographical region as the highly talented soccer players and play in a regular regional soccer competition. Group differences were tested using analyses of variance. The highly talented group showed superior motor inhibition as measured by stop signal reaction time (SSRT) on the Stop Signal task and a larger alerting effect on the Attention Network Test, indicating an enhanced ability to attain and maintain an alert state. No group differences were found for orienting and executive attention and visuospatial working memory. A logistic regression model with group (highly talented or amateur) as dependent variable and executive function measures that significantly distinguished between groups as predictors showed that these measures differentiated highly talented soccer players from amateur soccer players with 89% accuracy. Highly talented youth soccer players outperform youth amateur players on suppressing ongoing motor responses and on the ability to attain and maintain an alert state; both may be essential for success in soccer.

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Introduction

How can one optimally identify young talented athletes? This is a key challenge in sports, because identifying them at a young age helps them to promote their further development by selectively offering them the best training facilities, coaching, and support [1]. In general, a sport talent is defined as a young athlete who performs better than peers during training and competition at a young age, and who has the potential to reach the adult elite level [2]. Identification of talented athletes is also important in view of the high Olympic aspirations of many countries and to boost sports participation in the society [3–5]. For team sports, talent identification is complex because many skills (e.g. tactics, athletic skills and social interaction) may influence overall team performance, and skills of athletes may complement each other. The key question therefore is which skills are most important to the identification of talent.

In the past decades, most research on talent identification in team sports focused on physiological, anthropometrical, and technical characteristics of talented players. For example, it has been shown that physiological factors such as sprint performance, anaerobic capacity and interval endurance capacity discriminate between youth elite and non-elite field hockey and soccer players [6–8]. However, physiological and anthropometrical factors (for example body height, body mass and percentage body fat) appeared to be not predictive for future successful performance in soccer (see for a review [9]).

Recent evidence supports the importance of cognitive functions for sports performance. A meta-analysis by Mann et al. [10] showed that experts in various sports such as soccer and field-hockey, perform better than non-experts on sport-specific perceptual-cognitive tasks, such as visual fixation duration and quiet eye period. Also on basic attention and perception tasks, athletes perform better than non-athletes (see for a meta-analysis [11]). However, little is known about higher order cognitive functions in sports talents, especially in children and adolescents.

Higher order cognitive functioning, the so-called executive functions, might be cognitive functions that are particularly relevant for talent identification in sports. Executive functions manage other more basic cognitive functions (e.g. visuospatial perception) [12] and involve functions such as inhibition of behavior, attention, and working memory [13]. Executive functions might be important for successful performance in various sports, because these functions facilitate adaptation to new or changing situations, attention, as well as recall of game strategies [14]. A first attempt to measure executive functions in high division and lower division adult soccer players with a *non-sport specific task* was done by Vestberg and colleagues [15]. In that study, a Design Fluency task [16] was used, which is a multicomponent measure of executive functioning. Results showed

Introduction

- Executive functions manage basic cognitive functions and involve functions such as inhibition of behavior, attention, and working memory
- These functions facilitate adaptation to new or changing situations
- Little is known about executive functions in sports talents and the impact of general executive functions on the capacity of a player is largely unknown

Introduction

- **Executive functions may be important for successful performance in sports, particularly in team sports requiring quick anticipation and adaptation to continuously changing situations in the field**

Materials and methods

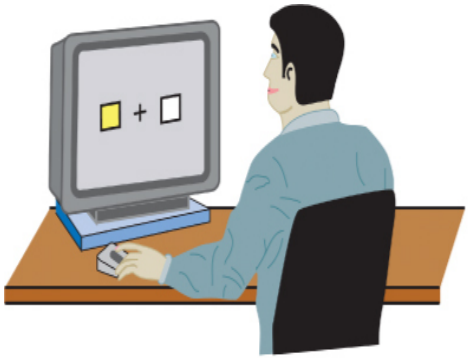
- 84 male highly talented soccer players and 42 age-matched amateur soccer players

- Both groups ranged in age from 8 to 12 years(mean age 11,9)

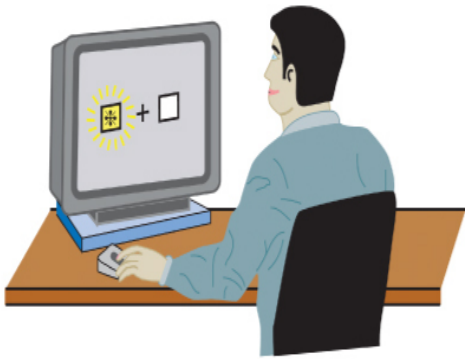
Materials and methods

- **Motor inhibition**

- **Various aspects of attentional functioning**



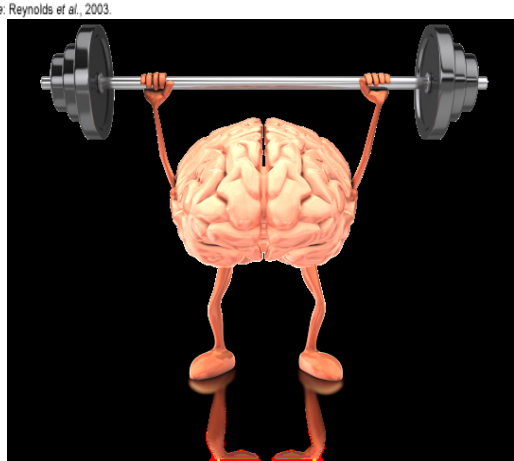
A peripheral cue appears (illumination of the left box)



The target appears at the cue location

Source: Reynolds *et al.*, 2003.

- **Visuospatial working memory**



Results: motor inhibition

- Differences on stop signal reaction time (SSRT) and percentage of errors
- 
- Highly talented soccer players showed superior motor inhibition and committed less errors than the amateur soccer players
- Highly talented soccer players showed slightly slower MRT on go trials as compared to amateur soccer players

Results: attention

- **The gain in MRT was larger in highly talented soccer players than in amateur soccer players**
- **No group difference was found for orienting attention**
- **No group difference was found for executive attention**

Results: Visuospatial (Working) Memory

- **No differences between groups were found for the visuospatial sketchpad, and central executive functioning of visuospatial working memory**

Conclusions

- **Executive function is correlated with success of adult soccer players and may be used in talent identification**

- **Highly talented youth soccer players outperform youth amateur players on suppressing an ongoing motor response and show superior ability to attain and maintain an alert state, both of which may be essential to success in soccer**

Conclusions

Positive aspects

- This is the first study that demonstrate enhanced motor inhibition in highly talented soccer players at young age
- This is the first study that investigates executive functioning in children who are playing soccer at the highest level
- Some results of this study are supported by other studies even in other sport

Limits

- Other objective outcomes of performance may be taken into account
- Role of players development

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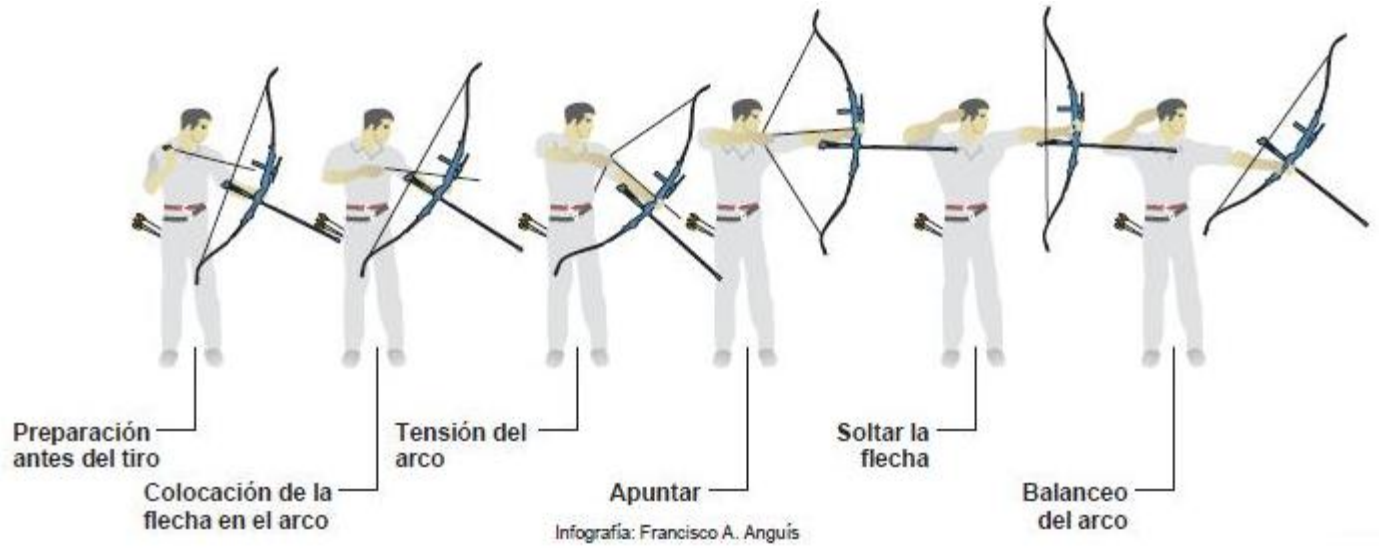
- **Perceptual skill in soccer: implications for talent identification and development. Williams AM. See comment in PubMed Commons belowJ Sports Sci. 2000 Sep**



Scopo dello sport è scagliare più frecce possibili verso il centro del bersaglio, posto a diverse distanze (90-70-50-30 per uomini, 70-60-50-30 per le donne).

In ogni torneo si scagliano 144 frecce, 36 per ciascuna delle 4 distanze; ogni arciere ha a disposizione 2’30’’ per scagliare 3 frecce.

CORTECCIA MOTORIA

Adibita alla pianificazione, controllo ed esecuzione dei movimenti volontari del corpo.

Può essere suddivisa in diverse aree funzionali:

- primaria (controlla direttamente l'esecuzione dei movimenti)
- secondaria premotoria (organizza i movimenti dei muscoli e contribuisce a creare gli schemi motori)
- secondaria supplementare (coordina e pianifica i movimenti complessi)

An fMRI Study of Differences in Brain Activity Among Elite, Expert, and Novice Archers at the Moment of Optimal Aiming

Woojong Kim, PhD, Yongmin Chang, PhD,†‡ Jingu Kim, PhD,* Jeehye Seo, PhD,‡ Kwangmin Ryu, MS,* Eunkyung Lee, MS,§ Minjung Woo, PhD,‖ and Christopher M. Janelle, PhD¶*

Cogn Behav Neurol • Volume 27, Number 4, December 2014

La maggior localizzazione dell'attività neurale degli elite e degli esperti rispetto ai principianti, permette una maggior efficienza dei processi complessi. Nel gruppo d'elite la maggior attività nel dentato indica che il *cervelletto* è coinvolto automaticamente nei movimenti simultanei per integrare la memoria senso motoria

Elabora informazioni tattili e spaziali

Elabora pericoli e problemi incontrati

Determina il comportamento

Behavioural Brain Research

Neural correlates related to action observation in expert archers

Yang-Tae Kim[a,1], Jee-Hye Seo[b,1], Hui-Jin Song[b], Done-Sik Yoo[c], Hui Joong Lee[d], Jongmin Lee[d], Gunyoung Lee[e], Eunjin Kwon[e], Jin Goo Kim[e], Yongmin Chang[b,d,f,*]

Con l'utilizzo della fMRI, osservando il Western-style archery, si è notato che gli esperti mostrano una maggior attivazione nella *corteccia premotoria*, nella *corteccia parietale inferiore*, nella *corteccia cingolata* e *nel giro paraippocampale*, sintomo che il grado di esperienza accumulata, stimoli la memoria episodica.

Cogn Behav Neurol • Volume 27, Number 4, December 2014

Neural Processes Distinguishing Elite from Expert and Novice Athletes

Daniel E. Callan, PhD † and Eiichi Naito, PhD**

La superiorità degli elite rispetto agli altri è dovuta a 4 processi neurali: efficienza neurale, espansione corticale, specializzazione dei processi e modelli interni; inoltre mostrano una maggiore attivazione *nell'area motoria supplementare* e nel *cervelletto*.

Apprendimento e controllo motorio

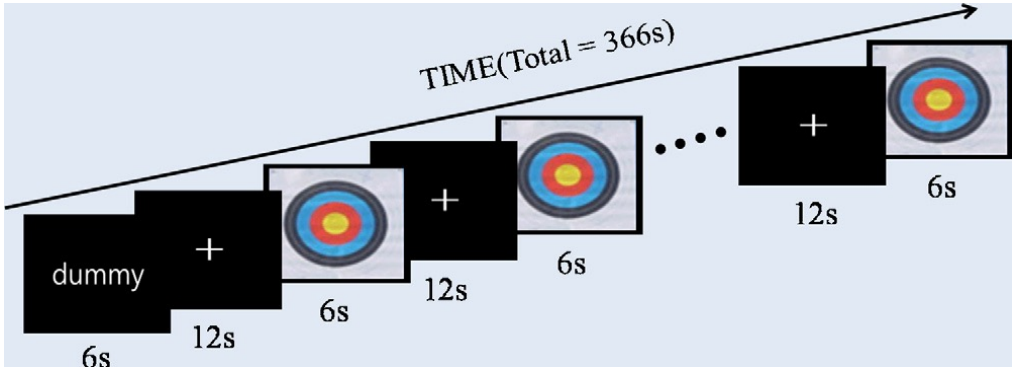
Coordina e pianifica i movimenti complessi

Neuroscience Letters

journal homepage: www.elsevier.com/locate/neulet

Neural correlates of pre-performance routines in expert and novice archers

Jingu Kim[a,*], Hyoung Mo Lee[b], Woo Jong Kim[c], Hye Ju Park[d], Sung Woon Kim[d], Doo Hwan Moon[d], Minjung Woo[e], Leo Keith Tennant[f]



Quando gli inesperti stanno mirando l'area frontale è tutta principalmente attivata, nel caso degli esperti, sono attivati il *lobo occipitale* e *temporale*

Elabora la visione

Elabora la memoria

IPOTESI

1) Maggiore è il grado di esperienza dell'atleta, minori e più localizzate saranno le aree cerebrali coinvolte
2) L'attività del cervelletto è differente tra gli esperti e i non esperti

Research Article

NMR IN BIOMEDICINE

Received: 16 April 2010, Revised: 22 June 2010, Accepted: 14 July 2010, Published online in Wiley Online Library: 12 December 2010

(wileyonlinelibrary.com) DOI:10.1002/nbm.1600

Neural correlates of motor imagery for elite archers

Yongmin Chang[a,b,†], Jae-Jun Lee[c,†], Jee-Hye Seo[c], Hui-Jin Song[c,†], Yang-Tae Kim[d], Hui Joong Lee[b], Hye Jung Kim[b], Jongmin Lee[b], Woojong Kim[e], Minjung Woo[f] and Jin Gu Kim[e*]

Le attività cerebrali di 18 atleti d'elite (6 uomini e 12 donne) e 18 non atleti (8 uomini e 10 donne) sono state registrate tramite la fMRI durante l'immaginazione di un compito di scoccare una freccia; ai partecipanti viene inoltre sottoposto il QMI.

STRUMENTI E METODI

Strumenti utilizzati:

- QMI (Questionnaire on Mental Imagery)
- fMRI (Functional magnetic resonance imaging)

Metodi:

- Due tipologie di t-test

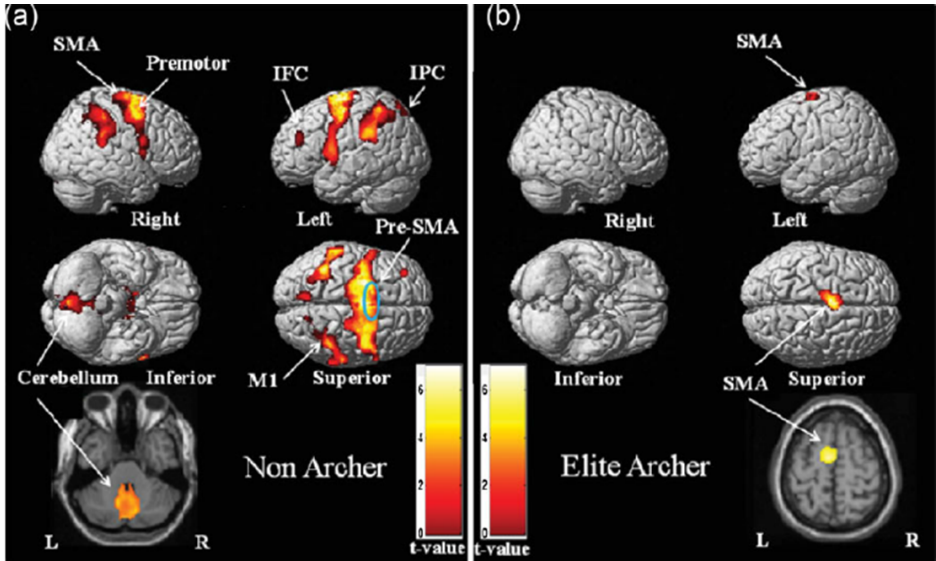


Table 1. Regions of activation from within-group analysis (false discovery rate corrected: $p < 0.05$)

Group	Region		Cluster size	Coordinates (mm)			Peak *T*
				x	*y*	*z*	
Elite archers	Supplementary motor areas	L	588	−8	−6	68	6.87
		R	76	4	−4	68	4.44
Nonarchers	Supplementary motor areas	L	1133	−10	−6	66	6.71
		R	1134	6	0	66	5.37
	Premotor cortex	L	1695	−22	−12	62	7.36
		R	1109	22	−14	56	4.31
	Primary motor cortex	R	70	32	−36	44	3.55
	Superior parietal cortex	L	268	−32	−50	50	5.95
		R	140	30	−56	44	3.87
	Inferior parietal cortex	L	1252	−34	−50	50	6.01
		R	534	40	−42	46	5.01
	Precuneus	L	151	−10	−68	58	3.93
		R	93	16	−68	48	2.99
	Inferior frontal cortex	L	133	−36	40	22	3.41
	Basal ganglia	L	1059	−22	−10	4	5.56
		R	1058	26	6	14	7.13
	Cerebellum	L	422	−6	−46	−36	4.49
		R	897	6	−76	−28	4.66

L, left; R, right.

Questo rivela come nei non atleti, a livello neurale vi è una più diffusa attivazione in seguito ad un compito di immaginazione mentale.

Table 2. Regions of activation from between-group analysis (false discovery rate corrected: $p < 0.05$)

Region		Cluster size	Coordinates (mm)			Peak *T*
			x	*y*	*z*	
Premotor cortex	L	84	−16	−12	56	3.96
Primary motor cortex	L	100	−18	−32	56	4.38
	R	283	22	−26	56	4.42
Inferior parietal cortex	L	74	−38	−50	50	3.85
Precuneus	L	261	−16	−66	38	4.55
	R	86	22	−62	50	3.64
Basal ganglia	L	318	−18	10	0	4.15
	R	385	18	−14	6	4.38
Cerebellum	L	371	−10	−58	−34	4.55
	R	547	14	−58	−34	4.59

L, left; R, right.

Nei principianti risulta essere presente un' importante attivazione a livello del cervelletto e dei gangli alla base (importanti nel controllo motorio e nell' apprendimento del movimento) in quanto stanno apprendendo un nuovo movimento.

RISULTATI

I risultati mostrano che le aree motorie premotorie e supplementari, la regione frontale inferiore, i gangli alla base e il cervelletto sono attivati nei non arcieri, mentre, negli elite, vi è principalmente una attivazione a livello delle aree motorie supplementari.

La differente attivazione del cervelletto è relativa al diverso grado di esperienza nelle prove mentali.

Per quanto riguarda il QMI non risultano esserci differenze significative tra atleti e non atleti.

CONCLUSIONI

L'economicità dei processi corticali negli atleti elite potrebbe contribuire in maniera consistente sulle sfide specifiche nelle quali loro sono maggiormente pratici.

Limiti: durante il compito di immaginazione mentale non si è controllato se il soggetto effettuasse attività muscolare (specifica al gesto o non specifica).

TALENT IDENTIFICATION IN RG

PHYSIOLOGICAL and ANTHROPOMETRIC DETERMINANTS

BRAIN and PSYCHOLOGICAL FACTORS

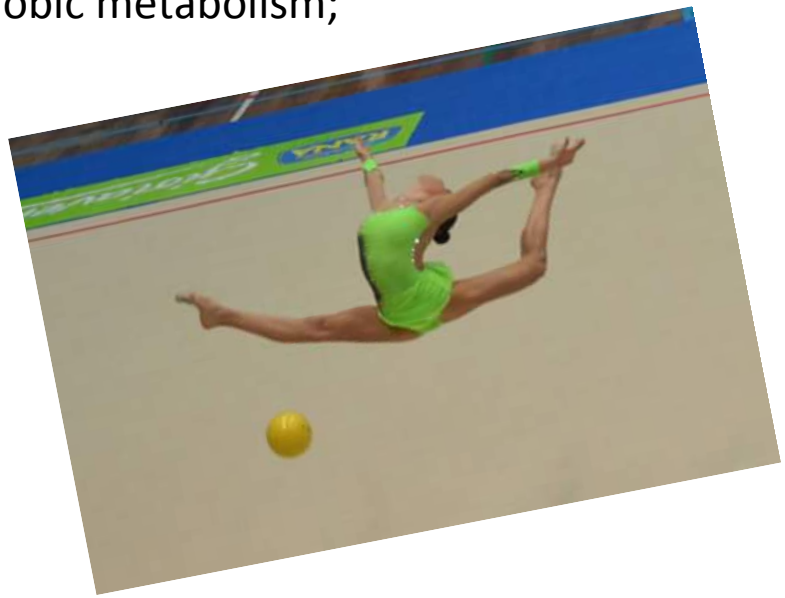
MOTOR SKILL

"Physiological and Anthropometric determinants of rhythmic Gymnastics Performance"

Douda, 2008
International journal of Science and Performance,(I.F. =2.683)

Succesfull performance in RG depends on 6 component:

1. Anthropometric characteristics;
2. Flexibility;
3. Explosive strenght;
4. Aerobic capacity;
5. Body dimension;
6. Anaerobic metabolism;



"Somatotype of Top-Level Serbian Rhythmic Gymnasts"

Popovic,2014
Journal of human kinetics
(I.F.= 0.698)

The Type of body constitution in the observed RGs was mainly characterized by the prevalence of the ecthomorphic component,with moderate values of the other two components.

Table 2

The descriptive statistics of the measured anthropometric variables of the sample in total (N=40)

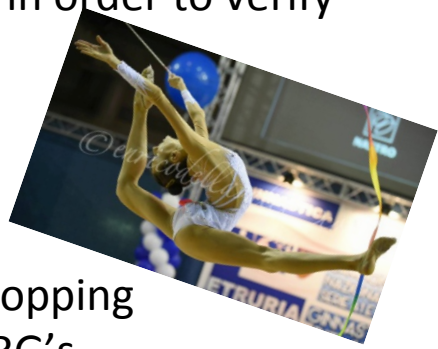
Variable	Mean±SD	Median	Range
Triceps SF	12.74±3.87	11.9	6 – 21.2
Subscapular SF	9±2.48	8.5	4.2 – 14.2
Supraspinale SF	10.03±3.74	9.6	4.2 – 18.8
Calf SF	8.79±3.81	8.1	3 – 17.8
Flexed arm G	22.95±2.68	23.1	17.5 – 28.2
Calf G	30.91±3.62	30.8	24 – 38.1
Humerus B	6.11±0.6	6.17	4.75 – 7.02
Femur B	7.84±0.7	8	6.53 – 8.82
HWR	45.17±1.23	45.05	42.41 – 48
SAD	1.32±0.68	1.32	0.08 – 2.89
Endomorphy	3.54±0.82	3.5	2.1 – 5.3
Mesomorphy	3.24±0.86	3.2	1.8 – 5.5
Ectomorphy	4.5±0.91	4.4	2.5 – 6.6

SF – skinfold, G – girth, B – breadth, HWR – height-weight ratio, SAD – somatotype attitudinal distance, SD – standard deviation.

"Leaping ability and body composition in RG for talent identification"

A.di Cagno, M.Piazza e altri,2008
J Sports Med Phys Fitness (I.F 0,757)

Leaping ability and morphological characteristics in RG was investigated in order to verify which parameters are useful indicators for the talent identification.



Elite vs sub-elite

Parameters can be considered important variables:

- **Stature**
- **thingh length**
- **FFM**

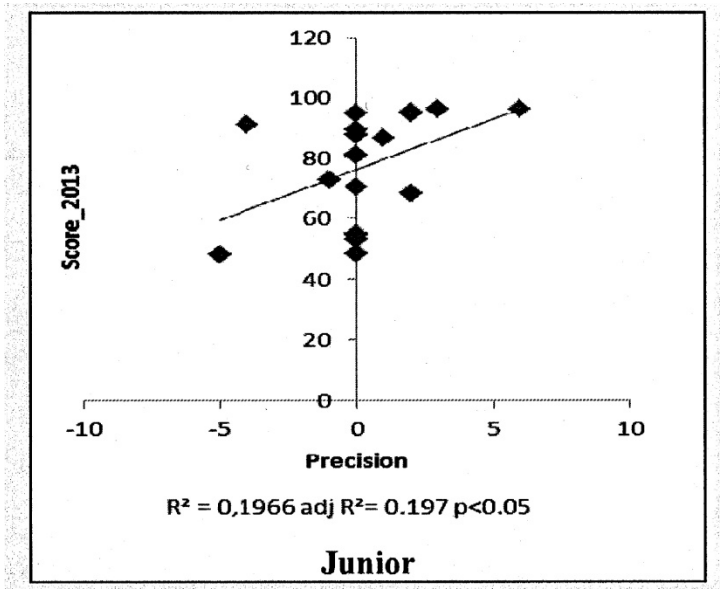
The correlation between hopping test (the stiffness) and RG's specific leaps reveals that this test is a way:

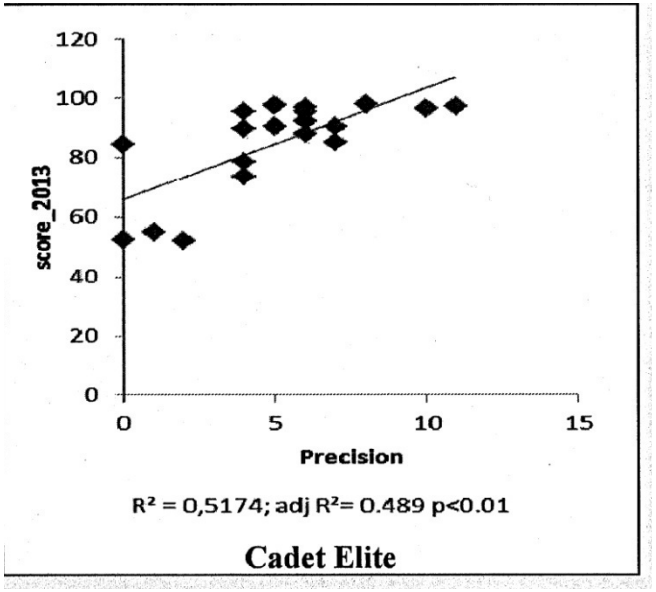
- **to have an objective evaluation of technical leaps**
- **to monitor training plan**
- **to select gymnasts for this skill**

"Motor learning as Young Gymnast's Talent Indicator"

A.Di Cagno, M.Piazza e altri, 2014
Journal of Sports Science and Medicine (I.F. =0,898)

In talent selection procedures it is better to include the evaluation of coordination and motor learning ability. In this manner talent identification processes should be focused on the future performance capabilities of athletes.





Evaluation of Coordination and precision in technical element and risk.

Selected paper:

ELSEVIER

Available online at www.sciencedirect.com

ScienceDirect

Journal of Science and Medicine in Sport 12 (2009) 411–416

Journal of Science and Medicine in Sport

www.elsevier.com/locate/jsams

Original paper

I.F. =3.079

Factors influencing performance of competitive and amateur rhythmic gymnastics—Gender differences

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Received 13 February 2007; received in revised form 27 November 2007; accepted 9 January 2008

INTRODUCTION:

Recently, the tendency of changing on gender inequalities in sport,introduced athletes of both genders in sports characterized by only one gender. After the new entry of male athletes in RG competitions, anatomical and physical characteristics to select men athletes in RG have be found.

- What is the effect of gender on morphological characteristics on RG leaping ability?

- What is the impact of motor and morphological factors on specific motor skill RG performance to find specific predictor of female/male attainment?

24 Physical education students (age 22 +/- 4)

12 male

12 female

Partecipants took part at the University RG group and had been training for at least 2 years, three times at week, to partecipate in the first experimental national competition for gender mixed couples. Male were athletes who partecipated in Gymnastics or Ballet, and female had been rhythmic amateur and competitive gymnasts.

Two testing session:

Anthropometric measures:

- Stature and sitting height
- Body mass
- Thigh lenght
- Skinfolds thickness (triceps,subscapula, suprailiac)
- BMI
- SHSR (sitting-height to stature ratio)
- FFM and FM

in laboratory by a well-trained anthropometrist assisted by a recorder who was familiar with the specific procedures.

The skinfold was taken on the right site of the body with a Harpender skinfold calliper.

Jump test:

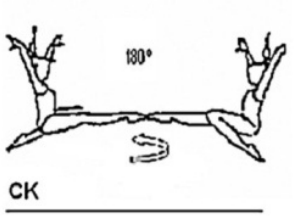
(to evaluate leg muscle power and stifness)

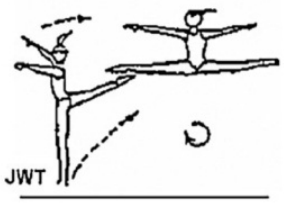
Three general vertical jump:

- Squat jump (JS)
- Counter-movement jump (CMJ)
- Hopping test (HP)

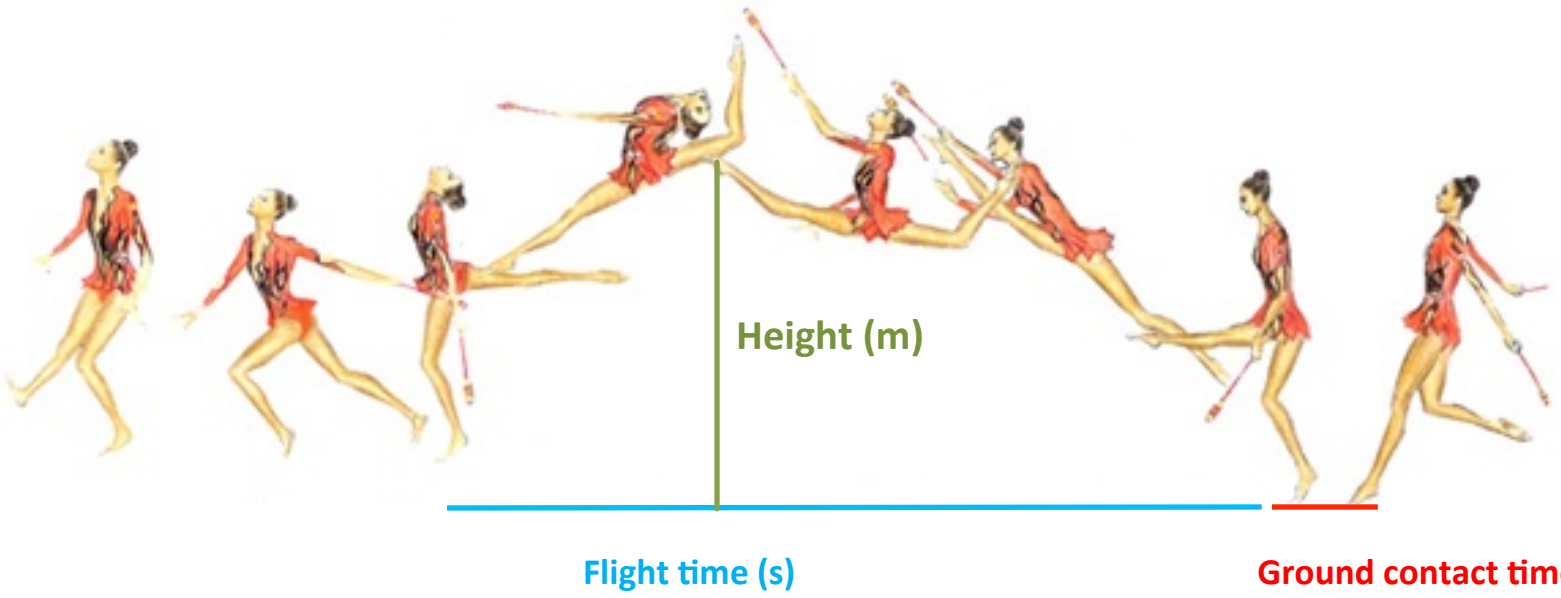
Three jump for specific leaping ability:

- Split test with stretched legs (SL)
- Cossack with 180° of rotation (CK)
- Jetè with turn (JWT)





Three trials of each jump. After 20 min of their usual warm-up and familiarity ,each athlete performed jumps with the Optojump . 30 sec was given between the three trials of each jump and finally the maximum value was considered.



Statistical analysis:

Descriptive statistics (means and 95% confidence interval) were performed for all variables.

ONE-WAY ANOVA: comparisons between two groups (male/female) for physical characteristics and jumping measures.

TWO-WAY REPEATED MEASURES ANOVA: [group(2) x trial (3)] also performed on both vertical (SJ, CMJ, HT) and specific (SL, CK,JWT).

MULTIPLE REGRESSION ANALYSIS: to evaluate the importance of antrhopometric measures, lower limb explosive power (SJ and CMJ) and stiffness (HT) on technical leap parameters.

BONFERRONI post hoc procedure if there were significant effects.

PEARSON'S CORRELATION: computed between anthropometric measures and jumping parameters calculated on full sample and separately y each gender.

LEVEL OF SIGNIFICANCE: P≤ 0,05

Table 1
Descriptive statistics of anthropometric measures and body composition characteristics of both gender gymnasts

	Male ($n = 12$)	Female ($n = 12$)
Stature (m)	1.74 (1.66–1.83)**	1.66 (1.58–1.74)
Mass (kg)	67.5 (47.44–87.52)**	51.5 (44.68–58.29)
Lower limb length (m)	0.97 (0.89–1.05)**	0.86 (0.77–0.95)
BMI (kg m^{-2})	22.2 (16.29–28.09)**	18.8 (16.57–20.97)
Sitting height (m)	0.78 (0.73–0.82)	0.79 (0.68–0.91)
Sitting height/stature ratio (%)	44.6 (0.42–0.47)**	47.8 (0.42–0.54)
Fat mass (kg)	13.8 (0.96–18.25)	13.0 (2.80–10.70)
Fat-free mass (kg)	57.9 (44.51–71.25)**	44.7 (39.38–50.09)

Values are means and lower–upper bound of confidence intervals; significant differences between male and female gymnasts: **$p < 0.01$.

STANDARDIZATION??

Men have greater stature, skeletal segment length that women.
But, FM and SH are similar: high values of stature and lower limbs length seemed to be required to reach high performance in RG jumping performance.

RESULTS:

Table 2
Vertical jumps and gymnastic specific technical leap characteristics as height, flight time and ground contact time of male vs. female athletes

	Male ($n = 12$)	Female ($n = 12$)
Vertical jumps		
Counter-movement jump height (m)	0.36 (0.44–0.64)**	0.25 (0.42–0.49)
Squat jump height (m)	0.33 (0.21–0.44)**	0.25 (0.20–0.25)
CMJ–SJ height (m)	0.031 (−0.03–0.1)	0.025 (−0.01–0.06)
Hopping height (m)	0.36 (0.22–0.49)	0.33 (0.26–0.41)
Hopping ground contact time (s)	0.27 (0.10–0.45)*	0.20 (0.10–0.29)
Gymnastic specific technical leaps		
Split Leap with leg stretched		
Ground contact time (s)	0.59 (0.07–1.12)*	0.34 (−0.15–1)
Flight time (s)	0.52 (0.40–0.64)	0.47 (0.37–0.56)
Height (m)	0.34 (0.19–0.48)**	0.27 (0.17–0.36)
Cossack with 180° of rotation		
Ground contact time (s)	0.59 (0.06–1.11)*	0.39 (0.03–0.73)
Flight time (s)	0.50 (0.38–0.63)*	0.42 (0.32–0.57)
Height (m)	0.31 (0.17–0.46)*	0.24 (0.09–0.38)
Jetè with turn		
Ground contact time (s)	0.54 (−0.09–1.18)*	0.33 (0.10–0.56)
Flight time (s)	0.41 (0.24–0.58)	0.38 (0.32–0.43)
Height (m)	0.21 (0.02–0.41)	0.18 (0.14–0.22)

Values are means and lower–upper bound of confidence intervals; significant differences between male and female athletes: *$p < 0.05$; **$p < 0.01$.

VERTICAL JUMPS:

- Female: HT height > SJ and CMJ
- Male: HT height = SJ and CMJ

TECHNICAL JUMPS:

- There is correlation (male vs female) in SL and in the CK but there isn't in JWT.
- In male the time of ground contact time is always < than the time of the flight time.
- In female the time of ground contact time is always > than the time of the flight time.

BUT

A short ground contact time at the take-off and a long flight time allows to reach a wide shape that is required by International Code of Point.

GROUND CONTACT TIME IN **HT (**HOPPING TEST) WAS POSITIVELY CORRELATED WHITH THE TECHNICAL LEAPS GROUND CONTACT TIME BOTH MALE AND FEMALE

CORRELATION TECHNICAL LEAPS AND STIFFNESS

=

HOPPING TEST COULD BE EASY WAY TO CONTROL LEAPING ABILITY IN RG

Multiple regression analysis was applied for male and female gymnasts with:
•anthropometric independent variables (FM,SHSR,BMI) as predictors;
• flight time, ground contact time of leaps as criterions

•FM e SHRS were significant determinants for flight time of SL e CK;
•SHRS was a significant determinants for ground contact time of HT

FM and SHSR were the selecting criteria for male jumping performance

CONCLUSION:

- Similar anthropometric characteristics have to be attained to reach high results for both genders.
- Low FM and SHSR values and high FFM values, stature and lower limb lenght couldbe consideree important variables in RG Jumping ability.

FUTURE IMPLICATION:

- Future studies should examine the interaction of other promising variables (pivot, balance difficulties,flexibility) in a comprehensive model of male/female rhythmic gymnasts.

LIMITS:

- Even if an attempt was made to determine the talent male gymnastics characteristics, they were less experienced in RG than the female.
- Use more specific leaps (split jump, split or “biche” with ring)
- Standardization of anthropometric measures.

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