



International Military Sports Council  
Conseil International du Sport Militaire

## **CISM INTERNATIONAL SYMPOSIUM**

„Sports science: fundamental tool of modern sports management“



**CASRI**



Prague, Czech Republic  
18<sup>th</sup> – 23<sup>rd</sup> September 2009

# **The CISM International Symposium 2009**

**Proceedings Book  
of the CISM International Symposium  
Prague, 18<sup>th</sup> to 23<sup>rd</sup> September 2009**

**International Military Sports Council (CISM)**

**Sport Research Institute of Czech Armed Forces (CASRI)**

## Proceedings Book of the CISM International Symposium 2009

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# CISM INTERNATIONAL SYMPOSIUM

*„Sports science: fundamental tool of modern sports management“*



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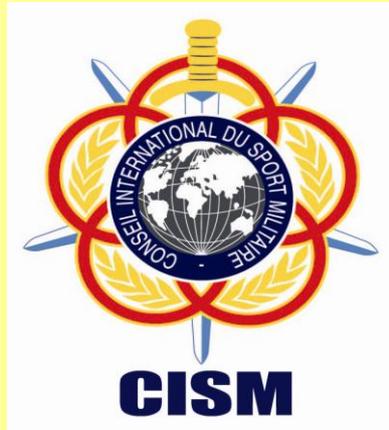
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# INTRODUCTION



## CISM President Introductory Word



**Dear CISM Friends,**

Thank to the Czech Delegation, CISM has been able to assure, also for 2009, the continuity of one of the most important traditions: the organization of the annual Scientific Symposium. This edition, indeed, has been particularly successful, from the point of view of the overall organization, of the presence of eminent keynote speakers and of the participation of numerous delegates coming from many member countries.

In this case, it has been very successful also the choice of the topic of the Symposium, which gave us the opportunity to emphasize one of the basic concepts of our organization, which says that Sport Science is really a “fundamental tool of modern sports management”.

We have also chosen this occasion to re-launch the CISM Academy. And now, thank to this old-new structure we will be able to contribute to reach some of the most important CISM goals. In fact, our intention is now, more than ever, to create synergies and interactions among the different Delegations, from one side, and between our Organization and the world of sport from the other side. We are aware of the needs of an advanced scientific strategy and we want to be ready also for these challenges.

I would like to conclude, by addressing special appreciation and gratitude to all the members of the Czech Delegation, to the kind speakers, to the participants and, last but not least, to our two fellow “actors”, Lt-Col Suzana Tkavc and Maj. Pedro Gagliardi who have been able to compose the “puzzle”. Well done! Bravo!

***Maj. Gen. Dr. Gianni Gola***  
***President***

## CISM Secretary General Introductory Word



**Dear CISM family,**

In the capacity of CISM Secretary General, I am convinced that CISM has gotten a new and fresh start in sports science thanks to the success of our recent International Scientific Symposium.

This resounding event was competently carried out by the Czech Delegation and Sport Department of CISM.

Counting on qualified organizing personnel and distinguished lecturers, this CISM International Scientific Symposium 2009 gave rise not only to a series of important discussions aimed at sports practicing within the armed forces on the basis of military sports science, but also to the re-launch of the CISM Academy, highlighting the CISM history.

Therefore, dear friends, it is with immense joy and pride that I address you these words keeping one eye on the past, and the other on the future with the attempt of shaping it to our advantage, while sharing with you the successful results of the present times.

Besides, it is worth to say that the high standard of the speakers proves that one can find lots of expertise in the armed forces, which can be used by the academy to strengthen the leading role of CISM when it comes to sports science management.

Finally, my special thanks to all the personnel somehow responsible for providing us with this magnificent event and, at the same time, allow me to invite you to maintain the same enthusiasm and strong will for the times to come.

God speed you all!

***Col. Alexandre Morisod***  
***Secretary General***

A handwritten signature in blue ink, appearing to read 'A. Morisod', written in a cursive style.

## Message of the Editor-in-Chief

### Preface



**Dear friends, dear researchers,**

First of all, allow me to welcome you by reading this Proceedings Book of the CISM International Symposium 2009. It is a great honor and pleasure for the Editor to issue the Proceedings Book of the most important CISM scientific event of the year.

This Symposium has double meaning. The first one is the Symposium as usual known for scientific findings of researchers from different Armed Forces all over the world. The second was to create favorable environment for the re-launch of the CISM Academy.

It is the principle of the scientific world to issue the Proceedings book based on the papers presented at International Symposia. Papers of five different sessions are presented in the first part. This Symposium was focused mainly on science as a fundamental tool of modern sports management topic, especially connected with the purpose and needs of CISM relative to the CISM Academy. The second part includes information on the CISM Academy with a Protocol book, signed by high authorities, speakers and participants in the CISM Academy re- birth ceremony at the end of the Symposium in Prague as well as the commitment by the Board of Directors at the 3<sup>rd</sup> meeting held in Ljubljana, Slovenia. With their signatures they showed support to the initiative of the CISM Academy.

During the Symposium sessions we have witnessed high quality presentations on very different topics. In this place I would like to express my gratitude to all excellent and highly qualified speakers who decided to share their knowledge with us and also to all participants for the remarkable and active cooperation with which you created more than fruitful and constructive discussions after every presentation.

I hope that this and the future publications will contribute, as one of tools, to the knowledge sharing between Armed Forces.

*Lt-Colonel Suzana Tkavc, MSc  
Symposium Director*

A handwritten signature in black ink, appearing to read 'Suzana Tkavc', written in a cursive style.

## List of speakers

### Key-note speakers:

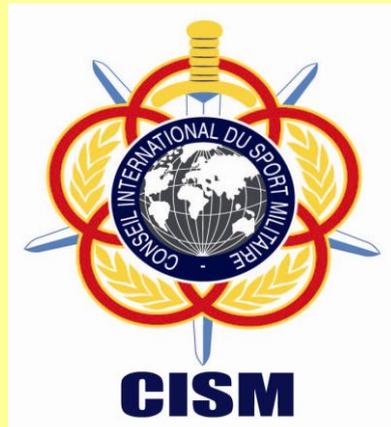
- |                              |                       |
|------------------------------|-----------------------|
| 1. <i>Lamartine da Costa</i> | <i>Brazil</i>         |
| 2. <i>Michael Spivock</i>    | <i>Canada</i>         |
| 3. <i>Václav Bunc</i>        | <i>Czech Republic</i> |
| 4. <i>Eva Čáslavová</i>      | <i>Czech Republic</i> |
| 5. <i>Lubomir Přivětivý</i>  | <i>Czech Republic</i> |
| 6. <i>Heikki Kyröläinen</i>  | <i>Finland</i>        |
| 7. <i>Damir Karpljuk</i>     | <i>Slovenia</i>       |
| 8. <i>Suzana Tkavc</i>       | <i>Slovenia</i>       |
| 9. <i>Matej Tušak</i>        | <i>Slovenia</i>       |

### Other speakers:

- |                                       |                      |
|---------------------------------------|----------------------|
| 1. <i>Cedric Laurent</i>              | <i>Belgium</i>       |
| 2. <i>Rafael Pinheiro Cunha</i>       | <i>Brazil</i>        |
| 3. <i>Gilvan Vasconcelos da Silva</i> | <i>Brazil</i>        |
| 4. <i>Wenbin Yang</i>                 | <i>China</i>         |
| 5. <i>Jean Marc Sene</i>              | <i>France</i>        |
| 6. <i>Harald Dobmeier</i>             | <i>Germany</i>       |
| 7. <i>Oliver Erley</i>                | <i>Germany</i>       |
| 8. <i>Gary Amstrong</i>               | <i>Great Britain</i> |
| 9. <i>Ciamak Amiri</i>                | <i>Iran</i>          |
| 10. <i>Kjell-Erik Kristiansen</i>     | <i>Sweden</i>        |
| 11. <i>Mesud Cerit</i>                | <i>Turkey</i>        |

**GENERAL PROGRAMME**

Date	Time	Activity	Location
Wednesday 16.9.	Whole day	Arrival of the CISM GS Members	Hotel Praha
Thursday 17.9.	Whole day	Arrival of the participants	Hotel Praha
Friday 18.9.	Whole day	Arrival of the participants	Hotel Praha
		Registration	Hotel Praha
	19,00	Opening Ceremony	Hotel Praha – Cinema Hall
	20,00	Opening reception	Hotel Praha - Restaurant
Saturday 19.9.	6,00 – 10,00	Breakfast	Restaurant
	9,00 – 9,35	<u>Opening Symposium Section</u>	Hotel Praha – Cinema Hall
	9,40 – 11,40	<u>1<sup>st</sup> session</u>	Hotel Praha – Cinema Hall
	10,15 – 10,45	Coffee break	
	11,40 – 13,40	Lunch	Restaurant
	13,40 – 16,40	<u>2<sup>nd</sup> session</u>	Hotel Praha – Cinema Hall
	14,55 – 15,25	Coffee break	
	18,00 – 20,00	Dinner	Restaurant
Sunday 20.9.	6,00 – 10,00	Breakfast	Restaurant
	8,30 – 11,30	<u>3<sup>rd</sup> session</u>	Hotel Praha – Cinema Hall
	9,45 – 10,15	Coffee break	
	11,30 – 13,30	Lunch	Restaurant
	13,30 – 16,10	<u>4<sup>th</sup> session</u>	Hotel Praha – Cinema Hall
	14,45 – 15,15	Coffee break	
	18,00 – 20,00	Dinner	Restaurant
Monday 21.9.	6,00 – 10,00	Breakfast	Restaurant
	09,00	Departure from hotel to FPES	
	10,00 – 12,05	<u>5<sup>th</sup> session</u>	FPES
	10,55 – 11,25	Coffee break	
	12,10 – 12,45	Demonstration of military activities	FPES
	12,45 – 13,45	Lunch	FPES
	16,00	CISM Academy re-launching ceremony	Hotel Praha – Cinema Hall
	18,00	Closing ceremony	Hotel Praha – Cinema Hall
19,00	Closing reception	Hotel Praha	
Tuesday 22.9.2009	Whole day	Cultural Day	
Wednesday 23.9.2009	Whole day	Departure of the participants	



Part I.

CISM  
International  
Symposium  
Sessions





## CISM International Symposium 2009



# OPENING SESSION

## CURRENT IN PHYSICAL EDUCATION AND SPORTS RESEARCH

Saturday, 19<sup>th</sup> September 2009

From 09:00

To 10:05





**Prof. Václav Bunc, PhD (CZE)**

---

## **ACADEMIC FORMATION**

- 1970**                    BSc - Technical University Prague
- 1979**                    PhD - Earned from Technical University Prague in applied Physics

## **WORK EXPERIENCE**

- Assistant Professor in Exercise Physiology
- Professor in Exercise Physiology
- Head of many research projects, author of great number of research reports

## **CURRENT FUNCTION**

- Dean of the Faculty of Physical Education and Sport, Charles University in Prague
- Lector of PhD study on Charles University and University of Graz
- Member of Czech and International scientific societies, member of New York Academy of Sciences



**Prof. Václav Bunc, PhD**

*Faculty of Physical Education and Sport of Charles University in Prague, Czech Republic*

**ABSTRACT**

Depending on their focus, research programmes in the area of PE and sports can be divided into two categories:

- a. Research into materials;
- b. Research into people.

Material research focuses on the research and development of new materials and technologies that affect sports performance. Many discontinuous advances in sports performance are to a substantial extent the result of progress made in the physical equipment of athletes. The classic example is the advent of laminates in the pole vault, new materials in swimming sports, etc.

Research programmes into people focuses primarily on:

- Development of new training methods
- Control and management of the training itself
- Assessment of the effect of training effort
- Identification and cultivation of sports talent

Proposals for physical interventions that offset the effects of current lifestyles and increase work efficiency and reliability. To accelerate and improve the quality of regeneration (as after the training exercise and after injury), also including the use of authorised means of support. Because not all situations can be directly checked or implemented in practical terms, modelling. Either of personal achievement or its prognosis is receiving a lot of attention in sports research. The forecasting exercise plays an essential role in the process of selection and cultivation of sporting talent, and in the verification of long-term exposure to training methods.

The one indispensable and basic form of successful research activity is teamwork, especially the direct research cooperation of researchers, clients and end-users of the results – trainers or methodologists. And it seems necessary for the coach to be a member of the research team.

Despite the many problems associated with ensuring the implementation of research programmes in the army, sports research is being carried out, even if its support is largely from sources other than direct funding for research in the field of PE and sports.

At the present time the balance of research is carried out in facilities that have the tradition and the necessary material and especially personnel support. Research is primarily carried out by the biomedical, natural science and social science disciplines, and takes place primarily in academic facilities, but also in departmental sports centres.

**CURRENT ISSUES IN PHYSICAL EDUCATION AND SPORTS RESEARCH**

In this day and age no systematic, long-term human activity can succeed without taking advantage of research and the knowledge it provides. The same is true for sports and physical activity. The contemporary role of research and academic enquiry is accurately summed up in the motto of the Report on Research in the Czech Republic for 2007 that was put together by the National Council for Research and Development:

*“Science turns money into knowledge and innovations turn knowledge into money.”*

In the area of sport, where applied research dominates, the above motto should be modified as follows:

*“Research turns money into knowledge, and knowledge then influences sports performance.”*

The knowledge gained from research programs directly reinforces experience gained through long-term training practice and sports performance and is not, as some individuals would have it, antithetical to it. The mutual relationship is shown in Chart 1.

Many practitioners in our world still argue that practical experience can substitute for knowledge gained from research studies. This idea is currently losing ground from at least two standpoints:

1. *No coach is capable during training practice of experiencing all the situations that can influence sports achievement;*

2 *Constantly improving sports performance is decided at a cellular and sub-cellular level, the principles of which cannot be practically and, most particularly, effectively employed without the knowledge gained through research.*

At the same time, we have to remember that even the best research results lose purpose if not applied in training practice, i.e. their practical ‘value’ or usefulness will always in some fundamental way be influenced by the coach, and the determining factor for success in his field will be his ability to use all available knowledge effectively.

To provide a better picture of the current situation of research in sports, we will summarise the basic conclusions found in the literature globally, and at the same time we will list the basic problems that frequently and widely limit research in sports in fundamental ways.

The first basic question is: Where is the research carried out around the world?

On the basis of studies by Culver and colleagues (2003), Gilbert and Trudil (2004), Silverman and Skonie (1997), Ward and Barrett (2002), Williams and Kendall (2007) and other available sources, it has been shown that in English-speaking countries the majority of research is carried out in universities or in specialized research centers, i.e. in facilities that are well resourced in terms of personnel and materials, and are thus able to secure these programs long-term and have appropriate experience.

What is being tested, and what is the object of the research?

Two-thirds of studies are carried out on a relatively small group of sports, and of these approximately 50% were on cycling, rowing, football, athletics and swimming. Research, therefore, is carried out on sports that have a sufficiently large base, are well known and popular, and have a media presence that makes it possible to assign part of their resources to targeted research activities.

What methods are being used?

The majority of research programs have used and do use the findings and methods of physiology and medicine. This unfortunately is also true of the initiation of research studies, i.e. who assigns research tasks. A fundamentally smaller amount of research work is initiated within the training environment, and the weak spot remains social science research. Another fundamental factor is where the research takes place, whether under real training conditions or in the lab, and on ‘whom’ the research is carried out.

Available data in the literature show that approximately two-thirds of researches were carried out under laboratory conditions, in artificial situations where the transfer of results into the training experience is often limited. Another ‘weak’ point is that only around half the studies were conducted with peak performers or athletes. The rest were mostly carried out on students or paid volunteers, where the direct applicability of knowledge into the world of high-performance, where selected individuals are nurtured over long periods, is often limited.

The advantage of current sports research is that it is open to virtually all modern technology, of which it often takes advantage (e.g. Bloch 2007, Ward and Barrett 2002).

At one end of the scale people have great hopes for the use of genetic engineering to identify the preconditions for kinetic endurance, while at the other they are also trying to take advantage of new understanding gained from social studies.

Virtually all available studies used teams of experts from a range of disciplines, and ad hoc research teams were created that varied in *modi operandi* according to the research problem being attacked. In all successful researches the coach was part of the research team, and it was he who devised and verified the translation of the results into practice.

Data on research done in Europe as well as in the Czech Republic are not summarized in as much detail as in the above-mentioned studies, but the areas of research and the way it is performed are similar. The essential difference lies in the gap between the financing that is generally available to researchers in English-speaking countries and the resources that are common in Europe or even in the Czech Republic.

The basic problems of sports research can be summarized as follows:

- Definition of the problem – especially clear definition of the research task, its timeliness/topicality, etc.
- Lack of information sharing between the designer and the client – e.g. on the one hand, you have researchers who do not have the relevant information about the needs of the sports environment, and on the other, the ‘coaching public’ who do not have enough information about the potential of research;
- Often unrealistic ideas about the benefits of research on the one hand, and its underestimation on the other;
- ‘Adaptation’ of the research problem into a solvable task – in addition to the definition of the research problem, it must be expressed in a form of words which is meaningful to the researchers;
- Preparedness and experience of the research team;
- Preparedness and experience of the client of the research;

- Transformation – translation of research findings into training instructions. It is not enough to publish the research findings; it is necessary they be translated into usable instructions;
- Distortion of research results in their practical application – often there is distortion of the research results through inappropriate use, frequently in unsuitable conditions, or by application to ‘unprepared’ athletes, which ultimately results in degradation of the research;
- Mutual distrust between researchers and clients – often there is a suspicion that research exploits the sports environment to obtain suitable material for publication, and conversely, that the sports environment only uses research findings to obtain benefits for the coach;
- Limited institutional support – top sports and state representation is highly effective advertising for any State; therefore, in addition to supporting the training process, the State should also contribute to securing the research program;
- Low support of systematic research from private sources – private funds are often only used to authenticate products that are then sold into the sports environment;
- Rarely is there a long-term approach – only infrequently do we find a long-term plan that is the product of consensus between researchers and the sports world;
- The confidentiality of research results in sports – sometimes this means duplication of effort, because not all the results of research programs for top athletes are published.

Depending on their focus, research programs in the area of PE and sports can be divided into two categories:

1. Research into materials
2. Research into people.

Material research focuses on the research and development of new materials and technologies that affect sports performance. Many discontinuous advances in sports performance are to a substantial extent the result of progress made in the physical equipment of athletes. The classic example is the advent of laminates in the pole vault, new materials in swimming sports, etc.

Research programs into people focuses primarily on:

1. Development of new training methods
2. Control and management of the training itself
3. Assessment of the effect of training effort
4. Identification and cultivation of sports talent
5. Proposals for physical interventions that offset the effects of current lifestyles and increase work efficiency and reliability
6. To accelerate and improve the quality of regeneration (as after the training exercise and after injury), also including the use of authorized means of support

It is possible for training process research results application to be illustrated schematically on a model of training process management; see Chart 2.

Because not all situations can be directly checked or implemented in practical terms, modelling. Either of personal achievement or its prognosis is receiving a lot of attention in sports research. The forecasting exercise plays an essential role in the process of selection and cultivation of sporting talent, and in the verification of long-term exposure to training methods.

The one indispensable and basic form of successful research activity is teamwork, especially the direct research cooperation of researchers, clients and end-users of the results – trainers or methodologists. And it seems necessary for the coach to be a member of the research team.

Although primary responsibility for sports results, and therefore for the implementation of research results, obviously lies with the coach or trainer, you cannot take away the responsibility for the application of research results from the researchers. The contribution to sports results of both parties involved should be clearly defined, whether in the event of success or failure.

What is the current status of sports research in the Czech Republic?

The Czech Republic has a long tradition of research into sport. Unfortunately, in recent years its support and use have declined. Successful research programs are mostly based on researchers’ and trainers’ personal contacts. There is no clear plan, nor any clear institutional support, which in recent years has been purely random, and not based on the long-term needs of the sports world or on the potential of the current research base. The result is an ever-diminishing supply of research resources, be they human or material. It is only possible in a very limited way

to undertake long-term planning, and especially to train new workers who, upon completion of their PhDs for example, will leave the research environment.

Despite the many problems associated with ensuring the implementation of research programs in the Czech Republic, sports research is being carried out, even if its support is largely from sources other than direct funding for research in the field of PE and sports.

At the present time the balance of research is carried out in facilities that have the tradition and the necessary material and especially personnel support. Research is primarily carried out by the biomedical, natural science and social science disciplines, and takes place primarily in academic facilities, but also in departmental sports centers.

Systematic research into PE and sports is run by universities (Faculty of Physical Education and Sport of Charles University in Prague, Faculty of Physical Culture of František Palacký University in Olomouc, and Faculty of Sports Studies of Masaryk University in Brno) and research centres of the Ministry of the Interior of the Czech Republic and Ministry of Defence of the Czech Republic (Czech Army Sport Research Institute).

Sub-issues are randomly dealt with by other university facilities (e.g. medical faculties, hospitals, some teaching and technology faculties), private entities (often with private money and aimed at the future sale of products), and certain 'clubs'.

The fundamental problem of current sports research is the funding and coordination of these activities. One result of insufficient funding is a decrease in real capacity for research work. It should be noted that the demise of facilities, and especially the loss of experienced researchers, is a practically irreversible process. Restoration of research programmes is an expensive and long-term process, often with very low efficacy.

Other factors limiting research into sports are some communication problems between researchers and research clients, and the cooperation of research centres.

Finally, although research into sport faces a number of problems primarily around its continued existence, it is still able to provide useful results. On the other hand, it is just a question of time before, without any defined support, it will be completely extinguished.

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## CISM International Symposium 2009



### 1<sup>st</sup> SESSION

Armed Forces as stakeholder in the development of sports science

Saturday, 19<sup>th</sup> September 2009

From 10:10

To 12:10





**Retired Navy Capt. Lamartine DaCosta, PhD (BRA)**

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## **ACADEMIC FORMATION**

- 1956** BSc Naval Sciences - Naval School Rio de Janeiro
- 1988** PhD Sport Management - University of Rio de Janeiro State
- 1989** PhD Philosophy - University Gama Filho - Rio de Janeiro
- 2005** Post doctoral experience - Professor of the International Chair in Olympism at Universidad Autonoma de Barcelona

## **WORK EXPERIENCE**

Member of CISM Academy (1996-1974);

International Projects on Knowledge Management (since 1999);

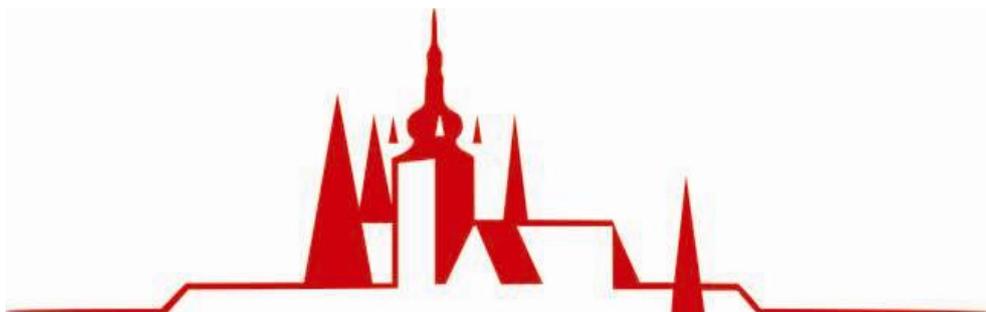
Editorial member for many scientific journals;

Research Subjects: Knowledge Management in Sports, urban renovation in sport mega-events, Sport for All.

## **CURRENT FUNCTION**

Full Professor University Gama Filho,

Professor of Masters and Doctorate Program in Physical Education



**THE ARMED FORCES AS STAKEHOLDER IN THE DEVELOPMENT OF SPORTS  
SCIENCE: PRACTICAL EXPERIENCES IN KNOWLEDGE MANAGEMENT**

**Retired Navy Captain Lamartine DaCosta, PhD**

*University Gama Filho – Rio de Janeiro, Brazil*

**ABSTRACT**

Military traditions historically encompass scientific and technological developments in any country or culture. Today's Electronic Warfare and other advanced technologies are increasing this trend upward in very broad and converging perspectives. Coincidentally, Knowledge Management's tools are becoming the convergence focus of recent military strategies in some Armed Forces worldwide. Theoretically speaking, this recent military approach to updated developments provided by Knowledge Management (KM) might include Sport Sciences as far as they may be considered a fundamental tool of modern management in both civilian and military environments. This contribution to the re-birth of CISM Academy aims to demonstrate the possibilities of KM for military sports concerns by means of practical experiences conducted by this study's Author. Thus far, five experiences of KM projects related to sport are reported covering countries and collaborators with large differentiation respectively to geographic location and educational or professional backgrounds from 1999 to date. Unsurprisingly, the financial and managerial support of these experiences came from leading international institutions connected to sports sciences, such as IOC, UNESCO, TAFISA etc. besides prominent universities with interests in sport activities and research. KM main principles and methods are also reviewed in order to identify new possibilities of Sport Sciences' developments with emphasis in tacit knowledge and meta-analysis, which are proposed as tools to search synergy between practice and theory as well as among distinct disciplines of knowledge. In conclusion, the possible role of Armed Forces as stakeholder in the development of Sport Sciences is discussed having KM as a basis, taking into account the noticeable differentiation among military practical functions and their growing needs of scientific support whether in rich or poor countries.

**INTRODUCTION**

Military traditions have historically included scientific and technological development in any country or culture. Today's Electronic Warfare and other advanced technologies are increasing this trend upward in very broad and converging perspectives. But key military values as discipline, group cohesion, rigorous training and so forth, remain without changes in different historical backgrounds.

This apparent contradiction between long-lasting military attitudes and today's technological advancements can be considered from many sources the strength and even the identity of today's military culture (Nuciari, 2007).

Sport in this interplay of past and present procedures and beliefs plays a peculiar role as it fits not only skill-based military activities and technological but also scientific needs to update military capability in any nation. In other words, sport – a modern expression usually related to physical training for competition and to recreational participation otherwise – remains in military grounds as a practice device to improve personnel's physical capacity and quality of life as it has emerged in recent decades as a scientific tool.

**The start-up of CISM Academy**

Not surprisingly, CISM's development experienced by itself the aggregation of scientific notions and principles to empirical sport practices from traditional military drills. Indeed, the creation of CISM Academy (ACISM) in the 1960s would be acknowledged today as a innovative project consolidated in the 1970s and 1980s, in view of its original aim to provide scientific content to sport competition promotions. Surely, CISM has its start in the 1950s as a post-war organization, a period also recognized in sport fields as a booming stage in terms of scientific-based physical training methods (DaCosta, 1968).

Such inaugural purpose of ACISM probably had been a consequence of CISM mission in promoting friendship sport competitions among World War II Allied Armed Forces in Europe, instead of only emphasising sport as a military drill. Therefore, most ACISM pioneer participants and leaders were acting in civilian sport in equal basis of military sport manifestations. The example of Major Raoul Mollet (Belgium), long standing General Secretary of CISM from 1960s to 1980s, has become emblematic for being a prestigious specialist in physical

training methodology for civilian purposes besides his military style management responsibilities. Therefore, ACISM's growth in the 1960s and 1970s had Mollet as a close support key-person acting both as a CISM leader and an ACISM expert.

The author of this essay himself witnessed the two-sides of the functional promotion developed by Mollet, including the recruitment of ACISM members. He had visited Brazil mostly as a leading name of physical training methods presenting his "Power Training" to civilian audiences in addition to his role of military leadership and manager. And until today, his books in Portuguese are available in non-military editorial design and language (Mollet, 1962).

As a consequence of Mollet's doctrine, I was recruited to ACISM and participated in its activities yet in 1960s nationally and internationally, keeping my civilian academic status and my military position in the Navy as a researcher. Later, during the 1970s, I became an international coach for military competitions and a sport researcher with international scientific impact, an outcome recently historized by Santoro & Soares (2009).

Moreover, Brazilian leading military specialists in physical training methods with casual or regular connections with ACISM in the 1960-1970s had similar careers as mine as a young coach and scientist. According to data reported by Correa (2005), those ACISM military-civilian distinguished participants were Captain Jose A. Pires Goncalves (Army), Lieutenant Manoel Tubino (Navy) and Captain Claudio Coutinho (Army), whose interventions in Brazilian sport physical training – military and civilian – became historical accomplishments with repercussions up to today. In the case of Captain Coutinho, it is important to mention his long-term association with Major Kenneth Cooper (US Air Force), one of ACISM's scientists and leader at that time (Tubino & DaCosta, 2005).

### **Putting the main focus on scientists**

This leverage support from ACISM to national groups seeking international development is yet a history to tell besides the groundbreaking example of Brazil. However, looking at the past from today's perspectives, it seems that ACISM had made synergetic interventions exchanging information from experienced specialists to newcomers from countries without the same scientific and technical infra-structure than CISM leading nations. Surely, ACISM common approach at its beginning consisted of mobilizing individual members with scientific prestige in sport to participate in courses, conferences or meetings, providing a collective development together with national-based experts. Summarizing, ACISM in its start focused more on scientists than on science itself as suggested by Gagliardi (2009):

The 60s and 70s saw the rise of CISM Academy (ACISM) with a creation of the organizational structure and statutes, which defined it as a scientific and pedagogical agency dedicated to research in selected areas of physical activity and sports training. As a symbol of this pioneer stage the book "Medicine of the Sport" was launched in Italy in 1960 including a chapter under the title "Military Sports Medicine", written by Colonel G. Tartarelli from Italy, on account of findings promoted by CISM Academy. In all, ACISM experiences may be referred to outstanding military scientists, following the trend signalized by Col. Tartarelli.

Taking into account the latter source, the emphasis on outstanding personalities also seems to be a consequence of the magazine – with the title of "Sport International" – and the technical brochures published by CISM General Secretariat located in Brussels, also led by Major Raoul Mollet in his capacity of chief editor. Thus far, Mollet acted mobilizing news and texts from sources and authors usually opening space to sport training advancements and counselling on behalf of ACISM activities. Of course, prominent names from military sport and sport sciences were targets sought by editorial led references.

Again, the present author may stand as a witness of that editorial orientation as I am able to report the reputation building process represented by those CISM media, a process of tracking opportunities to have research published in parallel to academic journals and books at least concerning marginal countries and languages in terms of scientific production. In my case, the spread of news about the results of my researches was made by "CISM-Sport International" throughout the 1960s as well as through the manual "Altitude Training", also published by CISM in early 1970s. In short, the impact made in the Portuguese language towards Brazil's sport scientific community had gained additional support in English and French. Besides, it reached a much more important audience worldwide, both in military and civilian grounds.

However, the media papers which have been produced by CISM since the 1960s might not have had the same outcomes in today's military or civilian environments on account of sport scientific production. On the one hand, the publication of non-military academic books and articles has been changing in terms of the access of new authors and themes in recent decades, which has made the whole process more selective despite more participation in international approaches.

Generally speaking, the emergence of the Internet and computer-based media has created another parallel alternative to marginal scientific producers even in sport concerns. Thus, the value of the old ACISM model would be found mostly in the relationship of scientists of different levels of experience and nationalities. And so, to return to the example of the original ACISM, it should be claimed that personal relationships are still the fundamental way to reach a collaborative knowledge production. Of course, the meaning of this solution is referred to relationships among different countries with a diversity of sport development levels.

### **Updating on CISM Academy in the computer age**

From CISM's perspective since 2004, this understanding is clearly shown in the role of its Sports Commission, that is, "To create possibilities for, and guidance to a positive development of sports, sports related matters and physical education within CISM and its member countries" (CISM, 2004). Moreover, the document "Sport Commission Internal Regulation" declares initially that "Sports are the main product of CISM with friendship as its aim", a definition supported by the following explanation:

In organizations which grasp over a variety of activities and interests there is a need of general guidance. In the field of different sports there are numerous things and needs that can and should be coordinated. The limited resources for military sports both in the organization of CISM and among our member countries have to be distributed with this taken into consideration.

Throughout the thesis of collaborative knowledge production, I will give definitions of new approaches to have CISM and even the Armed Forces as a stakeholder in the development of sports science, having in mind the renewal of the ACISM model in its best updated format. The search for this aim begins with the argument of networking, a new interpretation of the real accomplishment long sought by the original ACISM. Hence, Patricia M. Jones (2005) from NASA Ames Research Center, USA, is to be credited with the following clarification of networking for scientific purposes:

Relationships among people can be modelled as social networks in which network nodes represent people and network arcs represent relationships (e.g., friendship, advice, supervisor-subordinate relations) that change over time. Social networks also form a resource for collaborative knowledge management: the creation, exchange, and transformation of knowledge. Information technology offers several possibilities for making social networks and collaborative knowledge management more visible, inspectable, and systematic, which may aid the process of organizational learning.

### **From networking to Knowledge Management**

In sum, Knowledge Management (KM) is the central focus of my argument since networking has been proving as the means for improving collective knowledge, that is, organizational learning. Coincidentally, Knowledge Management's tools are becoming the convergence focus of recent military strategies in some Armed Forces worldwide. In this sense, it is significant to mention recent studies on KM for military power development, as ascertained in the joint study made by Lt. Col. Ismail Manuri and Prof. Dr. Raja Abdullah Raja Yaacob for the Malaysian Armed Forces (2006), or in the position paper from Dr. Petr Vsetecka (2006) for the Slovak Armed Forces.

In a nutshell, KM is oriented to management of continuous innovation, which implies in transferring knowledge from people to people much more than from machines to people. In other words, KM represents 70 % people, 20 % processes and 10 % technology, as assumed by Vsetecka. Furthermore, KM deals equally with explicit (documented information that can facilitate action) and tacit knowledge (comprehension gained through study, experience, practice, and human interaction).

Another point-specific definition has been issued by the Field Manual "Knowledge Management Section" from US Army (2008). From this military source it is acknowledged that knowledge creation is "the process of developing new knowledge or combining, restructuring, or repurposing existing knowledge in response to identified knowledge gaps". So forth, knowledge management presupposes the movement of knowledge — including knowledge based on expertise or skilled judgment—from one person to another. Summarising, KM is the art of creating, organizing, applying, and transferring knowledge to facilitate situational understanding and decision-making. Knowledge management supports improving organizational learning, innovation, and performance. Knowledge management processes ensure that knowledge products and services are relevant, accurate, timely, and useable to commanders and decision-makers.

Theoretically speaking, this recent military approach to updated developments provided by KM might include Sport Sciences as far as they may be considered a fundamental tool of modern management in both civilian and military environments, as already here concluded when analyzing traditional military values. Conversely, the CISM Sport Commission Internal Regulation (2004) seems to be open to KM innovative approaches as observed through its “Mission success factors” as follows by the list below:

- Managing by means of the Sport Commission Management Process.
- An effective Sport and Physical Education (PE) Policy.
- The equilibrium between top level Sports, Sports for all and Physical Education programs.
- Adequate resources for the execution of plans and projects.
- Dynamic relations with macro-sport and PE organizations worldwide.
- Maximum utilization of technological infrastructure and human resources.

Certainly, the last two items may be seen as pledges – specially the “maximum utilization of technological infrastructure and human resources” – which give organizational normative legitimacy to KM utilization by CISM. Actually, both items are claims embodying longitudinal data collection from many international sources and the intensive usage of electronic hardware and peopleware, idiosyncratic matters related to KM. Other factors are surely operational directions for inward references not applicable to outbound strategic needs of updating.

Having said that, the aim of examining the stakeholder role of the Armed Forces – including CISM’s participatory interventions – may be achieved by approaching to practical experiences in Knowledge Management for sport sciences developments. This suggests that the contributions to the re-birth of CISM Academy envisage possibilities of KM for military sports concerns by means of practical experiences conducted by the Author – in association with other researchers - of this essay. Thus far, five experiences of KM projects related to sport in general are reported in the next sections, covering countries and collaborators with large differentiation according to their geographic location and educational or professional backgrounds, from 1999 to date. These attempts seek insights and tools in order to provide CISM with alternatives to employ KM as a means to establish a stakeholder relationship with member countries in view of future military sport development and the respective re-new of ACISM.

### **KM experience in cross-national approaches**

This practical undertaking was promoted by Trim and Fitness International Sport for All Association – TAFISA during the period of 1999-2002, with an international book as an outcome planned to be published in English under the patronage of UNESCO and the International Olympic Committee-IOC. At the end of the project there was a 792-page volume printed and distributed by Meyer & Meyer Sport publisher from Germany, having as editors Lamartine DaCosta and Ana Miragaya, from the University Gama Filho, Rio de Janeiro, Brazil.

The 2002 Sport for All interesting case in terms of KM is mostly concerned with the search of balancing explicit with tacit knowledge in view of the large differentiation between academic researchers and Sport for All managers or leaders from a variety of countries. Often, the demarcation of scientific works is made by giving full priority to explicit knowledge. However, Sport for All programs worldwide were mostly conducted by non-academic managers, a fact that partly explained the dearth of books with review of this area of knowledge, a common publication found in many other sports areas.

The insufficiency of Sport for All explicit knowledge was clearly detected as referred to international congresses proceedings which did not have scientific value since simple event-oriented reports predominated instead of desirable fact-finding analysis and conclusions. Failure to note it is also the absence of scientific investigations based on Sport for All thematic possibilities. In all, upon tacit knowledge relied the cognitive process of **Sport for all** before 1999, when DaCosta & Miragaya had proposed to change the contradictory nature of managing a very complex social demand emphasizing practices and not theoretical explanations. Then, it is noteworthy to briefly forward the overall view made by these scholars in the introduction of the “Worldwide Experiences and Trends in Sport for All” (DaCosta & Miragaya, 2002):

The clear, coherent and direct claim of Sport for All has been facing sharp contrasts with the variety and complexity of the interventions needed to reach the expected results through the practice of physical activities since its outcome (...), since the 1960s Sport for All leaders all over the world have been advocating the need of sport for everyone while sport theorists from many disciplines of knowledge have tried to explain why and how. Nevertheless, both sides have never had a much-needed mutual understanding (p. 16).

Furthermore, the identified problem of Sport for All in terms of knowledge was firstly managed by means of elaborating the following aim for the international review book on Sport for All practices and theories (DaCosta & Miragaya, 2002):

On account of these contrasting circumstances, the chief editor of the present book had proposed the elaboration of an internationally joint effort do describe and analysed Sport for All experiences and trends from all continents in order to give more scientific content and legitimacy to national and local interventions (...) the international congresses ...have been accepting and accumulating contributions from a variety of countries and areas of knowledge without further consequences....As a result, Sport for All remains a confusing aggregation of explanatory attempts and of theoretical interpretations often based in individualistic criteria (p. 17)

Once the Board of TAFISA agreed with DaCosta & Miragaya's proposal in late 1997, the project of the review book had its start-up in 1999 with a call-for-authors manual to the almost 100 country-members of TAFISA. This document in printable format aimed to serve as a guidebook for contributions to be made by each country that showed adherence to the Sport for All review collective work (DaCosta, Gastaldoni & Miragaya, 1998). At that early stage, the standard approach to all authors and countries was a "comparative study that could primarily yield relationships and their foundations for building theoretical explanations" (p. 17) as later described by DaCosta & Miragaya (2002).

With that purpose, the call-for-authors' guidelines sent to prospective authors included a thematic framework to be strictly followed by all contributors, including those who did not have a graduate degree. The reason behind this disciplined text production was the need to level all authors up to a similar groundwork; otherwise, some free interpretation of Sport for All without a standard format would keep the aggregation of explanatory variables not only confusing, as it has been already mentioned, but also prone to follow individualistic criteria. Thus, after a pilot investigation made by the editors in 1998, the following categories were chosen to compose the standard framework for the chapters' writing tasks (pp. 18-19): History, Institutions, Marketing, Culture, Sponsorship and Finance, Target Groups and Activities, Settings and Activities, Strategies and Activities and Social Changes (DaCosta & Miragaya, 2002).

This model for authors' contributions had a successful reaction from prospective countries contacted by TAFISA. At the final stage of the book's production, there were 87 authors from 36 nations of the five continents, having the following profile: 46 authors held a PhD degree (52,8%), 16 had an MSc (18,3%) and 25 were leaders and managers, representing 28,7 % of the total. As such, the model here described was not rejected by academic authors, previously seen as more personal in their work. But, in contrast, the use of a framework for writing the texts increased the consulting relationships between authors and editors extending the project's duration for almost four years.

In short, the framework envisaged to discipline authors in specific focuses also created a platform of comparative analysis, in the perspective of extracting underlying understandings of Sport for All despite countries' differentiation. In this context, the comparative method was not taken in its complete formulation just because the editors explicitly avoided the search of artificial results from juxtapositions involving different elements. The option in this case was to select only similarities and differences from cross-national data and descriptions, so contrasts would help to illuminate assumptions, values, attributions and expectations, according to the editors' choices after a very detailed literature review (pp. 17-25).

The objective of this task was to construct tables to include the total of occurrences of variables of all participating countries. The reference to each category was made under the denomination of "frequency". Those tables represented the conclusions and had interpretative comments added to them. In a nutshell, one can read the survey book in two different ways: (i) focusing on each one of the national cases of Sport for All or (ii) scrutinizing the cross-national experiences and trends (pp. 751-785).

When comparing the Sport for All book methodological procedures designed in the late 1990 decade with today's KM tools, it can be argued that the final analysis embodied by frequency of variables was a simplified meta-analysis that is defined broadly in present times as a statistical technique which combines the results of several studies that ask the same or similar research questions. As the previous remark suggests, the international Sport for All survey published in 2002 used a very simple algorithm for convergence of information detection in a similar conception related to Google-like search tools.

Less creative, but just as important to stress the possible replication of the KM experience developed by the Sport for All book, is the claim that other cases reported in the next sections tested different approaches to KM mostly concerned to review books' collective production. Unsurprisingly, the financial and managerial support to these experiences came from leading international institutions connected to sports sciences, besides prominent universities with interests in sport activities and research. Again, KM main principles and methods will also be reviewed in order to identify new possibilities for the development of Sport Sciences with emphasis on tacit knowledge and meta-

analysis, which are here presupposed as tools to search synergy between practice and theory as well as among distinct disciplines of knowledge.

### **KM experience in multiple thematic approaches**

This case only merged specialists from two countries – Spain and Brazil – with dedication to Olympic Studies, a branch of knowledge which selects focuses and themes related to the Olympic Games and the so-called philosophy of Olympism. As in the case of Sport for All, the KM option was to develop knowledge by means of a review and updated book made by a collective association of authors and editors.

The final product of that Spain-Brazil cooperation network was a volume in printing format but transferred to PDF file to be hosted available for download on the Internet, named “University and Olympic Studies”, written in Spanish, Portuguese and English (summaries). In fact it was a composition of languages and media planned to fit knowledge exchange between two countries with similar levels of development in Olympic Studies during 2006-2007 stage, as seen in Moragas and DaCosta – Orgs (2007), also available on the Internet.

Miquel de Moragas, from the University Autònoma de Barcelona (Spain) and Lamartine DaCosta, from University Gama Filho – Rio de Janeiro (Brazil), both Ph.D. professors, acted as Organizers of the project of the book and of the two binational seminars. The events that took place in Rio de Janeiro and Barcelona set the state-of-the-art of Olympic Studies in both countries into place in overall and common perspectives. The editors were equally chosen among specialists in Olympic Studies with PhD degrees acting in both universities, namely, Ana Miragaya (Brazil), Otavio Tavares (Brazil), Chris Kenett (Spain) and Berta Cerezueta (Spain). As opposed to the Sport for All project, examined in the last section, the planned Spain-Brazil book and seminars were not commercial – despite the sponsorships involvements led by TAFISA. It was a typical government initiative of scientific support through financial aid from both Spain and Brazil.

Summarizing, the case of multiple thematic approaches to one single discipline of knowledge with binational scientific interests joined 103 Brazilian and Spanish authors from 18 universities coordinated by five top level specialists. This KM style project finally found common points of collaboration among researchers and students from both countries for future initiatives of Olympic Studies development. For that purpose the contributions included in the book represented short reports focusing on a diversity of thematic approaches in order to select and to have a starting point to new researches. In other words, this case study may be referred to as a state of knowledge review to identify priorities and opportunities for research works and the respective financial support from governmental scientific institutions.

### **KM experience in multidisciplinary approaches**

The case of the non-commercial book “Environment, Sport, Leisure and Tourism – Studies and Researches in Brazil” (Almeida & DaCosta, 2007) is a KM approach for multidisciplinary concerns having sport-related activities as the core for updating reviews. As a KM typical initiative, this project brought together 86 authors in 103 chapters (three volumes) in order to identify the state-of-the-art of sport & environment investigations in Brazil backed by a special chapter on meta-analysis focusing on regional and scientific approaches - mostly in the interest of leisure and tourism) - from a timeline perspective.

Similar to the latter study case, this KM accomplishment had an educational institution behind it: the Federal University of Para, located in Northern Brazil, Amazonas State, having its Research Nucleus for Environmental Research as the promoter of the book’s project as reported in the Internet site < [www.ufpa.br/numa/](http://www.ufpa.br/numa/) > (free access to PDF copy).

The collective and review book was finally elaborated in Portuguese with the special chapter mentioned above in English, written by Miragaya, A., describing the meta-analysis construction proposed by the project’s leaders, Ana Cristina Almeida, PhD and the author of this essay. It should be understood now that this KM option experienced a new step forward when compared to former and latter cases here already reported.

In fact, KM advancements imply not only having knowledge organization backed by peopleware using computers, but also the use of meta-analysis or equivalent procedures in view of the need of systematic updating of information and data. In computer based terms, this overall scrutiny for extracting knowledge from large databases is now made by Data Mining softwares, KM tools acknowledged by Webb (2009) when he describes the aims of the new journal “Data Mining and Knowledge Discovery”:

The premier technical publication in the field, Data Mining and Knowledge Discovery is a resource collecting relevant common methods and techniques and a forum for unifying the diverse constituent research

communities. The journal publishes original technical papers in both the research and practice of data mining and knowledge discovery, surveys and tutorials of important areas and techniques, and detailed descriptions of significant applications.

Conclusively, the case of the Brazilian-made KM approach to Environment & Sport themes may represent a test of the viability of a step-by-step methodology for collective construction of knowledge, starting with simple algorithms and reaching appropriate softwares for Data Mining needs and innovations.

### **KM experience in international transfer of knowledge**

The case of the book “Legacies of Sports Mega-events” (DaCosta *et al.* – Eds, 2009) is perhaps a more significant source of comparison with CISM plans to act as a stakeholder in sport development when dealing with a variety of needs from member countries.

Now it should be considered for the aims of this essay that this specific book is an international non-commercial volume issued by the Ministry of Sport in Brazil – 75 authors (6 from UK, Germany and Spain) from 35 universities organized as an epistemic community, that is, groups of authors with previous chosen topics related to the central theme of the book, supervised by editors, with selected international specialists as references for some subjects.

A seminar joining authors was then organized to discuss convergences of this area of knowledge. The objective of the project was to assimilate and associate international knowledge on mega-events and legacies to Brazilian national researches on these topics. Authors with different levels of experience with the central theme were accepted in both seminar and book, which in this conception represent a know-how transfer besides creating an initial base for the improvement of local experts.

To close on a more meaningful note, this transference of knowledge was inspired in ACISM actions in Brazil in the early 1970s, now using the label of “epistemic community”. Moreover, the format of the authors’ contributions was similar to the Spain-Brazil project as reported in the previous section. Therefore, the book was published in Portuguese with English summaries. The PDF version is available with free access on the following Internet website :< [www.confef.org.br/arquivos/legados/ Livro.Legados.de.Megaeventos.pdf](http://www.confef.org.br/arquivos/legados/Livro.Legados.de.Megaeventos.pdf) >

### **KM experience in multicultural approaches**

This case is also symptomatic for observations that can be discussed towards CISM new role of stakeholder for the sport development of country members. The book subjected to a KM treatment is the “Olympic Studies Reader”, an ongoing project for the period 2008 – 2010. Now, the central focus of this project is multiculturalism in sports, mainly grounded on Olympic development needs, as described below:

- Project of Sport University of Beijing and University Gama Filho – Rio de Janeiro, having a book as outcome (non-commercial) with support of the International Olympic Committee-IOC, with 86 authors from five continents in three volumes dated 2008, 2009 and 2010. Chinese Editors: Hai Ren & Niu Jing; Brazilian Editors: DaCosta, L. & Miragaya, A.; website for free access to first volume in PDF: [http://www.bsu.edu.cn/new/web/files/ OLYMPIC STUDIES READER.pdf](http://www.bsu.edu.cn/new/web/files/OLYMPIC_STUDIES_READER.pdf)
- Multiculturalism is not only a thematic choice for this book production but rather a means to give space and opportunity to publish authors and studies from countries and cultures still far from international sport institutions management possibilities. Thus, this project did not aim to transfer or to review knowledge otherwise. And in this concern, the IOC started up the production of the three-volume book through a “Call for Papers” (IOC, 2007) suggested by this essay’s author according to the experience of the 2002 Sport for All initiative. From the KM perspective, the synergy provided by the Olympic Studies Reader has contributed to the identification and promotion of authors, who have gotten more connected and articulated in search of multicultural values and procedures.
- From the IOC side, the publication aimed at students and researchers interested in Olympism has two main objectives: to provide knowledge on the main research themes related to the Olympic Games, Olympism and the Olympic Movement; and to offer guidelines and suggestions to develop future Olympic research projects. The innovation in this case lies on the use of Chinese as an additional language to English for international concerns, which allows the inclusion of more readers and researchers. This opens perspectives for the use of other languages for the same role.

- Olympic values-led texts selected or recommended to candidates to join the project have focused either on multiculturalism or on multidisciplinary approaches, respectively in relation to innovative trends or to scientific traditions for Olympic Studies concerns. The meaning of this option is to keep the traditional knowledge all together with new approaches to Olympic sport and sport in general through the eyes of diverse cultures.
- From the editors' viewpoint, the Olympic Studies Reader should be able to identify new foundations to Internationalism (nations) as an overlapping concept in relation to Multiculturalism (cultures) and Multilateralism (politics) from which Pluralism (values) may stand as an area of commonality (i. e. sharing of common attributes, solidarity) providing long-term) intercultural exchange between different levels of practical values-led interactions.
- Also as a new KM proposal from the Chinese-Brazilian editors, Plurality in this case is mostly referred to as multicultural interaction by means of the construction of common knowledge, as seen in the elaboration of texts by groups of authors with multiple national roots; hence, the supportive thesis to this conception is that values diversity in Olympic initiatives demands plural approaches not selection.

### **CONCLUSION – Towards a common construction of knowledge**

In a nutshell, the discussion of the five study cases must take into account that the KM solutions briefly presented here were mostly concerned with the development and updating of knowledge in large international and national organizations dedicated both to sport and to scientific research promotion. As suggested by the cases presented above, KM has multiple usages and approaches depending on the nature and objectives of the correspondent organizational basis or on the kind of intervention to be provided. Anyway, the step-by-step improvement considered in the previous sections may have new applications elsewhere. This is particular true to create new insights for today's CISM and future ACISM's intentions and planning.

However, the possible role of the Armed Forces – extensively to CISM and the renewed ACISM - as a stakeholder in the development of Sport Sciences is an effective and updated possibility having Knowledge Management as an operational and basic tool, taking into account the noticeable differentiation among military practical functions and their growing needs of scientific support whether in rich or poor countries.

Other suggestion that often comes out from the five projects reported is that a shared-values and plural construction of knowledge may act as a social construction with participants from different cultural and educational backgrounds. This thesis applied to KM background refers to a place to initially provide and then later promote shared-values and plural construction of knowledge, therefore creating decentralizing and favorable environments to make cultural interchange with multiple local contributions.

The presupposition of an appropriate place for collective construction of knowledge is a preferred approach of KM prominent researchers as, for instance, Kazuo Ichijo and Ikujiro Nonaka (2007), to whom innovative knowledge emerges from decentralized and favorable environments to make cultural interchange with multiple local contributions (tacit knowledge) in combination with traditional, empirical and academic knowledge (explicit knowledge). This social construction is heavily dependent on people's participation and access to sources.

If these points reflect the essentials of stakeholder functions, then the future KM solutions applied to CISM traditions and rules should have decentralized projects of shared-values and plural construction of knowledge as bases, keeping the spirit of military belonging and scientific commitments usually promoted by past ACISM's accomplishments.

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**SOME ASPECTS OF TACTICAL ACTIVITIES IN CONTEMPORARY AND FUTURE OPERATIONS IN RELATION TO PHYSICAL READINESS OF SOLDIERS**

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**ABSTRACT**

The article deals with the necessity of a global approach to preparation of a military professional. For instance, some tactical activities in contemporary and future operations point to requirements needed to preparation of soldiers, especially to aspects of their physical readiness.

Variable conditions of contemporary and future operations, such as global conception of the battlefield, asymmetric environment, severe cross-country and climatic conditions, require to pay attention to preparing of military professionals. Science disciplines, including military science and sport science, should overtake practice, study developing patterns of their research subjects and offer the solution to practical activities.

**INTRODUCTION**

The topic of this contribution covers some aspects of answers to four basic questions - WHO, WHAT, WHERE, and HOW will realize in contemporary and future operations, or, what he is supposed to be prepared for in these operations. Considering the aim of the event, which the contribution is being presented at, we would like to try to prefer the viewpoint of physical fitness while respecting all other facts and opinions. We would also like to think about the relationship between physical fitness requirements laid on professional soldiers by the physical training (PT) instructors and sport science (military sport science).

In any case, it is going to be a perspective on task accomplishment (combat task under the terms of tactical activities and operations) performed by specific personalities – military professionals.

Even the concept of “personality” contains some aspects of physical fitness. The concept of **Personality** is understood as an individual combination of biological, psychological, and social aspects of an individuality characterising a compact individuality of a particular person who focuses on reaching his goals and developing his abilities. It is formed by the relationships between people, environment, and society.

A professional is sometimes understood to be a specific personality. A **professional** is usually perceived as a person who is paid for what he does; a person who is qualified for his field of activity via professional education and practice. Skilled people who can do something very well though they are not paid for it are colloquially referred to as professionals, too.

**Military professionals** should not differ from professionals in other specialisations, branches, and jobs. As far as fully professional army (which the Czech Republic army as well as other world armies certainly is) is concerned, the concept of “military professional” can be polemized. Except for civilian employees, all other employees of the Czech Republic Army are “military professionals”. Moreover, a military professional should not be a professional “just because” he is paid for what he does. Having signed a professional contract, a personality does not automatically become a professional as far as real meaning of this word is concerned. As well as occupations of doctors or teachers, occupation of a soldier should rather be viewed (not just from outer military environment but also by every single soldier) as a vocation, an activity, a process in which it is necessary to watch development trends, adjust to them, and influence them in an active way. It is also related to all matters concerning physical fitness of a professional soldier (but not just him).

**1 DEMANDS LAID ON MILITARY PROFESSIONALS**

**The basis – a man (in the man-machine system)**

Development of science and technology always reflects itself in military technologies, new, more modern and effective weapons and weapon systems. Developed world armies keep on improving, so called, 21<sup>st</sup> century soldier system. Such a soldier shall be equipped with the latest means of observation, orientation in given area, communication, fire control, and other functions. At first sight it may seem that it is the machine, technical means,

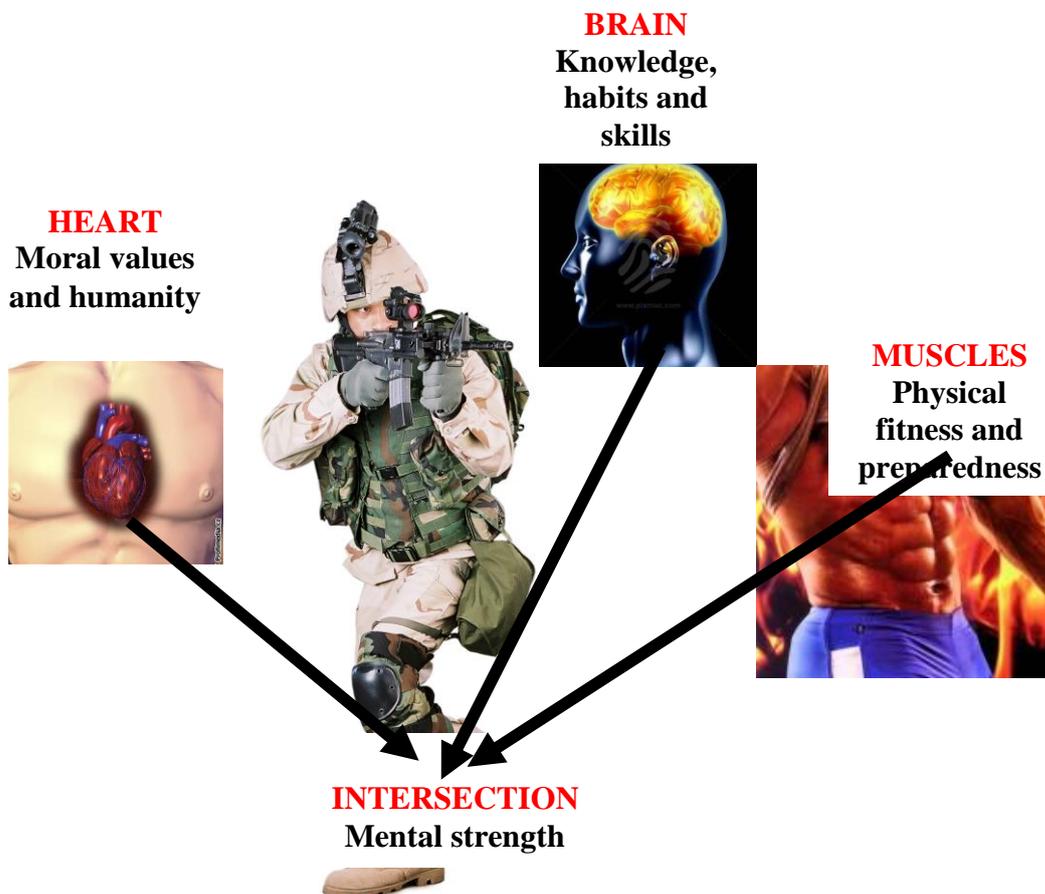
and soldier's equipment that play crucial part in the man-machine system. However, it is not so! At present time, and it can be expected that also in near future, it is going to be a man, a soldier who will play the most important role in the man-machine relationship; in military terminology – a soldier and a weapon system. A soldier as a complex personality.

### A complex perspective on a soldier's personality

A personality always presents itself as a whole showing all strong and weak points. A military professional should be a balanced personality who has at his disposal:

- Corresponding professional knowledge appropriate to his position, place and task which the soldier holds within his unit; necessary professional skills and habits;
- Sufficient mental strength towards impacts and stressors which he can meet in the battlefield (in the area of a task accomplishment)
- Physical fitness and stamina including proper development of all parts of the stamina;
- Moral qualities that guarantee respecting the ethical code, international humanitarian law, rules of deployment and other norms of an armed conflict.

All people are different; even in a military unit there are soldiers of not the same qualities. Some soldiers are mentally stronger, some are mentally unstable, some are experts in the field of booby traps, some are great signals, medics, etc. The same situation can be seen in the field of physical fitness. While somebody is able to overcome a tall obstacle, move hanging hand over hand along a rope, lift heavy burden, other person may not be able to do so. That is, however, what a unit commander's mastery is about. The commander must perfectly know his subordinates, their strong and weak points. He is supposed to use the strong points of individuals in favour of the whole unit and so compensate some of the weak points of individuals in the unit. If a unit is supposed to overcome a tall wall, the first one getting over is going to be the most skilful and able-bodied person. Then, he will help the weaker ones overcome the wall. On the contrary, physically weaker soldier can be mentally stronger; such a soldier can go first through a burning obstacle and help the stronger (but mentally weaker) one overcome it. Military team, a unit, can be perceived as a symphony orchestra where each player excellently plays his instrument, his part. Thus the whole orchestra can perform an excellent composition.



All soldier's attributes are mutually conditioned, and influence one another. It is a common thing that an able-bodied soldier is usually mentally strong either, because he is aware of the fact that he is strong, tenacious, and tough; all these aspects enable him to perform an efficient movement over the battlefield. What was said above can obviously work the other way round.

### **Ethical code of a military professional**

Ethical code of a military professional was introduced to the Army of the Czech Republic (ACR). This ethical code represents traditional military values. A professional soldier commits himself to respect the Ethical code, which goes as follows:

**Responsibility and sense of duty:** “Be aware of your duties, be initiative, have a creative approach to your service. “

**Selflessness:** “Give all, give more than you get, be aware of the fact that success of the unit means more than success of an individual. “

**Courage:** “Do not be afraid of making decisions; do not be afraid to accept new challenges. Be strong enough to overcome difficult, dangerous, and risky situations. “

**Loyalty:** “Be loyal to your country and its army; be loyal to your super-ordinates, respect your workmates. “

**Honour:** “Be straightforward and high-principled. Always act in accord with your conscience; you are bound by your vocation. “

Requirements of the ethical code look at a soldier's personality in a complex way. Demands on physical fitness and preparedness, which are considered to be an inseparable part of complex preparedness of a military professional, can be traced in the code.

### **Physical fitness elements**

When evaluating physical fitness and monitoring its development it is necessary to consider its individual elements:

- 1. Cardiovascular (aerobic) endurance** - an ability to perform muscle activity in a particular time.
- 2. Muscle strength** - maximum strength performed by one muscle or a group of muscles.
- 3. Muscle endurance** - ability of a muscle to resist tiredness.
- 4. Flexibility – articular agility** – determines the extent of movement performed by a joint.
- 5. Body composition** – expressing the rate between basic body mass and body fat.

The first four elements can be practiced in PT lessons whilst body composition is changing within the combination of exercises, education, and life style factors covering improving physical fitness, enhancing number of burnt calories and adapting the diet.

In dependence on particular needs, we can think about development of individual elements of physical fitness as well as about preferring one of them.

## **2 CONTEMPORARY AND FUTURE OPERATIONS**

Contemporary and future operations shall be viewed in a complex way, not only from the tactics and tactical activities point of view. Physical fitness of the soldiers will play an important role in those operations.

## Tactical activities in contemporary and future operations

Patrolling is a very common tactical activity in operations.



Mostly, the patrolling activity is carried out using vehicles (armoured fighting vehicles); however, there are areas, especially built up areas, where soldiers have to dismount from the vehicle and move on foot. If the vehicles are near the dismounted soldiers, the tendency is that the soldiers have only the essential weapons equipment on them. Still it means (together with ballistic protection and a weapon) quite heavy load to be carried. When, now and then, soldiers happen to patrol without the support of vehicles (e.g. when the vehicle was destroyed by a booby trap), the weight of the load they are supposed to carry while accomplishing a combat task can be tremendous. Equipment, ballistic protection, weapon with extra ammunition, radio (or other communication device), food, water, medical or other material can represent a weight of many kilograms. I know a PT instructor who wanted to press a suggestion that each soldier would have to carry (as a part of his equipment) basic mountaineering equipment – a carabiner, figure eight, and approximately a five meter long rope in order to enable the squad to make a several metre long rope, to overcome obstacles in mountain or built-up environment. Being a tactician, I agree. But I also must admit that this equipment means more kilograms to carry. Miniaturisation of components, modern light materials, multifunctional technical devices, multipurpose weapon systems – it all represents new present-day trends. Training should prepare soldiers to deal with a high, perhaps, an extreme burden, long distance movements on foot, including combat tasks accomplishment when carrying heavy load.

As far as physical fitness is concerned it is necessary to train soldiers the way they will perfectly and promptly control their bodies, be able to move in various ways across the landscape (walking, running, creepage), overcome obstacles and barricades, and should the need arise, transport either material, or, possibly a wounded mate across these obstacles. This calls for the ability to handle other “loads” up to his own weight.



*Picture – Casualty evacuation using a stretcher*

Escorting VIP's, military or humanitarian convoys, etc. plays a significant role in contemporary operations. From the physical fitness point of view, emphasis is put on speed and promptness of the reaction; during a long-lasting task accomplishment on muscle endurance. This is what training shall be focused on.

Some military operations can be of a rescue character. Such operations will require physical preconditions connected with special physical training. Especially in mountain and built-up areas, elements of military climbing training can be useful; during floods but also in combat operations on water surface elements of military diving can be applied. Destroying the enemy from a great distance is a general tactical trend. In spite of that, hand to hand combat must be taken into account. In such fight, elements of self defence or some kind of martial arts can be used, too.



*Picture – Riot crowd control operations*

In specific cases it is necessary to carry out operations in extreme weather conditions, including Nordic areas. In case of task accomplishment in winter conditions it is necessary to prepare predetermined soldiers for these tasks.



*Picture – Movement on skis with heavy load*

### **3 SOME OTHER ASPECTS OF THE SOLDIER-PHYSICAL PHITNESS RELATIONSHIP**

Physical fitness of a professional soldier can also be looked at from other aspects point of view – beginning with physical preconditions of young men and women who want to become professional soldiers and positions and tasks for specialists-PT instructors in the end.

## **Qualities of young people joining the army**

The fact that lifestyle of most of young generation is not considerably based on sport activities is probably a worldwide problem. Physical capacity of young generation is very low. However, this cannot mean that the entrance physical test limits shall be decreased or they will not be realized at all. It must be exactly and demandingly determined what enlistees must be able to perform at the beginning of their service and what performance they must be able to accomplish after training before they start to perform their function within their unit. An enlistee should certainly fulfil difficult norms of the strength and strength endurance part.

## **Motivation to do sports**

Motivating young generation to do sports is a task for the whole society, government, school, family, etc. Motivating soldiers to keep and enhance their physical fitness is a task for their commanders and PT instructors (including PT research workers). In dependence on the unit categories – ranging from combat to logistic ones, norms which the soldiers are able to fulfil anytime, and at the same time, norms which will make the soldiers train must be established. Training is the best exercise. Most of specialised trainings, especially tactics training is predetermined for including physical activities that can keep, develop, and check soldiers' physical fitness. Under the terms of checking and evaluating methods, including physical preparation annual check up, not only a negative motivation must be applied (the one who does not pass will be punished), but also a positive one making the soldiers reach the best results, not only the "pass" level results. High quality sports field, work organized by super ordinates, super ordinates' attitude to doing sports appear to be good motivation factors.

## **The phenomenon of women in the armies**

There is probably not such an army without women working in it. Position and task of women in the army is a discussed issue. According to available statistics, in developed armies 6-9 % of employees are women. After the Czech Republic Army professionalization there has been a significant growth of number of women. Nowadays there are about 13% of women in the ACR. They usually perform non-combat positions, but there are also women on combat positions. In the Czech Republic there are legal norms that determine a maximum weight of load that can be handled by women. Within the army, women have partially different norms and disciplines of PT check up. This is not the right trend. If a woman wants to perform a particular position in the army, she has to be able to fulfil the same norms as a man on the same position otherwise it is a matter of discrimination.

## **Position and task of a PT instructor in the army**

PT instructor must be a commander's advisor. He must be a devoted and enthusiastic organizer of physical training in the broadest sense. He must keep up with the times, monitor new information in his field of activity and thus be an active creator and evaluator of new pieces of knowledge. Keeping and enhancing his qualifications, including research work, must be one of essential requirements for performing his position.

## **CONCLUSION**

British army report that leaked out in British media reads that the soldiers are not capable of fighting. Democratic approach to the army caused that professional soldiers became a fat lazy herd.

According to Major Brian Dupree there is a danger of losing combat morale. Soldiers are released from regular exercising and obesity of British soldiers is on the increase. Number of soldiers classified as "personnel unfit to deploy" is growing. This is to be related with the democratic attitude to physical fitness. Nobody is forced to do physical exercise. In his report Major Dupree warns against the fact that this matter ruins the whole British army because fat and lazy soldiers are not able to deal with combat conditions in difficult Afghan landscape. Almost four thousand of army members had to be laid off because of obesity. The problem is that the upper figure of body mass index (BMI) is 32 for new recruits, while obesity starts at figure 30. Upper level of ideal weight is 25. Twenty five and more means the person is overweight.

This report points out some problems that are not typical just of British army.

**Position and task of sport science in the field of soldiers' physical fitness**

Under the terms of their relative independence, scientific disciplines, including both military and sport ones, should be one step ahead, explore natural relations of their objects' of research development and offer solutions for practical activities..

**Changes require changes**

Changing conditions of contemporary and future operations, especially complex conception of the battlefield, asymmetric battle environment, difficult ground and climatic conditions; these are just some of aspects that require continuous paying attention to the training of military professionals who accomplish their tasks in such conditions.



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## **CORRELATION BETWEEN SPORT, MOTIVATION FOR SPORT, GENERAL HEALTH, SATISFACTION WITH WORK AND LIFE IN SLOVENIAN ARMED FORCES**

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### **ABSTRACT**

The basic aim of the research was to discover the meaning of sport, its value among the soldiers and officers and its motivational effect and the correlation between sport in the army and general health and satisfaction with work and life. We tried to research the positive effects of sport on the work efficiency in Slovenian Armed Forces. We isolate the motiv and value sport among all values to explore the possibilities how to stimulate motivation for sport activity in the army. Different well known sport psychological measurements and tests have been used such as Self motivation Inventory, Participation (in sport) Motivation Inventory, Values Scale, Work Motivation, General Health Questionnaire, Attitudes Toward Sport, The Scale of Intension to Leave Work in Army, Work Efficiency Scale, Satisfaction with Life Scale, Body Mass Index and others. 141 subjects were involved into the research (75 soldiers and 66 officers in Slovenian Armed Forces). The results showed many useful data. Body Mass index is positively related to the years, employed in Slovenian Armed Forces. There is a positive connection between attitudes toward sport and general health and satisfaction in work. There is also a positive connection between sport attitudes and work efficiency. The main sport motives for the employers in Slovenian Armed Forces are: they like friendship and brotherhood through sport, they want to stay fit and they want to learn new sport skills. Those, who want to stay employed in Slovenian Armed Forces, they also have more positive attitudes toward sport. Through these results we can confirm very positive effects of sport on the general life and work in the Army. New researches should follow to discover more directions for practical suggestions.

**Key words:** *motivation, sport, health, satisfaction, armed forces.*

### **INTRODUCTION**

The army represents a special area of a person's life and work with specific working conditions, which require a lot of mental and physical strain. The armies worldwide have been increasingly integrating and performing common tasks, such as peacekeeping in war zones or common actions in combat in different war zones of the world with various conditions (climatic, geographic, cultural, etc.). For that an individual has to be well-prepared for such conditions. Systematic physical training is required in order to increase resistance of the soldiers to the harsh climatic conditions.

Positive aspects of physical exercise can be achieved when the exercise is based on the principles of sport recreation and fulfils its purpose and objectives (Tkavc, 2004). Numerous researches confirm positive impact of sports activities on the maintenance and improvement of health. Active individuals experience improvement in mental and physical characteristics, they look better, feel better, and rehabilitate faster. The most important aspect is the pleasure experienced by those who are regularly active. Moderate sports activity strengthens the immune

system and is physically and mentally relaxing. It reduces the amount of stress hormones in the organism, which improves the immune system and increases the body's resistance to infection (Ihan, 2000). Misigoj-Durakovic (2003) stated that physical exercise brings about a number of physiological and biochemical changes in the organism and changes in the manner of thinking and experiencing oneself and the environment.

All that leads to better mental functioning. Basic condition to achieve that is pleasure and satisfaction during the exercise routine. According to Tomori (2000), sports influence person's mentality as well. Motivation is a process, while motives are stimuli, which direct and manage the activity. Motives stimulate and determine human behavior every time a wish for a certain goal arises (Kronja, 1966). Motives as a mobilising dimension of a person's psychosomatic status release the lever which determines whether a person will be active in sports or not. An important set of motivation is also self-motivation, which expresses the capability of motivation self-control. Individuals with high self-motivation level prepare and motivate themselves and work independently, without any external support or "pressure".

The concept of subjective well-being is general and global and can be generally defined as assessment of well-being, satisfaction and happiness. Satisfaction with life represents a basic component of subjective well-being, in addition to the positive and negative affect. According to Diener (2000), the concept of subjective well-being also includes optimism and the sense of fulfillment. "Subjective satisfaction with life is a compromise between what is important to us and what we can actually achieve, considering the environment we live in" (Pychyl & Little, 1998). Several researchers (Diener & Biswas-Diener, 2000; Diener, Suh & Oishi, 1997; Myers & Diener, 1995) established that in general people are satisfied with their life. Numerous researches (Diener et al., 1997; Myers & Diener, 1995) stated that people, who are more satisfied, are also more successful in various areas of life; satisfaction is related to successful outcomes.

We wanted to examine various psychological characteristics of life and work in the Slovenian Armed Forces. The basic aim of the research was to discover the meaning of sport, its value among the soldiers and officers and its motivational effect and the correlation between sport in the army and general health and satisfaction with life. We tried to research the positive effects of sport on the work efficiency in the Slovenian Armed Forces.

## **METHODS**

### **Participants**

141 employees of the Slovenian Armed Forces (75 soldiers and 66 officers) collaborated in the research. In our sample were included employees of Slovenian army from seven different units.

### **Instruments**

- **Participation Motivation Questionnaire: PMQ** (Gill, Gross & Huddleston, 1983) with a list of 30 potential motives or reasons for sports participation. This questionnaire is particularly intended for young, who are active in sports, and the motivation of whom is still very diverse. The respondents evaluated each reason on a three-level ordinal scale (Very important; somewhat important; not important). In our research we adjusted this scale to a 50 mm graphic scale in which the left side indicated "the reason is irrelevant for me" and the right side indicated "the reason is highly important for me".

By using factor analysis of the reasons, the authors obtained the following main factors or incentives:

1. *Success and productivity* (e.g. "I like winning")
2. *Team atmosphere* (e.g. "e.g. I like groupwork/teamwork")
3. *Friendship* (e.g. "I like spending time with my friends")
4. *Recreation* (e.g.. "I like to get out of the house")
5. *Relaxation and releasing the superfluous energy* (e.g. "I want to release tension")

6. *Developing abilities* (e.g. "I would like to learn how to train/practice")

7. *Fun* (e.g. "I like having fun").

The importance of individual goals or of an individual incentive is used as attractiveness of a motive or incentive and as its valence in a motivational situation. The authors have reported factors with various levels of reliability, between 0.30 (friendship) and 0.78 (team atmosphere). Although the authors did not indicate any norms, they presented the results obtained from the sample of 720 boys and 418 girls. The results cannot be compared to ours, since the scale has been adjusted. The questionnaire was translated with permission and adapted for the purpose of researches (Tušák, 1996). In our research we also obtained seven factors, which are represented and described in results. Cronbach's alpha coefficient in our study is 0.94. Cronbach's alpha coefficients for separate factors range between 0.89 (*the motives of social recognition*) and 0.54 (*the motives of competence and promotion to a higher level*).

- **Satisfaction with Life Scale – SWLS** (Diener, Emmons, Larsen & Griffin, 1985). Between different components of subjective feeling of well-being this scale is narrowly focused on measuring general satisfaction with life and refers to similar constructions as positive affection and loneliness. It presents a cognitive aspect of satisfaction with life. Result on the scale can be labelled as an individual's global estimation of quality of their life according to personal criterions. The scale consists of five items to which an individual has to answer on the scale from 1 (not true at all) to 7 (completely true). For the end result we scored the average of the answers. Cronbach's alpha coefficient in our study is 0.87.

- **General Health Questionnaire - GHQ** (Goldberg, 1972). We were finding out the lack of health. It is a sift instrument for discovering psychiatric disturbances in residential communities as primary care or general practice. The instrument was adapted for use for the purpose of this study. It consists of 13 questions to which the participant has to answer on a scale from 1 (not at all) to 5 (a lot more than usually). A high number of points mean absence or lack of health (an individual has problems with sleeping, concentrating, is unhappy, irritable and depressive, has lost faith in him/herself and his/her abilities...). For the final result we scored the average of the answers. Cronbach's alpha coefficient in our study is 0.92.

- **Self-motivation Inventory** (Dishman, Ickes & Morgan; 1980) includes 40 statements, which measure:

- *Self-motivation or internal motivation of subjects* (e.g. "It is not really easy to promise that I would do something for sure" or "Whenever I undertake a difficult task I decide to persist until I finish it").

The respondents give answers on the basis of a five-level scale (1 = I completely disagree, 5 = I completely agree). For the final result we scored the sum of the answers. The authors reported the alpha reliability coefficient between 0.86 and 0.91. The coefficient obtained by the test-retest method is  $r = 0.92$ . They also reported a high positive correlation with the Thomas-Zander Ego Strength Scale. The results of the scale are also correlated with the attachment to certain training programmes or certain sports activities. Cronbach's alpha coefficient in our study is 0.89.

- **Work Efficiency Scale;** It is composed of 19 statements to which the participant answers on a five level scale (1 not true at all for me and 5 completely true for me). The statements are created in a way that show participant's preparedness for fulfilling everyday work duty and the biggest emphasis is on his psychophysical readiness. The results show individual's interest for good performing of defined motive tasks, his motivation, interest, effectiveness and reliability.

- **Values Scale** (Musek, 1993, 2000); It is composed of 54 items, which represent 54 independent values. The participant answers with scale from 1 to 100 in a way he values stated things. The participant's answers enable us to find out his value orientation and value hierarchy. Cronbach's alpha coefficient in our study is 0.95.

- We made questionnaire concerning intention for abandonment of workplace (IAW)(Celin, 2006). It consists of 10 statements. The participant labels how much a statement is true for him/her on a five level scale where 1 means I completely disagree and 5 means I completely agree. High result means high intention for abandonment of workplace (e.g. search of the other possibilities for work, thinking about the replacement of workplace...).

- For finding out the intention of points of view on sport we composed **The Point Of View Scale on Sport (SS)** (Tušak & Korenjak, 2006). It is composed of 35 statements (e.g. "I like competing at competitions", "Sport represents enjoyment to me"). The participant labels how much a statement is true for him/her on a five level scale, where 1 means I completely disagree and 5 means I completely agree. For the final result we scored the average of the answers. Cronbach's alpha coefficient in our study is 0.92.

- The participants forwarded us some demographic data (age, body weight and height...) and data about their work in the army (distance from work, satisfaction with the occupation...).

**Procedure**

After previous agreement with the Slovenian Armed Forces and their consent to collaborate in the research, we collected data in different units. The testees filled in the questionnaires individually and considering the instruction added. For any possible questions the testators were there to answer so that we explained any possible indistinctness. The filled out questionnaires were collected after the filling in was completed. The data was statistically handled with help of the program SPSS 15.0.

**RESULTS AND INTERPRETATION**

**Table 1.** Pearson's coefficients of correlation between motives, values, self-motivation, health,work efficiency, satisfaction with life and the point of view on sport with some demographic variables

Variables	Distance from work	Quantity of occupation time in SA	Satisfaction with the occupation in SA	Wish to stay in SA
BMI	,02	<b>,30**</b>	,10	,10
SMI	-,06	<b>,29**</b>	<b>,42**</b>	<b>,34**</b>
SWLS	-,15	<b>,28**</b>	<b>,37**</b>	<b>,31**</b>
IAW	,16	<b>-,23**</b>	<b>-,58**</b>	<b>-,65**</b>
GHQ	,07	,05	<b>-,22**</b>	<b>-,21**</b>
WE	-,16	<b>,33**</b>	<b>,44**</b>	<b>,38**</b>
M1	-,15	,10	<b>,28**</b>	<b>,25**</b>
M2	-,09	-,01	,14	,19
M3	-,05	,03	,18	,13
M4	-,10	,10	,15	,13
M5	-,06	,19	,09	,07
M6	-,11	,06	<b>,35**</b>	<b>,32**</b>
M7	-,10	-,03	,07	,08
M8	-,12	,04	,21	<b>,28**</b>
M9	-,11	,06	,15	,17
M10	-,02	,02	<b>,31**</b>	<b>,32**</b>
M11	-,01	,02	,17	,17
M12	,04	,04	,11	,15
M13	-,11	-,01	,17	,13
M14	-,07	-,01	,07	,10

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M15	-,07	-,08	,11	,16
M16	-,05	,03	,19	,21
M17	,10	-,07	,15	,20
M18	-,03	,13	<b>,36**</b>	<b>,40**</b>
M19	,02	,02	,13	,11
M20	-,06	,03	,15	,08
M21	-,04	-,04	,07	,06
M22	-,03	,05	<b>,26**</b>	<b>,32**</b>
M23	,02	-,06	,14	,21
M24	-,13	,11	<b>,33**</b>	<b>,29**</b>
M25	-,10	,09	,02	,03
M26	-,02	-,09	,17	,15
M27	-,09	,04	<b>,24**</b>	<b>,24**</b>
M28	-,15	,02	,03	,07
M29	,04	-,11	,16	,13
M30	-,19	,05	,15	,17
V1	,06	,05	,18	,15
V2	-,01	-,10	,01	,03
V3	-,02	,16	,22	<b>,22**</b>
V4	,13	,19	<b>,25**</b>	<b>,23**</b>
V5	,04	,13	,21	,11
V6	,08	,00	,06	,02
V7	,05	,11	<b>,34**</b>	<b>,29**</b>
V8	,05	-,03	,09	,08
V9	-,09	,03	-,01	,04
V10	-,02	,03	,14	,15
V11	-,11	-,07	-,06	-,11
V12	-,18	<b>,27**</b>	<b>,24**</b>	,18
V13	-,10	,08	,21	<b>,24**</b>
V14	-,19	,02	,18	,20
V15	,01	,03	<b>,32**</b>	<b>,26**</b>
V16	,08	-,16	,06	,02
V17	,04	-,18	-,20	<b>-,25**</b>
V18	,04	,05	<b>,29**</b>	<b>,28**</b>
V19	,00	<b>,24**</b>	<b>,29**</b>	<b>,24**</b>
V20	-,14	,10	,20	,16
V21	-,01	,13	,14	,07
V22	,12	,02	,21	,15
V23	,09	,05	<b>,32**</b>	,20
V24	,04	-,01	<b>,23**</b>	<b>,26**</b>
V25	,00	,19	,07	-,01
V26	-,07	-,05	-,01	,05
V27	-,05	-,10	,09	,06
V28	-,04	-,06	-,03	-,01
V29	,09	,01	,15	,12
V30	,04	-,07	<b>,23**</b>	,18
V31	-,04	-,10	,06	,03
V32	,02	-,12	-,03	-,06
V33	-,09	-,05	,21	,18
V34	-,02	-,08	,06	,05
V35	,11	-,10	-,03	-,05
V36	,03	,07	,02	,05
V37	,01	-,06	,10	,16
V38	,09	-,20	,05	,06
V39	-,03	-,01	,13	,12

V40	,01	<b>-,31**</b>	<b>-,26**</b>	<b>-,29**</b>
V41	,06	-,14	,06	,07
V42	,00	,07	<b>,33**</b>	,21
V43	-,10	,02	,20	,04
V44	-,03	<b>,24**</b>	<b>,28**</b>	<b>,22**</b>
V45	-,05	-,05	,06	,08
V46	,12	,02	,12	,02
V47	,13	-,15	,07	,01
V48	-,07	-,01	,16	,13
V49	,04	-,15	,08	,11
V50	,03	,03	,20	,18
V51	,13	,15	,19	,16
V52	-,10	<b>,28**</b>	-,01	-,03
V53	-,01	,01	,02	-,04
V54	,13	-,14	,06	-,01
SS	,04	,09	<b>,37**</b>	<b>,30**</b>

*Legend:* BMI – Body Mass Index; SMI – Self-motivation Inventory; SWLS - Satisfaction with life scale; IAW - Intention for abandonment of workplace; GHQ – Health; WE – Work Efficiency; SS – The point of view scale on sport; M1 – motive 1, M2 – motive 2... (PMQ); V1 – value 1, V2 – value 2 (Value Scale); \*\* p < 0,01.

As we can see from the table 1 individuals that are longer employed in the Slovenian army are having bigger difficulties with overweight. That is the consequence of irregular sport activity (negative correlation with weekly sport activity). Tkavc in her research in 2004 also found out that more than half of individuals in Slovenian Armed Forces are overweight with consideration of BMI. It is interesting that more than half of the individuals were doing regular sport activity and only one did not do anything. We could search for the reasons in the organized meals that individuals have in the army. Too much food against the use of calories. The longer employed are also more satisfied with their lives, more efficient at work, with bigger self-motivation, not thinking about leaving their work place. About the value orientation the results showed that they high value moral principles, respect the laws, nationality pride, and enjoyment in the art and on the other hand they care very little about food and drink.

We've also found out that individuals who are more satisfied with employment in the Slovenian Armed Forces are more satisfied with life, healthier, more effective in their work and more self-motivated. They also do not think about leaving their work place. They have a very positive point of view on sport, and they are involved with sport activity in the Slovenian Armed Forces because they like comradely spirit, wishing to remain in a good shape, be physically fit and healthy, to improve their skills and learn new skills, they like being the part of the group (team) and they also like the coaches and leaders. Results of value orientation suggested that they high value diligence, sport and recreation, wisdom, creative achievements, sport and movement, nationality pride, training himself, the progress of mankind, the loyalty, respect the laws, patriotism, moral principles and harmony with nature. Individuals who are not satisfied with the employment in the Slovenian Armed Forces highly value good food and drink.

Those individuals who wish to remain in the Slovenian Armed forces are more effective and self-motivated in their work. They also have less health problems are more satisfied with their life and their attitude to sport is positive. They are involved with sport activity in the Slovenian Armed Forces because they like comradely spirit, wishing to remain in a good shape and learn new skills, they like being the part of the group (team), be physically fit and healthy, they like team work, they want to improve their skills and also they like the coaches and leaders.

In a view of value orientation, we can say that those who wish to remain in the Slovenian Armed Forces highly value diligence, patriotism, sport and recreation, loyalty, cohabitation and peace between people, respect the

laws, harmony with nature, love of children, nationality pride and sport and movement. On the other hand, those who do not wish to stay in the Slovenian Armed Forces, highly value a comfortable life and good food and drink.

**Table 2** Correlation between point of view on sport and work efficiency, lack of health and satisfaction with life

Variables	work efficiency	lack of health	satisfaction with life
<b>point of view on sport</b>	<b>,31**</b>	-,14	,22

*Legend:* \*\*  $p < 0,01$ .

Table 2 shows that statistically significant correlation appears only between the point of view on sport and work efficiency. The correlation is positive and medium-sized. It means that individuals who have more positive point of view on sport are also more interested, reliable and effective at work.

## CONCLUSION

Through these results we can confirm very positive effects of sport on the general life and work in the Slovenian Armed Forces. New researches should follow to discover more directions for practical suggestions.

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## CISM International Symposium 2009



### 2<sup>nd</sup> SESSION

Training methods: science increasing performance

Saturday, 19<sup>th</sup> September 2009

From 14:00

To 17:00





**Prof. Damir Karpljuk, PhD (SLO)**

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## THE RELATIONSHIPS BETWEEN TESTS, MEASUREMENTS AND EVALUATION IN HUMAN PERFORMANCE

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### ABSTRACT

In the process of measuring human performance, a number of decisions concerning the methods used and the interpretation of data collection must be made. A wide range of instruments is used to assess abilities in the cognitive, psychomotor and affective domains. It is very important to properly determine the domains where the objectives are planned to be set, develop specific objectives and choose appropriate tests that can objectively, relevantly and validly measure the set objectives. When data are collected, evaluative decisions can be either norm-referenced or criterion-referenced.

**Key words:** *test, measurement, evaluation, norm, criterion*

### INTRODUCTION

The meaning of scientific research work lies in the incessant transfer of findings from theory into practice and also in the search of new challenges in the realm of practice. This involves the continual intertwining and complementing of findings and experience which are tested against scientific methods. Therefore, tests and measurements are also the focal point of our sphere of activity. They are elements of school, competitive and recreational sports, as well as of the sports activities of people with special needs. In addition to the selection of tests and measurements and the results obtained, the evaluation of the latter is also of crucial importance (Morrow, Jackson, Disch, & Mood, 1995). It is the evaluation that facilitates the designing of an appropriate and individually designed training programme and the choosing of suitable training means and content. For individual subjects, measurements can be carried out in the following areas (Oja & Tuxworth, 1995): aerobic capacity, motor abilities and body structure (body mass index).

Nearly all decisions made in the process of sport-motor analysis of an individual or a group should be underpinned by appropriate measurement and assessment, i.e. evaluation. Figure 1 shows the connections between tests, measurements and evaluation.

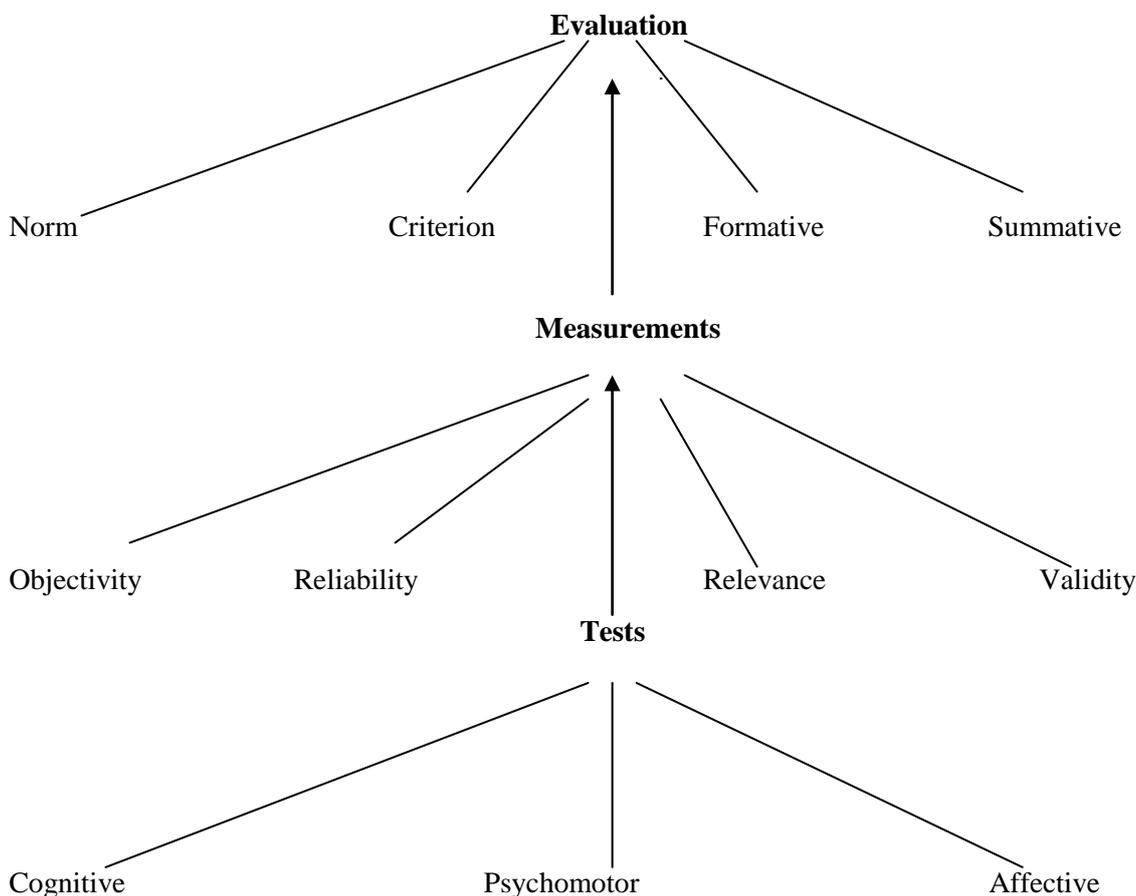
It is evident from the above that the coach, teacher and/or instructor must make a number of decisions when selecting training methods and content, planning the training process and interpreting the data collected from performed measurements. A broad range of measurement procedures and tests is used to define abilities in the cognitive, psychomotor and emotional area. First, one must decide in which of the abovementioned areas the objectives will be set, i.e. which changes in a person's abilities or characteristics will be achieved. Then more specific (concrete) objectives must be defined and such test selected that will offer an insight into the changes of a studied person or group in an objective, reliable, adequate and valid manner.

Once the data are collected, the evaluation should refer to the set standards or criteria. The comparisons referring to norms are those where a person's implementation (result) is compared against the implementation

(result) of other people who performed the same test. The standards referring to the criteria are used in the sense of comparing a person's implementation against the pre-defined standards or previous measurements concerning a specific behaviour, characteristic or ability.

**Figure 1.** Relationships between tests, measurements and evaluation

(adapted from Morrow, Jackson, Disch, & Mood, 1995).



The assessment/evaluation can be interim and/or final. An example of an interim or initial measurement is a pilot study based on which individual tests are designed or selected, the measurement protocol defined and the training programme drawn up, etc. In the continuation of the training process, interim measurements are carried out, changes evaluated, the training programme corrected, if required, or upgraded in specific periods of time, e.g. by mesocycle (Ušaj, 1996). Each interim measurement represents a starting point and feedback for the further designing of training programmes for the next training period. Such repeated assessments at intervals should incorporate a formal test, observation, adapted tests and feedback between the coach and the exerciser.

Final evaluation. This yields the final score at the end of a training period. On this basis, plans for the future can be drawn up, underpinned by a preliminary analysis of the training process, training means and content, a person's progress, their motives, wishes, etc.

At first glance, the difference between the interim evaluations and the final evaluation is merely the difference between the interim results and the final score. However, this is not the case, as the use of data distinguishes between interim and final scores. Scores are obtained throughout the training period on the basis of interim assessments or measurements, whereas the final score is essentially the evaluation of the entire work, i.e. the effects of the training on a person as well as the training process and selected means, content and strategies.

### **Simple example of losing weight**

Example: Body mass and fatty tissue percentages were measured. The initial and/or interim measurement showed 30% fatty tissue. Body mass should decrease by about 8 kg to reduce fatty tissue to 25%. What follows is the formulation of an appropriate, individually designed training programme, with emphasis placed on the loss of 1 kg of body mass every two weeks. In this way a person would lose 10 kg in 20 weeks. In addition to other measurements, the exerciser is weighed once a month, whereas they themselves also control their weight regularly and record results. In this way, the exerciser receives double feedback: that provided by themselves every day and that by us once a month when we carry out the weighing. The results of the interim measurements are compared to those of the initial measurements. On this basis our work is assessed, and the training programme and respective diet corrected. At the end of the planned period, the final measurement is carried out and the final score obtained, which is compared against the initial one. If the loss of body mass and fatty tissue equals the value which was planned jointly with the exerciser at the start, our work is assessed as positive and the set objective is considered achieved.

### **Examples of research in the armed forces**

Liu (2000) exposed the importance of sport in the armed forces. He has analysed the differences between two notions, 'military sport' and 'sport in the military'. Military sport is defined as a specific type of sport, where the training process is based upon combat readiness like that of the Chinese national strategy of defence system, and upon readiness for war or war-like conditions. Sports activities include different types of shooting with combat weapons, parachuting, military pentathlon, etc., and all of them are directly related to the assessment of the soldiers' combat capacities. On the other hand, sport in the military primarily includes the most common types of sport, like football, athletics, basketball, handball, cycling, etc., namely, the types of sport characteristic for ordinary, civilian society. Liu (2000) emphasized that these sport activities in the context of the armed forces do have certain specifics; at the same time the options are open as to the individual sports soldiers can have in addition to the military sport activities.

Tkavc (1999) defines sport in the Slovenian Armed Forces as an entity, and thus takes up the same point of view as Zechner (Bulletin, 1996). Based on definitions by Liu (2000) – military sport and sport in the military – and according to the purpose of sport in the Slovenian Armed Forces, her definitions could be related as follows. Military sport is a regular sport activity and also serves for assessing motor abilities, while sport in the military represents any other sport activities, ranging from sport for all to sports competitions. Despite different points of view and definitions, it is obvious that there is a universal notion of sport and that the principle goal of sport in the military is the adequate physical readiness of soldiers to successfully attend to their regular and combat duties (Tkavc, 1999).

Bonev (2000) has introduced a systematic definition of the abovementioned physical training factors – commonly called 'physical education' in the military. The author (Bonev, 2000) provided a basic model of sport training that should comprise the following elements: sport training as a part of regular armed forces personnel duties – 2 to 3 hours weekly; morning exercises – 30 minutes; elements of sport for all profiles (90 minutes) to be carried out off-duty; physical training aimed at enhancing combat readiness. Particular elements of training, explicitly emphasized, are athletics, marching various distances, movements with acceleration and changes of direction, sport gymnastics (floor, gymnastics, permitted apparatus adjustments), running, swimming, Alpine and cross-country skiing, rowing, combat sports, etc.

In specific conditions in Africa, Mudambo (1996, 2000) studied the effects of negative energetic ratio on military personnel in 'survival' training in hot weather conditions. The author stresses that in order to prepare soldiers for possible war conditions, the training process should include as many factors as possible (climatic, health-related, etc.) which soldiers would face in war conditions.

Adequate physical readiness is a significant aspect of universal armed forces readiness and an integral part of military support (Jaenen, 2000). Despite an increase in number and enhanced military equipment, mechanisation, means of transport, etc., a number of combat operations still depend on physically well-prepared soldiers (Jaenen, 2000; Karpljuk, Žitko, Rožman, Suhadolnik, & Karpljuk, 2000). For example, Canadian armed forces personnel (Jaenen, 2000) must be physically prepared to successfully carry out military operations in a geographically and climatologically diverse landscape. All profiles, from officers to soldiers, undergo a highly well-rounded physical readiness program. Their physical readiness is evaluated through various assessments based on the Human Rights Act (Jaenen, 2000), and the personnel are informed about it upon joining the Canadian armed forces.

US army personnel start their physical training program the first day upon entering the forces, and the program lasts until the end of an individual's military career. The athletic way of life in the US army is not an exception but rather a general activity of all its employees. The assessment of physical efficiency is based on the Annual Physical Training test (also used by some NATO members), and is comprised of push-ups, curl-ups and a 3200-metre (2 mile) run (Picarielo, 2000; Karpljuk, Žitko, Rožman, Suhadolnik, & Karpljuk, 2000). Picarielo (2000) stresses that physical efficiency readiness is based on endurance, strength and agility, as well as on developing mental abilities, cohesiveness within a group, and factors related to combat situations.

Karpljuk et al. (2005) did research about the effects of individually designed programmes of physical training based on US army standards on the motor abilities of Slovenian Armed Forces personnel. The aim of this research was to ascertain the effects of a training program, based on individually adapted intensity levels, on the motor abilities of Slovenian Armed Forces (SAF) personnel. The sample of subjects included 34 members of the SAF (16 in the experimental group – EG, and 18 in the control group – CG), aged between 35 and 40. The results were processed by the program SPSS 8.0 for Windows. Data processing was carried out in several phases. First, the basic statistical characteristics and the distribution of individual variables were determined, the measures of central tendency and the measures of dispersion were calculated, and a method of analysis of variance with a 5% risk level was used. The results showed that a characteristic enhancement of certain motor abilities of the sample studied can be improved by means of training process economisation and individually adapted training intensity levels. Statistically significant differences between the experimental and control groups were found in measurements of body fat (KG), push-ups (PU), curl-ups (CU), 3200-metre run (3200MR) and morning heart rate (MHR).

Although the research sample was small, this study at least in theory supports the need for future research in this area, as our evidence strongly suggests the effectiveness of individually designed training protocols on the physical readiness of Slovenian Armed Forces personnel.

## CONCLUSION

No matter which area of our life and work is considered, scientific research work follows similar principles to those which were briefly presented in our article. Thus the findings can be transferred into practice with great certainty, new challenges can be sought and new findings discovered. It is about the continuous intertwining of science, practice and experience to discover new paths. The tests, measurements and evaluation of results form a patchwork to which every researcher contributes with their practical work, thus adding to the explanation of new findings.

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## RELATIONSHIP BETWEEN ACE GENOTYPE AND SHORT DURATION AEROBIC PERFORMANCE DEVELOPMENT

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### ABSTRACT

We have previously demonstrated that, ACE D allele may be related with a better performance in short duration aerobic endurance in a homogeneous cohort with similar training backgrounds. We aimed to study the variation in the short-duration aerobic performance development amongst ACE genotypes in response to identical training programs in homogeneous populations.

The study group consisted of 186 male Caucasian non-elite Turkish army recruits. All subjects had undergone an identical training program with double training session per day and six days a week for six months. Performances for middle distance runs (2,400 m) were evaluated on an athletics track before and after the training period. ACE gene polymorphisms were studied by PCR analysis.

The distribution of genotypes in the whole group was 16.7% II, n=31; 46.2% ID, n=86; 37.1% DD, n=69. Subjects with ACE DD genotype had significantly higher enhancement than the ID (p<0.01) and II (p<0.05) genotype groups. 2,400 m performance enhancement ratios showed a linear trend as ACE DD > ACE ID > ACE II (P value for Pearson  $\chi^2 = 0.461$  and P value for linear by linear association = 0.001).

ACE DD genotype seems to have an advantage in development in short-duration aerobic performance. This data in unison with the data that we have obtained from homogenous cohorts previously is considered as an existence of threshold for initiation of ACE I allele effectiveness in endurance performance. This threshold may be anywhere between 10 and 30 minutes with lasting maximal exercises.

**Key words:** Genetics, Endurance- Insertion/deletion -Training-ACE

### INTRODUCTION

High performance in short duration aerobic performance (2-8 min) demands high power output and increased tissue oxygenation. It requires higher VO<sub>2max</sub> and strength endurance levels. Angiotensin I-converting enzyme (ACE) cleaves vasodilator kinins while promoting formation of the vasoconstrictor angiotensin II. Increased plasma angiotensin II levels restrict blood flow to tissues. The human ACE gene contains a polymorphism consisting of the presence (insertion, I) or absence (deletion, D) of a 287 base pair sequence in intron 16 (Rigat et al.1990) This polymorphism seems to have an important role on ACE at a cellular level (Davis et al.2000; Mizuiri et al. 1997) and may effect angiotensin II production.

The present data on the ACE I/D polymorphism and exercise performance are somewhat controversial. The ACE I-allele usually seems to be associated with enhanced aerobic endurance performance (Alvarez et al.2000; Gayagay et al. 1998; Montgomery et al. 1998; Myerson et al. 1999; Nazarov et al.2001). However, in some studies VO<sub>2max</sub> levels, which indicate an improved oxidative capacity, found to be related with ACE D-allele (Rankinen et al. 2000a; Zhao et al. 2003). On the other hand, ACE D-allele is related with higher fast-twitch (FT) muscle fiber ratio (Zhang et al. 2003), greater strength gain in the quadriceps muscle in response to training (Folland et al. 2000), and better anaerobic performance (Woods et al. 2001). In contrast, some researchers have not found a

relationship between *ACE* genotype and athletic performance in elite athletes (Rankinen et al. 2000b; Taylor et al. 1999), and sedentary subjects (Rankinen et al. 2000a).

Such associations with athletic performance and *ACE* I/D polymorphism have been replicated across different races, geographical locations, athletic status and sporting disciplines (Alvarez et al. 2000b; Myerson et al. 1999; Woods et al. 2001). Studies of those of mixed ability and mixed sporting disciplines have thus tended to be negative (Woods et al. 2001) as have those confounded by admixture of those of different race and sex or training regimen (Nazarov et al. 2001; Taylor et al. 1999).

We have previously demonstrated that, *ACE* D allele may be related with a better performance in short duration aerobic endurance in a homogeneous cohort (Cam et al. 2005). However, the study was cross-sectional and the group was small (n=88).

We postulated that *ACE* D allele is associated with a better short-duration aerobic performance development in response to identical training programs in homogeneous populations. To clarify this hypothesis, we aimed to study the variation in the performance as a result of six months endurance training in the army recruits.

## **METHODS**

### **Subjects**

The study group consisted of 186 male Caucasian non-elite Turkish army recruits. The study had appropriate ethics committee approval. Written informed consent was obtained from all participants.

### **Training program**

All subjects were undergone an identical training program with double training session per day and six days a week for six months. The program consists of flexibility exercises, circuit trainings, 2,400 m and/or 3,000 m runs, 1,000 to 3,000 m runs with military equipment, hurdling course, aerobic threshold and anaerobic threshold trainings. The circuit trainings were consisted of gallows, sit-ups, push-ups and rope-climbs, bomb throws, hurdling course. In initial two weeks, there were approximately 30 min whole body flexibility exercises and circuit trainings every weekday, 30 to 45 min anaerobic threshold runs and 45 to 60 min aerobic threshold runs alternately except Sundays. From third week onwards, one hurdling course training, and one or two of the 1,000 m to 3,000 m run with military equipment and/or the 2,400 m or 3,000 m running were replaced with one of the aerobic or anaerobic threshold training.

### **Exercise tests**

Performances for middle distance runs (2,400 m) were evaluated on an athletics track before and after the training period. Performance times were determined with digital timers in 0.01 sec accuracy by three referees. The time in the middle was recorded.

### **Genetic analysis**

Genomic DNA was extracted from 200 µl of EDTA-anticoagulated peripheral blood leucocytes using the QIAmp Blood Kit (QIAGEN, Ontario, Canada, Cat. no:51,106). Amplification of DNA for genotyping the *ACE* I/D polymorphism was carried out by polymerase chain reaction (PCR) in a final volume of 15 µl containing 200 µM dNTP mix, 1.5 mM MgCl<sub>2</sub>, 1x Buffer, 1 unit of AmpliTaq® polymerase (PE Applied Biosystems) and 10 pmol of each primer. The primers used to encompass the polymorphic region of the *ACE* were 5'-CTGGAGACCACTCCCATCCTTTCT-3' and 5'-ATGTGGCCATCACATTCGTCAGAT-3' (Rigat et al. 1992). DNA is amplified for 35 cycles, each cycle comprising denaturation at 94 °C for 30 s, annealing at 50 °C for 30 s, extension at 72 °C for 1 min with final extension time of 7 min. The initial denaturizing stage was carried out at 95 °C for 5 min. The PCR products were separated on 2.5% agarose gel and identified by ethidium-bromide staining. Each DD genotype was confirmed through a second PCR with primers specific for the insertion sequence (Shanmugam et al. 1993). The samples with II and DD homozygote genotypes and ID heterozygote genotype were selected at random. These samples were then purified by PCR products purified system (Genomics, Montage PCR, and Millipore) and directly sequenced by the ABI 310 Genetic Analyzer (ABI Prisma PE Applied Biosystems).

## Statistical analysis

Statistical analyses were performed using SPSS for Windows version 12.0 (SPSS Inc., Chicago, IL, USA). Methods applied were frequencies, cross-tabulations, descriptive statistics, and means. Statistical significance was set at the  $p < 0.05$  level. A  $\chi^2$  test with the data read from Finetti statistics program was used to confirm that the observed genotype frequencies were in Hardy-Weinberg equilibrium. Differences amongst *ACE* genotype groups in endurance performance were tested with analysis of variance (ANOVA) and post-hoc Bonferroni test. Genotype distribution across performance levels was compared by chi-square for linear trend. Differences between baseline and post-training values of each *ACE* genotype group were analyzed by t-test.

## Results

The distribution of genotypes in the whole group (16.7% II,  $n=31$ ; 46.2% ID,  $n=86$ ; 37.1% DD,  $n=69$ ) did not deviate significantly from those predicted by the Hardy-Weinberg equilibrium. The allele frequencies of the subjects were 0.398 and 0.602 for the I and D alleles respectively. Baseline 2,400 m performance levels were not different amongst *ACE* genotype groups (Table 1).

**Table 1- Differences amongst *ACE* genotype groups in 2,400 m performance**

<i>ACE</i> II	<i>ACE</i> ID		<i>ACE</i> DD	$\chi^2$	ANOVA P
( $n=31$ )	( $n=86$ )		( $n=69$ )		
Baseline	599.1 ± 33.0	591.9 ± 33.9	601.0 ± 40.3	1.305	0.274
Post-training	541.0 ± 25.4	532.5 ± 28.0	529.6 ± 28.7	1.809	0.167
<b>p (T-test)</b>	0.0001**		0.0001**	0.0001**	
Variation <sup>a</sup> (%)	9.59 ± 3.64	9.94 ± 3.7	-11.6 ± 3.4	6.669	0.02*
*: $p < 0.05$ ; **: $p < 0.01$ ; <sup>a</sup> : $\{[\text{last value/previous value}] - 1\} \times 100$					

All *ACE* genotype groups showed significant improvements in 2,400 m performance after training period as compared to baseline levels ( $p < 0.001$  for all). However, subjects with *ACE* DD genotype had significantly higher enhancement than the ID ( $p < 0.01$ ) and II ( $p < 0.05$ ) genotype groups (Table 1 and 2). Around 2,400 m performance enhancement ratios (variation %) showed a linear trend as *ACE* DD > *ACE* ID > *ACE* II (P value for Pearson  $\chi^2 = 0.461$  and P value for linear by linear association = 0.001).

## Discussion

We have previously reported that, *ACE* D allele may be related with a better performance in short-duration aerobic endurance (2,000 m) in a homogeneous cohort (Cam et al. 2005). and, also found that I allele responses better to medium-duration (30 min) aerobic endurance training (Cam et al. 2006). In this study, we demonstrated that *ACE* DD genotype has an advantage in short-duration aerobic endurance (2,400 m) development in response to training. Thus, it seems that the initiation of the effectiveness of *ACE* I allele in better performances or responses to training in endurance events is somewhere between approximately 10-30 min.

High level of power production,  $VO_{2max}$  and anaerobic capacity is necessary for success in middle distance running performances.  $VO_{2max}$  levels can be sustained 10-12 min (Martin 1990). Since our subjects baseline performances are close to 10 min and post-training performances are better, it suggest that their exertion is at least equal or even higher than  $VO_{2max}$ . Running performances corresponding to  $VO_{2max}$  resulted in 8-12mM blood lactate concentrations (Noakes 1998). Ohkuwa et al. (1984) had shown that mean peak blood lactate levels were 12 mM after an exhaustive 3,000m running in truck and field athletes. Thus, it may be postulated a high anaerobic energy contribution exists in 2,400 m maksimal running performance.

*ACE* D allele is seems related with a higher  $VO_{2max}$  (Rankinen et al. 2000a; Zhao et al. 2003) and superior performance in middle and long distance swimming (Tsianos 2004). *ACE* DD genotype may be associated with a greater skeletal muscle strength gain in response to training (Çolakoğlu et al. 2005; Folland et al. 2000; Hopkinson et al. 2004) and a higher anaerobic capacity (Woods et al. 2004). This genotype is found to be

related to a higher percentage of type –II muscle fibers (Zhang et al. 2003). Middle distance runners (800-3,000 m) have a relatively high percentage (48- 55 %) of fast-twitch fibers (Noakes 1991). Therefore, ACE DD genotype subjects may have an advantage in short-duration aerobic performances that requires high level VO<sub>2</sub>max.

Indeed, recent data have some conflictions on the effectiveness of ACE I/D polymorphism and exercise performance. Besides many research projects revealing that there may be an association between ACE I/D polymorphism and athletic performance, Rankinen et al. (2000b) concluded that there was no relationship between ACE I/D polymorphism and elite athlete status in 192 athletes whose VO<sub>2</sub>max was at least 75 ml kg<sup>-1</sup> min<sup>-1</sup>. Likewise, Taylor et al.(1999) did not find any association between ACE I/D polymorphism and elite athletic performance in achort, composed with both genders. However, they found a trend toward the DD genotype in males but the trend was inconsistent in females. Also, Sonna et al. (2001) have reported that ACE genotype was not strongly related to physical performance in their studies on the effect of training on aerobic power and muscular endurance in 147 healthy US Army recruits of different ethnicity.

## CONCLUSION

ACE DD genotype seems to have an advantage in development in short-duration aerobic performance. There was also a linear trend in performance enhancement as ACE DD > ID > II. This data in unison with the data that we have obtained from homogenous cohorts previously is considered as an existence of threshold for initiation of ACE I allele effectiveness in endurance performance. This threshold may be anywhere between 10 and 30 min lasting maximal exercises.

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**PHYSICAL FITNESS TRAINING AND ITS MAIN FUNCTIONS  
AT THE PRESENT STAGE OF CHINESE SERVICEMEN**

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**ABSTRACT**

As the fundamental basis of the military overall construction, physical fitness training of the serviceman has always been highly strengthened and widely promoted by our headquarters and the whole military. In this paper, we summarize the historical role of physical fitness training of our servicemen, indicate the realistic meaning of physical fitness training of our servicemen and introduce the main functions of physical fitness training of Chinese servicemen.

**Key words:** *Chinese servicemen, physical fitness training, army construction*

**INTRODUCTION**

As the fundamental basis of the military overall construction, physical fitness training of the servicemen has always been highly strengthened and widely promoted by our headquarters and the whole military. No matter in wartime or peacetime, physical fitness training is closely related to the army's overall construction and the implementation of the military responsibility. We can say, with the foundation, development and steady growth of People's Liberation Army of China, physical fitness training of servicemen played a very important historical role, which still maintain realistic meanings nowadays. At the present stage, physical fitness training in our army presents a picture of developing rapidly and steadily.

**1. The historical role of physical fitness training of Chinese servicemen**

It has been more than 80 years since the foundation of People's Liberation Army of China. She has been through all the hard times and constantly made brilliant achievements, through which physical fitness training played its important role.

**(1) In time of war, physical fitness training of our servicemen was one of the very important component parts of our battle effectiveness**

At the original stage of our army (the red army stage), the environment was very tough, what we were facing was not only the stronger enemy and rough life, but also the poor equipment and consecutive wars. Our equipment was mainly the broadsword and spear, sometimes there were little firearms, but the ammunition was insufficient. Facing the powerful enemy, how to keep the strong revolutionary mind and battle effectiveness was an important issue in front of our leaders. For improving the physical fitness standard of red army, in order to adapt to the requirement of launching guerrilla warfare, physical fitness training was widely promoted, and was considered as an effective method to improve the battle capability, which became a very important part of military training at that time. [1] For example, the red army often combined training with mountain climbing, drill exercises, martial arts, bayonet charge and wrestling, which contributed a lot in guerrilla warfare. Accompanying the foundation of the red army and the development of "red sports" in soviet area, physical fitness training has been closely related to the building and development of combat effectiveness. During the anti-Japanese wartime, against the Japanese invaders who was armed to the teeth, physical fitness training being the basis of combat effectiveness was further emphasized and promoted. Chairman Mao Zedong indicated: take exercise, beat Japanese; Zhu De, commander in chief of the Eighth Route Army wrote: improve physical fitness, cultivate warrior spirit. [2] The aim of physical fitness training was strengthened, so did the effect. During the liberation wartime, with the expansion of people's armed forces, and in accordance with the strategy of liberating the whole China, a large scale of military training activities had been promoted in our army, of which physical fitness training was one of the most important part. Through training, not only the physical fitness level and the military skill of the whole PLA got improved, but also the strong will of the officers and soldiers got grounded. Obviously, physical fitness training of servicemen, as one of the important methods of building and improving our battle effectiveness, had significant meaning in Chinese revolutionary history.

**(2) After the foundation of new China, physical fitness training of servicemen became the basis of our army's overall construction**

With the foundation of new China, physical fitness training, as the main demonstration way and content of our army's military sports, has been further established as the basis of army's overall construction. The primary function of training departments at all army levels was the organizing and implementation of physical fitness training, which made a very clear statement in the type of organization. Sports instruction committees should be founded in regiments or units above. Company's military committee should be represented by a sports committee member. It should be mentioned that in 1953, a special institution that cultivated military sports specialists-PLA institute of Physical Education had been founded in our army, which symbolized our army's physical fitness training drive on a path to becoming scientific and systematic, not only in organizing and implementation methods, but also in cultivating physical fitness training specialists. From the 80's, for further ramming the base of our army's overall construction, junior college courses, undergraduate courses and master graduate courses of military sports had been set in PLA institute of Physical Education. From 1998, physical fitness training of servicemen had been defined formally as one of the master graduate courses, which sufficiently proved that our commanding headquarters paid great attention to the important role of physical fitness training in army's overall construction. Although after the foundation of new China, big achievements have been reached in army's construction, the fundamental meaning of physical fitness training of servicemen still plays a positive role in improving overall physical fitness of officers and soldiers, cultivating strong will and function, accelerating the grasp of military skills and tactics, and enhancing the battle effectiveness of the troops.

## **2. The realistic meaning of physical fitness training of servicemen**

It has been the new phase of the new century, in the trend of the world new military revolution, the overall construction of PLA has turned a new page, we had brand new recognition of the realistic role of physical fitness training.

### **(1) The physical fitness of the servicemen is the carrier of battle effectiveness, which makes physical fitness training very important in military education and training**

The rapid development and wide use of the modern scientific technique in military territory produced unpredicted change upon the traditional warfare and battle form. The physical fitness of servicemen has separated from the direct cause of combat effectiveness, no longer the decisive factor of the construction of combat effectiveness. The physical fitness of servicemen is transferring from being the direct component of combat effectiveness to the carrier of putting combat effectiveness into full use, [3] which is the common sense of physical fitness training of servicemen adapting to the new military revolutionary.

But we also should observe that because physical fitness training of servicemen is directly related to the improvement of the physical fitness level of servicemen, it also influences the enhancement of army's overall construction. So, although physical fitness training of servicemen is not directly related to the foundation of the combat effectiveness in wartime any longer, it still is an important component of military training in the new historical condition with basic training role.

### **(2) The physical fitness of the servicemen is important to guarantee non-combat military action, which makes physical fitness training closely related to the implementation of the military responsibility**

As we all know, the Chinese government and people love peace, always devote in maintaining the world peace and our own construction and development. But because china is a developing country, our infrastructure facilities and public service system are not very developed, natural disasters happen frequently so we still depend a lot on manual work in defending them, like Changjiang river flood in 1998, ice and snow disaster in southern china in 2007, Wenchuan earthquake in 2008, all of which shocked the whole world. Our military played an irreplaceable role in fighting against these disasters, in which the high level of physical fitness of our servicemen acted to a great extent. The primary aim of PLA is serving the people, and this also reflects the strong quality and combat effectiveness of Chinese military. So, the servicemen's combat effectiveness is not only for combat actions, but also for non-combat military actions. It is said that "a thousand days training is just for a critical shot". The responsibility of servicemen is to be loyal to his nation and people, they must be there when the nation and the people need them the most. Under the trend of world peace and development, our army's construction and military training are obedient and ready to serve for the nation benefit. So, physical fitness training of servicemen has been closely related to implementing the military responsibility, which is also important to guarantee launching of non-combat military actions.

### **(3) The functions of physical fitness training decide its very positive realistic meaning in the army's overall construction**

Physical fitness training is training of the human body. Physical fitness training of servicemen is plentiful in content and complex in formation, although sometimes full of hardship, and even tests your mental resolve, but also brings the joy and happiness to the trainees in many aspects. So physical fitness training is not only the physical exercise, but also produces the effect on spiritual levels.

Because of its double effect, physical fitness training is beneficial to activating the army's cultural life and improving the spiritual stature. Physical fitness training requires confronting, challenging and defeating yourself; at the same time, physical fitness training strengthens teamwork, as many contents and subjects needs team cooperation, which possesses the quality and common sense of sports of cultivating teamwork sense and building harmony. Above all, because of its functions, physical fitness training played a very positive realistic role in the army's overall construction.

### **3. The main functions of physical fitness training of Chinese servicemen**

Physical fitness training of Chinese servicemen had a long history with abundant accumulation, which resulted from past experience and present situations. At present stage, the main functions are as follows:

#### **(1) Pay attention to standardization**

Physical fitness training of our army pays more attention on system construction. In 1950s, the Chinese government issued the <<Readiness for Labor and Hygiene>>, the trend of reaching the standard of <<Labor and Hygiene System>>was on fire in our army. In 1990, <<The Nation Physical Education and Exercise Standard>>was issued, our institute received the order from the commanding organs to work on the <<The Physical Education and Exercise Standards of servicemen>>, which started the trial implementation in1989, and was officially distributed and implemented by the headquarters of the General Staff and the General Political department in 1994. All the servicemen launched the vigorous activities of reaching the standard of physical education and exercise. In 1999, according to the commands of the headquarters, our institute organized specialist's research on <<The Physical Fitness Standard of Servicemen>>, which was printed and issued in trail version by the headquarters of general staff. Based on continuous modification and improvement, in November 2006, <<The Physical Fitness Standard of Servicemen>>was officially issued by the headquarters of General Staff throughout the army, which became the statutory document for physical fitness training of our army.

#### **(2) Lay emphasis on participation**

According to <<The Physical Fitness Standard of Servicemen>>, physical fitness training of our army ranges from the commanding organs to the grass-roots units and checkpoints; from generals to soldiers, all the officers and soldiers in the army are compelled to take part in physical fitness training and the test. In <<The Physical Fitness Standard of Servicemen>>, it is classified that different subjects and standards should be tested according to different ages. Therefore, physical fitness training of Chinese military troops has been concerned and participated by all the military crew. The activity of meeting the standard of physical fitness training has spread commonly throughout the army.

#### **(3) Put highlight on practicability**

One of the functions of our physical fitness training is to put highlight on practicability, which demonstrates in according to the human body's principle of growth and decline, the <<Standard>>emphasizing on improving the physical fitness or capability of officers and soldiers in order to keep the health level and complete the mission. We put sex and age as reference, scientifically set the training content and test standard. In basic subjects, we place emphasis on training strength, stamina, speed, agility and coordination; in the setting of training events, we stress the simplicity and learn ability of the training events so that it will be more operable for organizing and test; in training effect, we highlight the transformation from technical training to all-around quality training; which strengthens the practical value of physical fitness training and lighten the content of performance and formalization.

#### **(4) In pursuit of scientificity**

The nature of physical fitness training is physical training, which must obey and abide with the basic principle of human movement science. Only through practicing activities and complying with the principle, can we reach the predicted aim and effect, otherwise, training against the principles makes it easy to get unwelcome results. So, in recent years, our army laid emphasis on advancing the scientific nature of the training. In addition to making more efforts on scientifically researching the <<Standard>>, we also pay more attention on the scientific training process. One of the main tasks of our institute is to positively explore the scientific organizing and training method and scientific evaluation of the training effect.

This article is mainly about physical fitness training and its functions in present stage of the Chinese servicemen. We are willing to have a positive communication with all our colleagues from around the world.

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## ABSTRACT

**Introduction:** The effect of arousal / activation on shooting performance is too apparent to ignore. *Arousal* at a particular time has been defined as the energetic state at that time, reflected in electro-dermal activity and measured by skin conductance level; and “task related *activation*” as the change in arousal from a resting baseline to the task situation. The present study, aimed to investigate whether this terminology which was previously substantiated in laboratory tasks, was applicable in terms of behavioral performance in a military pistol shooting task.

**Methods:** A standard Browning pistol was used with elite shooters. Twenty one military elite shooters (mean age= 34 years) voluntarily took part in the study. Skin Conductance Level was recorded as an index of arousal. Activation was calculated by subtracting the level of baseline activity from arousal level. Several performance measures including scores, inter-shot intervals, and the total shooting time, as dependent variables were also electronically recorded.

**Results:** It was found that all performance measures decreased with increasing activation, but not with arousal.

**Discussion:** These findings support previous suggestions concerning the value of conceptualizing *arousal* and *activation* as separable aspects of the energetic of physiological and behavioral functions. The results are discussed in relation to the significance of current hypotheses explaining arousal-performance relationship. Implications for shooting performance are advanced.

**Key words:** *arousal, activation, electro-dermal activity, pistol shooting task, skin conductance level.*

## INTRODUCTION

Skin conductance level (SCL) is a sensitive measure of the tonic modulation of sympathetic activity [1], and the “gold standard” in the measurement of arousal [2]. A recent study with children showed that resting SCL was inversely related to alpha power in the simultaneous eyes-closed EEG, and directly related to alpha frequency [3]. These data, compatible with traditional EEG arousal concepts [4, 5], support the use of SCL as a simple measure of CNS arousal. Studies using functional imaging techniques [6-8], and other animal and human experiments, demonstrate descending cortical and sub-cortical influences on hypothalamic and brainstem mechanisms controlling sympathetic arousal. In particular, the amygdale exerts an influence on autonomic measures including skin conductance activity [9-12]. Lesion and electrical stimulation studies also implicate specific brain regions, including orbitofrontal, cingulate and insular cortices, in generating changes in peripheral autonomic measures [13]. These specific regions have been recognized as associated with emotional and motivational behaviors [7, 14]. Such findings indicate the close association of central and peripheral measures of arousal.

Examination of the literature suggests that arousal/activation affects aspects of performance. For example, early studies reported more than five decades ago, proposed links between performance and arousal/activation level [15, 16]. There are several hypotheses describing the arousal/performance relationship, among them the inverted-U hypothesis of optimal state, which is commonly applied in sport psychology [17]. But the arousal concept has not been particularly influential in psychophysiology. One reason for this is the lack of consistency reported between a range of measures often taken to apply to arousal, such as heart rate and skin conductance level [18-19]. Barry *et al.* considered that another reason was uncertainty arising from poor definition of the terms “arousal” and “activation”, which have often been used interchangeably [20]. Various terminologies that have been used to describe states of attentiveness in the CNS include arousal, alertness, vigilance, and attention. As most terms are used extensively with diverse associations, it seems that none are ideal to describe these cortical states [21].

Following the separation proposed by Pribram and McGuiness [22, 23], Barry *et al.* used “arousal” to refer to the current energetic state, and “activation” to refer to task-related mobilization of arousal [21]. Arousal

generally increases from baseline levels when the individual is engaged in a task, and this change in arousal (from baseline to task) is identified as task-related activation. The construct of “arousal” is always specific to the time of SCL measurement, either resting (“baseline”) or “activated” (during the task), while “activation” always refers to a change in SCL from baseline to task. Barry *et al.* then linked the effects of arousal to phased physiological responses, and related the effects of activation to behaviour/performance measures [21]. They used this conceptual division to study children’s performance in a continuous performance task (CPT). Vaez Mousavi *et al.* in a follow up study [25], and in an across subjects/between trials approach [26] also used this conceptualization to study adults’ performance in a CPT. Using SCL as the index of arousal and its mobilization from the baseline as the index of activation, Barry *et al.* found that performance measures (mean RT and number of errors) was predicted by activation, but not with arousal [21]. Similar finding was reported by Vaez Mousavi Hashemi, and Jalali after examining this idea in a sport shooting task [27]. They concluded that further investigations using arousal and activation as defined separable aspects of energetic function, and examining their effects on skilled behaviour, in terms of sport skills would be of value.

Therefore, the present study was designed to explore this conceptualization in a skilled performance task and with elite military pistol shooters. The hypothesis was that the performance on the shooting task is dependent on the task-relevant activation, but not on arousal. This hypothesis predicts that task-related activation, defined as the change in arousal level from a resting state to the task, will determine behavioural performance, defined in terms of scores, inter-shots interval, and the total shooting duration.

## METHODS

**Participants:** Twenty-one elite pistol shooters, 12 females and 9 males; mean age 34 years, participated in this study. They were all current or previous members of military pistol shooting team.

**Procedure:** After the study was described and written informed consent was obtained, participants performed part of the Standard Pistol Shooting Protocol, using a Browning pistols. Within the first epoch, they shot 15 shots (3\*5) at a target 25 m distant. In the second epoch, which was designed to record the baseline SCL, shooters performed 5 blank shots, obviously without any psychological drive for aiming. The third epoch was the repetition of the first epoch to come up with the total of 30 shots. Electrodermal activity was recorded, using a constant voltage device (UFI Bioderm Model 2701) from 7.5 mm diameter Ag/AgCl electrodes on the medial phalanges of the second and third digits of the participant’s non-preferred hand, at a constant voltage of 0.5 V, with an electrolyte of 0.05 M NaCl in an inert viscous ointment base. Electrodermal activity was sampled continuously at 10 Hz, both in the task and in the baseline. Performance measures, including the score for each shot, time interval between shots, and the total duration of shooting were collected during the task, using the electronic device Sius SA931 (Sius-Ascor).

**Data processing:** Baseline arousal level was derived for each subject as the lowest two-min mean SCL within that period. The mean SCL from the 0.5 s epochs immediately before the shot was taken as the activated arousal level. The difference between these two estimated arousal levels (activated – baseline) was taken as the task-related activation.

**Statistical analysis:** an initial repeated-measure ANOVA was used to test whether there was a significant increase in arousal from the baseline to activated state. Subsequently, simultaneous multiple-regression analysis was used to investigate the relationships hypothesized in the introduction. Three measures were taken as dependent variables: Total Points, inter-shot interval (S), and the total time spent on shooting 30 shots (S). Each of these was regressed on the independent variables – activated arousal level ( $\mu\text{S}$ ), and task-related activation ( $\mu\text{S}$ ) – in separate analyses.

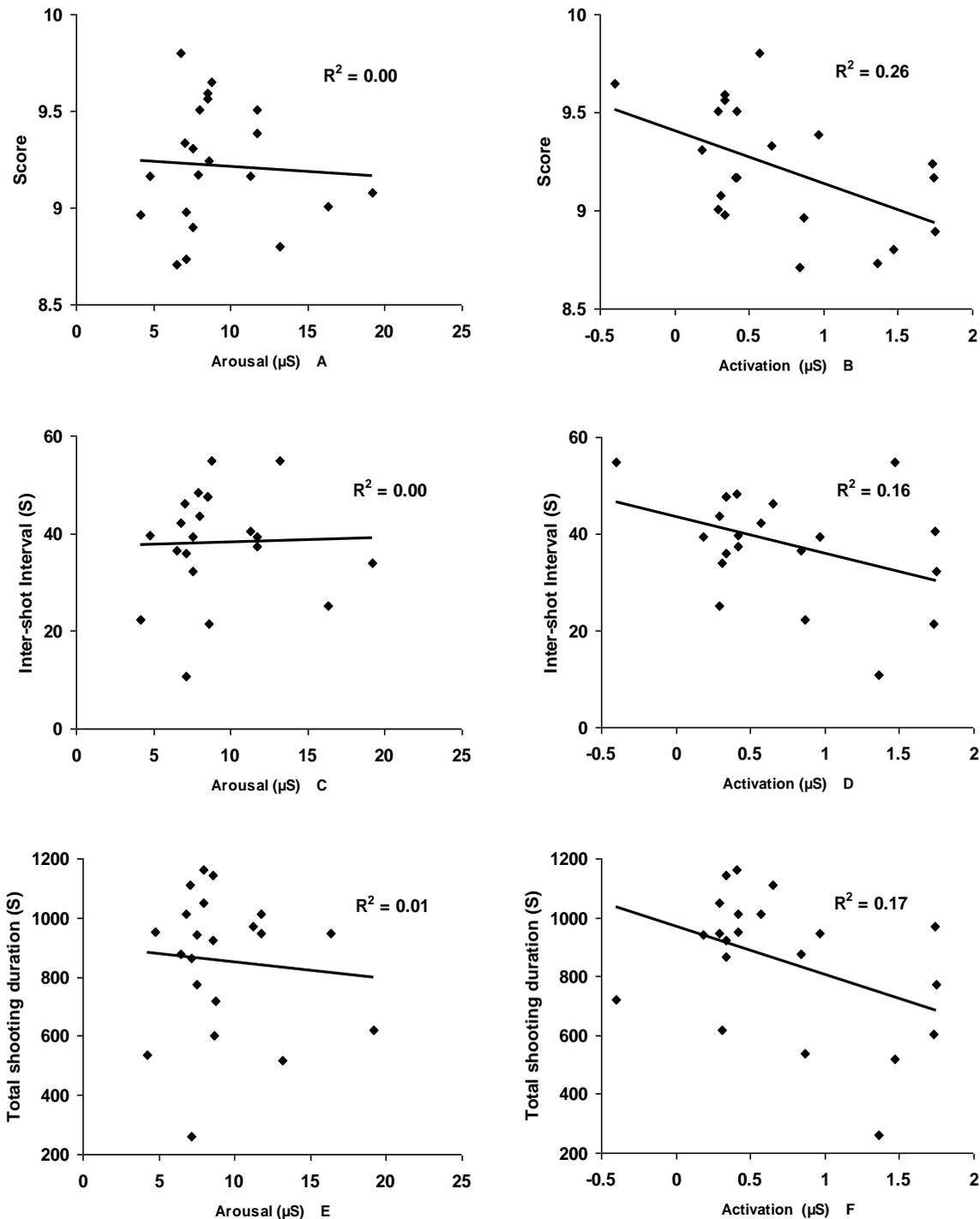
## FINDINGS

**Task related activation:** The overall SCL increased from 7.11  $\mu\text{S}$  in the baseline resting condition to 7.89  $\mu\text{S}$  in the activated task condition. This increase in arousal level was statistically significant ( $F_{1,20}=14.18, P<0.001$ ). As expected, the two within-subject measures of arousal (“baseline” and “activated”) were significantly correlated across participants ( $r=0.97, P<0.001$ ), sharing 94% of their variance. The measure of activation within subjects ranged from .19  $\mu\text{S}$  to 1.75  $\mu\text{S}$ , with a mean of .78  $\mu\text{S}$ .

**Performance:** The final score for each participant are shown in relation to each of the independent variables in different panels of Figure 1. Each set of data has been fitted with a linear regression line to indicate the relationship with the independent variable, and determination coefficient was written to indicate the strength of this relationship. The effect of arousal was not significant ( $F < 1$ , panel A). Panel B shows that shooting scores significantly decrease in higher levels of activation ( $F_{1,17} = 6.961, P < .05$ ), an effect explaining some 26% of the variance and .509 correlation in these measures. In panel C and D, the inter-shot interval is drawn in relation to

arousal and activation. There is no effect of arousal in panel C ( $F < 1$ ), while the effect of activation approached significance ( $F_{1,17} = 4.83, P = .072$ ), which explains some of the 16% of variance in these measures. In panel E and F, the total duration for spent to shoot is drawn in relation to arousal and activation. The total time of shooting was not significantly affected by arousal ( $F < 1$ ), but approached significance as an effect of activation ( $F_{1,17} = 5.012, P = .062$ ). An effect explaining 17% variance and  $-.42$  correlations between measures.

**Figure 1.** Dependant variables of the study, score, inter-shot interval, and the total shooting duration are drawn in relation to arousal and activation. In each panel, a line of best fit shows the relationship and determination coefficient shows the strength of that relation.



**DISCUSSION**

The overall increase in arousal level from the baseline to the shooting task supports the concept of task related activation and the use of the arousal change as its measure, since the overall increase in arousal level from the baseline to the shooting situation was significant.

Unlike several previous reports [21, 25], we didn't find any negative level of activation in our participants; this means all of our participants showed a task-related increase in arousal from the baseline to the task condition. The negative activation was previously attributed to either subject's preliminary experimental anxiety [21], or to the insufficiency of the baseline recording period [25]. Therefore, previous studies [23] suggested that future attempts to explore the arousal/activation conceptualization should ensure a longer period of rest before estimating the baseline level. In the present study we used a long enough period of time for recording the baseline activity. This is even longer than the periods Del-Ben *et al.* and Moya-Albiol *et al.* used in their studies [28, 29]. Therefore, no cause was present for obtaining negative level of activation.

The measure of task-related activation was found to determine behavioral efficiency in terms of score and other performance measures which ultimately lead to a higher performance. Current arousal level did not affect performance. These results provide significant support for our previous findings [25, 26] and our hypotheses in the present study.

The overall findings of the present study indicate that arousal and activation can be conceptually separated – the former as the energetic state at a particular time, and the latter as the change from a resting baseline to the task situation. We found that current arousal level did not affect behavioral measures in the task. In contrast, activation in the task affected all five measures of behavior in the task. These findings support the previous arousal/activation findings [21]. The important effects in this study were of parallel strength, with the significant  $r^2$  values ranging from 0.16 to 0.26.

Although previous studies provided evidence for differentiation of arousal and activation in laboratory tasks [21, 28, and 29], the present findings supports the application of these separate concepts in a sport task. Each subject provided one data point in each panel of Figures 1, and hence the study can be thought of as examining individual differences in state measures, and the effects of these differences on behavioral performance outcomes. Future studies in this area could usefully explore these relationships on a within-subject basis.

The overall results of the present study verify previous findings concerning differentiation of the energetic dimension into “arousal” and “activation”. Task-related activation affects behavioural performance in a shooting task, while arousal does not. The importance of this separation is that it may be useful in modifying and refining the conventional understanding of the role of the energetic dimension in physiological and behavioural performance. Pursuing this line of investigation in terms of individual differences in skilled performance, could be fruitful. The present results may gradually find their applications in training sessions, as well as talent identifications for pistol shooting.

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## **ABSTRACT**

### **Introduction**

Sporty performance is not only dependent on corporality and training conditions. In actual fact psychological processes affect them in a variety of ways.

From there it's essential to know the theoretical fundament which based on the adequate psychological methods to advice athletes effective and promising.

### **Configuration of actions**

For creating suitable sport psychological intervention it is necessary and useful to understand the complex structure of activities. It is an interaction of different connected factors. It seems like opaque and difficult. But by a closer view it is very easy and simple.

It's a network, composed of emotional and motivated person, the motor and mental task and finally the material and social environment.

On closer examination of this complex it follows varied indications and starting-points for analyzing mental problems and for formulation appropriate interventions.

### **Triad Phases of actions**

On the other way every activity is structured systematically. To know and to understand the linkage between the components and the structure of the activities is very helpful on the one hand to make the individual sequences of sport explainable and otherwise it's useful to find the right starting points for a mental training.

## **INTRODUCTION**

### **Performance Requirements**

Performance in sport is not only determined by physical attributes and fitness, but in a wide variety of way by mental processes such as attitude and expectation.

Sporting activities are not the result of a simple „relationship between a stimulus and a response”, but rather a complex form of behaviour under a host of different environmental conditions. This is why sporting activity must be considered holistically as a system process that encompasses the following elements:

- the functional link between the person involved and the environment,
- what the person involved experiences inwardly and what he does outwardly, and
- mental and somatic processes.

Ultimately, a person's subjective assessment of demands and the possibilities he has of meeting them impair his chances of performing to potential considerably.

In this presentation, I shall try to explain the matter of sporting activity in a way that allows the processes that take place to be described and elucidated, with the aim of developing well-founded measures to optimize sporting activities.

### **The structure of the activity**

#### **The Components of the Activity Situation**

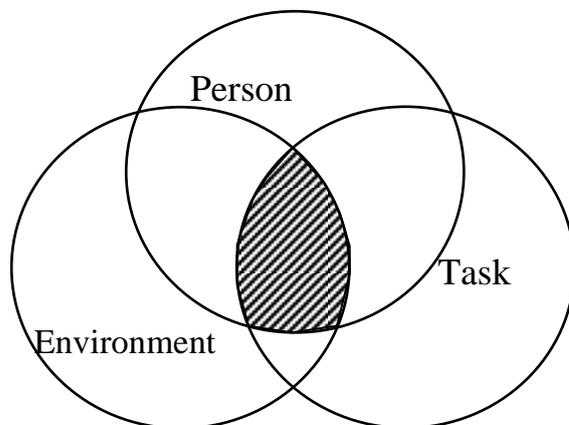
The primary concern in sports psychology is to optimize performance, that is to say, to improve

- a person's level of performance by enhancing his fitness, commitment and resilience (resistance, recovery ability),
- his relations with his social environment and
- Organizational structures and procedures in sport on the one hand and the material conditions on the other.

The intervention necessary for this can only be effective if all the facets of a sporting activity concerned are understood and analyzed. This may seem unclear and complicated at first glance, but if you look at it more closely, it can in the end be defined as simple and systematic.

Every activity situation is easy to structure and explain by using the three interrelated components involved: the person, the task and the environment (Nitsch & Munzert, 1977). This provides suitable access for a situation analysis.

**Fig. 1:** Basic Components of the Activity Situation according to Nitsch & Munzert (1997)



This interrelationship (Fig. 1) results, on the one hand, from the agent, who acts in accordance with his emotions and motivation and so rates the activities on the basis of his personal abilities and his interest in them. This means that activities are rated on the basis of the extent to which they evoke positive emotions such as pleasure and confidence or negative ones such as fear or annoyance. They are also rated on the basis of the motivation that prevails for carrying out an activity, for instance, success, recognition, health or social security.

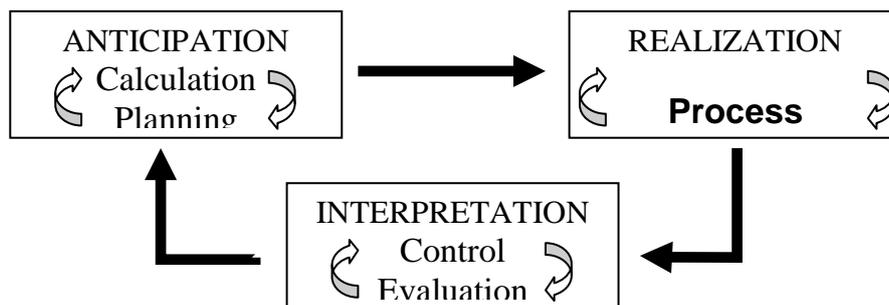
On the other hand, the agent considers the motoric and mental tasks he has to accomplish, which he rates on the basis of their attractiveness and ease with which they can be performed. He can render these challenges manageable and controllable by assessing the possibilities he has of mastering them and devising cognitive and motoric programmes for them. This becomes a key building block for accepting challenges and dealing with them with confidence.

Finally, the social and material environment plays a decisive part in this context, providing openings and suggestions for certain actions and activities. The reactions of spectators, trainers, friends and members of his family, team mates or opponents, the media and sponsors can have an influence on how a person goes about a sporting activity, either stimulating him, helping him to keep going, boosting him or hindering him. Above and beyond that, so-called material conditions prompt people to engage in sporting activities. For example, certain training and competition conditions (sports grounds and sports facilities, the weather, the equipment used in competition, etc.) can be a help or a hindrance or have a disruptive impact on them.

**The Phases of the Activity**

Following this explanation of the basic and interdependent or joint factors that influence an activity, I shall now take a closer look at the phases in which an activity is carried out and define them as a systematic model process (Fig. 2).

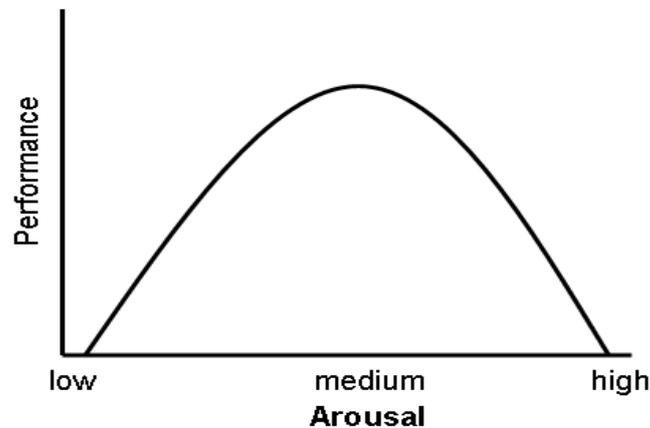
**Fig. 2** Phases of the Triadic Structure according to Nitsch (1986)



Every conscious action starts with it being anticipated. This phase is therefore called the ANTICIPATION phase. It involves a planning process being set in motion in which ideas, including resolutions and expectations, are developed. Two other steps that are taken in this phase are the definition of the aim, including the likelihood with which it can be achieved, and an assessment of the starting situation and possible consequences.

The primary concern in the REALIZATION phase that follows is to carry out the action and execute the plans developed in the previous phase. The process that plays a decisive role in this is the general appropriate psychophysical regulation. What is meant by this is the optimum functionality, which primarily entails arousal and tension control. The link between the level of arousal and the quality of performance was established by Yerkes and Dodson back in 1908, who discovered that a person must achieve a medium level of arousal to perform as well as possible (Fig. 3).

**Fig. 3** Link between level of arousal and quality of performance, Yerkes & Dodson (1908)



Furthermore, the so-called process regulation initiates the application of the complex plan systems with their sensomotoric processes and goes through them step by step by processing relevant information and control pulses.

The final phase of an action is the INTERPRETATION phase, in which a comparison is made between the action that was intended to be taken and the action that was taken and the result it yielded, while a subjective assessment is made to explain the processes that have taken place and the consequences of the action.

## CONCLUSION

The use of sport psychology to achieve effective practical intervention demands a scientific basis. The exemplary and systematic view of activity in general I have just presented can be used to draw up both instructions and guidelines for sporting activities. This applies not only to the optimization of action in competitive sport, but also to activities in health sport such as adiposity courses or coronary rehabilitation measures and sports counselling and personal coaching in leisure and mass sports.

I would like to conclude by remarking that irrespective of the field in which sport psychology is applied, it should ideally be applied on an interdisciplinary basis. This means that anyone considering counselling and intending to use intervention should discuss the matter with other people such as doctors, trainers and, possibly, members of their family, before taking recourse to such measures.

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**ABSTRACT**

In conjunction with the release of the Canadian Forces Health and Fitness Strategy in 2008, four research teams were constituted to develop environment-specific fitness standards for each of Navy, Army, Air Force and Special Operations Forces. Given the Canadian legal context dealing with Human Rights and Employer Discrimination, the development of these standards is an intricate and detailed process involving extensive task analyses in order to select representative tasks, as well as the use of various sources of information in setting performance standards. Such standards are developed in a way to satisfy the criteria of a Bona Fide Occupational Requirement in a court of law. In order to develop fitness standards which are fully representative of the common, critical and physically demanding tasks in operations, the following general steps are followed: populating a project management team, job familiarization, physical demands analysis, developing a representative subset of essential physically demanding tasks, characterization of tasks, development and standardization of test protocol, establishing scientific accuracy of test protocol, developing performance standards and evaluating any adverse impacts, implementing the test protocol and reviewing issues. The methods rely heavily on surveys, focus groups with military subject matter experts as well as in-field assessment of biomechanics and physiological responses to work. The information obtained from the task analysis is also used to develop physical fitness training programs to help ensure maximal operational performance at all stages of the deployment cycle. This paper will detail the steps involved in this multi-year process, drawing on examples from past and present research projects to highlight physiological, methodological, legal and implementation dimensions of occupational fitness testing in the Canadian military.

**INTRODUCTION**

Canadian Forces (CF) members must be physically fit to meet military operational requirements, to perform under a wide range of geographical and environmental conditions, to cope with the stresses of sustained operations, and be ready to respond on short notice. Thus, physical fitness training forms an important part of the CF physical education programme. All members of the CF are expected to achieve and maintain levels of physical fitness which will enable them to perform their normal duties with maximum efficiency; keep them prepared to meet any emergency that may require them to perform effectively under adverse conditions for a prolonged period of time; and contribute to the maintenance of their health. The necessary high levels of physical fitness required by Canadian Forces members can only be achieved through physical fitness training programs.

**Research and development of physical fitness programs**

Physical fitness training programs in the CF are developed based upon the results of task and physical demand analyses conducted during the research and development of operationally relevant physical fitness standards. During task analyses, the following measurements are taken: (i) weights of all equipment used on the job; (ii) heights equipment is lifted; (iii) distances equipment is moved; (iv) time required to complete all tasks; and (v) weight of gear worn by military personnel. During physical demand analyses, the physiological responses (heart rate, energy expenditure, oxygen uptake) and the perceived exertion of military personnel while they are performing their job tasks are documented. This information is then utilized to form the basis (frequency,

intensity, type and time) of physical fitness training programs. This process ensures a scientific linkage between physical fitness standards and supporting physical fitness training programs.

### **Levels of CF physical fitness programs**

There are three levels of physical fitness programs in the CF: (i) General; (ii) Environmental, and (iii) Occupation specific. General physical fitness programs ensure that all CF members are provided with an exercise prescription tailored to their individual needs and fitness test results. Environmental and Occupation specific physical fitness programs ensure that Navy, Army, and Air Force personnel, as well as members of specialized Occupations or Units, such as Fire Fighters and Special Operations Forces, are provided with operationally relevant physical fitness training. Within each of these different levels of programming, there are physical, functional, and operational training modalities. Physical training modalities include individual and collective programs comprised of traditional training methods such as running, cycling, swimming, circuit training etcetera. Functional training is comprised of multi-joint movements that are reflective of movements on the job, and can be conducted in traditional gymnasiums or fitness facilities and in austere conditions. Operational physical fitness training is comprised of tasks that are performed on the job, and is typically performed in the gear worn by military personnel

## **GENERAL PHYSICAL FITNESS PROGRAMS**

### **Canadian Forces Exercise Prescription (CF EXPRES) Program**

It is a mandatory military requirement that members participate in the Canadian Forces Exercise Prescription (CF EXPRES) Program, which is comprised of a preliminary medical screen, a physical fitness evaluation, an exercise prescription tailored to the individual's needs, the development of the necessary skills and knowledge to enable the member to participate effectively in the prescribed physical fitness programs, and regular participation in physical fitness activities in which the member can monitor and control frequency, duration, intensity and rate of progression. Guidelines for safe and progressive physical fitness training are detailed in CF EXPRES Program Guides. CF EXPRES Program Guides have been developed for muscular strength and endurance, walking, stationary cycling, swimming, rope skipping, cycling, jogging, cross-country skiing, skating, and snow-shoeing, and are provided to CF members upon completion of the evaluation portion of the program.

### **Soldier On Program**

The CF is committed to helping ill and injured members. The CF Soldier On Program was formalized in 2007 to contribute to optimizing the functional independence of CF personnel with a physical or psychological disability by delivering services that support their full and active participation in physical activity, recreation or sports. The Soldier On program provides the resources and opportunities for ill and injured military personnel to fully and actively participate in physical fitness, health and sports activities. The program is also aimed at accentuating the potential and value of injured/ill CF personnel rather than their disability.

### **Pregnancy and Exercise**

While the CF has developed a number of excellent fitness programs, none of them were designed to accommodate the special needs of the active pregnant woman. To this end, a fitness maintenance program specifically for pregnant women was designed with the health of safety of the CF member and her baby in mind. The *Guide to Fitness: during and after Pregnancy in the CF* (Wolski & Wenger 2003) is a resource available to CF women to assist them in maintaining some of their fitness levels during pregnancy.

## **ENVIRONMENTAL PHYSICAL FITNESS PROGRAMS**

### **Army Physical Fitness Programs**

The *Army Fitness Manual* (Wenger, 2005) is a 12-week Army Fitness Program designed to assist soldiers in achieving the levels of fitness required to complete the Army Fitness Standard. This program is a balanced and progressive, and is designed to develop all fitness components. In addition to the 12-week program, the *Army*

*Fitness Manual* contained specialty training programs such as an eight-week Garrison program, a six-week rapid deployment program, a three-week rapid deployment program, and a four-week field training program.

### **Combat Fitness Program**

Combat fitness conditioning encompasses special exercises designed to keep the trained soldier in top physical condition, which is one of the components of total readiness for service in field units and in a theatre of operations. The *Combat Fitness Program* (CFP) provides a more functional and intense physical fitness program option for CF personnel, and may best be described as a progression from the standardized *Army Fitness Manual*. The CFP derived its origins from many different training methods, and the program workouts are comprised of metabolic conditioning, gymnastic and body weight exercises, and weightlifting, power-lifting, and Olympic lifting training modalities.

### **Force Generation Fitness Programs**

To complement existing physical fitness programs, a new physical fitness program for the Navy, Air Force and Army environments is being developed in conjunction with the Environment-specific fitness standards as part of the CF Health and Fitness strategy. This program is based on the Force Generation Cycle of deployment, regeneration, individual training, collective training, and pre-deployment training. During the Force Generation Cycle, physical, functional, and operational training modalities are periodized. Specifically, during the regeneration phase of the Force Generation Cycle, this tactical athlete program is geared toward Physical training modalities. As a member moves through the Force Generation Cycle, functional and operational training modalities are incorporated, and during the pre-deployment phase of the Force Generation Cycle, functional and operational training become the primary training modalities.

## **OCCUPATION AND SPECIALTY SPECIFIC PROGRAMS**

There is a number of physically demanding CF occupations or specialties that have researched physical fitness standards that exceed the minimum CF requirements for physical fitness. To assist members of these physically demanding occupations and/or specialties to achieve the requisite levels of fitness for the safe, effective and efficient performance of their job, specialized fitness programs have been developed.

### **CF Fire Fighters**

Fire fighting is universally recognized as one of the most hazardous and physically demanding occupations. To ensure that all CF fire fighters have an adequate level of physical fitness, the Fire Fighter Physical Fitness Maintenance Program was introduced. This program is comprised of a task-based evaluation, a supporting fitness program, and educational resource materials. *Fighting Fire with Fitness* is a 12-week performance related fitness training program designed to assist CF fire fighters in achieving or exceeding the fitness levels required for the performance of professional fire fighter duties.

### **Special Operations Forces**

Joint Task Force Two (JTF 2) is the CF Special Operations Forces (SOF) Unit responsible for counter-terrorism operations. The physical demands of Special Operations require that members have excellent levels of physical fitness and an uncommonly high degree of determination to overcome physical and mental challenges. The JTF 2 Pre-Selection Physical Fitness Training Program (Jaenen, Wenger, Lee, Couturier & Salmon, 2004) is a strenuous 12-week program designed to bring SOF applicants to an elite level of fitness that is commensurate with the levels of fitness required for completion of the rigorous selection and training processes. Due to the strenuous nature of this fitness training program, personnel undertaking this program are strongly encouraged to first complete the training outlined in the *Army Fitness Manual*.

### **Core Training Manual for Deployed Operations**

Core strength training is an important component of CF SOF physical fitness training. The Core Training Manual for Deployed Operations was developed to provide SOF members with a program for maintaining core

strength while deployed. The program is designed to be completed in austere conditions with little or no equipment.

## **CONCLUSION**

Whether in peace or at war, members of the CF are expected to maintain a constant state of readiness in order to respond to any emergency situation which might arise and which would require them to perform effectively for prolonged periods of time under considerable physical and mental stress. The CF benefits significantly from a wide range of physical fitness programs that assist members in maintaining operational readiness.

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## CISM International Symposium 2009



### 3<sup>rd</sup> SESSION

Physical test: armed forces, fertile universe for  
scientific researches

Sunday, 20<sup>th</sup> September 2009

From 08:30

To 11:30





**Prof. Heikki Arimo Kyröläinen, PhD (FIN)**

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## **ACADEMIC FORMATION**

- 1987** MSc in Biomechanics and Exercise Physiology at the University of Jyväskylä, Finland
- 1991** Licentiate of Philosophy in Exercise Physiology and Biomechanics, Finland
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## **WORK EXPERIENCE**

Adjunct Professor in Exercise Physiology at the National Defence University, Helsinki;

Head of Pedagogy in the Department of Biology of Physiology;

Lecturer, Researcher Assistant;

Head Coach of Finnish long jumpers;

Vice-chair in the English Master's Degree Programme in the Biology of Physical Activity, Department of Biology of Physical Activity;

Bibliography: 78 original articles, 128 proceedings or abstracts; supervised 36 master theses and 82 bachelor theses;

Head of many research projects;

## **CURRENT FUNCTION**

Professor in Exercise Physiology, Department of Biology of Physical Activity, University of Jyväskylä, Finland, since 01.01.2009



**AEROBIC AND NEUROMUSCULAR TESTS ARE REQUIRED IN EVALUATING THEIR  
PHYSICAL PERFORMANCE OF SOLDIERS IN OPERATIONS**

**Prof. Heikki Kyröläinen PhD<sup>1,2</sup>**  
**Prof. Matti Santtila<sup>3</sup>**

<sup>1</sup>*National Defense University, Helsinki, Finland*

<sup>2</sup>*Department of Biology of Physical Activity, University of Jyväskylä, Finland*

<sup>3</sup>*Training Division of Defense Command, Helsinki, Finland.*

**ABSTRACT**

Good levels of both aerobic and neuromuscular fitness are of great importance in order to ensure sufficient physical performance of soldiers. However, it is well-known that physical fitness, especially, cardiovascular fitness of adolescents has decreased by 8-12 % during the last 2-3 decades (e.g. Dyrstad et al. 2005; Santtila et al. 2006; Knapik et al. 2006). Leyk et al. (2006) have studied more than 58000 applicants for the German Bundeswehr. They have found that failure rates of the male volunteers had significantly increased since 2001 and more than 37 % of the participants failed to pass the PFT. Changes in neuromuscular fitness seem, however, to be controversy. Knapik et al. (2006) have reviewed that muscle strength has increased among US Army recruits between 1978 and 1998. In a population-based study, muscle fitness has decreased but later than aerobic fitness (Santtila et al. 2006). In the present study, we have compared laboratory and field tests performed in military environment. Direct bicycle ergometer or treadmill running tests have been used as golden standard measurements of maximal aerobic capacity (peakVO<sub>2</sub> or VO<sub>2</sub>max), while predicted VO<sub>2</sub>max measurements are based on the assumption that there is a linear relationship between heart rate and VO<sub>2</sub> (Åstrand et al. 1954). On the other hand, muscle strength and endurance are also important factors in many activities of soldiers. In our VO<sub>2</sub>max studies by a bicycle ergometer, the initial work load was 50 W. It was increased by 25 W every second minute until exhaustion (MILFIT/FitWare, AinoActive Oy, Helsinki, Finland). VO<sub>2</sub> was measured continuously using a gas analyzer (SensorMedics, Yorba Linda, California, USA). Heart rate was recorded continuously by a heart rate monitor (Polar Electro, Kempele, Finland). In neuromuscular tests, bilateral isometric maximal strength of the arm and leg extensors, grip strength, and muscle endurance (recording of the number of repetitions in one-minute push-up, sit-up and squat actions) were utilized.

VO<sub>2</sub>max measured indirectly and directly correlated significantly ( $r=0.80-0.84$ ,  $p<0.001$ ) with each other. The absolute and relative differences between the methods varied from -0.4 to 1.3 ml·kg<sup>-1</sup>·min<sup>-1</sup> and from 0.9 to 2.7 %, respectively. Significant correlations were also found between maximal strength of the arm extensors and repeated push-ups ( $r = 0.58$ ,  $p < 0.001$ ) as well as between repeated squats and VO<sub>2</sub>max ( $r = 0.55$ ,  $p < 0.001$ ). No significant relationships were observed between maximal isometric strength of the arm or leg extensors and that of VO<sub>2</sub>max. The present predicted VO<sub>2</sub>max measurements only slightly over- or underestimated the VO<sub>2</sub>max values of the direct measurements. Therefore, it can be concluded that our protocol is fairly accurate and valid to predict VO<sub>2</sub>max values in male subjects. Nevertheless, in a large group of subjects with great interindividual variation in physical fitness, the muscle endurance tests such as push-ups, sit-ups and repeated seem to measure not only the level of muscle endurance, but also to some extent that of maximal strength. The relationship between maximal strength and muscle endurance was found in push-ups but not in repeated squats. However, the performance in repeated squats was related with VO<sub>2</sub>max, whereas that of push-ups did not. In conclusion, the present muscle fitness tests seem to measure rather well the overall fitness profile of soldiers, and the contributive role of maximal strength could be identified for the arm but not for leg extensor muscles.

**INTRODUCTION**

Good levels of both aerobic and neuromuscular fitness are of great importance in order to ensure sufficient physical performance of soldiers. However, it is well-known that physical fitness, especially, cardiovascular fitness

of adolescents has decreased by 8-12 % during the last 2-3 decades (e.g. Dyrstad et al. 2005; Santtila et al. 2006; Knapik et al. 2006). Leyk et al. (2006) have studied more than 58000 applicants for the German Bundeswehr.

They have found that failure rates of the male volunteers had significantly increased since 2001 and more than 37 % of the participants failed to pass the physical fitness tests (PFT). Changes in neuromuscular fitness seem, however, to be controversy. Knapik et al. (2006) have reviewed that muscle strength has increased among US Army recruits between 1978 and 1998. However, in a population-based study, muscle fitness has decreased but later than aerobic fitness (Santtila et al. 2006).

The decreasing trend in physical fitness together with simultaneously increasing body fat is one of the greatest threats for public health as a whole. These developmental trends are particularly prominent among young people. Existing data shows that physical activity levels decrease during the teenage years and young adulthood, while the prevalence of inactivity increases (Leslie et al. 2001). Changes in social environments are often cited as explanatory factors for decreased physical activity among young people. For example, TV viewing has been shown to be significantly associated with obesity and decreased physical activity (Sidney et al. 1996). Furthermore, within the early years of adulthood, significant changes in life circumstances and social-economical background may strongly affect physical activity patterns (Leslie et al. 2001). On the other hand, work-related demands have changed dramatically, which definitely has an impact on physical fitness. A positive association has been found between heavy physical work and a high level of fitness in young workers. More specifically, better cardiorespiratory fitness, handgrip strength, and trunk muscle endurance have been observed among men doing heavy physical work compared to those doing lighter work (Tammelin et al. 2002).

As a consequence of a reduced amount of physical activity (occupational, household and leisure time activities) combined with a hypercaloric diet, increasing numbers of overweight and obese individuals, especially among children and teenagers, exist worldwide (Rocchini, 2002; Reilly et al. 2004). In the United States, the prevalence of obesity has nearly doubled in the 1990s (Weinstein et al. 2004), while at the same time the prevalence of type 2 diabetes and other obesity-related diseases has dramatically increased (Patrick et al. 2004). The soldiers are recruiting from this same population of the youth. Therefore, the importance of physical fitness tests has increased while selecting capable soldiers, especially, for special forces. In the present study, we have compared laboratory and field tests performed in military environment.

## **METHODS**

The conscripts (n=68) and reservists (n=783) volunteered to participate in the present study. Direct bicycle ergometer or treadmill running tests have been used as golden standard measurements of maximal aerobic capacity (peakVO<sub>2</sub> or VO<sub>2</sub>max), while predicted VO<sub>2</sub>max measurements are based on the assumption that there is a linear relationship between heart rate and VO<sub>2</sub> (Åstrand et al. 1954). In our VO<sub>2</sub>max studies by a bicycle ergometer, the initial work load was 50 W. It was increased by 25 W every second minute until exhaustion (MILFIT/FitWare, AinoActive Oy, Helsinki, Finland). VO<sub>2</sub> was measured continuously using a gas analyzer (SensorMedics, Yorba Linda, California, USA) (Figure 1). Heart rate was recorded continuously by a heart rate monitor (Polar Electro, Kempele, Finland).

Furthermore, muscle strength and endurance are also important factors in many daily activities of soldiers. In the present neuromuscular tests, bilateral isometric maximal strength of the arm and leg extensors, grip strength, and muscle endurance (recording of the number of repetitions in one-minute push-up, sit-up and squat actions) were utilized (see Figure 1).

**Figure 1.** Maximal oxygen bicycle ergometer test (left), bilateral isometric strength test for the arm extensor muscles (middle), and push-up test (right).

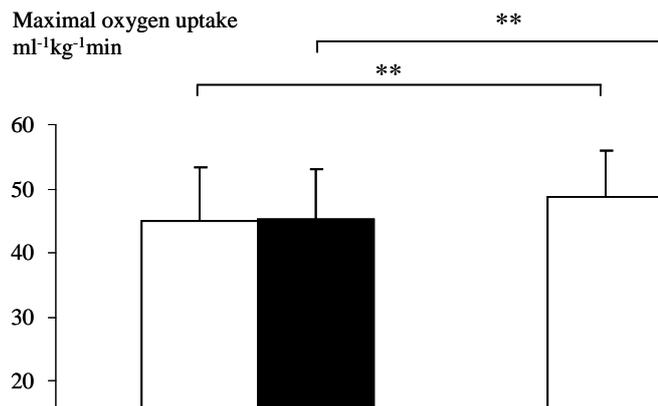


**RESULTS**

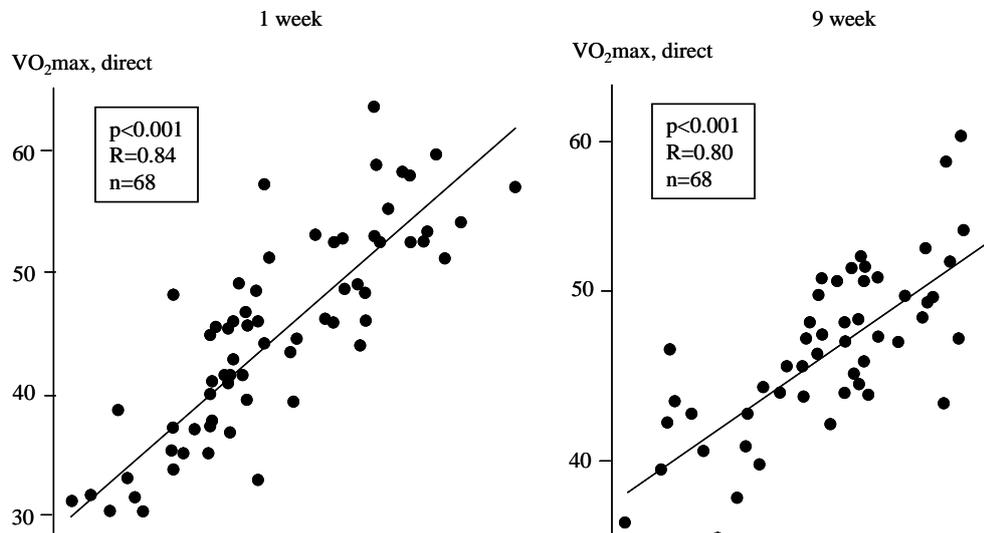
Figure 2 demonstrates that in the first tests, the predicted mean ( $\pm$ SD)  $VO_{2max}$  value was  $45.2 \pm 7.7$  ml·kg<sup>-1</sup>·min<sup>-1</sup>, while the direct value was  $44.8 \pm 8.5$  ml·kg<sup>-1</sup>·min<sup>-1</sup>. The absolute and relative differences between the methods were  $-0.42$  ml·kg<sup>-1</sup>·min<sup>-1</sup> ( $p=0.46$ ) and  $0.9\%$ , respectively. In the second test the predicted and direct  $VO_{2max}$  values were  $47.4 \pm 6.7$  ml·kg<sup>-1</sup>·min<sup>-1</sup> and  $48.7 \pm 7.3$  ml·kg<sup>-1</sup>·min<sup>-1</sup>. The absolute and relative differences between the methods were  $1.28$  ml·kg<sup>-1</sup>·min<sup>-1</sup> ( $p<0.05$ ) and  $2.7\%$ , respectively.  $VO_{2max}$  measured indirectly and directly correlated significantly ( $r=0.80-0.84$ ,  $p<0.001$ ) with each other (Figure 3).

The mean ( $\pm$ SD) maximal bilateral isometric strength for the leg extensors was  $2917 \pm 878$  N and for the arm extensors  $898 \pm 201$  N. Respectively, the mean ( $\pm$ SD) number of sit-ups was  $38 \pm 10$ , push-ups  $29 \pm 13$ , and repeated squats  $44 \pm 9$  repetitions per minute. Significant correlations were found between maximal strength of the arm extensors and repeated push-ups ( $r = 0.58$ ,  $p < 0.001$ ) as well as between repeated squats and  $VO_{2max}$  ( $r = 0.55$ ,  $p < 0.001$ ). No significant relationships were observed between maximal isometric strength of the arm or leg extensors and that of  $VO_{2max}$ .

**Figure 2.** Maximal oxygen uptake measured by direct bicycle ergometer (white bar) and predicted MILFIT protocol (black bar) during the first and ninth training weeks (\*  $p<0.05$ ) including changes in  $VO_{2max}$  with barrier line (\*\* $p<0.01$ ).



**Figure 3.** Relationship between the direct maximal oxygen uptake ( $VO_{2max}$ ) and predicted maximal oxygen uptake (MILFIT,  $VO_{2max}$ ) during the first and ninth week bicycle ergometer tests.



## DISCUSSION

The present predicted  $VO_{2max}$  measurements only slightly over- or underestimated the  $VO_{2max}$  values of the direct measurements. Therefore, it can be concluded that our protocol is fairly accurate and valid to predict  $VO_{2max}$  values in male subjects. Nevertheless, in a large group of subjects with great interindividual variation in physical fitness, the muscle endurance tests such as push-ups, sit-ups and repeated squats seem to measure not only the level of muscle endurance, but also to some extent that of maximal strength. The relationship between maximal strength and muscle endurance was found in push-ups but not in repeated squats. However, the performance in repeated squats was related with  $VO_{2max}$ , whereas that of push-ups did not. In conclusion, the present muscle fitness tests seem to measure rather well the overall fitness profile of soldiers, and the contributive role of maximal strength could be identified for the arm but not for leg extensor muscles.

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**Prof. Damir Karpljuk, PhD (SLO)**

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## **ACADEMIC FORMATION**

- 1994** BSc University of Ljubljana, Slovenia  
**1996** MSc University of Ljubljana, Slovenia  
**1999** PhD University of Ljubljana, Slovenia  
Post doctoral experience (Associated Professor)

## **WORK EXPERIENCE**

Research and paper work on “Military aviation personnel selection” and “The relationships between test, measurement and evaluation in human performance”(2009).

Bibliography: over 600 units

Research Subjects: didactics of sports education, health education, combat sports, army, motor abilities of school and preschool children, drug addicts, asthmatics, epileptics, diabetes, osteoporosis, mentally and behaviourally disturbed.

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**Prof. Damir Karpljuk, PhD<sup>1</sup>**  
**Prof. Maja Meško, PhD<sup>2</sup>**  
**Prof. Mateja Videmšek, PhD<sup>1</sup>**  
**Lieutenant Colonel Suzana Tkavc, MSc<sup>3</sup>**

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## **ABSTRACT**

The nature of work in military organizations involves a high degree of responsibility as it is to do with human lives. Therefore, the importance of an appropriate candidate selection is of utmost importance. In our study, we aimed to determine which tests differentiate Slovene military pilots from the control groups, and produced a profile of a military pilot. The sample consisted of 120 participants, 30 of whom were in the experimental group while the other 90 were in the control group. The experimental group included military pilots and the control groups included the general population, sport pilots and soldiers with no relationship with connection to aviation.

The participants in this research completed the personality inventory (BFQ) and Coping Responses Inventory (CRI) in a classroom, all motor tests and Complex Reactionmeter Drenovac (CRD) tests were performed in the gym. The statistical analysis, which was based on the discriminated analysis, identified statistically significant differences between the Slovene military pilots and the control groups.

The results showed that military pilots use strategies focused on a problem and that they cope with problem situations effectively. Slovene military pilots are also very emotionally stable and outstandingly extraverted with a greater desire for achieving goals and a greater tendency towards activity.

**Key words:** *Slovene military pilots, sport pilots, soldiers.*

## **INTRODUCTION**

### **Military pilot selection**

The nature of work in military organizations involves a high degree of responsibility as it is to do with human lives. Therefore, the importance of an appropriate candidate selection is of utmost importance. The need for a professional approach to candidate selection was expressed or perceived as early as in World War I. Implementing the selection process, military institutions motivated psychology experts to cooperate with them in this process. »Army Alfa« and »Army Beta« tests were applied to almost two million soldiers, however, these activities had no direct impact on the selection process (Zeidner & Drucker, 1989).

Air Force is, among others, also aimed at achieving and maintaining a high level of the required qualification of staff. To achieve this goal, qualified pilots have to meet the requirements of the position (Caretta & Ree, 2003). Since World War II human resource experts have been devoting their time, efforts and financial resources to identifying the characteristics of a well-qualified pilot and the instruments to be used in measuring (assessing) these characteristics (Caretta, 1989). Pilot selection as an element of a recruitment process has begun by implementing »self-selection«, which is still an important factor in civil pilot as well as in military pilot selection.

Only those who have a strong desire for flying by plane are able to try and may consequently obtain a flying license (Pohlman & Fletcher, 1999). In aviation, motivation is one of the prerequisite for military pilot service; it is a fundamental factor of success in this profession. Motivation enables people to function effectively while possessing certain abilities and knowledge. In prospective pilots, perseverance is a characteristic that represents a basic kind of a natural selection. It is demonstrated in the completion of the course and pursuing the career of a pilot. Later on, the procedure of pilot selection began to develop in more depth since pilot training represented a high expense. Therefore, in addition to »self-selection« more systematic and formalized procedures were introduced – initially by implementing a general selection method for selecting military staff, namely by physical qualification (Pohlman & Fletcher, 1999). At first physical requirements for military pilots differed only marginally from the requirements for other military staff (Brown, 1989; Hilton & Dolgin, 1991). Subsequently,

they tried to upgrade the military pilot selection process by conducting various research, at first in Italy and France (Dockeray & Isaacs, 1921). Pilot selection procedures have been rendered more effective due to their stringency.

Researchers established that pilots should be emotionally stable, possess good psychomotoric reactions and mental concentration, and should be able to take swift decisions. Italian researchers developed instruments for measuring reaction times, emotional states, balance, attentiveness and muscle strength, which were included in standard selection procedures. Shortly afterwards research began also in other countries. In addition to selection tests, they began to apply mental ability tests (pen and paper tests), which contributed to a stricter military pilot selection (Pohlman & Fletcher, 1999).

Military pilot selection is a multi-stage process. It is a process by which the decisions are taken in stages, from reviewing references, the number of flight hours, the test, the interview, the evaluation of the flight on a simulator to the evaluation of flying an aircraft and final interview (Caretta & Ree, 2003).

According to the planned development of the military aviation, the Slovenian Armed Forces plans long-term needs for aviation staff. Therefore, the Government of the Republic of Slovenia, on the initiative of the Ministry of Defense, opens applications for study grants (for aviation staff) every year. By way of the selection method, the most appropriate applicants are recruited. The selection involves a practical testing of candidates and is performed at the military airport. To serve this purpose, the methodology of candidate selection is designed.

Flight rules of military aircraft (Official Journal 46/2000, 31. 5. 2000) determine that a military person can manage or fly a military aircraft as a pilot, or they can fly as crew members if they meet the following requirements (provided for by the regulations):

- they have an appropriate aviation licence – a licence that is an upgraded civil licence with the prescribed military power;
- they are passed as medically fit to perform aviation tasks on the same category of an aircraft on which they are trained;
- they are theoretically and practically competent in performing tasks on a certain aircraft;
- they are issued with flight orders which are to be approved by a competent authority.

A candidate applying for a position of a military pilot in the aviation of the Slovenian Armed Forces selected to be trained according to the existent needs and plans has to fulfil the following requirements:

- a) Higher professional or university education in the aviation field
- b) "A" health certificate awarded by the organization authorized for the medical checks of aviation staff
- c) 200 flight hours in a motor airplane
- d) Examination for a sport pilot
- e) Examination for a professional pilot

Aviation staff can be subdivided by the levels of professional aviation qualifications in terms of skills or qualification and training for performing aviation tasks. The number of levels and the assessment procedure, defining the level of professional aviation qualification, are determined by regulations on military aviation professional staff. Checking the level of qualification is performed every two years in accordance with the regulations on military aviation staff.

In our study, we aimed to determine which tests differentiate Slovene military pilots from the control groups, and produced a profile of a military pilot.

## **RESEARCH**

### **Participants**

The sample consisted of 120 participants, 30 of whom presented an experimental group while the other 90 presented a control group. The experimental group included military pilots and the control groups included general population, sport pilots and soldiers with no relation to aviation. The members of the control group were selected with regard to the qualities of the experimental group members so that both groups were equivalent in terms of relevant factors (gender, age, health condition, level of education, etc), thus participating in the study of equivalent pairs.

### **Tools**

- BFQ questionnaire

BFQ (Big Five Questionnaire) is a tool for measuring personality structure according to the model of the 'Big Five' – i.e. the five major factors, which include ENERGY, AGREEABILITY, CONSCIENTIOUSNESS, EMOTIONAL STABILITY and OPENNESS.

- Coping Responses Inventory – CRI

To identify the strategies for coping with stressful life situations we used the CRI-Adult inventory designed by Rudolf H. Moos (Moos, 1990). The inventory consists of two parts. The introductory part (10 items) where someone presents a major problem from the last year of their life is followed by a longer second part (48 items) where the coping style is assessed using eight CRI sub-scales: logical analysis (LA), positive appraisal (PA), seeking guidance or support (SS), problem-solving action (PS) on one hand (thus assessing problem-focused coping styles) and cognitive avoidance (CA) on the other hand, acceptance or resignation (A), seeking alternative rewards (AR) and emotional discharge or emptying (ED) (thus assessing coping styles focused away from the problem). The logical analysis (LA) measures the cognitive effort to understand the stressor and the attempt to mentally prepare for the stressor and its consequences. The positive appraisal (PA) involves the effort to explain and positively reinterpret the problem while accepting the reality of the situation. The seeking guidance or support (SS) consists of behavioural efforts to seek information, guidance and support. Problem-solving action (PS) includes behavioural efforts to do something and to deal with the problem directly. Cognitive avoidance (CA) measures cognitive efforts to avoid a realistic consideration of the problem. Acceptance or resignation (A) encompasses cognitive efforts to respond to a problem by accepting it. The seeking of alternative rewards (AR) includes behavioural efforts to engage in new activities and create new sources of satisfaction. Emotional discharge or emptying (ED) covers behavioural efforts to alleviate tension by venting negative emotions. The first four strategies constitute the strategies of approaching (problem-focused) and the last four the strategies of avoidance (emotion-focused). The strategies are further subdivided into cognitive and behavioural.

- Complex Reactionmeter Drenovac - CRD series

CRD is an originally developed and rationally structured psychodiagnostic laboratory composed of 4 electronic instruments (of the type of reactionmeter), an IBM personal computer, professional printer, functional software for automatic measurement, generator of new tests and data base (Drenovac, 1994). In the CRD series, there are different instruments (CRD1, CRD2, CRD3 and CRD4), consisting of various tests. For the purpose of our research, we implemented CRD2 (spacial coordination), CRD 4A (visual proprioceptive regulation and control of performing a motoric activity) and CRD 4C (test incite the function of signal noticing).

## Procedure

The data were collected during the spring and summer of 2007 at different locations in Slovenia. The participants in this research completed the BFQ and CRI in a classroom, following the instructions specified on the inventory. There was no time limit determined to complete the inventory. All motor tests and CRD tests were performed in a gym.

The data were processed using the following methods:

- calculation of basic statistical parameters (descriptives); and
- discriminant analysis

All hypotheses were verified at a 5% risk level ( $p = 0.05$ ). The SPSS software package was used for the data analysis.

## RESULTS

The discriminated analysis was applied to all the groups, namely the group of military pilots and the control group. The analysis was applied to all the obtained variables in the following tests: push-ups, trunk-lifting, coordination and speed, in some of the tests in the CRD series, in the questionnaire measuring personality structure using the model of »the big five« - BFQ (big five questionnaire), and in the questionnaire identifying the strategies for coping with stressful life circumstances (CRI questionnaire – coping responses questionnaire).

We were interested in calculating the discriminant functions for the two groups (the military pilot group and the group including all the three control groups) by way of separate variable clusters. A summary of the discriminant analysis is presented in Table 16. A canonical correlation between all the variables and the first discriminant function is 0.52. A canonical correlation between four motor variables, which are (considered separately) all statistically significant, and the discriminant function is 0.22. A higher canonical correlation is shown only with the variables in the personality questionnaire BFQ, and amounts to 0.48.

**Table 1**

Summary of discriminates analysis for two groups (military pilots and control groups - altogether) after classification into separate variable clusters

ALL TESTS Function	Proper value	% variances	Cumulative %	Canonical correlation	Test of functions	Wilks' Lambda	Hi - square	df	Sig.
All tests	0.372	100.00	100.00	0.52	1	0.729	36.65	4	0.000
Motor tests	0.052	100.00	100.00	0.22	1	0.950	6.00	1	0.014
CRD	0.070	100.00	100.00	0.26	1	0.935	7.96	1	0.005
BFQ	0.301	100.00	100.00	0.48	1	0.768	30.69	3	0.000
CRI	0.231	100.00	100.00	0.43	1	0.812	24.13	4	0.000

## DISCUSSION

Since 2004 major changes have been introduced in the Slovenian Armed Forces. Slovenia has become a NATO member as well as the European Union member, which requires new solutions in the organization and functioning of the Slovenian Armed Forces. A new law on military duties was adopted, introducing a combination of a professional army and voluntary contract reserve formation into the Slovenian military system. In Slovenia, the changes in security conditions have emerged. All the changes that have appeared require a higher level of professionalism as well as higher standards and better combat readiness. Military Air Force has a significant role in a state's defense system, be it in peace or in a period of crises as maneuvering aircrafts can control the airspace and thus assure the sovereignty of a state, in particular the one that has a sensitive geostrategic position. The successfulness of the army and its desired goals cannot be achieved without highly qualified staff. Selection models and instruments should be found to make an optimal selection of candidates possible. This is especially true for smaller states, which, among other, lack qualified personnel. The nature of work in military organizations involves a high level of responsibility as people's lives are involved/in question. Therefore, the significance of appropriate candidate selection is even more important. In Air Forces, one of the most important goals is to achieve and maintain a high level of the required qualification. In order to achieve this goal, candidates for military pilots have to be highly qualified and should meet all the requirements. A good psychological readiness and motoric ability in military pilots are among the requirements necessary for a good qualification.

Motoric abilities are not equally developed in all people, which results in differences in motoric efficiency among individuals. In the Slovenian Armed Forces, there is a tendency towards well-developed motoric abilities among the majority of its members as motoric abilities of each individual soldier, as well as the whole unit, represents one of the key elements of combat readiness, which emphasizes the significance of army training (Karpļjuk, Rožman, Suhadolnik & Karpļjuk, 2000). The pertaining evaluation of motor abilities, as an element of the contents and tasks, is based on general and specialized guiding principles (Tkavc, 2004). Psychological characteristics of each individual soldier are, beside motorical abilities, the starting point of combat readiness (Novak, 2003). Therefore, we can conclude that the motoric abilities and psychological characteristics of soldiers are of utmost importance for appropriate combat readiness of armed forces. This is also related to the basic purpose of our research, which is to study some special characteristics of military pilots or to establish if it is possible to design a model or a profile for Slovenian military pilots. In our research we tried to define the special features of some motoric abilities and psychological characteristics of Slovenian military pilots and define those parameters that have lead to such a position.

In our studies we applied motoric tests (push-ups, trunk-lifting, coordination tests, speed tests), some of the tests in the CRD series, a verified questionnaire for measuring personality structures by the »Big Five« model and the questionnaire for finding out the strategies for coping with stressful living circumstances – stress coping questionnaire CRI.

In all motoric tests the groups distinguished statistically significantly between each other. In two motoric tests the military pilots on average reached the highest results, namely in the test of movement coordination and the test of movement speed.

In the research we focused on finding out the main motoric abilities and psychological characteristics of the Slovenian military pilots group, namely on finding out the special characteristics of this group. We believed that the special characteristics of the Slovenian military pilots can be defined in terms of the subspace of motor ability variables and in terms of the subspace of psychological characteristic variables. In our research, the special characteristics of military pilots were analyzed by way of discriminant analysis.

Accordingly, by way of discriminant analysis we aimed at finding out the characteristics of the military pilots group, namely the characteristics including all the applied variables in this research. We made a discriminant analysis for the two groups (the military pilots and the control groups) in the area of separate test clusters. By way of discriminant analysis we aimed at establishing which tests most accurately discriminated the military pilots from the other groups and best defined the characteristics of the military pilots group. We established that the military pilots were best distinguished from the other groups in the research by the cluster of all the tests used in our research, and they could also be quite equally distinguished by the BFQ test and CRI test. The CRD test series and the motor ability tests were those that distinguished them to a little bit lower extent. By way of discriminant analysis we established or determined the special characteristics of the military pilots that distinguished them from the other groups. These characteristics involved better emotion control - aspects that relate to tension control and involve emotional experiences, a higher level of emotional stability – the ability of emotional self-control, the ability of keeping steady nerves (not losing one's temper) and (mental) balance, absence of negative emotional states, energetic and dynamic functioning, communicativeness and enthusiasm, the ability of self-assertion, pushing oneself forward and influencing others and in turn a high level of extrovertness, a high impulse control - aspects relating to the ability of one's own behaviour, also in unpleasant, conflict and dangerous situations. Nevertheless, in comparison with other groups, the military pilots were less distinguished by the strategy of coping with stress, cognitive avoidance representing cognitive efforts to avoid realistic thinking about the problem, amiableness (as a personal trait) as well as longer maximum time in seconds in completing the test of spacial coordination measuring a mental function involving complex analytical processes.

Therefore, we can conclude that there is a correlation between the military pilots' motor abilities, psychomotoric abilities, personality, stress coping strategies and successfulness in the profession of military pilot. This correlation explains a part of successfulness variability in the profession of military pilot and cannot be neglected. In military pilot selection, more and more importance is given to motor abilities and psychological characteristics of military pilots as they represent performance parameters in this profession.

In the research presented we gathered a large number of data pointing out some important phenomena which will need to acquire additional attention in the future.

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## **ACADEMIC FORMATION**

<b>1984</b>	Federal Armed Forces Germany
<b>1986- 1993</b>	Medical School
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## **WORK EXPERIENCE**

Researcher in Military Ergonomics and Exercise Physiology  
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## **CURRENT FUNCTION**

Central Institute of the Federal Armed Forces Medical Services Koblenz  
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**ASSESSMENT OF SOLDIERS´ PHYSICAL PERFORMANCE AND FITNESS:  
A NEW APPROACH COMPRISING VALID TESTING, LINKED DATA  
AND MODERN QUALITY MANAGEMENT**

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## INTRODUCTION

Throughout the last decades numerous sport-motoric tests have been used in the military to assess soldiers´ physical performance and fitness (1, 3, 5, and 7). However; many of these sport-motoric tests fail to meet the quality standards of classic test theory (objectivity, reliability, validity). E.g., even small changes in the execution of sit-ups or chin-ups may result in vast differences in efficiency due to the inherent degrees of freedom in the test. Thus such performance tests have to be considered with some reservations (1, 4, 11, 15).

Acknowledging these shortcomings, the German Bundeswehr identified the need for new means of assessing physical fitness and performance in military personnel (2). A research project was initiated with the aim to develop a new system which would be able to assess basic physical capabilities irrespective of age or gender, at regular intervals, in every soldier throughout the complete working career (4). Strict adherence to quality criteria (objectivity, reliability, validity) was of paramount importance for the assessment of strength, endurance and coordination. For deployment throughout the German Bundeswehr, the individual tests needed to be suitable for a large, inhomogeneous population, for any age and for both genders (5-9). Data acquisition and analysis had to meet all prerequisites and requirements for modern quality management, including scientific research for continuous evaluation and adaptation.

For Bundeswehr-wide deployment the test-battery had to feature additional properties (4): It had to be easy to administer, largely independent of infrastructure and special tools or materials. Additionally, trained personnel should not be necessary for test implementation.

## METHODS

In order to meet the criteria outlined above, three sport-motoric tests reflecting strength, speed/ coordination and endurance were designed and evaluated. Design and selection were based on extensive research (4, 6, 8, 12-14). Further criteria for design and selection were to limit (i) degrees of freedom (ii) the amount of time for administration. All tests use simple timing with a stopwatch as basic means of measurement.

### ➤ **Strength test: Hanging off a horizontal bar in “chin-up” position**

Participants are supported in the “chin-up” position until the test begins. With the starting signal the support is removed and participants hang off the bar in the initial position until the position cannot be upheld any longer. The test ends when the chin can no longer be kept above the bar. Time is taken in seconds (Fig. 1).

Upper body strength is an important factor in lifting, load carrying or climbing (4, 9, 10). With a defined starting and cut-off position, and its largely isometric demands the test is designed to limit degrees of freedom as much as possible.



**Fig. 1:** “Chin-up” position

➤ **Speed/Coordination: 11x10-m shuttle run (with changes in body position)**

Short sprints combined with changes in body position often occur in the military setting, especially in MOUT scenarios. They require a unique mix of speed, and coordination. The shuttle sprint was designed to reproduce these demands under controlled conditions and limiting the degrees of freedom as much as possible (4, 15).

Participants of the 11 x 10-m begin lying face-down on a mat. A mark is placed in 10-m distance. With the starting signal the participants have to jump up, run around the mark and back to the mat, lie down again and start anew until 11 rounds have been completed. The time to completion is measured in seconds (Fig. 2).



**Fig. 2:** 11 x 10-m shuttle run with changes in body position from prone to upright

➤ **Endurance test: 1000-m run on the track**

Endurance has traditionally been assessed with running over longer distances. Reducing the distance to 1000-m also reduces the amount of time for test administration while retaining test-sensitivity for measuring endurance (4). The test component to determine endurance consists in a 1000m run on the track. The time is measured in seconds (Fig. 3).



**Fig. 3:** 1000-m run on the track

Information about age, gender and the situation at the workplace are recorded in a standardized oral interview.

➤ **Rating System**

In addition to the testing procedures, a rating system to provide fair and comparable ratings for men, women and elderly persons were developed (4, 8, 14). A baseline for minimum performance was defined for every test. For above-baseline performances the time in seconds is measured in every discipline and converted into a basic numeric. A bonus can be obtained depending on age and gender in each discipline (Tab. 1 and Tab. 2). The bonus is then added to the initial score in each discipline, results are then converted into school grades (1-4). One overall result is derived by combining the three grades for each discipline. This procedure ensures that the test system is neutral for age and gender at baseline and comparable for age and gender above.

**Table 1:** Bonus depending on age - in every discipline the following bonus is given for males and females for every year over 35 years

per year	+ 0,5 %
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**Table 2:** Bonus depending on gender – in every discipline the following bonus is given for females at every age

11 x 10-m dash with changes in direction and body position	+ 15 %
Holding on a horizontal bar in chin-up position	+ 40 %
1000-m run on the track	+ 15 %

➤ - Data processing and-storage

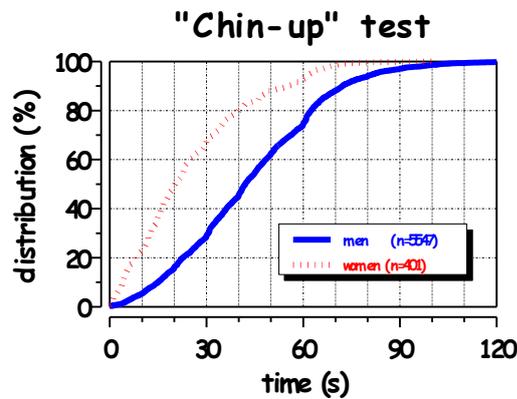
To account for the postulated requirements with respect to modern quality management, including scientific research for continuous evaluation and adaptation, a modular database system was designed implemented (10). Interview results and all individual test results are aliased; time tagged and stored allowing for cross-sectional as well as longitudinal analyses.

**PRELIMINARY RESULTS**

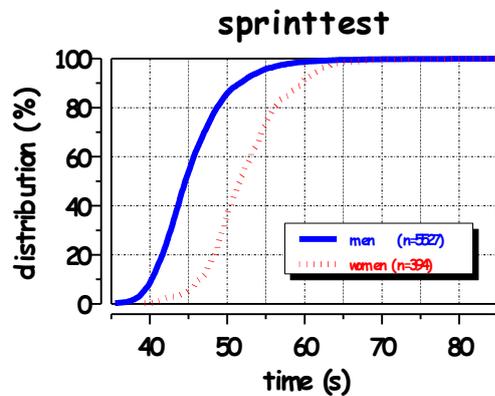
For evaluation purposes, data were obtained from over 6000 healthy participants. All participants were informed of aim and scope of the testing and gave their written consent.

Figs. 4, 5 and 6 show sensitivity of the newly developed or adapted tests. Results are spread enough to allow for differentiation between individuals. All tests are also able to detect differences between genders.

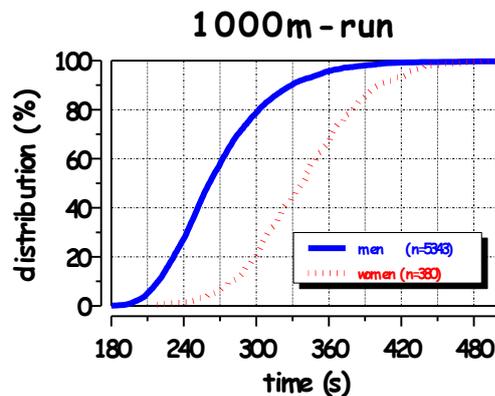
**Fig. 4:** Hanging off a horizontal bar in “chin-up” position. (Distribution of holding times over all given as cumulative percentage)



**Fig. 5:** 11 x 10-m shuttle run with changes in posture: Time needed to complete 11 turns. (Distribution of sprint times given as cumulative percentage)



**Fig. 6:** Running times of 1000-m run on the track. (Distribution of 1000m-times given as cumulative percentage)



## CONCLUSIONS

At this stage, testing procedures consist of

- (i) Recording the physical capability with three simple tests, complemented with basic information about the individual. All tests are easy to administer and require neither specialized infrastructure nor specially trained personnel for administration.
- (ii) Using the derived baseline as cut-off criteria as well as using the rating system to modify scores. All scores and ratings are transparent and balanced for age and gender.
- (iii) Data acquisition and analysis using a newly developed, modular IT-framework and a relational database to allow for modern quality management and scientific research and for continuous evaluation and adaptation of methods.

Single procedures as well as the complete system have undergone extensive testing and evaluation with more than 6.000 participants. Special focus was put on practicability, correct definition of baseline values, sensibility of the rating system, usability of the quality management system and acceptance in the military personnel. The use of a relational database system allows for combined datasets, connecting interview data with the results from all testing procedures, thus providing a comprehensive overview over performance capabilities down to the individual level. It provides further analysis potentialities and provides the necessary and reliable basis for the desired open and amendable system. New features can be implemented easily while data integrity and consistency is retained. As a next step a lifestyle-specific questionnaire and a defined set of anthropometric measurements may be a good addition to the datasets. The whole system, combining specific well-founded tests with modern information technology ensures procedures that meet the demands of both the military setting and a modern quality management.

With the modification of procedures and rating systems and the ability to use 6000 datasets as base cohort, the test will be implemented as standard Bundeswehr procedure in 2010.

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## **ACADEMIC FORMATION**

- 1990** BSc  
**2001** MSc - University of Francois Rabelais of Tours - France  
**2003** PhD - University of Rennes 2 - France  
**2004** Doctor's assistant in the service of physiology and sports medicine of Pitié-Salpêtrière – Paris – France

## **WORK EXPERIENCE**

Doctor of the French female national team of soccer (F.F.F.);  
Member of the board of the French Sports Medicine Society (S.F.M.S.);  
Research Subjects: “Screenings of hearing disorders and the balance at high-level sportsmen parachutists” (2008) and “Proposition of a questionnaire of evaluation of the level of practice of the military and sports physical activity within the French armed forces” (2009)

## **CURRENT FUNCTION**

Laboratory of Functional Explorations of the sportsman in the National Sports Center of French Army



**PROPOSITION OF STANDARDS FOR MEASURE ON STABILOMETRIC  
PLATFORM AFP 40/16**

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**ABSTRACT**

The objective of our work was to compare the values of the " standards 85 ", validated on stabilométric platform 5hz with those obtained by a platform AFP 40/16. A group of 45 subjects with an high-level of sport practice participated in the measures. Those subjects were 25,5 years old + 6,3, 1,76 m + 0,1, 73,1 kg +8,8 practising of the sports varied 22,1 hours / week + 8,7. A stabilométric platform Satel ® was used. The protocol of the stabilométric measures was realized in static condition, opened then closed eyes, alternately on hard ground then soft ground. The data processing concerned the parameters of performance: surface, LFS, Xmeans and There Means.

Paramètre sol dur	Normes 85 YO	YO	Normes 85 YF	YF
X-mean	1.1 (-9.6/11.7)	-1.1 (-13.9/11.7)*	0.3 (-10.5/11.1)	-0.03 (-15.2/15.2)*
Y-mean	-29.2 (-1.5/-57)	-39.1 (6.5/-84.7)*	-27.5 (-3.6/-51.4)	-36.9 (5.7/-79.5)*
Surface	91 (39/210)	137 (5/269)*	225 (79/638)	225 (0/501)*
LFS	1 (0.82/1.39)	0.96 (0.52/1.4)*	1 (0.70/1.44)	1.1 (0.5/1.7)*

- No significant difference with " standard 85 "

Paramètre sol mou	YO	YF
X-mean	-2.6 (-20.9/15.7)	-1.1 (-20.7/18.5)
Y-mean	-9.7 (-55.1/35.7)	-4.6 (-50/40.8)
Surface	458 (130/786)	1723 (387/3059)
LFS	1.8 (1.2/2.4)	1.3 (03/2.3)

Discussions and conclusions: the " standards 85 " seem valid for platforms AFP 40/16 on hard ground. We propose besides new standards on soft ground. Limits of standards more tightened for our sports population seem necessary as well as to widen the processing of data raised in particular in frequency analysis ad in dynamic condition measures.

**INTRODUCTION**

The screening of abnormalities of the posture at the not painful stage seems essential in sports medicine, which is above all a prevention medicine (Measure S and al. 2001).

The posturography introduced the measure into the observation of the phenomena of orthostatic posture control. The publishing of the standards «standards 85 ", allowed the clinician to say if their patient was situated in a range of normality. Problem: today the posturography platforms recommended by AFP (French society of posturology) are with a frequency of acquisition in 40Hz and a coding 16 bits (said AFP40 / 16). The problem is that the standards 85 were validated with platform in 5Hz. There is today thus no standard for these news platform recommended.

The first objective of this work was to compare the values of the standards 85 with those obtained by a platform AFP40 / 16 to a group of 45 sportsmen subjects.

The second objective was to make a preliminary study of disentangling. The idea was, in a first time, to identify "sectors" to be dug to know new parameters for medical prevention.

We have in this led purpose a forward-looking study by making a series of posturographics measures to sports subjects of good and high level by a AFP40 / 16 platform.

## MATERIAL AND METHODS

### Material

#### Subjects

It is about a group of confirmed sportsmen practising military varied sports, which participated in these measures.

The average of age of the subjects is:

	Age
Moy.	25,5
Dév. Std	6,3
Minimum	7,0
Maximum	55,0

The anthropometric characteristics of these subjects are:

	taille(en m)
Moy.	1,76
Dév. Std	,06
Minimum	1,63
Maximum	1,87

	Poids(en Kg)
Moy.	73,1
Dév. Std	8,8
Minimum	55,0
Maximum	93,5

Duration of the sports practice:

We do have to note that the declared duration corresponds in the time of presence on playing field and that we can consider that there is an intense practice for half of the declared time.

The population of military sportsmen practises varied sports. We classified them to identify the type of the main sport.

Type of the main Sport :

- Pivot (Example: tennis, volleyball): 11
- Pivots-contacts (Example: football, basketball(sneaker), handball): 15
- On-line (Example: running, swimming, cycling): 19

### **Posturography Platform**

It is about a posturography platform of type SATEL ®.

The dimensions are 480X480X65 mm. The weight of 12 kg.

The used sensors are of type beam at the constant moment

The capacity of load by each sensor is 100 kg, with a sensibility in 0.017 %

The peculiarity is that the sampling frequency is in 40Hz with coding in 16 bits

### **METHOD**

#### Protocol of examination

The subjects were examined:

- At first to collect an anamnesis: as it is about military subjects, some of examinations are realized every year with the aim of a medical follow-up. We leaned on the results of these annual medical examinations besides the interview with the subjects to complete the elements of anamnesis necessities.
- Secondly to measure the anthropometric parameters before every posturography measure.

#### *Collection of the anamnesis*

- Identification of the subject:
  - o name, first name, sex
  - o Rank and unit of affectation
  - o Date of birth, age

Are indispensable to be able to classify the data and if necessary contact again the subjects if necessary.

- Sports activity
  - o Number of hours for a week
  - o Type of activity: on-line / pivot / pivot-contact

The idea is to look for a correlation between the sports activity, on a quantitative and qualitative plan and the posturography parameters of performance.

- Traumatic histories
  - o Knees and peg
  - o Rehabilitation

The idea is to compare the subjects having suffered from traumatism which can intervene in the neuro-driving control with the other unhurt subjects. This should allow us to look for criteria of functional recovery on the postural plan.

- Vision
  - o visual Acuteness
  - o Feel chromatic
  - o Vision of the relief

The question was to observe if these parameters of the vision intervened in the postural control.

- Coefficient of chewing

The question was to observe if this parameter measuring globally the dental occlusion intervened in the postural control.

All these parameters of the anamnesis was collected by means of a form.

#### *Collection of the anthropometric parameters*

- Weight and size

The measure of the weight was made at every sportsman's systematically on the same balance before the meal and in underwear.

The measure of the size was made removed the shoes by means of a height gauge

- The length of lower limbs

The measure of the length of lower limbs was made by means of a metre-ribbon by taking the vertical line enter the big trochanter and the ground by way of the lateral malleolus.

- Dominant side

Was determined by a test for the eye and by an interrogation for the members

### ***Posturographics measures***

We realized measures in static condition, opened then closed eyes, on hard then soft ground.

We shall note that the distance with the target to be fixed was 75 cms. We chose a target point and not a thread not to give visual information of verticality to the subject

### **Data Processing**

Our attention is in a work of disentangling essentially concentrated on the data of performance in static condition: the average surface, the position X and Y and LFS

### ***Définitions***

The surface corresponds to the area of the reliable ellipse which contains 90 % of the positions sampled by the center of pressure. It is considered as the most rigorous statistical measure of the dispersal of these positions (Takagi and al 1985).

A surface beyond the superior limit of normality means that there is an abnormality - statistics - of the precision of the control of the posturales oscillations

The average position X corresponds to the average of the values of the abscissas of the center of pressure on the reference table of the statokinésigramme. She is named X-mean.

The average position X (right-left) of the centre of gravity shows symmetry of the postural tonus. When this parameter goes out of its limits - very narrow - of normality, we can be sure that exist a frank abnormality of symmetry of this tonus, any evident orthopaedic cause having been eliminated.

The average position Y corresponds to the average of the values of the orderly of the center of pressure on the reference table of the statokinésigramme. it is named Y-mean.

The LFS corresponds to the road which the center of pressure goes through by surface unit. The LFS has no unit. A strictly normal road is represented by a LFS equal to the unit. If the LFS is upper to the unit it means that the road gone through by surface unit is upper to the normal; conversely a parameter LFS lower than the unit, means that the road gone through by surface unit is lower than the normal.

It is necessary to know that the value of the posturogramm length depends on the frequency of sampling. The standards of the parameters which use the length, as the LFS, can be thus used only if the signal processing was realized on the data of a realized recording, or reduced, in a cadence of sampling of 5 Hz

### ***Methodology***

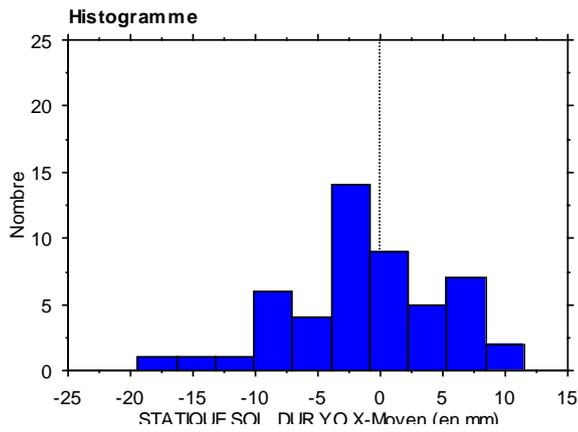
We realized at first a descriptive analysis of the data of posturographics performances of our 45 subjects by calculating for each of them the average, the distance-type and the distribution of the values. Then secondly we made a study more detailed of the cases «abnormal subjects 85 », to allow a discussion of the "profile" of these subjects.

**RESULTS**

**Descriptive Analysis**

**VALUES OPENED EYES (YO) ON HARD GROUND ( SD)**

	Moy.	Dév. Std	Minimum	Maximum	Médiane
STATIQUE SOL DUR YO X-Moyen (en mm)	-1,11	6,37	-19,40	11,50	-1,58
STATIQUE SOL DUR YO Y-Moyen (en mm)	-39,07	22,87	-75,30	80,10	-41,48
STATIQUE SOL DUR YO Surface (en mm <sup>2</sup> )	137,22	66,55	41,00	391,00	123,50
STATIQUE SOL DUR YO LES	96	22	52	139	96



**VALUES CLOSED EYES (YF) ON HARD GROUND ( SD)**

**VALUES OPENED EYES ( YO) ON SOFT GROUND ( SM)**

**VALUES CLOSED EYES ( YF) ON SOFT GROUND ( SM)**

**ABNORMAL SUBJECTS FOR THE STANDARDS 85**

The standards exist for the measures on hard ground only, eyes opened and closed. We present the cases of subjects having exceptional values the opened eyes and present their results opened and closed eyes.

**X MEAN**

The Standard 85 gives a interval going from 9.6 to 11.7 mm.

*Subjects above the interval*

No subject >11.7 mm

*Subjects below the interval*

3 subjects < -9.6 mm

	Moy.	Dév. Std	Minimum	Maximum
STATIQUE SOL DUR YO X-Moyen (en m...	-15,200	4,015	-19,400	-11,400
STATIQUE SOL DUR YO Y-Moyen (en m...	-24,100	17,930	-34,800	-3,400
STATIQUE SOL DUR YO Surface (en m...	106,000	28,618	88,000	139,000
STATIQUE SOL DUR YO LFS	,853	,084	,800	,950
STATIQUE SOL DUR YF X-Moyen (en mm)	-16,200	5,116	-19,400	-10,300
STATIQUE SOL DUR YF Y-Moyen (en m...	-24,733	17,454	-35,600	-4,600
STATIQUE SOL DUR YF Surface (en mm²)	161,667	24,214	134,000	179,000
STATIQUE SOL DUR YF LFS	1,157	,102	1,040	1,230
STATIQUE SOL DUR YF LFS	1,157	,102	1,040	1,230

The subjects having Xmean to the left remain diverted to the left blindly.

We do not note with this abnormality any other abnormality on Ymean, surface or LFS.

**Y MEAN**

The Standard 85 gives a interval going from -1.5 to -57mm.

*Subjects above the interval*

1 subject > -1.5 mm

	Moy.	Dév. Std	Minimum	Maximum
STATIQUE SOL DUR YO X-Moyen (en mm)	,800	•	,800	,800
STATIQUE SOL DUR YO Y-Moyen (en mm)	80,100	•	80,100	80,100
STATIQUE SOL DUR YO Surface (en mm²)	391,000	•	391,000	391,000
STATIQUE SOL DUR YO LFS	1,120	•	1,120	1,120
STATIQUE SOL DUR YF X-Moyen (en mm)	5,700	•	5,700	5,700
STATIQUE SOL DUR YF Y-Moyen (en mm)	74,100	•	74,100	74,100
STATIQUE SOL DUR YF Surface (en mm²)	700,000	•	700,000	700,000
STATIQUE SOL DUR YF LFS	0,30	•	0,30	0,30

We notice by this subject that besides having a very previous position, it presents an increased surface. It is a high-level crossman sportsman to whom we calculated besides an energy cost in the running very high.

**Subjects below the interval**

7 subjects < -57mm

	Moy.	Dév. Std	Minimum	Maximum
STATIQUE SOL DUR YO X-Moyen (en mm)	-1,443	8,373	-9,000	11,500
STATIQUE SOL DUR YO Y-Moyen (en mm)	-62,614	6,263	-75,300	-57,700
STATIQUE SOL DUR YO Surface (en mm <sup>2</sup> )	139,571	47,141	71,000	214,000
STATIQUE SOL DUR YO LFS	1,113	,099	,940	1,230
STATIQUE SOL DUR YF X-Moyen (en mm)	1,143	10,326	-12,200	13,000
STATIQUE SOL DUR YF Y-Moyen (en mm)	-55,243	10,315	-74,100	-44,100
STATIQUE SOL DUR YF Surface (en mm <sup>2</sup> )	216,714	86,506	151,000	372,000
STATIQUE SOL DUR YF LFS	1,200	,254	,850	1,000

Subjects having Ymean in back stay in back blindly, nevertheless we note a tendency to refocus. We dont note any abnormality in Xmoyen, surface or LFS.

**Surface**

The Standard 85 gives a interval going from 39 to 210 mm<sup>2</sup>

**Subjects above the interval**

6 subjects > à 210 mm<sup>2</sup>

	Moy.	Dév. Std	Minimum	Maximum
STATIQUE SOL DUR YO X-Moyen (en mm)	-1,167	4,769	-8,600	4,500
STATIQUE SOL DUR YO Y-Moyen (en mm)	-27,133	54,035	-66,400	80,100
STATIQUE SOL DUR YO Surface (en mm <sup>2</sup> )	262,667	65,817	214,000	391,000
STATIQUE SOL DUR YO LFS	1,012	,257	,700	1,320
STATIQUE SOL DUR YF X-Moyen (en mm)	-,700	6,679	-8,900	8,000
STATIQUE SOL DUR YF Y-Moyen (en mm)	-21,000	47,168	-49,500	74,100
STATIQUE SOL DUR YF Surface (en mm <sup>2</sup> )	425,500	197,664	225,000	700,000
STATIQUE SOL DUR YF LFS	1,008	,358	,670	1,560

We note that the subjects having an increased surface tend to normalize blindly. The only one of 6 subjects stays with a surface increased blindly, was the same who had a very previous position.

**Subjects below the interval**

No subject < à 39 mm<sup>2</sup>

**LFS**

The Standard 85 gives a interval going from 0.72 to 1.39

**Subjects above the interval**

No subject > 1.39

*Subjects below the interval*

4 subjects < 0.72

	Moy.	Dév. Std	Minimum	Maximum
STATIQUE SOL DUR YO X-Moyen (en mm)	1,700	5,646	-3,900	9,300
STATIQUE SOL DUR YO Y-Moyen (en mm)	-36,550	9,738	-48,400	-27,300
STATIQUE SOL DUR YO Surface (en mm²)	118,750	88,917	41,000	238,000
STATIQUE SOL DUR YO LFS	,645	,054	,570	,700
STATIQUE SOL DUR YF X-Moyen (en mm)	,625	3,884	-4,300	5,200
STATIQUE SOL DUR YF Y-Moyen (en mm)	-40,800	8,668	-49,500	-28,800
STATIQUE SOL DUR YF Surface (en mm²)	110,500	93,443	26,000	244,000
STATIQUE SOL DUR YF LFS	,637	,078	,570	,710

We find that on 4 subjects which have a low LFS with opened eyes, 2 keep it low blindly. There is for none of the subjects of abnormality associated by the other criteria of performance: surface, X and Y means.

**DISCUSSION**

**Abnormal Subjects**

Generally speaking, We note that there are few "abnormal" subjects:

- Is it Necessary to refine the standards for the sports population? Indeed we can consider that the sports population is not identical to the general population.
- Considering the stressed driving constraints, we can expect from the sports population of the values of performance for stabilométrique superior to the general population.
- These more restricted standards would so allow us to identify insufficient postural recoveries, particularly after rehabilitation.

We notice that the abnormalities of the criteria of posturography performances of our subjects were always isolated, except a case where we observed at the same time a very previous position and a high surface.

4 subjects having a left abnormality of Xmean, and presented disorders of the eye motricity confirmed by an orthoptic Measure. We can discuss the interest of the use of a posturography platform for screening of disorders of the eye motricity having for consequence an postural asymmetry (Measure S and collar(pass). 2001).

**VALUES ON HARD GROUND**

If we compare our values observed to those of the standards 85 (Gagey and collar(pass) 1995):

Measured parameter	Standard 85 YO	YO	Standard 85 YF	YF
<b>X-mean</b>	1.1 (-9.6/11.7)	<b>-1.1 (-13.9/11.7)</b>	0.3 (-10.5/11.1)	<b>-0.03 (-15.2/15.2)</b>
<b>Y-mean</b>	-29.2 (-1.5/-57)	<b>-39.1 (6.5/-84.7)</b>	-27.5 (-3.6/-51.4)	<b>-36.9 (5.7/-79.5)</b>
<b>Surface</b>	91 (39/210)	<b>137 (5/269)</b>	225 (79/638)	<b>225 (0/501)</b>
<b>LFS</b>	1 (0.82/1.39)	<b>0.96 (0.52/1.4)</b>	1 (0.70/1.44)	<b>1.1 (0.5/1.7)</b>

We find that the reliable intervals of our measures are more important, what comes probably from the fact:

- Of the smallest number of subjects included in our study;
- Of the presence of possible subject (s) abnormal because as we saw him(it), certain parameters were exceptional 85.

However this comparison would tend to consider that the standards 85 are valid for the posturography platform AFP40 / 16.

## VALUES ON SOFT GROUND

Measured parameter	YO	YF
<b>X-mean</b>	<b>-2.6 (-20.9/15.7)</b>	<b>-1.1 (-20.7/18.5)</b>
<b>Y-mean</b>	<b>-9.7 (-55.1/35.7)</b>	<b>-4.6 (-50/40.8)</b>
<b>Surface</b>	<b>458 (130/786)</b>	<b>1723 (387/3059)</b>
<b>LFS</b>	<b>1.8 (1.2/2.4)</b>	<b>1.3 (03/2.3)</b>

We note that surfaces and LFS are very increased eyes opened and closed with regard to the hard ground. These measures seem logical because there is a disturbance of the information proprioceptive.

Besides, we note that the coefficient of Romberg is more important on soft ground ( 376 ) than on hard ground ( 288 ). This goes to the direction of the rise of the role of mink when the proprioceptive information is perturbed. There would be a variable "weight" of the role of sensorial entries to the postural control.

## CONCLUSIONS

The study of the posture in the field of the sports medicine seems to be an important field of investigation. The introduction of a technique of measure seems indispensable to try to study and to report most objectively possible our observations.

It seems that Normes85 remains valid for the posturography platform AFP40 / 16, but a more pushed study remains necessary, in particular at the sportswomen.

It is necessary to discuss the interest of smaller limits of standards for our sports population.

The posturography associated with the postural clinical examination seems to be a method allowing to detect oculo-driving disorders having a postural echo

It seems necessary to treat more widely all the data which we raised. In particular fréquentielles analyses and dynamic measures

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## **ACADEMIC FORMATION**

<b>1997</b>	BSc - Military Sciences
<b>2001</b>	BSc - Physical Education
<b>2004</b>	MSc - Science of Human Motricity
<b>2006</b>	MSc - Public Health
<b>2006</b>	PhD - Public Health
<b>2008</b>	MSc - Military Operations

## **WORK EXPERIENCE**

Specialization - Military Operations, Exercise Physiology, Physical Training, School Supervision

Participation in boards of examiners: 6, Participation in events: 28;

Research Subjects: Military Physical Training Basis and its evaluation in the Armed Forces Friends Nations, Armed Forces Sports Legislation, Military Physical Training and Operational Activities, Military Physical Training and Organization of Competitions in the level Army, Great Unit or Unit, Military Physical Training and Sports Practice, Military Physical Training and Health, Military Physical Training and its Evaluation.

Bibliography: Articles published in journals: 21;

## **CURRENT FUNCTION**

Staff Officer (Chief of the Logistics Section)



**SCIENCE INCREASING PERFORMANCE: DERMATOGLYPHICS, SOMATOTYPE AND BASIC PHYSICAL QUALITIES PROFILE OF BRAZILIAN MILITARY ATHLETES**

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**ABSTRACT**

Genetics represents a modern science that can collaborate in the process of a sports talent discovery (Fernandes Filho, 2003). Fingerprints, as a component of hereditary characteristics, had been used in some countries as a tool to select players since the childhood (Liang & Li, 1996). The somatotype is used to classify the individuals, according to their physical type in categories (endomorph, mesomorph and ectomorph). In each sports modality, the athletes present distinct physical characteristics in accordance to the needs demanded for a higher level of performance (Mansur et al., 2002).

The main objective of this research is identifying the dermatoglyphics, somatotyping and basic physical qualities profile of Brazilian Military Pentathlon, Modern Pentathlon, Fencing (foil) and Volleyball military athletes, male, top level of performance. They had composed a sample of thirty seven subjects, divided in four groups, being six Military pentathletes (Mil P), seven Modern pentathletes (Mod P), twelve fencers (F) and twelve Volleyball players (V). All athletes had been evaluated and characterized on age, body mass, stature; dermatoglyphic profile, by protocol of Cummins and Midlo (1942) - total ridge count (TRC), D10 index and kind of fingerprints (arch-A, loop-L and whorl-W); somatotype, by the anthropometric method of Heath-Carter (1967); and basic physical qualities of speed - 50 meters launched running (Mil P, F); agility - Shuttle Run (Mil P, F); maximum aerobic power ( $\dot{V}O_{2max}$ ) - Léger-Boucher (Mil P, Mod P) and ergoespirometry (F); and anaerobic resistance - 40 seconds running (Mil P, F). The dermatoglyphic profile results, which include the most informative and integral indexes, presented D10 index of  $9.20 \pm 2.17$  (Mil P),  $14.1 \pm 3.63$  (Mod P),  $12.6 \pm 4.66$  (F) and  $13.5 \pm 2.88$  (V); TRC  $82,3 \pm 42.34$  (Mil P),  $128.6 \pm 30.42$  (Mod P);  $119,9 \pm 46,98$  (F) and  $132.08 \pm 38.27$  (V); L=  $7.60 \pm 1.52$ , W =  $0.67 \pm 0.52$  and A=  $1.33 \pm 1.75$ , with higher incidence of L and lower of W (Mil P), L =  $5.0 \pm 2.45$ ,  $4.60 \pm 2.88$  and  $0 \pm 1.13$ , with balance between L–W and lower of A (Mod P); L =  $5.8 \pm 3.05$ , W =  $3.4 \pm 3.4$  and A =  $0.8 \pm 1.99$ , showing higher presence of L and lower of A (F); L =  $5.83 \pm 2.21$ , W =  $3.83 \pm 2.24$  and A =  $0.33 \pm 0.78$ , disclosing a higher amount of L and lower of A (V). Based on dermatoglyphic classification (Abramova et al., 1995) it seems that the sample of Mil P classifies has, probably, maximized somatic-functionary level of force and minimized of coordination; the group Mod P seems to have higher performance of coordination and speed resistance, lower of force and the speed; the group F has higher level of coordination and lower of relative force; and group V, better in coordination and lower in relative force. The somatotyping results are 1.5-5.5-2.2 (Mil P); 2.3-4.5-3.4 (Mod P); 2.5-4.0-3.3 (F), all meso-ectomorphic; and 2.6-4.2-2.6 (V), balanced mesomorphic.

Therefore, this study came to present the profile of the Brazilian military athletes, in order to allow the comparison of this population, at another opportunity, with its own results, among other sports, with national and international teams, and serving as concrete data of high level sports formation and renewal of Brazilian military teams.

**1 INTRODUCTION**

The high level sport is supported in scientific bases that seek to unite genetic factors and phenotype, searching for better performances (Silva & Fernandes Filho, 2008).

The physical characteristics of high level athletes, as well as the hereditary qualities, the psychological disposals and the physiological bases, established as models, have great importance in the selection, planning and training of young talented athletes (Wang, 1989).

Genetics represent a modern science that can collaborate with sports election questions. It had as great propellant Gregor Johan Mendel (1822-1884), monge and Austrian biologist. For Fernandes Filho (2003) the “inheritance of the biological characters is related to certain laws, in such a way that, by knowing the genealogy of a couple, we will be able to foresee its descent”.

Bouchard, Malina & Perussé (1997) places that the variability of human being represents a substratum of genetics, whom it aims to define relations with the sequence of DNA variation and genetics interaction, co-acting with life style factors and environment variables.

Nikitjuk (1979) presented researches that purported to discover morphologic and functional characteristics and that could relate with the hereditary succession and the eventual detention of sport talent.

Moskatova (1988) that already identified the relation between hereditary succession and speed of movements found that different traces of speed are also fruit of different genetic conditions; even so its alterations are fruit of external actions. There are clear differences in the genetic conditions of speed movement's characteristics of arms and legs, as well as left and right extremities; the level of the genetic condition of motor speed suffers alterations according to age. Thus, the level of significance of the specific genotype in the determination of the speed characteristics and its evidence of alteration, relatively limited under influence of the sports training, inspires the correlation of biological laws of development and potentiality for training of these motor traces.

According to Hebbelinck (1989), coaches use their own experience and intuition in the works of talent selection. The most trustworthy method would be the identification of the ideal type of an athlete for each sport modality, as predetermined profiles of confirmed athletes (Silva, Zary, Pinheiro-DaCunha, Martins et al., 2003). The athlete, with a physical type in accordance with the standards established for its sport, would have better conditions to develop other qualities (as physiological and psychological), necessary to the elite sport (Hebbelinck, 1989).

## 2 OBJECTIVES

The objective of the present study was to identify dermatoglyphics, somatotype profile, as well as basic physical qualities of high level Brazilian military athletes from the modalities of Military Pentathlon, Modern Pentathlon, Fencing (foil) and Volleyball.

## 3 LITERATURE REVIEW

### 3.1 Fingerprints

As standard of genetic mark, there are the fingerprints, also known as dermatoglyphics. Its formation occurs between the third and sixth month of the fetal life and remains steady with aging, hence the development after birth does not have any effect in fingerprint variability, except in some pathological conditions, bringing advantage over other physical or physiological measures in human beings (Chakraborty, 1991). In the Medicine, fingerprints have intrigued the humans, since the primitive era, and along years, it comes as subject of study for anatomists, physiologists, geneticists, anthropologists and doctors.

The majority of authors distinguishes three groups of fingerprints drawings: arch, loop and whorl. The drawings form constitutes a qualitative characteristic and the amount of lines (AL), the total ridge count (TRC) - the amount of cutaneous crests inside the drawing represents the quantitative characteristic. The evaluation of the intensity of drawings is done by checking the presence of deltas and it is calculated the called delta index – D10; arch (A)– the drawing without delta; loop (L)– the drawing with a delta; and whorl (W)– the drawing with two deltas, corresponding to an evaluation 0, 1 and 2 respectively. So, the maximum evaluation is 20 and the minimum, 0 (the somatory of deltas in the 10 fingers), resulting as the simplest drawing the arch and the most complicated the whorl (Gladkova, 1966).

The analysis and classification of fingerprints index, and of more than 80 somatic-functionaries indexes of Russian high level athletes, form five main claims (TABLE 1), that are distinguished by the different dominant functionary, as can be observed, the low intensity of drawings (D10) and low TRC is correlated to higher levels of manifestations of strength and power, but with lower levels of coordination and resistance; and the opposite: the rise of D10 and TRC is correlated with the reinforcement of the dominants resistance and coordination. Maximum values of D10 and TRC are guided to the development of coordinating qualities of the organism (Nikitjuk et alli, 1989; Abramova et al., 1995). The lower levels of D10, increasing parcels of simple drawings (A, L), reduction of complicated drawings (W, WS drawing) and the increase of the TRC – fast and high powered sports. The high level of D10, absence of A, increasing of 50-90% of the parcel of W and TRC increasing mark sports and different groups: speed, resistance, games and fights. The modalities of strength and speed are situated in the field of lower values of D10 and the TRC; the complex proprioception sports - in the field of high values; resistance sports occupy intermediate position. All modalities of games present the same tendency: the difficulties of game responsibilities, the magnifying of the field activity during a game is correlated to the complication of digital

drawings, increase of D10 and AL, increase of the percentage of drawings incidence (W, WS drawing), with the reduction L and disappearance of A.

**Table 1:** Classification of fingerprints and somatic-functionaries index among high level Russian athletes (rowers, N=101)

Class	Fingerprints		Somatic – functionaries	
	D10	TRC	Minimum	Maximum
I	5.5	26.5	Strength (absolute) Resistance Coordination	Strength (relative)
II	9.0	47.7	Coordination	Strength
III	11.6	126.4	Strength (relative)	Strength (absolute)
IV	13.1	134.2	Strength (absolute)	Resistance Coordination
V	17.5	162.8	Strength (relative)	Coordination

Font: Abramova et al. (1995); Dantas et al. (2004), adapted by the authors.

Thus, allied to physical qualities, fingerprints are the genetic marks that can serve as pointers of main parameters of endow and motor talents, differentiating not only the specific functional characteristics for each modality, but also the joust specialization required in each sport. Following, in TABLE 2, some information of national studies:

**Table 2:** National studies about high level sportsmen and beginners

Modality	Year	N	A	L	W	D10	TRC
Parachutists	2003	22	0	6,7±3,19	3,1±3,23	13,1±3,24	101±19,15
Swimming speed male	2003	15	0,2±0,56	7,5±1,96	2,3±1,88	12,1±1,96	106,7±25,81
Swimming speed female	2003	7	0,9±2,27	7,6±2,07	1,6±1,51	10,7±3,25	107,7±41,17
Militaries Physical Education	2003	25	1,8±2,27	5,9±2,64	2,3±2,31	10,4±4,62	84,0±47,72
Acrobatic trampoline male	2003	8	0,4±1,1	6,0±2,0	4,0±3,0	13,0±3,0	112,0±39,0
Karate	2003	14	0	4,6±1,87	5,4±2,35	15,4±4,08	159,7±24,08
Gymnastics female	2002	25	0,6±1,05	6,3±2,18	3,1±1,45	12,4±3,08	97,8±25,74
Triathlon male	2002	10	0,6±1,9	6,3±2,99	2,9±3,03	12,3±4,08	118,6±44,92
Hunters Air Force pilots	2002	34	0,3±0,0	6,4±2,45	3,4±2,55	13,1±2,90	129,4±32,10
Volleyball male	2000	22	0,7±0,29	6,5±2,94	3,4±2,97	13,4±3,11	125,0±39,12
Orienteering male	2003	8	0	5,0±2,78	5,0±2,78	15±2,78	143,3±20,32
Futsal male	2000	66	0,0±0,17	6,5±2,89	3,5±2,90	13,5±2,93	147,4±32,88
Futsal children	2003	12	0,6±1,24	6,5±2,15	2,8±2,44	12,2±3,43	98,9±21,13
Soccer	2003	48	0,58±1,3	6,9±2,7	2,56±2,7	12,0±3,2	99,17±35,5
Handball female	2003	18	2,6±1,51	6,5±1,93	1,0±1,43	8,0±2,37	90,0±36,31
Handball beginners	2003	32	0,2±0,74	7,0±2,67	2,8±2,77	12,6±3,05	94,6±25,08
Fencing foreigners male	2004	6	0,2±0,41	4,0±3,46	5,8±3,76	15,7±4,08	155,8±32,44
Fencing female	2005	8	1,0±1,0	7,0±1,0	2,0±3,0	11,0±4,34	80,5±37,15
Judo female	2004	28	0,6±1,1	6,3±2,7	3,2±3,0	12,6±3,6	109,1±34,4
Swimming resistance	2004	48	0,57±1,08	6,3±2,9	3,13±3,3	12,57±3,4	136,13±49,0

Font: Fernandes Filho (2003, apud Pinheiro-DaCunha & Fernandes Filho, 2004) adapted by the authors.

### 3.2 Somatotype

The somatotype is an instrument used to know and identify characteristics of the athletes, being an excellent aid to a talent discovery, and allows a continuous checking of body composition, during a competition season (International Society for the Advancement of Kinanthropometry, 2000).

The somatotype final classification is an expression of three numbers that indicates the observed physical aspect, as well as its classification, allowing, the direct comparison between two or more physical types.

According to Carter (2000), somatotype allows description and comparison between sportsmen in distinct levels, characterizes alterations of physical components in different phases of life and during the training and compares relative form of men and women, as an analysis of body image.

For a multicriteria sports election, it is necessary, not only to establish a somatotype for the sport in question, but, also, to determine desirable indexes in relation to physical capacities of the athletes.

#### *3.2.1 Endomorphic component*

Endomorphy indicates, as main characteristic of physical structure, the rounding of corporal curves. An obese is a good example of full endomorphy, therefore the muscular relief is practically not noticed. It appears as a large abdominal volume, short neck and squared shoulders (Carter & Heath, 1990).

#### *3.2.2 Mesomorphic component*

Among its main traces, there are distinguished the great apparent muscular relief, with predominant contours in the regions of the trapeze, deltoid and abdomen, as a more massive bone structure, mainly in forearm region. The presence of body fat is small, allowing a good visualization of the muscles. This is the type of body structure frequently found in athletes (Carter & Heath, 1990).

#### *3.2.3 Ectomorphic component*

This third component, indicative of thinness and fragility, can be identified by the body linearity, with discrete muscular volume and small amount of fat tissue (Carter & Heath, 1990).

### 3.3 Basic physical qualities

According to Tubino & Moreira (2003), the identification of qualities or physical valences is the first step to be made for the development of a physical preparation, also considered as a basic point for the desired success.

The athlete election, for the different sports, is based on the efficient capacity to decide motor tasks of character technical-tactical. This efficiency can be linked to characteristic of resistance, speed, flexibility and agility, allied to psychic factors and adjusted to somatotype (Fernandes Filho, 1997).

According to Marins & Giannichi (1998), after determining the physical qualities to be tested, it is necessary to choose tests with coefficients of validity, fidedignity and objectivity, so that the gotten results can express a trustworthy parameter.

Military and Modern Pentathlon are sports of combined tests, that demand an athlete with a multiplicity of physical qualities, amongst can be detached: aerobic resistance, anaerobic resistance, explosive strength, agility, speed, flexibility and coordination (Ferraz Filho, 2008; Rolim Filho, 2007).

For Águila, Aljoe & Ferrer (2002), Fencing presents as physical qualities, to be developed in a training process, since childhood until the adult age, coordination, speed, strength, resistance and flexibility. Cortés & Calvo (2001) mentions that, inside basic physical qualities to be developed for a fencer, it is distinguished strength, basically of legs, a special resistance because of the competitions characteristics, flexibility for the necessary amplitude of movements and the speed.

Zary & Fernandes Filho (2005) presents as imperative necessities to the excellent performance of a Volleyball athlete, the coordination, the explosive strength and the presence of great stature, so that it is possible to remain in the high income.

In such a way, Fernandes Filho (2003) declares that, in the process of physical evaluation of a high level sportsman, the results obtained by tests are basic to develop a good program of development of physical qualities.

## 4 METHODOLOGY

### 4.1 Subjects

The sample was constituted by 37 military athletes, convoked to take part on Brazilian Military Sports Commission (CDMB) teams and participants of Conseil Internationale du Sport Militaire (CISM) Military World Championships. All sample is of the masculine gender, high sports level, voluntary, divided in four groups, being six military pentathletes (Mil P), seven modern pentathletes (Mod P), twelve foil fencers (F) and twelve Volleyball players (V).

### 4.2 Procedures

Initially, the subjects were informed about the objectives of the study and, after answering an anamnesis, signed the assent term.

After that, it has been made recommendations to the regular procedures during data collection.

#### 4.2.1 Fingerprint protocol (*Dermatoglyphics*)

The chosen protocol was Cummins & Midlo (1942). The collection of the fingerprints was carried through by using paper and *Impress* brand fingerprints cushion. After the collection, the preliminary data processing was given, which standard method is the following:

- 1) More common drawings in the hand fingers distal phalanges (FIGURE 1):
  - Arch “A” - drawing without deltas (*Fig 1-a*);
  - Loop “L” - drawing of a delta (*Fig 1-b*); and
  - Whorl “W” - drawings of two deltas (*Fig 1-c*).



a- Arch (A)



b- Loop (L)



c- Whorl (W)

**Fig. 1:** Most common drawings of fingerprints

2) Amount of lines (AL) - the amount of lines of the skin crests, inside of the drawing, is counted, according to line that bind the delta to the center of the drawing, without taking in consideration the first one and the last line of crest.

Therefore, there were calculated the following basic fingerprints indexes:

- The amount of the drawings of different types for ten hand fingers;
- the AL in each hand finger;
- The summary intensity of the drawings, in the ten hand fingers, or the delta index, (D10), gotten by the addition of deltas of all drawings, in way that the “evaluation” of an A is always 0 (the delta absence), L is 1 (a delta) and W is 2 (two deltas), that is,  $\Sigma L + 2 \Sigma W$ ;
- The total amount of the lines, in the ten hand fingers.

#### 4.2.2 Somatotype

The measures of somatotype had been obtained by the method of Carter & Heath (1990).

For determination of the components (endomorph, mesomorph and ectomorph) it was made the measurement of skinfolds - subscapular, tricipital and supraespinale - using *Cescorf* brand scientific compass. In the measurement of bone diameters biepicondilar of the humerus (elbow) biepicondilar of the femur (knee), used paquimeter *Cescorf* and for the perimeters of the arm and leg, the anthropometric ribbon *Sanny* brand. Body weight and height had been measured with the stadiometer *Filizola*.



**Fig. 2:** Somatotype evaluation

#### 4.2.3 Basic physical qualities (physical tests)

The sample was submitted, in different days, to the following physical tests to the measurement of basic physical qualities, related to each group: speed - 50 meters launched running (Mil P, F); agility - Shuttle Run (Mil P, F); maximum aerobic power ( $\dot{V}O_{2max}$ ) - Léger-Boucher (Mil P, Mod P) and ergoespirometry (F); and anaerobic resistance - 40 seconds running (Mil P, F).

## 5 ANALYSES AND RESULTS DISCUSSION

The drawings of the fingerprints, its types of combination, D10, AL had been analyzed, as well as the TRC. The somatotype was evaluated in its three components of endomorphy, mesomorphy and ectomorphy. There were also observed the values reached in the physical tests elected to evaluate basic physical qualities of each sport.

It can be seen in TABLES 3, 4, 5 and 6 the average, minimum and maximum results, as well as the standard deviation of the sample characterization, fingerprints drawings, D10, TRC, somatotype and basic physical qualities.

**Table 3:** Sample characterization by sport groups (Mil P, Mod P, F and V)

		N	$\mu$	Minimum	Maximum	$\sigma$
<b>Age (years)</b>	Mil P	6	35.33	31	43	4.93
	Mod P	7	26.33	23	31	3.31
	F	12	22.3	18	28	4.03
	V	12	28.67	23.2	34.6	3.55
<b>Body mass (kg)</b>	Mil P	6	72.28	62.9	82.8	8.16
	Mod P	7	73.4	62.4	77.0	7.67
	F	12	70.6	57.10	81.70	6.69
	V	12	86.83	78.7	93.8	5,59
<b>Stature (cm)</b>	Mil P	6	174.92	166	181	5.41
	Mod P	7	180.33	170	185	4.54
	F	12	179.4	173.5	188	4.01
	V	12	194.67	183.5	204	6.64

For the analysis of the fingerprints results, constant of TABLE 4, is perceived that in the group Mil P there is predominance of digital drawing L, moderate indexes of D10 and the TRC, located between levels II and III of the classification of dermatoglyphics and somatic-functionaries indexes, proposal for Abramova et al. (1995). The physical qualities of strength, speed, power and static stability, symptomatic in sports of high power and short time of duration, are perceived by the type of digital drawing and the amount of lines. However, coordinative

characteristics and of relative strength could be revealed less developed, in case that they have not been stimulated in the adjusted phases of the motor development, by means of the accomplishment of specific training.

In the group Mod P, the average of dermatoglyphic characteristics related to the digital drawings indicate the predominance of L and W. It is also perceived the reduction of the drawing A. In accordance with TABLE 4, the variable characteristic of the fingerprints had presented D10 with average value 14.1 and TRC of 128.6, that suggests high somatic-functional levels of coordination and resistance of speed.

In group F, concerning the TRC, it had similarity to the Russian athletes of Ski and Karate (Abramova et al., 1995), Brazilian Volleyball athletes (Medina & Fernandes Filho, 2002) and triathletes (Anjos et al., 2003). For the D10, the values had been similar to the skiers, biathletes, road cyclists (Abramova et al., 1995) and fast swimmers, triathletes, soccer players and futsal infantile category and handballers, all Brazilians.

The values found in group V corroborate with the affirmation of Abramova, Nikitina and Ozolin (1995), in which the absence of A and the increase of the parcel of W characterize modalities of strength and coordination, being fit in Class IV.

**Table 4:** Dermatoglyphics results by sport group (Mil P, Mod P, F and V).

		N	$\mu$	Mínimo	Máximo	$\sigma$
<b>Arch (A)</b>	Mil P	6	1.33	0	4	4.93
	Mod P	7	0.04	0	3	1.13
	F	12	0.8	0	6	1.99
	V	12				
<b>Loop (L)</b>	Mil P	6	7.6	5	10	1.52
	Mod P	7	5.0	1	9	2.45
	F	12	5.8	0	10	3.05
	V	12				
<b>Whorl (W)</b>	Mil P	6	0.67	0	1	0.67
	Mod P	7	4.6	1	9	2.88
	F	12	3.4	0	10	3.4
	V	12	3.83	4	10	2.44
<b>D10</b>	Mil P	6	9.2	6	11	2.17
	Mod P	7	14.1	8	19	3.63
	F	12	12.6	4	20	4.66
	V	12	13.5	9	20	2.88
<b>TRC</b>	Mil P	6	82.3	20	143	42.34
	Mod P	7	128.6	62	149	30.42
	F	12	119.9	39	192	46.98
	V	12	132.08	95	197	38.27

In table 5, the somatotype results are detailed. It is observed that group Mil P presented 1,52-4,63-2,20, being characterized as mesoectomorphic. In relation to other sports, for not existing other results about Military Pentathlon, it can be compared Track and Field athletes of speed - 100 and 200 meters, and with the ones of Decathlon, that possess the same characteristics of the Military Pentathlon, since it is a sport of combined tests.

In the group Mod P it is observed that the subjects of the study present, as somatotype profile, also the mesoectomorphic classification, with average 2,3-4,5-3,4, where the mesomorphism is dominant, and ectomorphism has higher values than endomorphism.

The components of group F presented as values of somatotype 2,5-4,0-3,3, that, one time more, characterizes the sample as mesoectomorphic. Concerning other studies, the gotten result reveals the same classification in foreign foil fencers done by Rodríguez et al. (1986, apud Carter & Heath, 1990), inferior levels of endomorphy and mesomorphy and superior of ectomorphy, according to Eiben (1980, apud Carter & Heath, 1990).

In group V, it is perceived predominance of mesomorphy in relation to ectomorphy, fact proven by the biggest development muscle skeletal. These results coincide with the joined by Carter & Heath (1990), that is, the majority of Volleyball athletes is ectomesomorphic, having differentiation in some countries, in which they tend

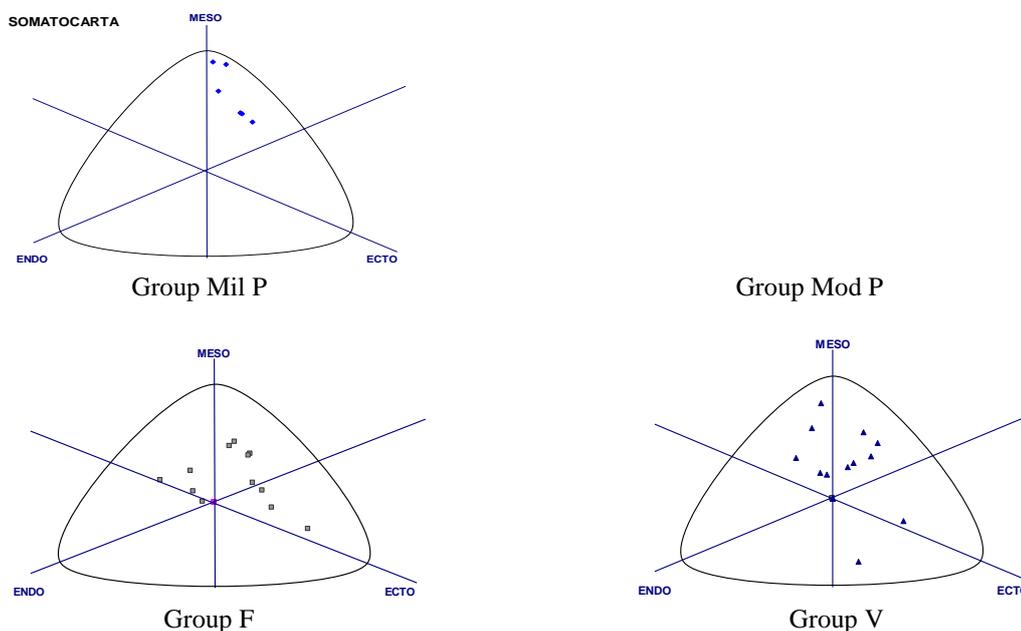
for the mesomorphy, other times to ectomorphy. In all the cases, mesomorphy and ectomorphy are the highest components.

**Table 5:** Evaluation of somatotype, following sport groups (Mil P, Mod P, F and V).

		N	$\mu$	Minimum	Maximum	$\sigma$
<b>Endomorphy</b>	Mil P	6	1.52	1.32	1.69	0.13
	Mod P	7	2.3	1.75	2.65	0.47
	F	12	2.5	1.7	4.3	0.94
	V	12	2.6	1.8	3.1	0.69
<b>Mesomorphy</b>	Mil P	6	4.63	1.48	5.55	1.03
	Mod P	7	4.5	1.56	4.85	0.95
	F	12	4.0	2.3	5.1	0.91
	V	12	4.2	2.8	5.6	1.69
<b>Ectomorphy</b>	Mil P	6	3.08	2.2	6.88	0.57
	Mod P	7	3.4	2.15	5.45	0.68
	F	12	3.3	2.2	5.5	0.95
	V	12	2.6	2.2	5.8	0.86

The sample somatotype distribution can be easier observed on the somatocharts of the groups, on the following figure 3:

**Fig. 3:** Somatocharts



About the basic physical qualities, the average value of the  $\dot{V}O_{2max}$  of the group Mil P demonstrates a very aerobic resistance. In relation to the result of the anaerobic resistance ( $296,5 \pm 4,04$  m), they presented similar values to Track and Field athletes ( $295,90 \pm 17,70$  m). About agility, the results had presented values close to Futsal players.

The group Mod P had presented average value of  $\dot{V}O_{2max}$  intermediate in relation to the groups Mil P and F [ $50,7 \text{ ml}(\text{kg} \cdot \text{min})^{-1}$ ], being this fact justified by the specific characteristics of each modality.

Group V could not be evaluated because of the training phase, that was presented next to competitions, in order to prevent any interference in the planning of the activities and in its physical preparation.

There had not been found, in searched literature, results of tests of the other physical qualities, for a similar sample, so that can be done the pertinent comparison. However, the values detached are basic for the accomplishment of future comparisons.

**Table 6:** Physical tests results (basic physical qualities), following the sport group (Mil P, Mod P and F)

		N	$\mu$	Minimum	Maximum	$\sigma$
<b>Speed (sec)</b>	Mil P	6	5.81	5.51	6.15	0.24
<b>50 m lauched</b>	F	12	6.3	5.42	7.42	0.54
<b>Agility (sec)</b>	Mil P	6	9.03	8.80	9.25	0.17
<b>Shuttle Run</b>	F	12	9.9	8.84	11.18	0.72
$\dot{V}O_{2max}$ [ml(kg.min) <sup>-1</sup> ]	Mil P	6	66.47	62.5	70.5	3.25
<b>Legér-Boucher and</b>	Mod P	7	58.55	51.7	63.6	2.87
<b>Ergoespirometry</b>	F	12	50.7	45.7	54.7	3.53
<b>Anaerobic resistance (m)</b>	Mil P	6	296.5	292	303	4.04
<b>40 seconds running</b>	F	12	263.3	225	290	18.72

## 6 CONCLUSION END RECOMMENDATIONS

This research endeavored, by means of qualitative and quantitative indexes, represented by fingerprints, anthropometric characteristics evidenced by somatotype and for the values of basic physical qualities, to describe the profile of the Brazilian military teams of Military Pentathlon, Modern Pentathlon, Fencing and Volleyball, raising data of informative marks, objective and of orientation of sport election.

Of course, the values found in the applied tests to evaluate the basic physical qualities can not translate the performance presented in a competition. Such affirmation is justified in the impossibility of evaluating the desired physical quality and the applied motor gesture in tests, the concentration level, the emotional state of the athletes, amongst other factors during the competitions.

The identification of the ideal profile of an athlete still requires other subsidies as psychological characteristic, or the inquiry of the behavior for the complementation of these results. It is known, however, that the information presented here represent only a small contribution, which concerns the knowledge of the characteristics of the practitioners of these modalities, not having, however, to restrict only the future studies in this area, but to be used so that they make possible tools for research in the most diverse sports.

It is expected that this research contributes with the scientificity in the election, orientation, detention of talents and physical preparation more and adjusted individualized, allowing the development of the analyzed sports, on the part of coaches, athletes and studios, as a ampler and including knowledge of the modalities.

As main and final recommendation, attempt this study to allow that this same population can be compared, in other chances, with other national and international teams, and/or serves as an subsidy concrete of the formation of the high level athlete and renewal of the values, knowing that the sport performance is a complex phenomenon to be studied and conceptually it must be dealt with distinct form inside of the areas of study and research of Sport Sciences.

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Head of Sports Department in HQ of SAF and in Doctrine and Development Centre; Lecturer and other;

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Bibliography: over 100 units (monographies, articles, foreword, coursebooks, lectures, mentor, co-mentor, reviewer, editor, projects, etc);

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**CONGRUENCE BETWEEN PHYSICAL FITNESS EVALUATION AND THE RESULTS OF  
MOTOR ABILITY TESTS PERFORMED BY MEMBERS OF THE ARMED FORCES**

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**ABSTRACT**

The study aimed to examine a test battery with the existing physical fitness evaluation and compare it with the results of the evaluation of motor abilities. The scores (depending on the result, age and gender) for each motor ability test were used to determine the types of statistical groups which were then compared with the existing physical fitness evaluation groups.

The sample of subjects consisted of 83 members of the Slovenian Armed Forces who fully performed all three tests: push-ups, sit-ups and a 3,200-m run. The subjects were divided into four age groups. The sample of variables included the number of points achieved in the push-up, sit-up and running tests. The classification in the groups was based on the K-means clustering method, whereas Ward's criterion function was used as a similarity measure in the classification. Three statistical groups were obtained and their typology was determined based on the characteristics of the final cluster centres: 'performing excellently', 'underperforming in terms of endurance' and 'underperforming in terms of strength'. The typology of statistical groups points to a combining of the strength and endurance tests with those subjects with poor motor abilities and an unequal distribution of motor abilities in the selected test battery. A bivariate analysis was conducted to compare the types of statistical groups with the physical fitness evaluations and to thus establish congruence. The finding was that a direct comparison was impossible due to the characteristics of the clusters, with the exception of subjects with a high level of physical readiness.

The comparison revealed inequality in the tests of strength and endurance in terms of evaluating physical fitness, owing to which the evaluation could be misleading and might fail to yield realistic results of physical readiness. Moreover, it also raised the question of whether the structure of the evaluated motor abilities was sufficient for evaluating physical fitness where only two dimensions were being compared. The resulting incongruence puts into question the selected test battery and physical fitness evaluation criteria and therefore also the validity of the points system. Among other things, an examination of the distribution of subjects into age groups by type of statistical group and by physical fitness evaluation revealed that motor abilities diminished with age irrespective of the fact that age was taken into account in the points system.

**Key words:** *test, motor abilities, physical readiness, physical fitness, soldier*

**INTRODUCTION**

The armed forces constitute a special area of human life and work where the working conditions are specific and involve high levels of mental and physical strain (Berčič, 1980). In the army, tasks can be associated with extremely high, prolonged mental strains which demand from a member of the armed forces a high level of physical readiness and a top mental condition. Even though the physical readiness of soldiers plays an important role in the performance of their duties, many armed forces in the world deal with problems of their members not regularly engaging in a sport (Tkavc & Karpljuk, 2006).

The purpose of sport in the Slovenian Armed Forces and the pertaining evaluation of motor abilities, as an element of the contents and tasks, is based on general and specialised guiding principles. The general ones relate to sport since, with time, the positive aspects of exercise have contributed to sport becoming an ever more important factor of every man's life. The positive aspects of sport exercise are essentially achieved when a sport activity follows the principles of sport recreation and fulfils its purpose and objectives (Tkavc, 1999). In the army, members are required to demonstrate special physical fitness which exceeds the level typical of sport-recreational activities. Therefore, in the army sport exercise aimed at maintaining health is both the basis and the prerequisite for the appropriate physical readiness of each individual member (Tkavc, 2004b). The main purpose of sport in the army is to provide for appropriate and overall psychomotor development of army members so that they – being

healthy, strong, vigorous and capable of working and learning – can participate in activities in their environment and withstand the pressures of today's pace of living and the requirements of the military profession (Jošt, 1994). The motor abilities of an individual and a unit are some of the basic elements of combat readiness (Karpljuk, Žitko, Rožman, Suhadolnik, & Karpljuk, 2001). Soldiers who are not physically ready cannot fully discharge their duties in line with the army's general mission. The army tests the level of physical readiness by evaluating motor abilities. Last but not least, one of the most demanding conditions in the army is the physical fitness of its members (You and the APFT, 1987).

The aim of verifying and evaluating the motor abilities of members of the Slovenian Armed Forces is to systematically check the level of motor abilities of those members assigned to military duties, thus serving as a basis for the Ministry of Defence's planning and implementing of sport activities (Instructions for evaluating motor abilities of employees of the Ministry of Defence assigned to military duties, 2002). Usually in the armed forces a failure to pass the test or fulfil the minimum criteria thwarts a member's development in terms of major personal aspects of a military post as they become ineligible for promotion and attendance at military training and/or schools and for command. In the Slovenian Armed Forces physical fitness is one of the aspects of the assessment of professional competence for military duties. The same tests and criteria for evaluating motor abilities apply to all members on active duty, candidates for contractual Reserve service and candidates for professional service in the Slovenian Armed Forces (Instructions, 2002). A motor test battery includes the push-up, sit-up and 3,200-m run tests. The times for the runs and number of sit-ups and push-ups that have to be achieved are based on gender and age. This battery of motor tests is designed for active personnel (infantry) in the US Army and also for the US Army National Guard (Dunn, Luther & Smith, 1994). Other branches use different tests. Those with a diagnosed medical condition can also conduct alternate tests, e.g. bike, swim, walk and other. The Slovenian Armed Forces also operates an alternative test for individuals with medical limitations, i.e. 3,800-m walk; however, this will not be dealt with in the present study.

According to the definition by Kurelič et al. (1979), a battery of motor tests consists of a complex of motor abilities selected for a special purpose. The results are evaluated using a point scale and the person's physical fitness is evaluated according to specific criteria. One can speak of motor task standardisation (Šturm & Strojnik, 1994) in terms of defined procedures for executing individual motor tasks as well as in terms of standardised results by converting them into points which constitute a physical fitness evaluation. The results are converted into points for each test separately using point tables. The achieved points criterion in each test and the sum total of the achieved points constitute a physical fitness evaluation (Tkavc, 2004b). They are similar to Dr. Cooper's point tables for evaluating aerobic capacity (1979) with which almost everybody dealing with those topics and researches in the field of physical tests is familiar.

In the present work, the problem was investigated using motor ability tests on the basis of the three US Army tests and a point scale on members of the Slovenian Armed Force. The study aimed to examine the test battery with the existing physical fitness evaluation and compare it with the results of the motor ability tests. The scores (depending on the result, age and gender) for each motor ability test were used to determine the types of statistical groups and compare them with the existing physical fitness evaluation groups.

## **METHODS**

### **Sample of subjects**

The sample of subjects consisted of 83 members of the Slovenian Armed Forces who fully performed all three tests. None of the subjects had any medical limitations that would have required the use of the alternative walk test. The subjects were divided into four (4) age groups according to Cooper's classification (1979): 13 subjects in the under 29 years age group (15.7%), 43 in the 30 to 39 years age group (51.8%), 20 in the 40 to 49 years age group (21.4%) and 7 in the above 50 age group (8.4%). The point scale in the Instructions (2002) offers a classification in eight age groups; however, our subjects were divided into four age groups to allow for a higher number of subjects in each.

### **Description of the tests**

**Push-ups** (PU): the subject assumes a front-leaning rest position by placing their hands on the ground in the width of their shoulders and performs the test by bending their elbows until their upper arms are parallel to the ground and returning to the starting position. The objective and result of the exercise is the maximum number of correctly performed repetitions in 120 s.

**Sit-ups** (SU): the subject lies on their back with their knees bent at a 90-degree angle and raises their upper body forward to the vertical position, with their arms crossed across their chest and hands resting on the opposite

shoulders. A sit-up is completed when the elbows touch the thigh and the body returns to the starting position until the shoulder blades touch the ground. The objective and the result of the event is the maximum number of correctly performed repetitions in 120 s.

**3,200-m run (3200MR):** the subjects conduct this event in groups of a maximum of 16. The objective of the exercise is to run a distance of 3,200 m as fast as possible. The result is the time spent completing the course, measured with a stopwatch in whole seconds.

### Evaluation

The results of the PU, SU and 3200MR tests are evaluated using a point scale and based on gender and age, where the sum total of points yields the physical fitness evaluation for each individual. Each of the three tests is evaluated using a 100-point scale. The evaluation 'highly fit' requires a score of a minimum of 80 (eighty) points in each test and the overall score of the three tests of a minimum of 250 points. The evaluation 'fit' requires a score of a minimum of 50 (fifty) points in each test and the overall score of the three tests of a minimum of 180 points. In the event the minimum number of points in the test, i.e. 50, is achieved and the overall score of the three tests is 150, the evaluation is 'partly fit'. A failure to meet this criterion results in the evaluation 'unfit' (Instructions, 2002).

### Data-processing methods

The sample of variables included the points achieved in the PU, SU and 3200MR tests. The variables were standardised. Descriptive statistics included a calculation of minimum and maximum values, arithmetic means, standard deviation, kurtosis, skewness and the Kolmogorov-Smirnov test. The K-means clustering method was applied for the classification into groups. A classification was made into two, three and four groups. The purpose was to check whether the classification was the most appropriate, which is why two control classifications were additionally made. Ward's criterion function was applied as a similarity measure in the group classification. The most appropriate classification proved to be in three groups. The typology of the statistical groups thus obtained was determined on the basis of characteristics of the final cluster centres. A bivariate analysis was used to investigate the distribution of subjects by age group in terms of the types of statistical groups and the physical fitness evaluation. Moreover, the types of statistical groups were compared with the physical fitness evaluation and the congruence between them established. The statistically significant correlation between the types of statistical groups and the evaluations of physical fitness was verified using the ANOVA at an alpha risk of 5%.

## RESULTS

According to the descriptive statistics, the highest scores (100 points) were achieved in the PU, SU and 3200MR. The lowest score was achieved in the 3200MR (0), followed by the SU (48) and PU (58). The highest average was achieved in the PU (81.01), followed by the 3200MR (79.87) and the SU (78.59). The characteristic of the Kolmogorov-Smirnov test shows a normal distribution of variables (PU 0.191; SU 0.026; 3200MR 0.029). The characteristics of the final cluster centres of the classification in three clusters (Table 2) show above-average values for the PU, SU and 3200MR in Cluster 2. Cluster 1 recorded distinctive below-average values for 3200MR and below-average for the SU. In Cluster 3 all values were below average, especially in the PU and SU. According characteristics of each cluster we define three types of statistical groups. Subjects from all age groups were classified in all three statistical groups (Table 3) but not in the groups of physical fitness evaluation (Table 4). In terms of the type of statistical group (Table 3) the majority of subjects (38) were distributed in the group 'underperforming in terms of strength' (Cluster 3 according to the final cluster centres), 35 in 'performing excellently' group (Cluster 2 according to the final cluster centres) and 10 in the 'underperforming in terms of endurance' group (Cluster 1 according to the final cluster centres). In terms of physical fitness (Table 4) more than half the subjects were distributed among 'fit' (52), followed by 'highly fit' (25) and 'unfit' (6). A comparison of the physical fitness evaluations against the statistical groups reveals a low overlapping ratio (Table 5, Figure 1).

The physical fitness evaluations overlap with the types of statistical groups (Table 5, Figure 1) in the following percentages: the evaluation 'unfit' overlaps with the 'underperforming in terms of strength' group to the extent of 16.7% and with the 'underperforming in terms of endurance' group to the extent of 83.3%; the evaluation 'fit' overlaps with the 'underperforming in terms of strength' group to the extent of 71.2%, with 'underperforming in terms of endurance' to the extent of 9.6% and with 'performing excellently' group to the extent of 19.2%; the evaluation 'highly fit' overlaps with 'performing excellently' group to the extent of 100%. A statistically significant correlation (0.000; statistical significance was set at the  $p < 0.05$  level) was established between the physical fitness evaluation and the types of statistical groups.

**Table 1:** Descriptive statistics

	Minimum	Maximum	Average		Std. Dev.	Skewness	Kurtosis	Kolmogorov-Smirnov C	
	Statistics	Statistics	Statistics	St. error	Statistics	Statistics	Statistics	K-S test	Char. of ND
PU points	58	100	81.01	1.53	13.895	.054	-1.411	1.084	.191
SU points	48	100	78.59	1.73	15.748	.145	-1.466	1.471	.026
3200MR points	0	100	79.87	2.22	20.208	-1.673	4.082	1.454	.029

**Table 2:** Final Cluster Centres

	Cluster		
	1	2	3
Achieved PU points	-.18799	.85249	-.73572
Achieved SU points	.06411	.82974	-.78111
Achieved 3200MR points	-1.91348	.70077	-.14190

**Table 3:** Distribution of age groups by type of statistical groups

		Age groups				Total
		up to 29	30-39	40-49	50+	
Types of statist. groups	Underperf.-strength	5	20	10	3	38
	Underperf.-endurance	1	4	2	3	10
	Performing excellently	7	19	8	1	35
Total		13	43	20	7	83

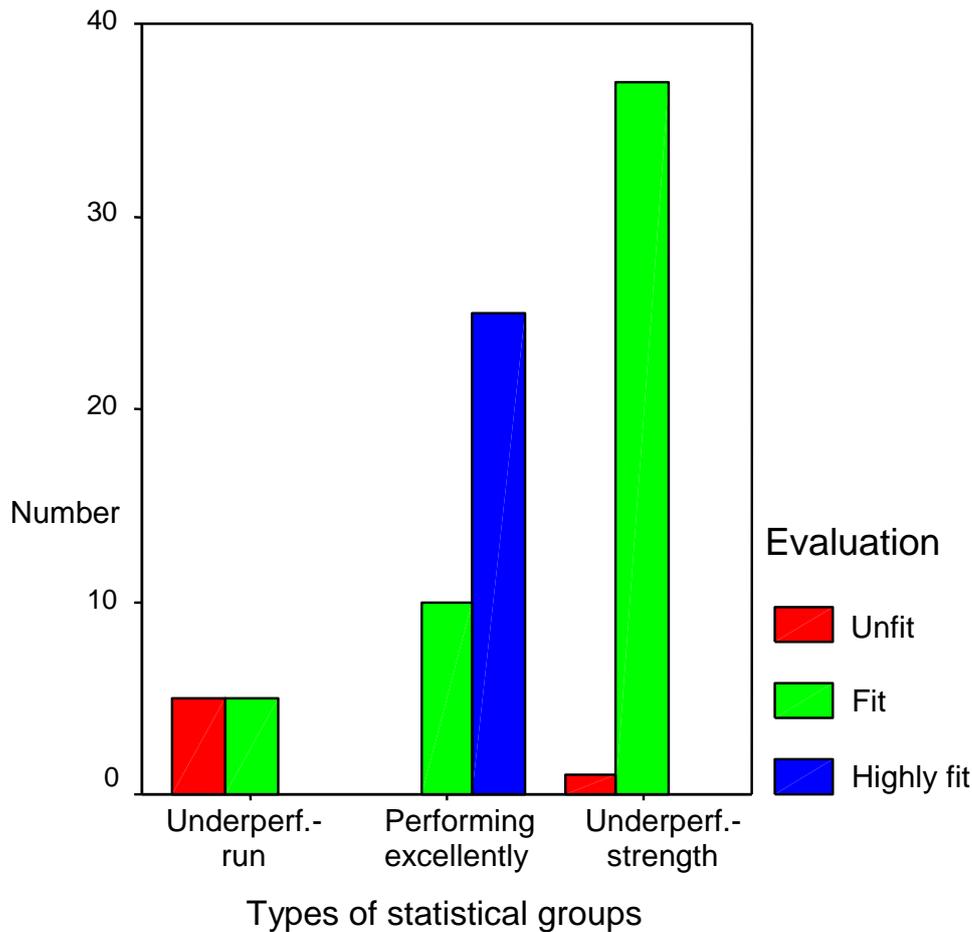
**Table 4:** Distribution of age groups by physical fitness evaluation

		Age groups				Total
		Up to 29	30-39	40-49	50+	
Physical fitness evaluation	Unfit		2	1	3	6
	Fit	8	28	12	4	52
	Highly fit	5	13	7		25
Total		13	43	20	7	83

**Table 5:** Comparison between the evaluation of physical fitness and types of statistical groups

			Types of stat. groups			Total	
			Underp.-S	Underp.-E	Perf. excel.		
Physical fitness evaluation	Unfit	Number	1	5		6	
		% Types of stat. groups	2.6%	50.0%		7.2%	
		% Phys. fitness evaluation	16.7%	83.3%		100.0%	
			% Total	1.2%	6.0%		7.2%
	Fit	Number	37	5	10	52	
		% Types of stat. groups	97.4%	50.0%	28.6%	62.7%	
		% Phys. fitness evaluation	71.2%	9.6%	19.2%	100.0%	
		% total	44.6%	6.0%	12.0%	62.7%	
	Highly fit	Number			25	25	
		% Types of stat. groups			71.4%	30.1%	
		% Phys. fitness evaluation			100.0%	100.0%	
		% Skupaj			30.1%	30.1%	
Total	Number	38	10	35	83		
	% Types of stat. groups	100.0%	100.0%	100.0%	100.0%		
	% Phys. fitness evaluation	45.8%	12.0%	42.2%	100.0%		
	% total	45.8%	12.0%	42.2%	100.0%		

Statistical significance of ANOVA: 0.000 (p<0.05)

**Figure 1:** Comparison between the physical fitness evaluation and types of statistical groups

## DISCUSSION

The existing assessment consists of four evaluations: highly fit, fit, partly fit and unfit. None of the subjects in our sample was evaluated as 'partly fit'. When the subjects were classified in groups, the most appropriate classification proved to be in three groups. Hence the most appropriate evaluation is considered to be a three-level evaluation. The evaluation 'partly fit' should be closely scrutinised and an analysis conducted to establish the number of soldiers falling into this category; on this basis it should be established whether this evaluation is at all rational. After all, considering the requirements of the military profession, a member of the army must be fit to perform their work. If a member fails to meet the criteria, they are unfit. Given the broad variety of tasks, some military duties require a high level of fitness and, given that the results are in fact within the range, the three-level evaluation is not only reasonable but probably also the most practical. The evaluation 'partly fit' could perhaps be used for classifying members of the army with medical limitations who perform alternative tests and are considered as falling outside the category of healthy and fit-for-army members.

According to the characteristics of the final cluster centres, there is a group with above-average values in the PU, SU and 3200MR (Cluster 2) demonstrating good physical readiness in terms of repetitive strength (hereinafter referred to as 'strength') and general aerobic endurance (hereinafter referred to as 'endurance'), which is why it was named 'performing excellently', as well as two groups which are non-homogeneous in terms of the characteristics of the final cluster centres in the PU, SU and 3200MR: Cluster 1 recorded average values in the SU but very below-average values in the 3200MR, which is why it was named 'underperforming in terms of endurance'; Cluster 3 recorded below-average values in the PU, SU and 3200MR and thus performed the worst of all three groups, with distinctively negative results in the PU and SU, which is why it was named 'underperforming in terms of strength'. The above speaks in favour of combining the tests of strength (PU and SU) and endurance (3200MR). The results confirm that the test battery includes two tests of strength and one of endurance. This finding can also be associated with the assertion of Karpljuk et al. (2001), namely that the nature of the evaluation

of individual motor abilities basically differs in each test. Moreover, the classification shows an imbalanced representation of motor abilities (of individual tests) in the selected test battery, which means that the test of strength and the test of endurance are not equivalent in the physical fitness evaluation. The latter is also corroborated by the comparison of the physical fitness evaluations with the statistical groups. The evaluation of fitness is considered appropriate as the 'performing excellently' group overlaps entirely with the evaluation 'highly fit'. A point to make here is that perhaps the criteria are too high as the 'fit' members were also categorised in the 'performing excellently' group. Despite the average SU results, the 'underperforming in terms of endurance' group overlaps to the highest percentage with the evaluation 'unfit', due to the distinctively negative values in the 3200MR. This means that those subjects who were evaluated as 'unfit' mostly performed poorly in the run. Inversely, the 'underperforming in terms of strength' group overlaps to the highest percentage with the evaluation 'fit', even though it is the worst of all the groups due to average values in all three tests (PU, SU and 3200MR).

This gives rise to several questions. Is it easier to meet the strength evaluation criteria than those for running? Or does the above only show the lack of proportionality, given that two tests of strength dominate the test battery? This clearly shows that the physical fitness evaluation could be misleading when assessing someone and might fail to yield realistic data concerning their physical readiness. This indicates incongruence in the evaluation points system, which further raises the question of whether information about physical readiness is truly obtained and whether one may speak of physical fitness if only two dimensions of the motor ability structure are considered. Jošt and Agrež (1994) define seven primary motor abilities (strength, endurance, speed, flexibility, co-ordination, balance and precision), with strength and endurance being just two of them. Some authors do not classify endurance among motor abilities on the grounds that endurance is a general ability of every human being (Pistotnik, 2003). Endurance is a life-long ability as it is required throughout one's life (Bravničar-Lasan, 1996). Notwithstanding the above, the question arises of whether strength and endurance are the only abilities – even if they might indeed be the most important for a soldier – to be prioritised in the framework of the characteristics and requirements of the military profession. Is it not true that co-ordination and flexibility, for example, are also critical for a soldier when moving in the battle field? Jošt and Agrež (1994) state that it can be established from the set of motor tasks what members of the Slovenian Armed Forces are required to master (several hours' marching, short and medium-long sprints with changes in direction, climbing with free and mixed hangs, crawling and climbing, throwing, lifting and carrying, pulling and pushing) and that the motor skills are very heterogeneous, including nearly all natural types of movement. These motor skills primarily require well-developed energy potential as displayed in motor abilities of the endurance type and which manifest themselves in different types of strength and speed.

On the other hand, some movements and motor tasks such as overcoming artificial and natural barriers as well as handling different objects and technical devices mainly require a high level of co-ordination and flexibility.

The obtained classifications and characteristics of the clusters show that, with subjects with lesser physical readiness, the physical fitness evaluations cannot be directly compared to the statistical groups because of the combining of the tests of strength and endurance. The only exception is physically fit subjects who achieve good results in all three tests, which is also discernible from the characteristics of the clusters of 'performing excellently' group and the comparison of the latter with the evaluation 'highly fit'. The results put into question the selected test battery and physical fitness evaluation criteria and thus also the validity of the points system.

Standardisation of results is a challenging task and so is the verification of its validity. According to Astrand and Rodahl (1986), in some cases it is very difficult to standardise muscle strength measurement for several reasons (e.g. to measure maximum muscle force different types of resistance exercises can be used on training devices – bench press, curl, squat) and the same applies to push-ups. Regardless of the above, the PU as a test of strength is applied by the Slovenian Armed Forces and some others. One could question the adequacy of individual tests in the selected test battery. We can improve our understanding of the execution of tests from the practical point of view. Using the observation method during the process of testing physical fitness, we established that the bulk of incorrect and harmful-to-health executions of exercises were seen in the PU test. Therefore, this test can in the long run be considered as jeopardising the health condition of members of the army. The incorrect and harmful-to-health performance of the PU test is mainly due to the low level of fitness in terms of arm strength (and the entire body) and the incorrectly learnt execution. For these reasons, it is probably the most difficult test of all three to measure objectively and, therefore, the grader subjectively assesses whether the exercise is performed correctly.

The study results showed the physical readiness of the subjects in terms of strength and endurance. According to the physical fitness evaluation, most members of the army were 'fit', followed by 'highly fit' and 'unfit', which means that the majority demonstrated good physical readiness. In terms of the physical fitness

evaluation, the descriptive statistics corroborate the above. In all three tests some subjects achieved the maximum number of points (100) and were, on average, close to the criterion of high fitness (80 points). The ability to achieve high levels of physical readiness or fitness in terms of both strength and endurance is substantiated by the characteristics of the clusters of 'performing excellently' group and the overlapping of this group with the evaluation 'highly fit'. This high level of physical fitness can be attributed to regular and systematic training and high motivation. A low level of physical fitness in terms of strength and endurance is substantiated by the characteristics of the final cluster centres of the classification in the 'underperforming in terms of strength' group. In the 'underperforming in terms of endurance' group the distinctively below-average values in the 3200MR confirm the poor level of endurance. Most subjects underperformed in terms of strength (38), accounting for less than half of the total, whereas together with the 'underperforming in terms of endurance' group (10) their share exceeded one-half.

In terms of age, physical fitness declines with years regardless of the fact that age is already considered in the process of converting points into scores. This raises the question of the evaluation criteria even if, according to Pokorn (1998), the pace of the age-related downturn in physical abilities depends on the physical activity of each individual, as regular physical activity can cause a stagnation of abilities between the ages of 25 and 50. In our case this could mean that members of the army are insufficiently physically active and fail to maintain the vital capacities of their body. Another explanation is that the types of statistical groups indicate poorer results and poorer physical readiness since the existing evaluation and ensuing finding that the physical fitness evaluation depends mainly on the evaluation criteria. Clearly, the decline in physical fitness with age is substantiated by the distribution into types of statistical groups by age as well as physical fitness evaluation.

As regards the achievement of the results in the tests, it should not be overlooked that members of the army are informed beforehand of the criteria and this can influence their decision on the score they wish to achieve. It is possible that someone might decide to fulfil only the minimum fitness criterion, even if they are capable of achieving more. Owing to this inclination of each individual (their motive), the fulfilled criteria and achieved points do not necessarily paint a realistic picture of their physical readiness. Moreover, our sample was relatively small, particularly in the youngest and oldest age groups. Based on the above, one can hardly speak of good or poor physical fitness and, in fact, this was not what the study aimed at. It is true that the comparison of the existing physical fitness evaluation with the results reveals incongruence, which is why the evaluation criteria should be investigated further (Tkavc, 2004b).

## CONCLUSION

The study results reveal a need for: (1) a balanced test battery; (2) a test battery that establishes physical readiness (fitness) more comprehensively, according to the motor ability structure; (3) an evaluation structure that yields realistic information on physical fitness and individual motor abilities and thus underpins proper planning of the training process and other procedures relevant to sport exercise in the army. Our study applied one of the multivariate methods.

The results revealed the problems associated with a synthetic physical fitness evaluation and thus the need for the further and profound study of this subject. Formulating a battery of motor tests, criteria and physical fitness evaluations is a challenging and responsible task and it therefore needs to be constantly verified in practice, investigated and confirmed by scientific work methods. The study and periodical verification of an existing test battery applied in practice can thus serve as one of the forms of its evaluation.

The process must also consider the changes brought about by global and local development trends. Perhaps, it sometimes seems like the easiest way, is to use something which other armies employ and has already been 'tested'. Consideration must also be made of geographical, socio-demographic and other characteristics of and differences between various cultures. A study is a way to establish or verify the state of affairs using a selected sample.

The findings can be shared with others and thus help paint a clearer picture and enable a critical understanding of the state of affairs. This can also trigger new questions. If new findings raise a series of new questions, further research is inevitable. In this way research becomes a sensible continuum.

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## CISM International Symposium 2009



### 4<sup>th</sup> SESSION

Science: an efficient toll for sports administrators

Sunday, 20<sup>th</sup> September 2009

From 13:30

To 16:30





**Prof. Matej Tušak, PhD (SLO)**

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## **ACADEMIC FORMATION**

- 1992**                      University Degree of Psychology (University of Ljubljana)  
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## **WORK EXPERIENCE**

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Research Subjects: personality, motivation and health status, sport identity and the effectiveness in sport ,the coach leadership and social skills, voluntary work in sport, stress and coping stress in civil defence

## **CURRENT FUNCTION**

Associate Professor in Sport Psychology at Faculty of Sport, University of Ljubljana (full time job);  
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## **ABSTRACT**

The aim of the research was to evaluate ranking of the sport activity values and motives among soldiers and officers in Slovenian Army. We were also interested in understanding the meaning of physical and sport activity for the employers in the Slovenian Army and how being physically fit influence on work efficiency. We also were interested in differences between soldiers and officers in Slovenia Army. 100 subjects were measured (70 soldiers and 30 officers) with Musek General Values Scale, Participation Motivation Scale and Attitudes Toward Sport Scale. The most important among all sport activity motives are those, connected to physical preparedness: good physical skills and abilities and to be fit and physically ready. The most important value is general health, which can be reached through sport and physical activities. There are also be found that the employers in Slovenian Army do not physically train because of the orders but because of their own benefits. Sport activity is important factor of work efficiency, because both soldiers and officers see it as healthy way of life and pleasure. They relate sport activity to efficient work in the Army. It was also found that good physical preparation is more important to officers than soldiers. Those results can be understand as a confirmation of good and right human resource planning for military tasks and also confirmation of sport activities in Slovenian Army. Sport exercise with the purpose of remaining health can be understood as a basic condition for appropriate motor abilities and efficiency of the soldiers and officers in the Army.

**Key words:** *motive, value, ability, armed forces.*

## **INTRODUCTION**

Slovenian Armed Forces are defence forces, which autonomously or in alliance based on international treaties execute military defence. Hierarchical organization of the Slovenian Armed Forces provides efficient and proper management and command.

The armies worldwide have been increasingly integrating and performing common tasks, such as peacekeeping in war zones or common actions in combat in different war zones of the world with various conditions (climatic, geographic, cultural, etc.). For that an individual has to be well-prepared for such conditions.

Picarielo (2000) emphasized physical training is based on endurance, strength and speed, as well as on the development of mental skills, cohesion within the group, and on the factors that are related to the conditions on the battlefield. Even without the extreme additional burden, many individuals often face problems; their own bodies present a greater challenge and burden than the task, which they are supposed to accomplish. Such problems are usually health related (increased body weight and related symptoms, daily exposure to stressful situations, problems with motion organs, cardio-vascular diseases, etc.) (Karpljuk, Žitko, Rožman, Suhadolnik & Karpljuk, 2000; Karpljuk et al., 2003; Novak, 2003). All these factors and diseases have a negative impact on performance of assignments and duties in operating units in the field, as well as in command, branches and in everyday life (Tkavc, 2004).

Life dynamics of an individual actively includes one's personality, which on the one hand depends on various motives and on the other hand also has the role of a stimulus or guide. Since the old days people have believed in internal and external powers and forces which drive and direct us, thus inducing our behaviour. In the broadest sense motivation represents an oriented and a dynamic behavioural component, which is a characteristic of all animal organisms. It includes stimulation and guidance of activities (Tušak, 2003). Motivation is a process,

while motives are stimuli, which direct and manage the activity. Motives stimulate and determine human behaviour every time a wish for a certain goal arises (Kronja, 1966). Motives as a mobilising dimension of a person's psychosomatic status release the lever which determines whether a person will be active in sports or not. An important set of motivation is also self-motivation, which expresses the capability of motivation self-control. Individuals with high self-motivation level prepare and motivate themselves and work independently, without any external support or "pressure".

The aim of the research was to evaluate ranking of the sport activity values and motives among soldiers and officers in Slovenian Army. We were also interested in understanding the meaning of physical and sport activity for the employers in the Slovenian Armed Forces and how being physically fit influence on work efficiency. We were also interested in differences between soldiers and officers in Slovenia Army.

## METHODS

### Participants

100 employees of the Slovenian Armed Forces (70 soldiers and 30 officers) collaborated in the research. In our sample were included employees of Slovenian army from seven different units.

### Instruments

- Participation Motivation Questionnaire: PMQ (Gill, Gross & Huddleston, 1983) with a list of 30 potential motives or reasons for sports participation. This questionnaire is particularly intended for young, who are active in sports, and the motivation of whom is still very diverse. The respondents evaluated each reason on a three-level ordinal scale (Very important; somewhat important; not important). In our research we adjusted this scale to a 50 mm graphic scale in which the left side indicated "the reason is irrelevant for me" and the right side indicated "the reason is highly important for me".

By using factor analysis of the reasons, the authors obtained the following main factors or incentives:

8. *Success and productivity* (e.g. "I like winning")
9. *Team atmosphere* (e.g. "e.g. I like groupwork/teamwork")
10. *Friendship* (e.g. "I like spending time with my friends")
11. *Recreation* (e.g.. "I like to get out of the house")
12. *Relaxation and releasing the superfluous energy* (e.g. "I want to release tension")
13. *Developing abilities* (e.g. "I would like to learn how to train/practice")
14. *Fun* (e.g. "I like having fun").

The importance of individual goals or of an individual incentive is used as attractiveness of a motive or incentive and as its valence in a motivational situation. The authors have reported factors with various levels of reliability, between 0.30 (friendship) and 0.78 (team atmosphere). Although the authors did not indicate any norms, they presented the results obtained from the sample of 720 boys and 418 girls. The results cannot be compared to ours, since the scale has been adjusted. The questionnaire was translated with permission and adapted for the purpose of researches (Tušak, 1996). In our research we also obtained seven factors, which are represented and described in results. Cronbach's alpha coefficient in our study is 0.94. Cronbach's alpha coefficients for separate factors range between 0.89 (*the motives of social recognition*) and 0.54 (*the motives of competence and promotion to a higher level*).

- Work Efficiency Scale; It is composed of 19 statements to which the participant answers on a five level scale (1 not true at all for me and 5 completely true for me). The statements are created in a way that show participant's preparedness for fulfilling everyday work duty and the biggest emphasis is on his psychophysical readiness. The results show individual's interest for good performing of defined motive tasks, his motivation, interest, effectiveness and reliability.
- Values Scale (Musek, 1993, 2000); It is composed of 54 items, which represent 54 independent values. The participant answers with scale from 1 to 100 in a way he values stated things. The participant's answers enable us to find out his value orientation and value hierarchy. Cronbach's alpha coefficient in our study is 0.95.

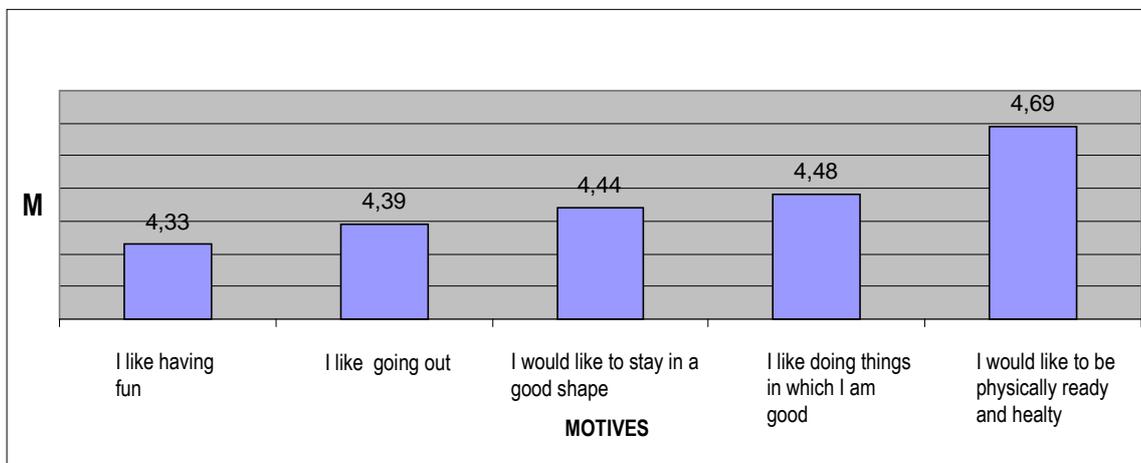
- For finding out the intention of points of view on sport we composed **The Point Of View Scale on Sport (SS)** (Tušak & Korenjak, 2006). It is composed of 35 statements (e.g. "I like competing at competitions", "Sport represents enjoyment to me"). The participant labels how much a statement is true for him/her on a five level scale, where 1 means I completely disagree and 5 means I completely agree. For the final result we scored the average of the answers. Cronbach's alpha coefficient in our study is 0.92.

**Procedure**

After previous agreement with the Slovenian Armed Forces and their consent to collaborate in the research, we collected data in different units. The testees filled in the questionnaires individually and considering the instruction added. For any possible questions the testators were there to answer so that we explained any possible indistinctness. The filled out questionnaires were collected after the filling in was completed. The data was statistically handled with help of the program SPSS 15.0.

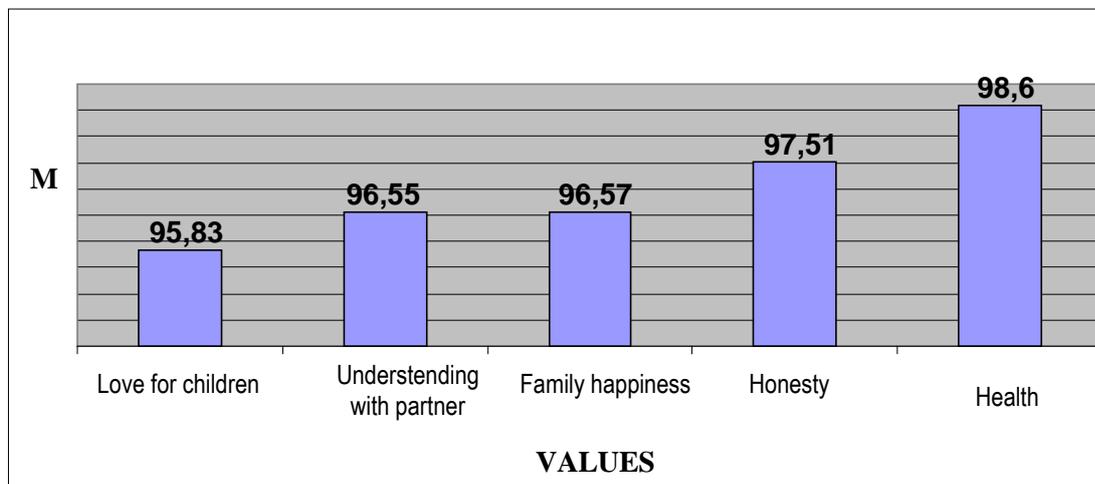
**RESULTS AND INTERPRETATION**

**Picture 1:** The most important motives of employees of Slovenian Armed Forces.



We found out that the most important among all sport activity motives are those, connected to physical preparedness: good physical skills and abilities and to be fit, physically ready and healthy. Similar results in one of the research have received Tkavc (2003), namely the acquisition of physical fitness as the biggest motive among employees of Slovenian Armed Forces. This shows the awareness of employees about the importance of physical preparedness. There are also be found that the employees in Slovenian Armed Forces do not physically train because of the orders but because of their own benefits.

**Picture 2:** The most important value of employees of Slovenian Armed Forces.



Picture 2 indicates that the most important value is general health, which can be reached through sport and physical activities. Similarly in one of the research in the Slovenian Armed Forces in the first place was classified utilitarian value - health (Tkavc, 2003).

We also found out that sport activity is important factor of work efficiency, because both soldiers and officers see it as healthy way of life and pleasure. They relate sport activity to efficient work in the Army. The integration of sport in everyday life of employees probably resulting from many years of efforts by sport professionals in the Slovenian Armed Forces, who have designed a system of sport in the Slovenian Armed Forces, including performing a variety of educational forms, in cooperation with experts from the Faculty of Sport. The Slovenian Armed Forces also contribute a major proportion to the regularly physical active population of Slovenia, as already noted Tkavc (2003).

Good physical fitness and health are important to officers and also soldiers, but placed greater importance to the officers, because they have a crucial meaning at decision making, while experiencing both the physical and psychical effort. In addition to all this they easily overcome stress if they are physically well prepared and therefore they valued this motive the most. It should be also noted that officers are better educated and because of the role of decision-making also have more opportunities to participate in various forms of education and consequently are more aware about healthy lifestyles as soldiers.

## CONCLUSION

Those results can be understand as a confirmation of good and right human resource planning for military tasks and also confirmation of sport activities in Slovenian Armed Forces. Sport exercise with the purpose of remaining health can be understood as a basic condition for appropriate motor abilities and efficiency of the soldiers and officers in the army.

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## **WORK EXPERIENCE**

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## **CURRENT FUNCTION**

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**HOW KNOWLEDGE MANAGEMENT IN ERGONOMICS CAN HELP AVIATION  
AND SPORT RESEARCH FOR MILITARY CONCERNS?**

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**ABSTRACT**

Several approaches of ergonomics interventions and analyses as well as anthropometric parameters, have been used to reduce physical stress in flight cockpit. Furthermore, ergonomics may play a role synergically directed to sport research concerns. The aim of the present study is to make a critical evaluation through a qualitative literature review of several studies relating ergonomics into aviation environment, in order to explore whether ergonomics/anthropometric concepts could be useful to both military planes and sport-oriented projects developments. The qualitative review is one way to better know and understand some subject and to manage the knowledge once it can combine and synthesize results from a wide-ranging of studies.

Search tools as OVID/MEDLINE, COCHRANE/Trials Registry and Academic Google (1989 through June 2009), using terms of ergonomics, human factors, anthropometric parameters, workplace interventions or biomechanics, linked to pilots/athletes selection, cockpit evaluation, aircraft/airplanes projects, sports training, pilots/athletes performance, military pilots/crew selected article bibliographies also focusing on possible sport-related repercussions.

The authors verified that one of the main factor that affect the quality of life as well the pilot's performance during flight is in the currently using crew's chair once some sittings in the Brazilian Air Force airplanes do not offer a correct comfort conditions to the flight personnel. Another found was that in order to specify accurate ergonomics requirements is strongly recommended to base on the huge number of ordinary pilot's experience instead of test pilots. The adopting of ergonomics parameters as an admission and selection criteria has been largely used. The critical measures for a correct evaluation of the aircraft's cockpit dimensions must be taking in the seating position: stature, buttock knee, knee height, leg length and eyes height. Due to anthropometry the most part of female population is unfit in order to operate effectively the flight controls. It is concluded that the anthropometric parameters knowledge from a specific population is very important in the development or acquiring process of any equipment, as well as accurate ergonomics requirements in aviation an promote the improvement of operational performance and flight security, adding the decreasing of musculoskeletal dysfunctions and death risks.

This study may be useful to possibly conclusions based on results combination from multiply sources including sport training contributions which are fundamentally based in operational performance. Future research works on ergonomics and sport may be based in a common matrix of relationships aiming to provide a physical training complement to equipment requirements.

**Key words:** *ergonomics, biomechanics, anthropometry, sports science, aviation.*

**INTRODUCTION**

A crucial issue in ergonomics, biomechanics and anthropometry is the translation of research findings about human performance into design and training guidance. In other words, how can empirical findings about human work and sport actually help designers create systems/equipments and coaches teach movements that fit how people work, train, compete and think?

According to International Ergonomics Association (IEA – 2000), Ergonomics is the scientific discipline concerned with designing according to the human needs, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance.

Ergonomics draws on many disciplines in its study of humans and their environments, including anthropometry, biomechanics, mechanical engineering, industrial engineering, industrial design, kinesiology, physiology and psychology (IEA, 2000).

Anthropometry is one of the vital tools in determining the selection of military aviators. The need for stringent anthropometric selection criterion is meant to ensure aircrew aircraft compatibility during training and later, without compromising individual comfort and safety (Sharma et al., 2007).

For safe and successful operation of flight displays and controls is, in part, dependent on the anthropometric characteristics of the pilots with respect to the design of a particular aircraft (Buckle et al., 1990).

Successful competition in sports has been associated with specific anthropometric characteristics, body composition and somatotype (Bayios et al., 2006).

An emerging concern about the cockpit dimensions or seat design have been occurred due to current increasing number of female pilots, who weight less and is shorter than their males counterparts. In addition, ejection seat limits maybe need to be revised and redesign once the anthropometric measurements are significant risk factor for ejection injuries and even death (Edwards, 1996; Patterson, 1989).

Biomechanics is one of the disciplines in the field of Human Movement and Exercise Science and it can be divided into three broad categories from a research perspective. Clinical biomechanics involves research in the areas of gait, neuromuscular control, tissue mechanics, and movement evaluation during rehabilitation from either injury or disease. Occupational biomechanics typically involves research in the areas of ergonomics and human growth or morphology as they influence movement. Research in sports biomechanics may take the form of describing movement from a performance enhancement or injury reduction perspective (Elliott, 1999).

Ergonomic research primarily study human capabilities in relationship to their work demands. Information derived from ergonomists contributes to the design and evaluation of tasks, jobs, products, sports equipment, environments and systems in order to make them compatible with the needs, abilities and limitations of people (IEA, 2000).

According Grayson et al. (2005) the ergonomic analyses aim to identify physical stressor as awkward posture, repetitive motions, high force requirements, static position, vibration and extend reach in order to eliminate or reduce effects over the work people (Genaidy et al., 2007). This process may be perfect applied to pilots and athletes once some of them are under one or more of these physical stressors.

Ergonomic practices may greatly benefit from the advances made in ‘evidence-based medicine’, defined as ‘the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients’ (Sackett et al. 1996). To the ergonomic practitioner, the practice of ‘evidence-based ergonomics’ should integrate his/her individual experience as well as the best external available evidence from systematic research (Genaidy et al., 2007).

Similar to evidence-based medicine (Rosenberg and Donald 1995), evidence-based ergonomics may consist of four steps: (1) formulate a clear question from a user standpoint; (2) search the literature for relevant ergonomic articles; (3) evaluate (i.e. critically appraise) the evidence for its validity and usefulness; (4) implement useful findings in ergonomics practice.

The study’s methodological quality is benchmarked against a number of criteria, such as measurement quality. This may be further subdivided into selected qualities criteria (Genaidy et al., 2007).

Correctly performed systematic literature reviews can provide a comprehensive and unbiased assessment of the published scientific evidence about specific questions (Bigos et al., 2009).

The aim of the present study is to make a critical evaluation through a qualitative literature review of several studies relating ergonomics into aviation environment, in order to explore whether ergonomics/anthropometric concepts could be useful to both military planes and sport-oriented projects developments.

## **METHODS**

### Basis for the methodology

It is been sought to use a systematic methodology to identify evidence about the effectiveness of biomechanical, ergonomic and anthropometrical interventions to contribute to both military planes and sports science developments.

### Criteria for Selecting Studies for Review

Studies including pilot and/or athlete selection, cockpit and/or sport equipment design, ergonomics, human factors, anthropometric parameters, workplace interventions or biomechanics, once they were related to sports training, performance enhancement, cockpit evaluation, aircraft/airplanes projects, sports movement, were included.

Search Strategy for Identification of Studies

An extensive search of OVID/MEDLINE, COCHRANE/Trials Registry and Academic Google (1989 through June 2009) was undertaken, using terms of ergonomics, human factors, anthropometric parameters, workplace interventions or biomechanics, linked to pilots/athletes selection, cockpit evaluation, aircraft/airplanes projects, sports training, pilots/athletes performance, military pilots/crew selected article bibliographies also focusing on possible sport-related repercussions. Reference lists of retrieved articles were also searched for additional articles as well as a personal collection of articles.

Methods of the Review

Titles and abstracts were identified by electronic database search, and a reviewer scrutinized hand searches. Studies thought relevant by the reviewer were retrieved for full-text review.

Each article was examined and those that met the following inclusion criteria were included: (1) experimental studies; (2) present ergonomics, biomechanics and anthropometric practical application; (3) clear description of types of interventions and/or analyses; and (4) adequate information for the calculation of statistical results.

**RESULTS AND DISCUSSION**

The review literature selective analysis focused on biomechanical, ergonomic and anthropometric, finally point out applications in Aviation, cockpit design as follows. Ergonomics analyses and interventions are used as primary prevention to reduce physical stressor in the workplace, and may increase efficient and productivity. Simple modifications often can be made to a workplace that enables the work to be completed with less effort on the part of the employee (Grayson et al., 2005).

For successful and safe operation of aircraft, pilots must be able to operate controls effectively and be able to see all displays clearly, as well as the exterior environment. Designers need to take full account to human diversity in order to accommodate variations in, for example, seated eye height and functional reach (Buckle et al., 1990).

In their study, Buckle et al. (1990), as example of practical application of the anthropometry, suggest a cockpit design process for determining the dimensions of the flight deck layouts and for current modifications from the pilots (representative user population) anthropometric measures.

Singer and Dekker (2001) in their study concern about pilot-cockpit/panel interaction comment that existing certification rules and regulations cover technical issues in detail, while leaving the human-machine interface to vague subjective evaluations. As a result, designs have been introduced into cockpits that were actually not intended to accommodate them, and many opportunities for human error have been created. The problems identified in this paper could be addressed by (1) the application of more detailed and relevant ergonomics requirements, based on existing human-computer interaction (HCI) standards, and (2) the evaluation of new designs with a more operationally oriented testing method. The proposed evaluation method measures objective performance and error criteria while exposing the representative user population in the full operational environment in detriment of test pilot has been showed as an efficient and safe methodology. In addition, it measures the final effects of crew error and reaction to technical failures, doing this while treating both critical and non-essential functions.

**Pilots' seat**

Complaints of discomfort and low-back pain during middle- and long-range flights were reported among traffic pilots (Lusted et al., 1994). These complaints may cause a pilot to lose concentration and can thus affect the safety of a flight. Pilot seats with a range of adjustment options were designed to guarantee seating comfort (Goossens et al., 2000).

In a recent study it was shown that some of the causative factors of discomfort can be related to biomechanical aspects (Zhang et al., 1996).

In a research developed by Goossens et al. (2000) using a diagnostic questionnaire based on anthropometric and biomechanics dimensions the impression gained from the results of this study is that the cockpit seats which were evaluated are not able to provide comfortable sitting positions, once some improprieties were observed and some following improvements could be suggested: (1) Increase the elective seat depth by

making the seat flat in anterior-posterior direction, (2) Raise the lumbar support, (3) Make the armrests adjustable in height by translation instead of rotation and (4) Tilt the entire seat to an angle at the ischial tuberosities up to 7-10°.

In a similar study made by Da Silva (2006) with some cockpit seats from Brazilian Air Force fleet, including C-130, majority of the dimensions did not meet pilots' comfort as following: no effective seat depth, lack lumbar support design, height and position of the armrests deficient, no seat inclination and some seats presented no backrest regulation. These deficiencies in design do not provide the necessary comfort and adjustment for safe and effective flight operation.

According Goossens et al. (2000) when a backrest is used, an inclination must to be applied to the entire seat, to give proper support to the ischial tuberosities in all positions.

When treating of flight planes the concern must be with the ejection seat, which critical anthropometric limitations as weight, seating height, thigh length and others. Representing trouble aviators who are weightless or tall due to some studies have indicated risk of back injuries and even death during ejection for people below 78 Kg or seating height above 96cm (Sharma, 2007; Patterson, 1989). These parameters highlight the necessity of use anthropometric selection criteria for pilots as well as probably female population excluded.

### **Pilots' selection**

Due to sometimes is not possible to develop and/or modify the layout cockpit, an anthropometric parameter is necessary to be defined as pilot selection criteria. Considering that the seated eye height is the most critical dimension on the basis of operational requirements, it should be used to derive stature criteria for both design and selection (Buckle et al., 1990). In other words, using the Buckle's formula it is possible to determine the cockpit dimensions and reach from the user population's anthropometric measures or the anthropometric selection criteria from the cockpit dimensions.

On the other hand, Ree (1989) says that the standing height alone is not sufficient to evaluate de cockpit dimensions. For the complex pilot's tasks other anthropometric measures must be accounted. The critical measures are sitting height, thigh length and knee height.

As an example of the importance to know the flight deck dimensions and the necessary pilots' anthropometry is that very tall pilots stub their legs against the lower part of the instruments panel. The manipulation of the pedals may become critical in abnormal situations or in emergencies once if an engine failure occurs during take-off, maximum displacement must be attainable for either leg (Ree, 1989).

Indian Air Force (IAF) follows an exhaustive protocol to determine the fitness of trainee pilots for fighter aircraft. This includes laying down range of standard static anthropometry measurements, anthropometric limitations (in cm) for various fighter aircraft and cockpit / encapsulation trials for determining the aircraft stream for the trainee pilots. Anthropometric measurements (weight, height, sitting height, leg length, and thigh length) are strictly followed due to limitations of the cockpit layout and the available ejection systems (Sharma, 2007).

According Sharma et al. (2007) sitting height (SH) is the determining factor for the overhead clearance, design eye point (DEP) and the range of adjustment of the seat height for adequate vision inside and outside the cockpit. Thus SH invariably is the final determinant in most of the cases for fitness for training in fighters, whether helmet adds to the SH or not.

Buckle et al (1990) defend that it is important that anthropometric pilots' selection criteria should be established scientifically. However, the stature criteria for selection based on functional seated eye height proposed in Buckle's study, might be exclude 73% of the British, 19-65-year-old female population and 13% of the male population. Demonstrating that in current planes due to cockpit dimensions and design the most part of female population is unfit to operate effectively and safely the flight controls.

### **Sports training and athletes' selection**

The identification of causal relationships in movement is always an important step in identifying critical variables for performance (Elliott, 1999).

According Elliot (1999), important biomechanics knowledge is that a shoulder internal rotation is a key factor in the development of endpoint speed in many over-arm and side-arm movements (i.e. tennis serve, baseball pitch and American football pass). Therefore, an increased understanding of this causal movement will help the coach to better prepare his/her athlete.

Sheppard et al. (2008) in their study assessed the relationship between strength and power and anthropometric variables (height, weight, standing reach, and ratio of body-mass divided by the sum of seven skinfolds – triceps, sub scapulae, biceps, supra-spinal, abdominals, quadriceps, and calf) with counter movement

jump (CMVJ) ability and spike jumps (SPJ) – approach jump ability, once both are considered critical performance in volleyball.

The results of this study (Sheppard et al., 2008) demonstrate the importance of recognizing the influence of the various force-velocity qualities on each other, in order to identify the individual sub-components of strength and power qualities that influence jump performance. With the knowledge of the limiting factors in strength and power performance of an athlete, the strength and conditioning coach and sport scientist can more effectively tailor the training accordingly so that a performance increase can more likely be achieved.

In order to verify the influences of anthropometric, body composition and somatotype in relation to sports performance as well as in competition levels (Bayios et al., 2006) conducted an investigation with 518 athletes from the Greek first National League (basketball, volleyball and handball). Twelve anthropometric measures required for the calculation of body composition indexes and somatotype components were obtained according to the established in literature.

The findings indicated that the effect of competition level of the athletes was decisive, since the A1 division players were taller and heavier, but at the same time leaner, than A2 counterparts ( $p < 0,001$ ), revealing the qualitative superiority of A1 player division (Bayios et al., 2006).

A practical application in this research (Bayios et al., 2006) will be in young athletes' selection process due to the significant difference ( $p < 0,001$ ) seen in body height among the three investigated sports (Greek elite team ballplayers) could possibly accounted for by a more strict selection criteria.

Concerning sport biomechanists' fact-fidings on fitness, an awareness of the mechanics of movement would better equip and prepare athletes to learn, teachers to teach, and coaches to detect and correct flaws in sports performance (Elliott, 1999).

### **Technique modification for movement enhancement**

The importance of the turn is apparent when one realizes that it occupies 20% of the time for a 50 m event in a short-course pool. Blanksby et al. (1996) has completed a number of studies which describe turning techniques both kinetically and kinematically in an attempt to identify key variables for the various strokes. In general terms high performance freestylers, who produced greater force on the wall while recording shorter contact times, produced faster turn times. Those who turned further from the wail (less knee flexion) also produced faster turn times.

Research on swim turns continues, with investigations on techniques used in various strokes and the optimal depths for streamlined gliding, currently being published. Lytflle et al. (1998) demonstrated that drag at the surface was significantly higher than at 0.2, 0.4 and 0.6m depth for all velocities tested.

According Anderson et al. (2007), biomechanical and stroke characteristics are important elements in competitive swimming, appears to be an excellent predictor of competitive performance. Therefore, the coaches will be advised to monitor the stroke rate of swimmers in test sessions, and routinely use training set at both maximal and sub maximal speed, as well as seek to improve the stroke movement in order to refine technique.

### **Equipment design**

One part that is most popular in ergonomics and biomechanics is the equipment design from an optimization of performance or injury prevention perspective. In running shoes (Oleson et al., 2005), bicycle frame (Garside and Doran, 2000) or wheelchair (Van der Woude et al., 2001), the purpose of design modifications is to study of how design can influence human performance.

Manual wheelchair propulsion in daily life and sports is increasingly being studied. Initially, an engineering and physiological perspective was taken. More recently a concomitant biomechanics interest is seen. Themes of biomechanical and physiological studies today are performance enhancing aspects of wheelchair use and the ergonomics of wheelchair design (Van der Woude et al., 2001).

A good example in how the ergonomic design equipment can improve athlete performance is the triathlon bike frame adaptation. The further forward the seat tube angle is shifted, the more closely the cycling position resembles that adopted during running. It might be that the use of frames with steep seat tube angles reduces the effect of the transition from the cycling to the running phase by minimizing alterations required in muscular recruitment and patterns compared with those required during cycling with a traditional 73° seat tube angle (Garside and Doran, 2000).

## CONCLUSIONS

The qualitative review developed in previous sections is primarily a knowledge management approach towards a brief benchmarking. As such, this study forwards a basic meta-analysis combining results from a wide-ranging of studies.

Extensive research and several high-quality studies have been developed due to improve performance in both military pilots and elite athletes. The concepts of ergonomics, biomechanics and anthropometry were the base of these studies in order to provide better conditions to work or training as well as technique/task and equipment enhancement.

The adopting of ergonomics parameters as an admission and selection criteria has been largely used. The critical measures for a correct evaluation of the aircraft's cockpit dimensions must be taking in the seating position: stature, buttock knee, knee height, leg length and eyes height. Due to anthropometry the most part of female population is unfit in order to operate effectively the flight controls. It is concluded that the anthropometric parameters knowledge from a specific population is very important in the development or acquiring process of any equipment, as well as accurate ergonomics requirements in aviation an promote the improvement of operational performance and flight security, adding the decreasing of musculoskeletal dysfunctions and death risks.

It may consider the military pilot a kind of athlete once the war training and missions request excellent physical and physiological conditions. In other words, both are submitted to extremes efforts and environments.

The analysis in this paper shows that the knowledge of the ergonomics, biomechanics and anthropometry concepts has been useful in aviation and sports science applications in order to improve design, technique, comfort, movement, task, productivity, performance, and safety as well to help in pilots and athletes selection.

Conclusively, this study may be useful to possibly conclusions based on results combination from multiply sources including sport training contributions which are fundamentally based in operational performance. Future research works on ergonomics and sport may be based in a common matrix of relationships aiming to provide a physical training complement to equipment requirements.

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## **ACADEMIC FORMATION**

<b>2004</b>	BSc - Physical Education Université Libre de Bruxelles
<b>2006</b>	Master of Physical Education Université Libre de Bruxelles
<b>2007</b>	Secondary Higher School Teaching Certificate

## **WORK EXPERIENCE**

Erasme's Hospital, ADEPS, ULB, European School, Different schools;  
Assistant at Free University Bruxelles.

## **CURRENT FUNCTION**

Belgian Defence's researcher



## **A SOLDIER AS MANAGEMENT TOOL: FUNCTIONAL & OPERATIONAL FITNESS**

**Prof. Cedric Laurent, MSc<sup>1</sup>**  
**Cpt. Cmde. Hans Vancauwenbergh<sup>1</sup>**

<sup>1</sup>*Free University of Brussels – Belgium*

### **ABSTRACT**

A soldier must be able, during his overall career, to carry out a certain number of various tasks and be capable to fulfil his function as well on a professional as medical and physical level. In terms of physical condition adapted physical tests and a regular follow-up are extremely important. Personnel having a good physical and mental condition are a key success factor and **the** challenge for a flexible, polyvalent army in a multinational environment.

A scientific study was launched on this matter in partnership with the ULB (University Libre de Bruxelles), in order to determine functional and operational physical tests based on the idea: “a soldier as management tool”.

The study is composed of a functional part and an operational part. Currently, the functional side is being studied and a questionnaire has been initialised to analyze the specific physical requirements to each function. The use of this knowhow to the recruiting standards must reduce dropout during training and gives the opportunity to start with a scientific follow-up.

At a later stage the difference between functional and operational fitness, by task and by type of mission, will be stipulated.

A critical management within the sports organisation and a scientifically based study are essential for a successful sports policy, aimed on operationality and availability and can persuade our commanders that Physical Training & Sports is vital for every soldier.

### **INTRODUCTION**

A soldier must be able, during his overall career, to carry out a certain number of various tasks and be capable to fulfil his functions as well on a professional as medical and physical level. In terms of physical condition, it's very important to have adapted physical tests and regular follow-up. Personnel having a good physical and mental condition are a key success factor and the challenge for a flexible, polyvalent army in a multinational environment.

Since April 2009, a scientific study was launched on this matter in partnership with the ULB (Université Libre de Bruxelles), in order to determine functional and operational physical tests based on the idea: “A Soldier as Management Tool”. The study is composed of a functional and an operational part. Currently, the functional side is being studied and a questionnaire has been initialized to analyze the specific physical requirements to each function. The use of this knowhow to the recruitment standards must reduce dropout during training and gives the opportunity to start with a scientific follow-up and data base. At a later stage the difference between functional and operational fitness will be stipulated by task and by type of mission.

A critical management within the sports organization and a scientifically based study are essential for a successful sports policy, aimed on operationality and availability and can persuade our commanders that Physical Training & Sports is vital for every soldier.

### **METHODS**

In a first step of the study, we will define recruitment standards and functional physical tests and in the second step, we will define physical operational requirements. To assess the minimum functional physical level for every job, we have created a questionnaire. When all the questionnaires will be analyze, clusters will set up

according to the physical requirements of each function. The collected data we will allow us to determine a battery of physical tests. For the new recruits, a temporary recruitment test is implemented.

## **Subjects**

All the people of the Belgian Defense are concerned by this study as well as the new recruits and the voluntaries.

## **Protocol**

### First step

The questionnaire is divided into 6 major points:

Aerobic endurance measured by a 2400 m run and a 16 km march with and without load

Strength measured by lifting and carrying different loads

Flexibility, co-ordination, capacity of recovery and eventual specific tests.

The aerobic endurance will be evaluated with the Leger-Boucher test adapted on treadmill because this test allows us to measure the  $VO_2$ max with a very good average and in order to all the soldiers realize tests in the same condition.

## **Temporary solution**

### Recruitment test

To avoid a lost of time and especially to resolve problems due to defective recruitment tests and a lack of physical fitness of our youth, the implantation of new temporary recruitment tests was absolutely necessary.

This new test is based on a population study in one of our basic instruction centers. The results of about 200 new recruits by entrance and at the end of their instruction were compared.

The first idea was to develop a classical 2400m run but due to legal regulations this wasn't possible. For this reason, we adapted the Leger-Boucher test on track to a treadmill.

The Leger-Boucher test: The first minute of the test is used to adapt to the treadmill and to warm-up. After this, the test starts by running on a speed of 6 km/h. The speed increases every 30" by 0.3 km/h and the gradient is of 2% during the entire running test. The test ends by a maximum speed of 14.9 km/h.

According to the works published by "BodyTalk", we have decided to put the score of 10/20 for a running time of 13'45" and the maximum score of 20/20 for a time of 9'10". The performances are adjusted according to percentile because the functional fitness standards mean gender and age free physical fitness and this readiness should be maintained during the period of occupation in this specific function (Institut for Aerobics Research, Dallas, Texas, VS).





**Kjell-Erik Kristiansen (SWE)**

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### **ACADEMIC FORMATION**

- 1980** Officer Norwegian Army  
**1983** Norwegian University of Sports  
**1983-1995** Different courses in sports leadership, sports physiology, training, etc.

### **WORK EXPERIENCE**

- Sports teacher, Borlänge (Sweden)  
Trainer orienteering and skiing (clubs, district, national teams)  
Personal mentor for individual sportsmen/women 02 Olympic gold medals

### **CURRENT FUNCTION**

- Sports journalist, TV-commentator sports (Eurosport)  
Announcer big sports events (Olympic Games, World championships, World Cups, others)



**Kjell-Erik Kristiansen<sup>1</sup>**

<sup>1</sup>*Eurosport – Announcer big sports events*

**ABSTRACT**

Why did Petter win...? Because he was all the time focused on the sprint and ready to be in front when he needed. He knew that the others were afraid of his sprint and he used it to get in the right position at the right time. After nearly two hours of skiing and 50 kilometers he still had the focus on the gold medal, while a lot of the others were more than satisfied just to stay in the group. For reigning Olympic champion Giorgio Di Centa it was a failure to miss the medals and end in 4th place. But for Finnish skier Teemu Kattilakoski in 8th place it was a great achievement, because it was his first top-10-finish of the season.

**SPORTS AND PERSONALITY**

What gives the “motor”? The final “motor” is made of all your thoughts, feelings and energy together. Are sportsmen different? Sportsmen and women are very often goal focused and used to pressure and competitions. That’s something they very often can use after their career. Sport’s effect on children? Investigations tell us that children are learning to control their feelings and to take negative influences better than other kids. It has also shown that children through sport can increase their tolerance for stress and are getting more stable on the emotional level.

Top athletes = big ego?

Top athletes = dominant?

Top athletes are often very focused on themselves and they have often a big need of attention and are sometimes more dominant in groups than others.

**FEELINGS - NERVOUS BEHAVIOR**

Stress and pressure related to competitions can be caused by you, by media, by trainers, by family or by fans. Very often it’s caused by you and we see athletes who are not satisfied even if the people around are very impressed. Attitude: Fight or run...How do you attack the situation...? Do you want to fight and win or do you just want to get out of there...? This will affect the outcome of your achievement. What kind of leader are you...? Do you know how you are as a leader? You are as important as the athlete(s). Are you the dominant leader demanding this and this? Or are you the talking one, talking all the time with you athletes. Do you feel that you have a good balance with the athletes...? Think positive - have the right picture in your head. How do you see yourself in the competition-situation...? Do you see yourself in a positive way or do you see yourself in a negative way...? That will of course have an impact on the outcome of your effort.

**SELF-KNOWLEDGE**

Do you know yourself...? Have you made an analyze of your strong and weak sides...? Have you got a clear goal of what you want to achieve. Have you got a clear way how to get there...? Do you know your athletes...? The same questions to the trainer as for the athletes in the previous question. Do the athletes know each others...? If you are a team, it’s important that all the athletes know as much as possible about each others. This will help them to understand how they react in different situations. How do you train mentally...? Are you using your plans for the training or have you already forgotten what you decided when you made your plan...? Do you have somebody to talk to or to get help from...? Do you believe in yourself...? Does everybody know their role...? Extremely important in team sports. Also important between athletes, coaches and other involved. If somebody misunderstands their role in the team, it can destroy for the whole team.

**CONCENTRATION - FOCUS**

Do you have focus on what you are actually doing...? There is no use to train only what you are good at. The result will never be better than the weekend’s link of the chain. Can you focus on the things you have been training on

when the pressure is on with spectators, trainers, press and TV around...? Are you too concentrated...? Not unusually. Many athletes are thinking about their sport and their performances “24 hours” and that will take unnecessary energy and make it more difficult to reach the goals. Everybody needs time to relax and think about something else. How well prepared are you mentally for the competition...? Do you have the feeling of controlling the situation, that you now all the difficulties and that you are ready to tackle them? Are you sure there is nothing that can surprise you in the last moment. If you have done your preparations right, there shouldn't be anything that can get you out of control. Do you want to get success or avoid losing...? This is a little bit the same questions we had before: Are you running or staying to fight?

### **THE WAY TO GO - PSYCHOLOGICAL “TOOL-BOX”**

Find you goal, define it. Analyze yourself, who are you? What do you need to improve? The trainer's observation. Have a dialogue. Use a third part if necessary. Make a plan how to reach your goal

We win (not right, you exclude the possibility of losing - big pressure)

We lose (not right, you don't see the possibility of winning)

We CAN win, but (right, here you have all options open)

### **THINK POSITIVE**

### **MAKE THINGS EASY...!!!**





**Prof. Michael Spivock, PhD (CAN)**

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## **ACADEMIC FORMATION**

- 1996**                    BSc - Exercise Science/Athletic Therapy;
- 2000**                    MSc - (Experimental Medicine) Laval University, Québec City, Canada;
- 2008**                    PhD (Public Health/Health Promotion), University of Montreal.

## **WORK EXPERIENCE**

Athletic Therapist for several provincial level sports teams, treating on-field emergency injuries as well as clinical rehabilitation.

Fitness Trainer/Training floor Supervisor, Nautilus Plus Fitness Centres

## **CURRENT FUNCTION**

Research Manager – Human Performance, Canadian Forces.



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**FIT TO FIGHT: DEVELOPING AND DELIVERING OPERATIONALLY RELEVANT  
FITNESS STANDARDS FOR THE CANADIAN ARMED FORCES**

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**Prof. Tara Reilly, PhD**  
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<sup>1</sup>*Canadian Forces, Director General Personnel and Family Support Services, Director of Fitness, Ottawa, Canada.*

## **ABSTRACT**

In conjunction with the release of the Canadian Forces Health and Fitness Strategy in 2008, four research teams were constituted to develop environment-specific fitness standards for each of Navy, Army, Air Force and Special Operations Forces. Given the Canadian legal context dealing with Human Rights and Employer Discrimination, the development of these standards is an intricate and detailed process involving extensive task analyses in order to select representative tasks, as well as the use of various sources of information in setting performance standards. Such standards are developed in a way to satisfy the criteria of a Bona Fide Occupational Requirement in a court of law. In order to develop fitness standards which are fully representative of the common, critical and physically demanding tasks in operations, the following general steps are followed: populating a project management team, job familiarization, physical demands analysis, developing a representative subset of essential physically demanding tasks, characterization of tasks, development and standardization of test protocol, establishing scientific accuracy of test protocol, developing performance standards and evaluating any adverse impacts, implementing the test protocol and reviewing issues. The methods rely heavily on surveys, focus groups with military subject matter experts as well as in-field assessment of biomechanics and physiological responses to work. The information obtained from the task analysis is also used to develop physical fitness training programs to help ensure maximal operational performance at all stages of the deployment cycle. This paper will detail the steps involved in this multi-year process, drawing on examples from past and present research projects to highlight physiological, methodological, legal and implementation dimensions of occupational fitness testing in the Canadian military.

## **BACKGROUND**

### Current fitness standards in the Canadian Forces

Canadian Forces (CF) members must be physically fit to meet military operational requirements, to perform under a wide range of geographical and environmental conditions, to cope with the stresses of sustained operations, and be ready to respond on short notice. In order to ensure this operational readiness, fitness training and testing are integral part of military life. In the mid-eighties, the Canadian Forces developed a Minimum Physical Fitness Standard (MPFS) for all military personnel, regardless of trade classification, age or gender. Five common military tasks were identified as ones that all personnel might be expected to perform in time of emergency (Stevenson, Andrew, Bryant & Thomson, 1985).

This Common Military Task Fitness Evaluation consists of:

1. Sea evacuation.  
Aim: Simulate casualty evacuation during a fire on board a ship.  
Men and women under 35: 210 seconds  
Men and women 35 and above: 277 seconds
2. Land stretcher evacuation.  
Aim: Simulate a land evacuation of a casualty on a stretcher over 750m.  
Men and women under 35: 900 seconds  
Men and women 35 and above: 1188 seconds

3. Low-high crawl.  
 Aim: Simulate conditions of self-protection when under enemy fire.  
 Men and women under 35: 140 seconds  
 Men and women 35 and above: 185 seconds
4. Entrenchment dig.  
 Aim: Simulate self-protection by digging an entrenchment.  
 Men and women under 35: 510 seconds  
 Men and women 35 and above: 673 seconds
5. Sandbag carry.  
 Aim: Simulate self protection or protection of others from natural elements.  
 Men and women under 35: 12 sandbags in 10 minutes  
 Men and women 35 and above: 9 sandbags in 10 minutes

Given the logistical issues involved with administering such a test to nearly 100 000 CF members on a yearly basis, the Canadian Forces Exercise Prescription (CF EXPRES) evaluation was developed as a predictor of one's ability to successfully perform these 5 Common Military Tasks and achieve the minimal physical fitness standards. The CF EXPRES evaluation is administered annually to all CF members except those subject to environment or occupation-specific standards (e.g., those under Land Forces Command, Special Operations Forces, Fire fighters, Search and Rescue Technicians). The CF EXPRES evaluation consists of 4 test items:

- A 20-metre Shuttle Run
- Handgrip dynamometer to predict muscular strength;
- Push-ups to predict upper body muscular endurance; and
- Sit-ups to predict abdominal muscular endurance.

Table 1 shows the standards for males and females based on age groups for the CF EXPRES evaluation.

Though the minimal physical fitness standard which is being predicted by this test is identical for males and females, regression equations showed that the inherent biomechanical and physiological differences between the 2 genders yielded different predictive standards. The difference in standards based on age is reflective of a 90% maximal heart rate restriction which was imposed on persons aged 35 years and above at the time.

**Table 1** Minimal Physical Fitness Standards as predicted by the CF EXPRES Test.

	Male		Female	
	Under 35 yrs	35 yrs+	Under 35 yrs	35 yrs+
<b>20 MSR - stage</b>	<b>6.0</b>	<b>5.0</b>	<b>4.0</b>	<b>3.0</b>
<b>Hand Grip</b>	<b>75</b>	<b>73</b>	<b>50</b>	<b>48</b>
<b>Push-ups</b>	<b>19</b>	<b>14</b>	<b>9</b>	<b>7</b>
<b>Sit-ups</b>	<b>19</b>	<b>17</b>	<b>15</b>	<b>12</b>

*Adapted from [www.cfpsa.com/en/psp/fitness/general\\_e.asp](http://www.cfpsa.com/en/psp/fitness/general_e.asp)*

The CF EXPRES Test is also used to assess the overall fitness level of the member in order to provide a personalized exercise prescription based on results.

Subsequent to the development of the Minimal Physical Fitness Standards, a series of occupation and environment-specific tests were developed to reflect the particular physical demands of various operations. These include specific tests for CF Divers, Firefighters, Search and Rescue Technicians and Special Operations Forces. (Detailed descriptions of these standards as well as others currently under development are available at <http://www.cfpsa.com/en/psp/HumanPerformance/projects/index.asp>)

Changes in equipment, operations and the very nature of warfare over the past 20 years have led some to question the relevance and applicability of Common Military Task Fitness Evaluation and the corresponding EXPRES test. Furthermore, recent legal rulings by the Supreme Court of Canada have yielded new guidelines for the development of fitness standards to ensure their scientific and legal foundations. It is for these reasons that, in conjunction with the release of the Canadian Forces Health and Physical Fitness Strategy, the Chief of Military Personnel mandated a review of physical fitness standards in the Canadian Forces in the spring of 2008.

## Canadian legal/human rights context

The landmark case of *Meiorin vs the British Columbia Government (British Columbia (Public Service Employee Relations Commission) v. British Columbia Government Service Employees' Union* [1999] 3 S.C.R. 3) yielded a series of definitions and guidelines for the acceptance of occupational fitness standards in Canada (Supreme Court of Canada 1999). In essence the Supreme Court of Canada ruling in this case stated that

*“It is not discriminatory practice to refuse, exclude, expulse, expend, limit, specify or prefer in relation to any employment if the employer establishes the practice to be based on a BONA FIDE OCCUPATIONAL REQUIREMENT (BFOR)”*

The ruling went on to define a BFOR as a standard or policy put in place by an employer

1. for a purpose **rationally connected** to the performance of the job and in an honest and good faith belief that it is **necessary** to the fulfillment of that legitimate, work-related purpose
2. and for which it has been demonstrated that it is impossible to **accommodate** individual employees sharing the characteristics of the claimant without imposing **undue hardship** upon the employer

Subsequent to this decision, a consensus forum was held on establishing bona fide requirements for physically demanding occupations in the fall of 2000. The proceedings of this forum yielded a step-by-step process to developing fitness standards for physically demanding occupations based on best scientific practices, human rights legislations and court rulings (Gledhill, Bonneau & Salmon, 2001). This process has been applied to the development of standards for several physically demanding occupations including the military, firefighters, police officers and corrections officers.

Surveys, focus groups with subject matter experts as well as in-field assessment of biomechanics and physiological responses to work are employed in order to establish the necessity and the rational connection criteria set forth in the 1999 ruling. (Please see section below on Fitness Standard Development Process for a more detailed description of methods)

## Current Research and Development Mandate

### Health and Fitness Strategy

In April 2008, the Chief of Defence Staff released the Canadian Forces Health and Physical Fitness Strategy (Canadian Forces, 2008). In addition to lines of operation addressing healthy nutrition, maintaining a healthy weight and an addiction-free lifestyle, one of the main objectives of this strategy is to increase the level of physical fitness of Canadian Forces Personnel. To this end, four research teams were assembled to address the specific needs of each of the Navy, Army, Air Force and Special Operations Forces. Though the research teams are focused on identifying the physical demands of each environment and establishing fitness standards, the overarching goal transcends well beyond fitness testing, to the promotion of a culture of health and physical fitness in the Canadian Forces exemplified by a lifelong lifestyle commitment by all personnel (Canadian Forces, 2008).

## Fitness Standard Development Process

### Phase 1: Job familiarization

This first phase of research aims to essentially understand the nature of the job and identify the physical demands associated with its successful performance. The information gathered in this step will provide critical information on essential tasks required for safe and efficient completion of job duties (Taylor & Groeller, 2003). Particular emphasis is placed on recording tasks which are common (could conceivably be required of all personnel regardless of occupation, rank or position) and critical (where a failure to complete these tasks could result in injury to oneself, a colleague or the public or in significant loss or damage to crown property).

Firstly a Project Management Team is populated, consisting of key stakeholders and subject management experts. This can include senior incumbents, representatives from personnel management, legal advisors, medical advisors and others as needed. The main duties of the Project Management Team are establish the foundations for the project define common, critical tasks and assist in steering the project through the various phases. Job familiarization then involves interviews, focus groups, surveys, and reviews of literature (including available training, operations and specifications manuals) in order to identify the demands associated with the occupation or environment. Oriented by the information gathered in the job familiarisation step, the physical demands analysis involves site visits and job shadowing to quantify the requirements of the job. Wherever possible, precise weights, distances, heights and frequencies are measured and recorded in order to facilitate subsequent selection steps.

### Phase 2: Quantification of physical demands

The primary output of Phase 1 is a database containing detailed descriptions of as many as several hundred tasks, such as *“lifting 30 kg from floor to shoulder height, carrying for 100m and placing on overhead shelf”* or *“walking at a pace of 3km/hour for 9 hours”*. Phase 2 relies in large part on the expertise of subject matter experts to distil this list to a manageable subset of tasks which are judged to be physically demanding, critical and common. It is vital in this phase to obtain approval of the Project Management Team and of the most senior levels of leadership, particularly when determining whether specific tasks are truly common (could be expected of all personnel in the group regardless of occupation, rank or position). Once a subset of approximately 5-10 representative tasks are identified, their precise demands as well as the physiological responses they elicit are measured on a large, stratified sample of incumbents. Measurements can include heart rate responses, metabolic demands and specific biomechanical analyses.

### Phase 3: Test and standard development

At the end of Phase 2, the subset of tasks is refined, reduced if similar demands are found between tasks and quantified in terms of physical demands. Phase 3 involves taking these tasks and designing a representative test battery. More specifically, the Project Management Team helps to determine whether the fitness test designed will include task simulations (such as the Common Military Task Fitness Evaluation) fitness components as predictors (such as the CF EXPRES) or a hybrid test containing elements of both approaches. Though task simulation tests are often better accepted by incumbents and commanders (there is a clear link between the job and the test) they tend to be more logistically complex and resource-intensive to administer. Once a test battery is developed, it is important to establish its accuracy in measuring the element or task of interest. This is usually done by comparing the heart rate response, metabolic demands, rate of perceived exertion and time to completion (where applicable) of the simulated test battery to actual field measurements. Performance standards are developed using a variety of converging methods. Firstly Subject Matter Experts view videos of the tasks being performed at various speeds (usually at increments of 0.5 standard deviations from the mean) and are asked to rate whether each video clip is being performed at an acceptable and safe pace. To further validate the ratings of the experts, natural breaks are sought in the distribution of performance scores.

Once a standard is set, it is important that adverse impacts on subgroups are avoided or mitigated. Concretely this means that the passing rate of any sub-group (e.g., persons of a certain height, females, members of certain ethnic or racial groups) can be no less than 4/5 the pass rate of the overall group of incumbents tested (US Department of Labor 1971). For example, if the overall pass rate of incumbents pilot tested on the new standard is 82%, the pass rate of any single sub-group can be no less than 65.6%. In the event that any subgroup is found to be negatively affected by the test, accommodations to the test or the actual task are explored in order to mitigate these effects. The final step involves implementing the test (often as a training objective for a set period of time) and addressing any issues that arise. These issues can include acceptance by incumbents and commanders, the mobilization of resources needed for testing, issues related to predictive errors in fitness component tests, associated programs and remedial measures, policy/career implications for those who do not attain the standard (both incumbents and applicants), standards and quality control in the administration of the test (particularly in multi-centre organizations such as the Canadian Forces) and the establishment of feedback loops to ensure continued relevance and validity of the test.

## **CONCLUSIONS**

For the Canadian Forces, basing fitness standards and programs on specific common, critical and physically demanding tasks not only ensure operational readiness of our personnel but it also helps to safeguard their legal human rights. Since the fitness test is a clear reflection of actual job demands, incumbents understand the relevance of the standard to which they are being held and are in a position to easily relate it to their occupational reality. It is important to mention however that this process tends to be extremely resource-intensive for the employer, with one test sometimes taking as long as 3-5 years and several hundred thousand dollars to develop. It is the belief of the Canadian Forces however that this investment is well worthwhile when the payoff is the confidence that the right person is being placed in operations at the right time.

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**Col. Lubomír Přivětivý, PhD (CZE)**

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## **ACADEMIC FORMATION**

**1984** Pedagogical Faculty, J. E. Purkyně University, Brno

**1993** PhD - Faculty of Physical Education and Sport, Charles University

## **WORK EXPERIENCE**

Primary School, Polná; Secondary School, Jihlava;

Military college of the land forces Vyškov, Department of Physical Education and Sport (in the years 1994 - 1996 head).

Bibliography: publication in military and civilian journals – a co-author of several collections from international symposia and conferences.

Research Subjects: physical performance and military professionals' motoric activities and health - oriented physical condition. He participated in pioneering special physical preparation into the military teaching program.

## **CURRENT FUNCTION**

Head of Military Department at the Faculty of Physical Education and Sport, Charles University in Prague



**THE POSSIBILITIES OF PHYSICAL FITNESS ASSESSMENT AS A PREDISPOSITION FOR WORK PERFORMANCE IN ARMED FORCES.**

**Colonel Lubomir Přivětivý, PhD  
Prof. Vaclav Bunc, PhD**

*Faculty of Physical Education and Sports, Charles University, Prague, Czech Republic*

**ABSTRACT**

The goal of sport scientists is to change the life style of subjects such as the predisposition of better work performance and quality of life. During last two decades it was many times declared that the subjects with higher physical fitness are able to work longer time and that the probability of significant mistakes is lower then in subjects with the lower level. Physical fitness is not only a performance oriented criterion but it is more interpreted as the predisposition of the subjects' health state. This physical ability is strongly pre-determined by a level of actual functional fitness thus the preserving of functional fitness becomes an issue of high interest.

Functional fitness is defined as having physical capacity to perform normal everyday activities of daily living safely and independently without undue fatigue and without the decline of physical and/or work performance.

The primary goal is to be able to accurately monitor the functional fitness of a wide range of abilities in the army so that evolving weakness might be identified and treated before resulting in impairment leading to limitations in functional behavior.

For this purpose testing basic physical performance, specialized performance and testing natural motor skills are used.

**Key words:** *physical fitness, health-related fitness, performance-related fitness, work performance, testing*

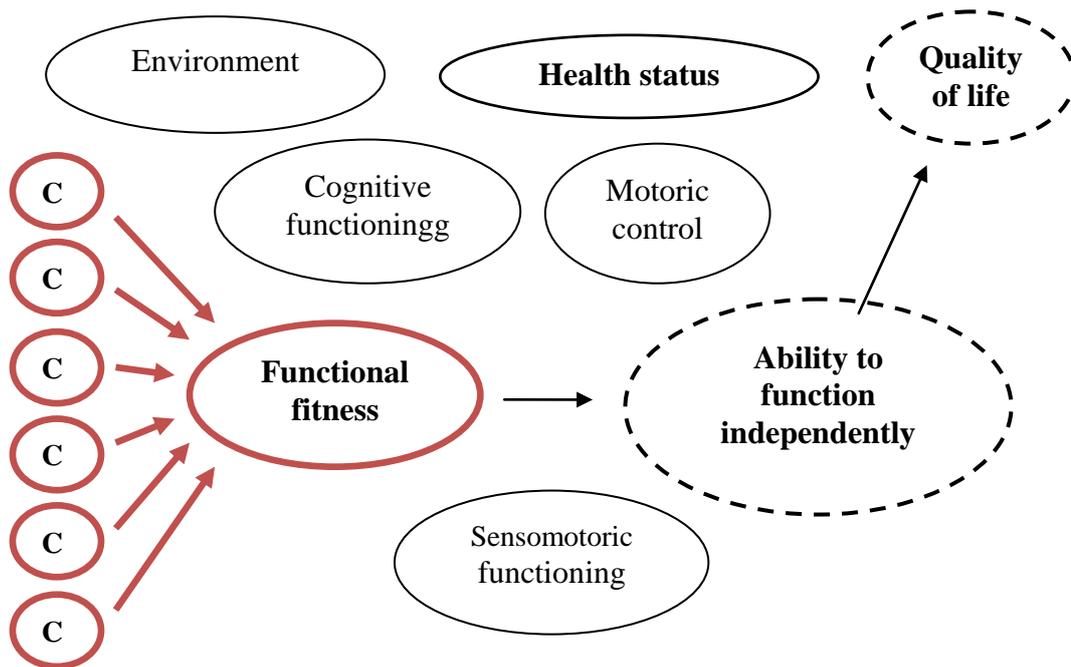
**THE POSSIBILITIES OF PHYSICAL FITNESS ASSESSMENT**

The goal of sport scientists is to change the life style of subjects like a predisposition of better work performance and quality of life. During two last decades has been many times declared that the subjects with higher physical fitness are able to work longer time and that the probability of significant mistakes is lower then in subjects with the lower level. The physical fitness is not only performance oriented criterion but more interpreted like a predisposition of subject's health state. This physical ability is strongly pre-determined by a level of actual functional fitness thus preserving functional fitness becomes an issue of high interest.

In order to maintain certain functional fitness status, attention to physical activity levels is one of the easiest ways to offset physical dependency or postpone impairment. The beneficial effects of physical activity on various functional fitness components such as aerobic endurance, muscular strength, velocity, flexibility and balance, joint mobility and appropriate body weight in older adults have been well established (Shephard, 1994). The ability to measure those components is needed for an early detection of potential decline, which is crucial for planning effective and successful preventive programs. Accurate assessment of initial functional status is also important for predicting risk factors for functional dependence, institutional discharge planning, or documenting and evaluating those preventive strategies.

Functional fitness is defined as having a physical capacity to perform normal everyday activities of daily living safely and independently without undue fatigue and without the decline of physical and/or work performance. There are other factors that play an important role such as health status (number of chronic conditions), cognitive functioning, sensomotoric functioning, motor control, or environment. As illustrated in Figure 1, the combination of all those factors determines the general ability to function independently. However, this study is restricted to only one factor – functional fitness with a special attention targeted on measurement issues.

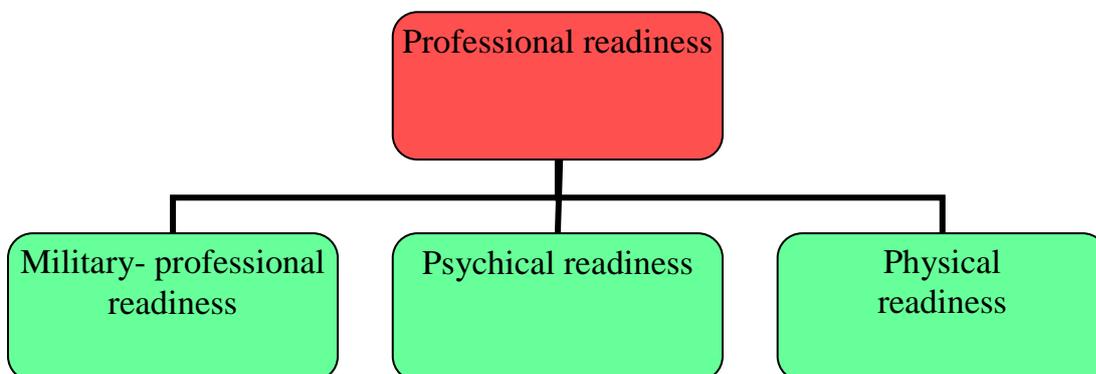
**Figure 1** Diagram illustrating the focus of this study – how functional fitness contributes to the quality of life (C1 – C6 represents individual functional fitness components)



Based on the previous text much of the usual age-related decline in functional fitness is preventable and even reversible through proper attention to physical activity. Until recently, however, most instruments to evaluate physical functioning were developed either for non-trained individuals or for specific sport events. Instruments appropriate for frail individuals are too easy and not sufficiently challenging to evaluate fitness in army, instruments for non-trained individuals are usually too demanding hence unsafe and inappropriate for the majority of the army population. The primary goal is to be able to accurately monitor the functional fitness of a wide range of abilities in army so that evolving weakness might be identified and treated before resulting in impairment leading to limitations in functional behavior.

The physical and psychical load of soldiers fulfilling various tasks escalating by high intensity, risk, variability and duration are very demanding to their physical, psychical and social personality features. The successful mastering of demanding situations of military activities anticipates the development of subjective assumptions, which may interindividually and intraindividually considerably vary. But the result must be an adequate serviceperson's professional preparedness, enabling to preserve a high level of combat readiness and working capacity. The professional readiness consists of three integral parts – military-professional, psychical and physical readiness (Kubálek, 1993).

**Figure2** Physical readiness – a part of the serviceperson's professional readiness



The service personnel's physical readiness is defined as a complex of optimally developed and functional closely interconnected serviceperson's physical and locomotoring dispositions enabling them to fulfill motoric

demanding professional tasks and adequate action in psychosomatic and motoric situations of service and combat activities.

The effectivity of the physical preparation and the current performance is determined by testing. The testing of the service personnel's physical performance is a part of the control and evaluation and serves to the evaluation of fulfilling the aims and tasks not only of the physical training, but the military training also. Motoric tests used for that purpose are divided into two categories. Basic tests survey general ability for service in the armed forces and special tests survey the level of skills needed for the given military specialization. Every serviceperson should be tested in each category at least once in a year.

Besides the basic and special tests we must not forget testing before the entry to the armed forces. This is in some sense even more important, because it co-determinates on the quality of the personnel the armed forces will have. At present it is one of the critical points, with the setting and before all demanding the fulfilling of performance requirements and the interpretation of the principle of equal chances for women and men in the armed forces.

On one side the modern society makes life easier with regard to the physical effort, on the other side actually this leads to the general decrease of population's physical performance. The sport science is able to give reasons for the training process and how to control its results on one side, but on the other side this process is affected by incompetent interventions of the personnel clerks for example, changing willfully the criteria to enter the armed forces. Together with the lawyers there are even efforts to affect the performance level by the service personnel alone to run down the requirements. Or even tolerance of physically inefficient servicepersons. That all in the interest of preserving the number of servicepersons or to receive new ones. The specific interest of one influential group is so superordinated to the general interest of the armed forces as such. Without regard to the fact that armed forces in required numbers but for physical inefficiency and ill health unreliable cannot guarantee their country the purpose of their maintenance.

#### On the entry to the armed forces and the decline of the population performance

Problems on the performance requirements for applicants for the service in the armed forces are i. a. discussed. The already mentioned continuing decline of the population performance raises problems where to get not only physically, but also locomotive capable personnel. Considering the deficiency of those personnel in connection with the declining interest in military career only one solution for the armed forces actually appears - during the recruitment to apply the health aspect above all. To create such a system of physical training within the armed forces which enables to reach with healthy, but still inefficient individuals the necessary quality using attractive methods by steps. Not in a general scale, but according to clearly defined rules and requirements in connection with the serviceperson's specific position. There is no other way for the armed forces as to respect that the civilian environment is not able to prepare a serviceperson.

#### On the setting of testing sets and testing criteria

Here we encounter similar problems as during the recruitment. In the effort to implement the criteria not only a change of the performance limits, but also the composition of testing sets and the evaluation occurs with the aim to reach better overall results. Another disfavoured moment is that the time of testing is known in advance and this in connection with the lower requirements in practice implies that the training starts shortly before the particular test. Nevertheless it is known that also trained persons, if not practicing movement activities come after some time to the level of those who do no sport (Cureton – Warren, 1990). Testing physical performance is not purposeless. Its importance lies at least in two levels. In the first, the performances level the adaptation to movement load, increasing of physical condition and thus creating prerequisites for good working efficiency accounts. In the other one, the health, the contribution of aerobic efficiency (as the most important aspect of physical efficiency) for prevention of diseases connected with lack of movement activities is mentioned. But the results of the last years show that the aerobic efficiency of service personnel declines. One of the reasons is the way of evaluation and at the endurance capabilities the change of norms so that they do not support the development of aerobic effectivity (Bunc, 1994). In some cases the unassuming and benevolent attitude of commanders to service personnel not fulfilling the requirements of physical effectivity in a long term or not attending the tests at all contributes to this not very good situation. On the other side beyond considerably worsened conditions there is a great space for the work of gym instructors.

#### On women in armed forces

Imbalanced views also exist on the question of equal chances of both sexes in the armed forces. Thoughts on the legal claim for equal working chances run at fulfilling combat tasks to the possible impeachment of the ability of women to withstand such an employment mentally, but above all physically. Documented, doubtless scientific works exist – some of them originate from also our faculty of the Charles University, which overwhelmingly document the difference in capabilities and possibilities of men and women. There are anatomic, physiologic and other differences, which no physical training removes without the risk of harming the woman

organism. The morphological and functional differences between men and women that cause the different performance are the basic obstacle why women cannot on general level adequate practise some military vocations. The physical performance of women is about one quarter lower (Havlíčková, 2003, Laubach, 1976). Requirements for maximum strength and strength components are in many cases inevitable success presumptions in military activities. The development of muscular strength seems to be the basic component of physical readiness in most military professions as well as in sport (Kraemer et al., 2001). This visual angle is supported both by American armed forces statistics (Knapik, 2001), and British armed forces (Gemmell, 2002), illustrating that the bodily injury frequency caused by training doubles at women. The sports science respects those facts in the whole sports history not only by separating men and women races, often by different composition of sports events and the evaluation, but also by differences in medical controls et al. I think that also the sports science and physical culture in general should effectively lobby against unwise standpoints covered under the noble-minded idea of abolishing discrimination. It is not meant how to make the recruitment of women difficult or to prevent them to fulfil themselves professionally. The physical readiness of women, even though different from the readiness of men predestinates them to physically less demanding positions. There are many of them in the armed forces. At the same time this does not mean that there are positions beyond woman's reach in the armed forces. Equal chances yes, but not discriminating to the armed forces.

### RÉSUMÉ

The armed forces are changing continually and still more sophisticated equipment steers for strict specialization. Different requests are the reason that besides basic tests various special tests must exist and probably also various tests for recruitment. Testing of the physical performance must be a natural part of all trainings, because its results enable to predict the future performance, to indicate weak points, measure the improvement, enable to evaluate the training program success and above all motivate for further training. But the goal of the physical training can not only be the fulfillment of military test standards. The servicepersons should in a possible greatest extent place regular moving activities into their lifestyle. With regard to the above mentioned it is necessary besides the obligatory movement activities to offer the servicepersons a wide scale of other possible activities respecting their interests. Evidence exists that after a challenging, above all strength training, the organism much quicker recoveries by aerobic activities with low load than by passive rest (Corder, 1998). The sports science is an effective help in nearly all mentioned problems. It allows finding useful methods of transfer of its chosen results also into the useful service personnel's training applications. I think that even the CISM as a worldwide very influential organization associating army sportsmen often with the highest sporting level could some of its outputs orient in this direction. It would gain an effective argument in situations with which the countries of the whole world from time to time solve (see the present financial crisis) to support military sports personnel also in difficult times. The armed forces should be interested in keeping top sports personnel in their structures also because in their existence and performance level they see a significant effect other than only a political-propagandistic one.

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## CISM International Symposium 2009



### 5<sup>th</sup> SESSION

Creating synergy between science and management

Monday, 21<sup>st</sup> September 2009

From 09:00

To 11:05





**Prof. Eva Čáslavová, PhD (CZE)**

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## **ACADEMIC FORMATION**

- 1969-1974** University for Economy, Prague - Faculty for national economy
- 1982-1984** PhD - Institute for Economy of Czech Academy of Sciences
- 2001** Habilitation for Ass. Prof. at University for Economy, Prague

## **WORK EXPERIENCE**

Social economic researches of sport;  
Foundation of the Magister study of Sportmanagement at the Charles University  
Researches in the field Sport Marketing, Sport Management;  
Preparation of Congress European Association for Sport Management 2010 in Prague;

## **CURRENT FUNCTION**

Head of Department of Sport Management, Faculty for Physical Education and Sport, Charles University



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**THE EVALUATION OF MANAGERIAL FUNCTIONS IN THE CONTEXT OF MODERN  
MANAGEMENT THEORIES**

**Prof. Eva Čáslavová, PhD<sup>1</sup>**

<sup>1</sup>*UK FTVS, Prague*

**ABSTRACT**

This contribution is focused on findings arose from modern management theories in particular managerial functions as well as on analyzing of extent of its application within sport field and armed forces. It considers five managerial functions – planning, organizing, staffing, leading and controlling - by H. Koontz and H. Wehrich (1993) as a fundamental perspective.

Within planning as a managerial function it deals with planning process strategy for organization by Ansoff (1984), Porter (1980) and Hamel (1994) and demonstrates opportunities which strategic planning affords to sport institutions. Organizing as a managerial function describes modern trends in organizing and creating of organizational structures by P.F.Drucker (1973); author of the contribution points out problems occurring unless it is not respected in sport fields. Staffing works on manpower planning and is based on evaluation of capacity demand required for works in process and works considered in the future. Author is analyzing uniqueness of non-profit organizations in the field of sport. Leading as a managerial function is aimed at analysis of motivation theories; theories of understanding of motivation reasons (Maslow, Herzberg, Alderfer, McClelland), theories of course of the motivation process (Vroom, Porter, Lawler, Adams, Skinner), and theories of specific purpose.

Within this function, author later analyzes implementation of leadership theories. Within controlling as a managerial function analyzes findings that bring effective control activities in global attitude and especially in the field of sport and other fields of non-producing sphere.

**Keywords:** *managerial functions, strategic planning, organizing, staffing, leading, controlling*

**THE EVALUATION OF MANAGERIAL FUNCTIONS**

In my contribution I would like to focus on managerial functions, its progress in modern management school theories and point out current implementation in the field of sports in the Czech Republic.

The basic theme of managerial work is content and concept of managerial activities (functions). Managerial functions are performed by any leading worker whether he/she is leading manufacturing concern, sport organization or military unit and formation. Theoretical works in the present modern management trend pursued and are pursuing managerial functions classification and content. These theories resulting especially from manufacturing organization case studies do have so stable theoretical content that it can be and is implemented in non-manufacturing organizations.

Classification of managerial functions has proved necessary for arrangement of organization management findings. It is true, that individual authors have classified different number of managing functions and the curiosity is up to 19 managerial functions by American author J. B. Miner, but the most popular is classification by Harold Koontz and Heinz Wehrich. They have defined 5 managerial functions:

- Planning,
- Organizing,
- Staffing,
- Leading,
- Controlling.

In the follow-up explanation I will concentrate on above classification of managerial functions and its impact and differentiation in present modern management theories. These functions are also termed as sequential managerial functions, since they are implemented step by step in logical sequence (Diagram 1).

Every sequential function is permeated with running functions such as communication, decision-making, implementation, which is not going to be a subject of my contribution.

**Planning**

This managerial function has been primarily developed alongside formation of entrepreneurial strategy and its school of thought shall be implemented both in sport organizations and military units and formation. Preference of strategic planning is given by motivation of uncertainty and risk reduction in the long-term development in concrete organization. The ground is formed by:

- H. Igor Ansoff (1990) “Implanting strategic management“,
- Michael E. Porter (1980) “Competitive Strategy“,
- Gary Hamel (1994) “Competing for the Future“.

At present, a synthesis made by the Czech authors Vodáček and Vodáčková (2001) is on the basis of a world management literature dividing the strategy defining process into 7 phases:

a) Statement of mission

Statement of the main mission and philosophy of the organization.

b) Analysis of initial state, particularly strengths and weaknesses of the organization

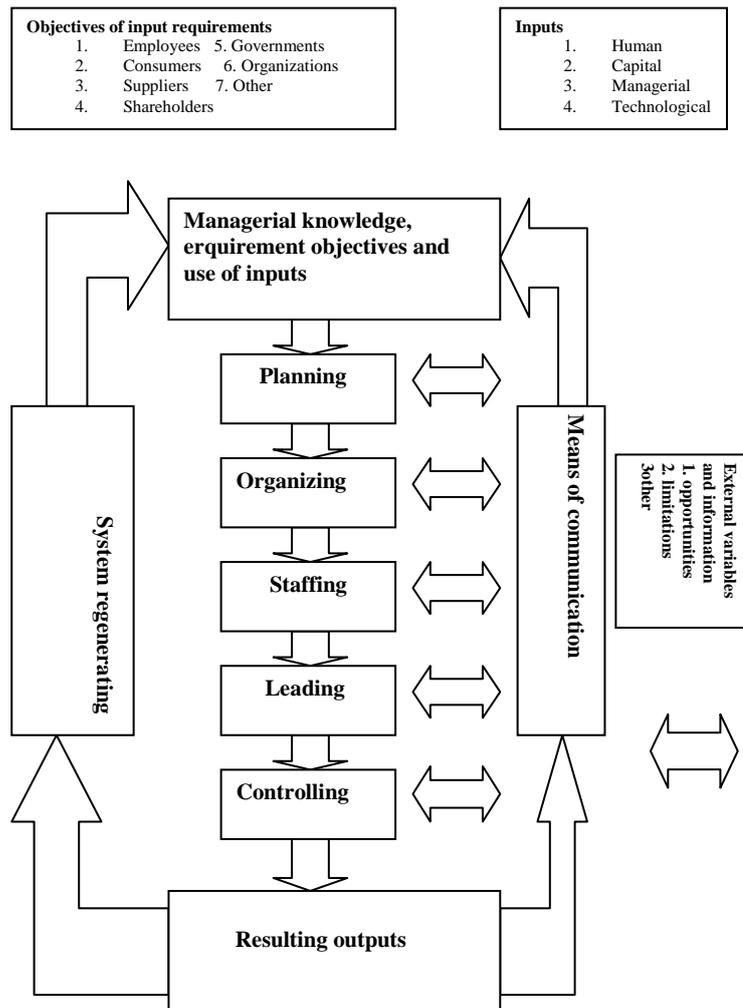
Analyzing not only in entrepreneurial environment but elsewhere it is desirable. It analyzes, first and foremost, comparison with potential competition and procedures for further projection activities.

c) Analysis of potential development resources and creation of specific strengths of the organization including analysis of use of resources efficiency

The point is an originative interconnection of strengths and weaknesses analysis with resource conditions leading to creation of strong position of the organization in the intended term.

d) Statement of objectives for speculated strategy

**Diagram 1 – System conception of management**



Source: Koontz, Weihrich 1988

Framework of objectives is the issue of the organization's top management. It is important to define parameters for each objective (content, way of achievement or analyzing, term, connection to framework of planning etc.). It is recommended, ideally, to set relatively small number of objectives (4-6) according to the organization's type of activity.

e) Statement of scripts and selection of an appropriate strategy

Chosen script predefines detailed elaboration of general selected strategy as well as elaboration of partial strategies for separate autonomous components of organization or fields of activity.

f) Analysis of selected strategy suitability

Organization must be prepared for the changing conditions; opportunities, threatens in the follow-up implementation process

g) Strategy implementation

This phase comprises also reevaluation of strategy and possibly previous phases. I am stating an experience in strategic planning in implementation to activities performed by sport organizations.

Strategic planning enables the sport organizations:

- To analyze a way how to build a sport organization,
- To specify the most important target groups, i.e. groups of persons which primarily assist in objectives meeting,
- To state short-term, medium-term and long-term objectives,
- To define way how to meet the objectives.

I proposed content of sport organization's strategic plan for the area of sport management. It is necessary to mention, that the strategic planning in the Czech sport environment is most often implemented on the basis of business organizations, where the creation of entrepreneurial strategy seems to be a necessity.

There are already elaborated some means and tools of planning for the field of sport, i.e. SWOT analysis for sport events planning.

## **Organizing**

Organizing and organizational structures are, by P.F. Drucker (2001), the oldest management function. Modern management trends put the accent chiefly on:

- Simplicity and flexibility of organizing methods and types,
- Independent conduct of organizational components,
- Using of integrated procedural management reengineering approaches chiefly with the assistance of information technologies.
- Reduction of organizational types which only arrange a decision making or works for other units,
- Analyzing of staff units slenderness and assignments with appropriate workers in professional and qualifying way,
- Increasing of linear leaders' value and reputation, who are performing prestigious activities,
- Linking of organizing methods and types with motivation systems of participation in shown good/bad results,
- Replacement of rigid rules, regulations and organizational types with development of direct and informal communication,
- Using of informal structures and developing of screen cooperation.

These trends are described in works by P. F. Drucker (1999) "Management Challenges for the 21st century", G.S. Gardiner (1996) "21st Century Manager – Meeting the challenges and Opportunities of the New Corporate Age", F.J. Guillart, J.N. Kelly (1995) "Transforming the Organizations – Reframing Corporate Direction, Restructuring the Company, Revitalizing the Enterprise, Renewing People", S. Helgesen (1995) "The Web of Inclusion: A New Architecture for Building Great Organizations".

Trends above are relevant for all managing areas in organization including sport and armed forces and following of these trends results in more effective use of resources and more precise outputs.

There are evident defects in sports organizing, which create a basis for ineffective drawing from funds, imprecise financial documentation, wrong division of power of decision resulting in doubling of performed functions or, on the contrary, to absence of some. Within big sport organizations is a problematic wrong choice of managing range and number of chosen managing levels, which affect an effective business in relation to communication and incurred costs.

### **Selection, assignment and assessment of workmates (staffing)**

This managerial function lies in ability to ensure an appropriate selection of good and long-faithful workmates, their assignments according to specialization, fair assessment and further professional development. It is intentionally said as workmates – cooperation among personnel - modern management is interested in originative and loyal approach than in simple recruitment of workers.

Modern management lays a great emphasis on personnel affairs. Some authors talk about “human resource management” as a separate field or possibly about “personal management”. They usually include some parts of other managerial functions in their theories (in particular planning and leading) and this area often becomes autonomous.

Selection and assignment of workers work on manpower planning and is based on analysis of capacity requirements for works in process or works considered in the future.

Uniqueness is occurring in the field of sport chiefly in non-profit organizations which cooperate with volunteers. We can hardly monitor their occupational qualifications for selection, but it is rather oriented on time and location, in particular for sport events.

### **Leading**

Modern management gives a great amount of findings, opinions, experience, methods and approaches how to achieve an active and quality participation of workers in meeting the organization’s mission and objectives. These methods and approaches are focused on workers, who lead bigger teams, to control the whole spectrum of approaches necessary for personnel managing with a different need of authoritative and autonomous decision making. In historical connection, these approaches result from theories X and Y originated in the 1950s dealt in work „The Human Side of Enterprise“ (1989) by D. McGregor. In modern management a work by J.A. Pearce and R.B. Robinson is a follow-up to it and deals with transition from autocratic to liberal managing, possibly to full liberty of participation in organization’s activities.

This managerial function pays high attention to personnel motivation. Modern management distinguishes three types of motivation:

#### a) Theories of understanding of motivation reasons

The most popular theories are:

- Maslow’s “Hierarchy of needs theory“ focuses on specific functions adjusting it to the considered conditions. These functions use sociological economic analysis designed to particular needs measure.
- Herzberg’s “Two factors theory” was originated in the later 1950s, despite of this fact, it ranks among the most popular motivation theory. The first group of factors comprises motivators and the second hygienic factors. Present management deals with determination of economically adequate limits by static testing to ensure that hygienic factors do not have dissatisfactory influence. Another research orientates on intensity and economic benefit of each motivation factor in comparison with costs, elicitation and duration. (Herzberg’s work “Managerial Choice: To be Efficient and to be Human“).
- Alderfer’s “ERG theory” has a similar conception as above mentioned theories, it divides human theories into three hierarchical groups:
  - Provision of existence,
  - Provision of social relations with working environment,
  - Provision of personal or vocational and qualifications growth.
- McClelland’s “need for success achievement theory” focuses on three levels of hierarchically sorted motivations.

It is based on:

- Need for affiliation
- Need for power,
- Need for achievement.

#### b) Theories of course of the motivation process

These theories focus on elicitation, duration, regulation, preservation and termination of motivation action.

It involves:

- Vroom’s “expectancy theory” pays attention to estimate, evaluate and monitor personal objectives and interests,
- Porter’s and Lawler’s “extended expectancy model” works on the fact that employee’s expected motivation reward is decisive for the strength of motivation efforts in comparison with anticipated efforts and risks of achievement (Managerial Attitudes and Performance),

- Adams's "equity theory" deals with rewards with respect to costs incurred to the employee in comparison with other employees,
- Skinner's "reinforcement theory" considers that previous findings, impressions and experience do considerably influence human reaction to similar situations in presence. Skinner defines four possible motivation methods – positive motivation, negative motivation, activity strangling and negative punishment.

c) Theories of specific propose

This group of motivation method assigns specific attitudes suitable for managerial applications to the above mentioned groups. They are as follows:

- Employee's participation in decision making; this application deals with participation usefulness, gravity of occurred problems and a way of participation choice,
- Manager's self-motivation which deals with participation in achieved output, need for passing the risks of hard and responsible activities.
- Other motivation attitudes; comprising motivation programs to raise quality of working life or involvement of employees to internal business activities.

All theories mentioned above hold an important position for sport practice. However, I would say that sport organizations in the Czech environment do not intentionally and continuously deal with motivation and motivators. Details show results of research aimed at personnel matters in sport organizations in Prague, which was carried out by Sport Management Department in the years 2007-2009. We can also say that using of motivation methods requires ability of creative thought and knowledge of managing psychology. Despite its great importance, some managers welcome rather simple practical advice. (Vodáček, 2000)

Literature of modern management differentiates between general functional managing of personnel and different version of leadership forms. Differentiation occurs also at carrier of both forms - managers in the first case and creative managers or leaders in the second case. Creative managing confesses a great expansion in modern management theories. There are various classifications of present attitudes towards leadership, which are divided into three groups in conception of modern management:

a) *Characteristic features of leader*

At present, these theories are based on opinion that some of the characteristic features of leader are rather congenital (energy, partial intelligence, assertiveness and behaviour), but either must be consequentially developed or can be fully developed.

The present managerial literature analysis carried out by Vodáček (2000) shows that for good creative leaders are usually typical following abilities:

- ***understanding of workmate's mind***, to understand what are their motivators and how it changes in time and according to situation,
- ***gaining of workmate's loyalty***, to create a coherent team of people and to know how to motivate them in order to inspiration and creation of an environment which evokes positive response to objectives and full willingness to meet them,
- ***responsible and effective leading*** to meet the objectives including their active participation,
- ***meeting the motivation needs*** including a great portion of moral impulses (sense of pride on participation, sense of self-realization etc.) (Ghiselli, 1971)

b) *Theory of leader's behavior*

There are three basic types of creative leadership in managerial literature of modern management – autocratic style, democratic style, free style. Later works deal chiefly with democratic and free style – so called "System 4" (Likert 1976). Likert's theory of four systems works on experimental analysis of manager's and leader's behaviour and says that creative leaders use:

- ***Exploitive-authoritative style***,
- ***Benevolent-authoritative style***,
- ***Consultative style***,
- ***Participative style***.

Other theories do in later years point trends toward significant independence of decision making power of led employees or groups. However, it is counterbalance with responsibility according to risk of performed activities and employees initiative. It is important to realize that creative leader's behaviour can be noticeably changed according to situation even for the same team.

In conclusion I would like to emphasize that managing by a leader does not mean a loss of discipline and control of formal or informal built team. However, it rather results from environment and spirit of leadership and thus it is conscious, created without use of violence and cleared of the carrot and stick philosophy. A monograph “Understanding Motivation” (1990) by John Adair is very interesting in this respect.

c) *Theories of state conditions of leader's success/failure*

There are three theories:

- **Leadership continuum theory** recommending differentiation of behaviour and leadership according to the situation and conditions (Tannenbaum, Schmidt)
  - **Leadership effectiveness theory** recommending open style of creative leadership according to situation parameters (Fiedler)
  - **Path-goal theory** recommending division of objectives into well-arranged and manageable substeps. (House)
- Classical recommendations are shown in opinions by managerial celebrities in their autobiographic and reasoning books. In the sport area these theories are use rather intuitively than it would be involved in regular training of sport leaders.

## Controlling

Controlling is the last sequential managerial function. This function analyzes differences between present state and planned objectives of organization, and how to work with them in implementation of leading process. Modern management classifies control process by:

- **content,**
- **management level,**
- **implementation concept.**

Control methods and practices are used according to classified control process. Modern management deals with recommendations for effective controlling (Vodáček 2000). We can emphasize following recommendations:

- to plan and organize control **procedure in accordance with evaluated managerial process content,**
- to pay attention to **economy of control process,**
- **to pay attention to the right timing of control** and notice significant differences about planned intentions,
- to ensure adequate **control quality,**
- to respect **differences resulting from organizational parameters** of controlled groups,
- to work on declaration of power and responsibility, independence factor and function of controlled employees and teams,
- ideally, **to use simple control procedures,** but it can not be at the expense of reliability and profundity of control results,
- to suggest **practicable and economical remedial action.**

Control specifics in business organizations and citizens associations in the field of sport appear in:

1) choice of critical points and standards of control

it is primarily grounded on meeting the objectives and programs serving as control points, further on economics standards – costs, revenues, capital.

2) time shift of budget according to accounting period and budget by sport season serving as a base for decision making.

Managerial activities in the field of sport work both on general activity concept and content and are specific according to sport aspects. The high effectiveness of sports organization's activities can be only achieved in mutual harmony of these aspects. For that reasons, there was founded a field of study Management of Physical Education and Sport at the UK FTVS in 1996. It was the first in the Czech Republic engaging in sport organizations management.

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## **ACADEMIC FORMATION**

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**SCIENCE VERSUS THE CRAZY GANG: SYSTEMS AND CHARISMA  
IN FOOTBALL MANAGEMENT**

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**ABSTRACT**

Protagonists in football management are forever seeking a competitive advantage over opponents. This search takes onboard both socio-cultural and scientific approaches designed to motivate players to perform to the best of their abilities. Such a belief system is pertinent to the military-soldiers need to be motivated to do their tasks, the responsibility for achieving this lies with the officers. What is considered effective changes over the years as new thinking comes along and gurus are proclaimed. What remains a constant in the case of both football and combat is the need to finish as the victors; the search for successful playing systems thus never ends. The appointment of Egil Olsen as coach of the Norwegian national football team in 1990 coincided with the rapid professionalization of football in Norway. His success (primarily at youth level football) was largely based on what were perceived to be 'scientific' training methods combined with match analysis he developed with colleagues at the Norwegian University of Sport and Physical Education. Although notorious in the eyes of foreign critics for its defensive and 'long-ball' tactics, the success achieved by the national side under Olsen meant that a 'Norwegian style' of play was invented. Olsen's success did not go unnoticed or unappreciated outside Norway. In 1999 he was appointed manager of the English Premier League team Wimbledon FC, a club that had enjoyed a phenomenal rise in status over the previous 20 years, premised largely on its irreverent stance towards pomposity and the prevailing ideas of rationality in the English game. Their irreverence saw them celebrate their notoriety with the nomenclature of 'The Crazy Gang'. Unorthodox in all they did they were to prove-at times- a nightmare to manage. This presentation examines how Olsen's positivist/ scientific approach to football clashed with the cultural and mythological preconditions of an English football club. There could only be one winner.

**SYSTEMS AND CHARISMA IN FOOTBALL MANAGEMENT**

The world's military spends most of its time preparing for conflict and very little time in theatres of war. Such a scenario might present problems. How do training regimes remain lively both for those who have to lead and those who have to execute them? How do those tasked with delivering the training inspire the personnel in their command to do what they are told despite the possibility that they have ideas they think superior to that they are instructed to do? Furthermore, how can military personnel be trained for conflict when no two such engagements will be the same? Such questions are also applicable to the world of elite-level football. What follows examines a London-based football club by the name of Wimbledon FC that, having worked its way up from obscurity to the English Premier League (EPL) in the 1980s, was eventually relegated in 2000 after an acrimonious season. The players were in revolt against a foreign-born coach whose winning credo, which had worked so well with the Norwegian national side, did not 'fit' with the playing personnel he inherited. One might best consider that a football club is akin to a Platoon led by a Commanding Officer. The latter is tasked to lead, the former are required to follow orders. Footballers however cannot be court-martialled for insubordination, and the coaches employed to instruct them exist in a structure which is negotiable not proscribed, and which alters with the club's hierarchy and ownership. That said, the story has resonance for the military.

The personality at the centre of this analysis is a Norwegian soccer coach by the name of Egil Olsen, better known by his nickname, Drillo, a description that translates to 'dribbler' and is thus a homage to his footballing career during which he was renowned for running at opponents while closely controlling the ball. His abilities won him 16 Norwegian caps and the position as Norway's national team coach, taking the side to two successive World Cup finals in 1994 and 1998. In taking the manager's job at Wimbledon, Drillo became the first Norwegian to hold such a status in English football. His appointment came at a time when those who could boast of inventing the game realised lessons could be learned from the foreigners they had once taught. By contrast, the Norwegians were always very keen on football as played in Britain. In the early years of football in Norway, clubs sought wisdom from Scottish and English coaches. FC Brann of Bergen had Scottish coaches throughout their formative

years (1908-1915). A few Norwegian clubs were actually founded by British engineers working on industrial sites. Some of the men who founded the clubs also appeared as coaches. The Norwegians were always open to new footballing ideas and coaches from Scandinavia are evident throughout the history of the Norwegian game. The same could not be said for England – and Scotland – until the last 15 years or so. As I write, only 19 of the 44 managers in England's top two divisions are English. Managers at four of the top six English Premier League clubs, along with the manager of the English national team, were trained in other countries.

The Wimbledon job was never one sought after by the top talent in football management. From its Lebanese-born Chairman down to its ancillary staff, since the early 1980s the club had enjoyed a reputation as the home of the carnivalesque and celebrated the nickname of 'the Crazy Gang'. This nomenclature has survived changes in playing personnel. A spirit of misrule survived over the years celebrated most obviously via initiation ceremonies for new recruits. The players and officials loved bloodying the nose of the bigger entities. Sometimes this pursuit was more than metaphorical. The Crazy Gang of the late 1980s contained players who, by virtue of their physicality, took it upon themselves to intimidate opponents – often in the tunnel before the game as the teams prepared to enter the pitch together. Some assumed the right to dictate to team-mates training warm-up routines, a habit which provoked internal brawls. Not renowned for being graceful in victory, the personnel that constituted the Crazy Gang enjoyed many boorish antics; members of the public did not enjoy sharing hotels with the team. This attitude was the strong point of the club, through its managers and chairman Wimbledon proved capable of recruiting strong-minded players some of whom had reputations earned elsewhere in the game that had prevented them being signed by other clubs. The club selected from within its ranks or purchased players who were strong in character and comfortable in the company of the irreverent and at times the reckless. These attributes combined to produce a 'spirit' that was difficult to define or qualify. In reality there were few attractions to prospective players to join this club. Wimbledon paid the lowest wages in the league and had stadium facilities that were basic by anyone's standards.

In part, the attraction was playing for managers who were different to the run-of-the-mill figures in the English game at the time and who enjoyed a reputation for both having fun with the players and allowing the players a degree of initiative. Such managers tended to be strong characters best described perhaps as intuitive men who ran things their way and did not invite democracy or debate. There were, notably under Dave Bassett (1981-1987) and Joe Kinnear (1992-1999), no rigid rules that would define them as 'disciplinarians' or much in the way of organisational structures. Instead there were direct, succinct, and informal communication channels. Both men could be authoritative but were generally tolerant of innovation and of players who assumed a leadership role in training or in actual matches. The appointment of Drillo should not have altered this state of affairs. Wimbledon only joined the Football League in 1977 and, after two promotions in two years under Dave Bassett were by 1984 in the Second Division of the league structure. Two years later a third place finish saw them enter the top flight of English football. They finished the 1986/87 season sixth in the highest league. A year later they won the FA Cup, beating the famous Liverpool FC 1-0 at Wembley. The following year John Fashanu became the club's first England international when he made his debut against Chile. The good times continued and in 1994, under the management Joe Kinnear, Wimbledon once again finished sixth in what was now the English Premier League. In the early summer of 1999 Kinnear suffered a heart-attack. A replacement was found in the shape of Drillo. At first sight there was good logic in such an appointment.

Similar to Wimbledon, the Norwegian national side had come from nowhere and with limited resources achieved what many believed was unattainable – for the most part under the management of Drillo. Like Wimbledon the Norwegians proved that they could play ugly and win and Drillo could argue that his method was proven and in fact was both quintessentially English and a parody of that played by Wimbledon over the previous two decades. Drillo was in fact conducting a style of play that had been discovered by a military figure by the name of Wing Commander Charles Reep. Away from affairs of aviation Reep was an amateur statistician who, after watching a top-class game in England in the 1950s, argued that more goals were scored when fewer passes were made from defence to attack. Such logic was hugely influential in the coaching schemas of English football and the ensuing playing style, titled variously 'Direct Football', 'Route One', 'Percentage Football', and 'The Long-Ball Game,' was executed to great effect by managers of many English clubs. Even its most vehement critics agreed to its effectiveness with players of limited ability and its use when adopting a counter-attacking formation against sides considered superior in technique.

In 1997 Drillo's Norwegian national side beat Brazil 4-2 in a friendly fixture in Oslo. They then beat them 2-1 in a 1998 World Cup fixture in France. Many Norwegians consider these fixtures to be as significant as

Norway's momentous 2-1 victory over England in a 1981 World Cup qualifier. Drillo's system as executed by the Norway team followed two principles: 1) If your team win the ball while the opponent's defence is unbalanced, then counter attack as fast as you can with few and quick passes. 2) If your team win the ball and the opponents are sitting back with a balanced defence, then skip elaboration and hump it high towards the goal. When correctly executed the first principle made Norway look a bit like Arsenal in the early 1990s at their most free flowing. The second principle earned them a reputation for playing like a caricature of the Wimbledon style. Drillo had a fervent belief in statistics; continually pump the ball up to whoever was the nominated target man and he will miss some but also score a certain amount of times. One might define it as algorithmic football, and indeed Drillo was quoted many times as saying that with him as coach the Brazilian national would win every competition it entered. The reason why his system never won Norway a World Cup winner's medal was in Drillo's logic explainable by the fact that he did not have players who were fast and skilful enough.

Drillo has been widely misunderstood for having hated talented or intelligent players who could think for themselves. He was known to like intelligent players and valued their opinions. The Drillo of this time believed in nothing but his system and allowed for little in terms of individual freedom and creativity. His was a schema based on the 4-5-1 formation and the tall muscular 'target man' combined with zonal defending. Drillo defended his 'style' as a necessity, citing the Norwegian players' inferior skill level almost as if this were an innate fact. Anything that could not be reduced to hard and exact science did not appeal to Drillo; footballing success was reducible to a systematic and scientific plan. This passion impressed some, and Wimbledon employed him at the age of 58 on a two year contract worth £330,000 a year. After eight defeats in a row and a 3-0 defeat at fellow relegation strugglers Bradford City, Drillo was sacked. Two games later Wimbledon were relegated from the EPL – after a 14 year presence and on the twelfth anniversary of lifting the FA Cup.

The *coup de grace* was delivered 11 months into the contract by Bjorg Rune Gjelsten, one of Wimbledon's two Norwegian owners. On making the decision, Gjelsten told the press: *I think from the club's side and Egil's side, we underestimated the cultural differences in this tough league.* In the Norwegian context Drillo could rely on functional soldiers to make his system work. Such men were not expected to produce the unexpected. There were functional soldiers at Wimbledon, but in truth it was more than a failure to implement a system that caused the parting of ways. In the attempt to correct poor performances and avoid relegation Drillo brought in new players and attempted to curtail the consumption of his pre-existing personnel. The new boys did not gel with those established; results did not improve. The players stated publically they could not understand what Drillo was trying to implement and anyway were not being used to the best of their abilities. Drillo declared that drinking beer after games was thenceforth banned for all players. Those who enjoyed beer ignored this diktat. On one memorable occasion when the players were ordered back for extra afternoon training they returned smelling of alcohol having gone in their training kit to a pub near the training ground. Before a vital relegation fixture two of the players spoke out against Drillo in the national press. The following day one was sent off for violent conduct in a match Wimbledon lost 3-0. Drillo's task was not assisted by a tabloid press out for his head, ably assisted by ridicule from players, both past and present. According to Vinnie Jones – a founder member of the Crazy Gang – the Norwegian players Drillo had brought in had no fighting spirit and were therefore not true Wimbledon players. Such men "...give Vikings a bad name", others he would drown in a river or line up against a wall and kick the sense out of. Former manager Joe Kinnear publically mocked Drillo's complaints about noise and traffic pollution in south-west London. It was open season on a man who was basically the eccentric and sensitive leader of a footballing platoon. In the face of such ridicule one Norwegian-born former Wimbledon player spoke up for Drillo. The 32 year-old Stale Solbakken put the issue metaphorically when stating: "A brain surgeon should not have to work with peasants". For him the Wimbledon players were lazy and trained less than part-time Norwegian footballers and, having never played to a system, could not understand what Drillo was trying to implement. In this scenario they sought comfort in the myths and legacies of the Crazy Gang. Science did not work, 'culture' of a kind won the day.

Drillo was a poor communicator, and this went a long way to achieving the ultimate shame in managerial parlance: 'losing the dressing-room' – and ultimately his job. Before a game at Manchester United he told the Wimbledon team in the memory of one present, "I am not expecting you to win this afternoon. Maybe next week..." This was not textbook motivational ability – even if realistic. Obsessed with computer analyses of individual player performances, Drillo expected his players to log onto a web-site containing match facts and statistics he had created with his technical team. Few did. He was perhaps too sensitive by nature for the Crazy Gang. This was a man accustomed to the Norwegian fjords, who found himself in a busy corner of south-west London. He seemingly never got over the socio-geological shock and articulated this to a journalist, who reported

him as saying: *England is noisy. There are too many cars and too much smoke. I do miss the silence and the mountains of Norway.* Maybe bigger issues were at stake here; can a man who professed a belief in the political philosophy of Maoism really be the authoritarian figure that so often wins in football? The Norwegian mountains were soon his to behold. A degree of naivety or stubbornness has to be considered. Was Drillo really not able to measure the responses of his players to his techniques? Maybe he did and ignored them. Was he really so surprised by the cultural differences he encountered? In his defence, Drillo might argue that he was an ‘impact’ manager. His methods worked in the setting of international football where a disparate group of players is assembled for short periods of low frequency coaching sessions for usually one game and for a maximum four games in quadrennial tournaments. Furthermore, by virtue of Norwegian cultural norms and the absence of high expectations, Drillo had the luxury of minimal press intrusion in previous managerial positions. At Wimbledon, however, he entered the global world of the most hyped league in the history of the game, with an attendant media that bordered on the hyperbolic. He had the further advantage of managing a team – Norway – that had never won anything of prestige.

The ‘scientific’ style may well have suited the Norwegians that Drillo coached. The system was considered safe and had the backing of hard science. It required self-discipline and avoided exuberance. It reflected a society that did not promote individualism. Drillo thought its lack of efficacy at Wimbledon could be explained by the disloyalty of players (and some backroom staff) and his admitted inability to implement his favoured system: *The only thing I blame myself for is that I never managed to impose my style on the team... . I would have felt really depressed if I had managed to implement what I believed in and still failed.* However, he was quick to add a cultural proviso: *In England they are more worried about ‘fighting spirit’ than real knowledge about football. I think that is down to the players’ will, but it is also a matter of being able to understand the system.* As a positivist, Drillo was convinced the system worked but the tools (i.e. the players) used to accomplish the task were not available at Wimbledon. But people – like belief systems – can change. The Drillo described in this text no longer exists; he has since come out as a much more moderate character exemplified by his conduct as Norwegian national coach. He now admits that the system was fallible.

What is described here should provoke citizens in uniform to deliberate on their role in the world. That might sound rather grand, and a critic of what precedes can justifiably point out that the tasks of the military are more complex than merely ‘winning’ conflicts. Indeed many will argue that that which comes under the rubric of ‘Peace-keeping’ – or even the ceremonial – dominates the lives of dozens of Armies globally. All the same, I feel the arguments raised still apply in various milieus. In the contexts of multi-national military co-operation – be it in conflict or peace-keeping – someone has to have ultimate command. How and why such people are chosen fascinates this author. Is it like football in that some nations are assumed to have the expertise by virtue of history and tradition? Are some nations reducible to the accolade of ‘warriors’ and so assumed to be capable of performing the requirements of the military anywhere when asked? Are some armies and the regiments they contain continuing a fighting tradition that is not always definable but attracts recruits who wish to perpetuate both the myths and the realities and all that lies between? Finally, similar to football, new nations appear on the world scene due to socio-political change, and such nations can prove exceptionally capable; will the traditional powerhouses of the military look to them for new ideas? Or is it locked into tradition and inertia? Ultimately this paper asks of both football and armed conflict, are such contests won by rigid adherence to systems or the innovations of individuals? These questions should both concern us and provoke informed debate: War is too important a contest to be left to Generals.





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- 1956** BSc Naval Sciences - Naval School Rio de Janeiro  
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International Projects on Knowledge Management (since 1999);

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**CREATING SYNERGY BETWEEN SCIENCE AND MANAGEMENT:  
FROM OLD TO NEW CISM ACADEMY**

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**ABSTRACT**

The original CISM Academy (ACISM) during late 1960s and early 1970s has made efforts to develop scientific-based sport training in Latin America. In Brazil, ACISM and local Armed Forces established a successful partnership providing technical brochures and refreshing courses having civilian and military target groups working together despite different sport specialization backgrounds. Thus, sport coaches and medical doctors participated in ACISM activities in Rio de Janeiro, main sport studies center in the country at that time, in addition to opportunities of international technical exchanges in Europe. Sport research started in Army P.E. School of Rio de Janeiro during the 1930s but at the 1970s stage became evident the need of decentralization to other areas nationwide. Again a special ACISM event in 1972 brought civilian sports medical doctors and coaches together in a intensive seminar aiming to consolidate sport physiology in different areas of the country in terms of knowledge production. As a result three new and non military laboratories were organized in Rio Grande do Sul, São Paulo and Minas Gerais early on ACISM promotion, giving birth to a model with noticeable impacts in new initiatives of sport sciences many years ahead. Additionally to other influences besides ACISM, the number of sports sciences laboratories in Brazil had increased to nearly 200 units of different sizes up to 2005. So far, this contribution to the re-birth of CISM Academy aims to review old roles played by this institution, framing them in the context of synergy between science and management, one of the explanation of the successful intervention of Brazil's case which might represent similar occurrences in other countries. The methodology is a historical analysis made by the Author of this study who was a member of ACISM and speaker during the 1972 event, followed by an analysis of the presupposed synergy by means of Knowledge Management (KM) theoretical approaches. In practical terms, the latter analytical interpretation has a support of data collected by the Author as the chief organizer of the "Atlas of Sport in Brazil", an ongoing project beginning in 2003 ([www.atlassportbrasil.org.br](http://www.atlassportbrasil.org.br) – English version). This work in progress of KM includes equally civil and military facts finding in a time line frame, making possible observations and projections of the synergic approach. Conclusively the relationships between science and management and the interplay between military and civilian scientific development are discussed. The aim of this paper is to provide an overview of fact-findings concerning the re-birth of CISM Academy (ACISM), framing them in the context of synergy between science and management. Firstly, a brief historical case review of original ACISM scientific interventions is presented; then I will forward the presupposition that those past activities were synergetic in their managerial meaning, as understood in present days. Secondly, I will elaborate the argument of synergy as a management tool on account of a collective practical knowledge construction.

**From old to new CISM Academy**

The original CISM Academy (ACISM) during late 1960s and early 1970s has made efforts to develop scientific-based sport training in Latin America. Particularly in Brazil, ACISM and local Armed Forces established a successful partnership providing technical brochures and refreshing courses, having civilian and military target groups working together despite different sport specialization backgrounds. Thus, sport specialists, medical doctors and P.E. university's teachers participated in ACISM activities in Rio de Janeiro, main sport studies center in the country at that time, conducted by military – and invited civilian ones in some cases - experts from Europe and United States with international reputation.

It is important to mention that sport research in Brazil started in Army P.E. School of Rio de Janeiro during the 1930s but at the 1970s stage became evident the need of decentralization to other areas nationwide. Again, a special ACISM event in 1972 brought civilian medical doctors, coaches and teachers together in a intensive seminar aiming to consolidate sport physiology in different areas of the country in terms of knowledge production.

As a result three new and non military laboratories were created in Rio Grande do Sul, Sao Paulo and Minas Gerais States early on that ACISM promotion. Consequently, these positive reactions gave birth to a post-

event model with noticeable impacts in new initiatives of sport sciences many years ahead nationwide. With other influences besides ACISM in civilian institutions, leaders and managers, the number of sports sciences laboratories in Brazil had increased to nearly 200 units of different sizes up to 2005.

This outstanding impact in sport science in one single country has been identified *inter alia* by Correa (2005) when reporting the 1972 ACISM Rio de Janeiro Seminar, a joint event with Brazilian Armed Forces Sport Commission (CDFA) and Ministry of Education and Culture (MEC) from Federal Government. For this accomplishment, Major Raoul Mollet, CISM General Secretary, himself, travelled from Brussels headquarters to Rio de Janeiro to coordinate the international participants.

The Seminar's works included 356 Brazilian participants from all regions of the nation and the distinguished international experts – military and civilian - were namely K. Cooper, P. Rasch, J. Higgins e F. Kobs (USA); R. Mollet e L. Ribeiro (Europe); L. DaCosta e M. Rocha (Brazil). Still on account of Lt. Col. Correa mentioned above as a source, the sport science drive in Brazil had the 1972 Seminar as a milestone whether coincidental or not with ACISM influences. Symptomatically, in early 1970s there were 32 P.E. university courses in Brazil, a total increased to more than 800 courses in 2008, revealing an unexpected and huge growth when compared with the country's economic development in the same period of time.

Indeed, many Brazilian participants of the ACISM Seminar acted afterwards as development vectors as detected by Tubino & DaCosta (2005), creating laboratories and the discipline of “methodology of sport training” as well in most P.E. university courses. This evidence also may reinforce the thesis of synergy between international experts and their national counterparts at least on account of civilian human resources. Summarizing, the ACISM old roles had hypothetically provided synergetic effect in terms of scientific knowledge in Brazil and probably in other CISM member countries. Thus, new ACISM proposal may have as point of departure an updated approach based upon synergy, as follows in the next section.

### **Synergy as a computer-based collaboration tool**

Actually, in today's computer age, synergy is an expected effect when scientific data can be used as a repository “which is considered a gateway to managerial information or the expert's knowledge, i.e. the Knowledge Management (KM) concept” (McManus & Snyder, 2003). In other words, the renew of ACISM now under discussion may enhance the ability to share information by utilizing database tools and softwares in Knowledge Management concerns.

In other words, synergy is surely a management creation in nowadays perspectives giving grounds to institutions – whether dedicated to sport or not – towards extracting valuable information by utilizing a data repository. In short, the new roles of ACISM would imply in being connected to Knowledge Management (KM) procedures and devices in view of its past successful experiences.

As I recently described elsewhere (DaCosta, 2009), KM is oriented to the management of continuous innovation which implies in transferring knowledge from people to people much than from machines to people. Furthermore, KM deals equally with explicit (documented information that can facilitate action) and tacit knowledge (comprehension gained through study, experience, practice, and human interaction). In operational terms, the interplay between tacit and explicit knowledge is a transfer of knowledge based on expertise or skilled judgment from one person to another.

### **KM as a tool for scientific collaboration: the case of Atlas of Sport**

In practical terms, the latter analytical interpretation of KM has been tested in recent years by the Author of this study case who was also a member of ACISM and speaker during the 1972 event. In this privileged capacity I had become the chief organizer of the “Atlas of Sport in Brazil”, an ongoing KM project beginning in 2003 and sponsored by a group of civilian sport organizational bodies with military participation in data surveys (Army, Navy, Air Force and Military Police). This project had as outcome a CD ROM Beta form in 2004, a paper book version in 2005 (920 double pages) and a web-based site from 2007 on with free access at [www.atlasesportebrasil.org.br](http://www.atlasesportebrasil.org.br) > in Portuguese and English versions. <

Scientifically speaking, this work in progress of KM includes equally civil and military facts finding in a time line frame, making possible observations and projections of the synergetic approach as far as data contributors were selected either in academic institutions (explicit knowledge) or in non professional areas of sports activities (tacit knowledge). In this context, contributors have been taking part in the Atlas of Sport project by means of a volunteers' network promoted by the Federal Council of Physical Education-Brazil, a nationwide non profit organization with almost 200 thousand members in 2009.

In terms of reference for consulting purposes, the Atlas of Sport in Brazil (DaCosta-Org, 2005) is a database that combines historical and scientific information with sporting events and development processes, if any. The methodology includes information and data – that is mostly descriptions and statistics - in timeline and location frames having texts and mapping displays as the output. This cultural and geographic mapping in double size volume from 2005 version had 199 chapters and 410 authors from different professional and educational backgrounds participating in voluntary basis. The thematic areas scrutinized by the Atlas summed up 20 choices, 5% of them with direct Armed Forces participation. Aggregation of knowledge from all chapters was represented by scenario methodology at the end of the 2005 book and available in the Internet version up today through a search tool included in the Atlas of Sport site.

Data and information collection tasks have been oriented by a standard framework to be followed by authors. This device was assumed on account of the former KM experience of DaCosta and collaborators with Sport for All in international coverage (DaCosta & Miragaya, 2002). That standard orientation proved its effectiveness facing the authors' educational and professional diversity and the KM operational need of combining tacit with explicit knowledge. Another measure to guarantee scientific value of Atlas of Sport's texts and maps have been the intervention of editors, that is the function of supervising and eventually checking information and data came from authors. This editorial process during the 2003-2005 phase implied in having three thousand files circulating among authors and editors under the coordination of the project's organizer.

In all, this KM sport national project encompassed 17 supervising editors, mainly with Ms and PhD degrees covering texts elaboration and thematic surveys; non academic authors were mostly sport local leaders or clubs and federation's managers in addition to P.E. undergraduate students who worked in field surveys for selected authors. Post investigation focusing on Atlas's volunteers suggested a sense of belonging connecting project's participants to their production (Perisse Nolasco, 2006).

As a KM project envisaging synergetic and networking procedures, the Atlas of Sport has been updating as a multimedia development towards scientific promotion in sports contrasting with other similar achievements which aims at putting into place information retrieval and production without identified personal mediation and supervision. This priority to sport specialists and devotees development instead of making them users makes the difference facing other similar systems. Table 1 in this concern presents comparative features from Wikipedia, Encyclopedia Britannica and Atlas of Sport in order to find out the very nature of KM adopted by the latter system.

In addition to the Atlas of Sport's differentiation as a database tool, the following benefits shed light to its role as a platform for sport specialists and laymen development in KM perspectives and national scope:

- The most comprehensive databank of Physical Education and sports in Brazil;
- All about Brazilian Physical Education, sports (traditional, Olympic, non-Olympic, extreme, adventure, clusters), recreational activities (leisure and traditional games), publications, educational institutions, organizations related to sports (government, clubs etc), military organizations, professionals, athletes, human resources, health clubs among others;
- All chapters with descriptive texts containing summaries, historical background, bibliography, sources and references, as concerned to explicit and tacit knowledge;
- Detailed maps showing where sports are played, taught and investigated in the country with definitions and historical background;
- Complete tables and figures of market sizes and other quantifiable information;
- Interpretations of facts by scientists, supervisors of respective areas;
- Bilingual information (Portuguese and English);
- Operational objectives proposed to survey facts of memory and inventory of physical activities in Brazil not only as sports practices and P.E. practices but also as physical activities geared towards health and leisure;

- Contents to reach the following target publics: politicians and government authorities; media; sports and physical education leaders and professionals; managers and directors of sports confederations (national level), federations (state level), leagues (municipal level) and clubs (local level); researchers and teachers in Brazil and abroad; military sport specialists;
- Financial support provided by eleven leading organizations associated in a “Consortio” (consortium), a unique instrument in Brazil when it comes to the sports area and similar activities in education, leisure and health;
- Mobilization of volunteers similar to actions that gave origin to Brazilian sports clubs since XIX century, and, in essence, that still keep some of them active: (1) the appeal to the common cause and (2) team work aiming at concrete and successful results;
- Preservation of the tradition started by the very first study of local sports inventory made in 1893, held at the Turf Club of Rio de Janeiro;
- Chronology of memory facts used as framework for each chapter and for the Atlas system as a whole, creating new possibilities for history research and continuing updating;
- Consideration of oral reports (tacit knowledge) as valid but non permanent references at the same level of biographic and documental sources (explicit knowledge);
- Acceptance of spatial inventory made by field observation and local consultation as much as temporary estimates and quantitative data for submission to progressive updating;
- Definition of sports adopted by the European System of Sports Statistics (COMPASS), which is the model chosen to organize data so that they become comparable with data from other countries, and therefore more analytical and conclusive;
- Standardization of COMPASS sport definition considering sports “as all forms of physical activity which, through casual or organized participation, aim at expressing or improving physical fitness and mental well-being, forming social relationships or obtaining results in competition at all levels”.

### **CONCLUSION: towards the new ACISM using KM solutions**

Conclusively the relationships between science and management and the interplay between military and civilian sport scientific development in the computer age still trust in people to people transfer of knowledge as they did in the 1970s in the interest of original ACISM. However, database electronic system with access to Internet is now a groundbreaking to this synergetic effect of peopleware. In this new technological setting, innovation is a continuing search as long as computers are not submitted to limitations in moving to one country to another as experienced by old ACISM.

These arguments are supportive to the renew of ACISM as referred to KM theory and practice as demonstrated by previous sections. In brief, KM is a creative practical knowledge construction by means of peopleware. Moreover, the KM project Atlas of Sport here discussed is a large-scale and low-cost enterprise which may be a model to future ACISM operations. In spite of being hosted by national institutions and directed to regional interests, this project gave insights and operational solutions to similar international achievements in sports as reported by DaCosta (2009).

Finally, to find a recovery of ACISM towards KM solutions is not only a technological updating but a search of military scientists for their own power on behalf of sport friendship, as they did in the challenging past times of 1970s.

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## Highlights of the Symposium

### Opening ceremony of the Symposium



## Highlights of the Symposium

### Symposium's sessions



## Highlights of the Symposium

Coffee-breaks & unexpected Symposium's happenings



## Highlights of the Symposium

### Demonstration of military activities



## Highlights of the Symposium

### CISM Academy Re-birth Ceremony



## Highlights of the Symposium

Thanks to Symposium speakers & organizers & gift exchange



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# Part II. CISM Academy

## SPORT, SCIENCE AND ACADEMY

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Sport, Science and Academy should be three connected elements in CISM. We are dealing with sport as a core business, from basics- soldiers' physical performance to top sport- top athletes. Science exists mostly on the Symposiums and this event is the best opportunity to share knowledge, researches and experiences between Armed Forces from all over the world. But the time between one Symposium and another is like a hole with a lack of information and links. This is why we need scientific body which should take care for this important field in CISM.

CISM already has the CISM Academy in the past. In many contacts with CISM representatives, I realized that some of them are not aware about it and neither about meaning of the CISM Academy. Exactly from this reason we decided to use expression "re-birth", to achieve greater impact and response in the process of initiative to revitalize the CISM Academy. You can read more about CISM Academy history in the following pages, but let us firstly pay attention to some definitions to clear out what we talk about and why.

We can find many definitions of sport. One of them defined a sport as an organized, competitive and skilful physical activity requiring commitment and fair play (wikipedia.org). Zechner (1992) wrote that Physical exercises have been performed during the earliest phases of human development. Perform to military tasks the Physical Fitness is one of basic sport aims in Armed Forces. It makes sport in armed forces an essential factor and integral component of the process of education and training as a whole. It does far more than just make service personnel physically fit and improve motor skills (Kuhn, 1992).

Science comes from the Latin *scientia*, meaning "knowledge" and refers to any systematic knowledge-base or prescriptive practice that is capable of resulting in a prediction or predictable type of outcome. In this sense, *science* may refer to a highly skilled technique or practice. In its more restricted contemporary sense, Science refers to a system of acquiring knowledge based on scientific method, and to the organized body of knowledge gained through research. Science is sometimes called experimental science to differentiate it from applied science, the application of scientific research to specific human needs (wikipedia.org). We can meet both of them in sport related researches as well in Armed Forces.

Latin Academia means "*the school where Plato taught*", from Greek Academia (thefreedictionary.com). Nowadays we can find expression "Academy" used in different ways. In the (military) world we mostly meet this expression in two ways: 1. School for training in a particular skill or profession- "Military academy"; 2. Academy related to the Science and Education, as an institution or society for the advancement of science. Last one is more common in the scientific community, established in the frame of the Universities, Faculties and/or Institutes.

CISM is a worldwide sport organization. In the world of sports, growing competitiveness has led athletes and scientist through a search for other means to achieve a better performance (Buck, 2005). Means, that speaking about CISM Academy we talk about sport and science in the military world.

We have enormous potentiality all over the world. Some of our member countries have their own military sports institutions. Some of Armed Forces cooperate very successful with civilian sport related institutions (universities, faculties, institutes, etc) in national and international level. There are different systems from country to country but findings are that we have potential which should be managed more effective.

Exactly this is our intention, we would like to improve this important field in CISM and assure its continuity. This is the main reason why we would like to establish CISM Academy again. The basic purpose of the CISM Academy should be management of science, researches and experiences in physical fitness, education and other issues between Armed Forces of member countries of CISM and involved institutions. This is also an answer on question why we need the CISM Academy: we need a permanent scientific body.

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## UPDATING ON THE ROLE OF CISM ACADEMY

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### **Brief Historic from CISM Academy**

CISM Academy was in the past a scientific and pedagogical study centre dedicated to research in many key areas of physical activity and sport manifestations: high-performance, social, educational and military in the Armed Forces worldwide.

The activities started in 1951, during the General Assembly in Cairo. According to the initiative of Captain Raoul Mollet (Belgium) and Captain Edmond Petit (France), it was decided to concentrate efforts on activities of physical training studies. At that time, CISM Academy had the following objectives:

- spread new methods of training used by troops around the world;
- keep a nucleus of military and civilian authorities in the field of sporting training, medicine and social inclusion;
- collect and file information on the modern methods of training;
- lead research in specific areas according to the necessity of CISM;
- lead symposia in which selected authorities could present studies and material brought up to date in all area of physical activity manifestation;
- spread new discoveries, methods and techniques of training for the countries members through technical booklets, symposia and clinics;
- foment and divulge initiatives in the field of the social inclusion by sport;

The 60s and 70s saw the rise of CISM Academy with a creation of the organizational structure and statutes, which defined it as a scientific and pedagogical agency dedicated to research in selected areas of physical activity and sports training. As a symbol of this pioneer stage the book “Medicine of the Sport” was launched in Italy in 1960 including a chapter under the title "Military Sports Medicine", written by Colonel G. Tartarelli from Italy, on account of findings promoted by CISM Academy. In all, previous experiences may be referred to outstanding military scientists, following the case signalized by Col. Tartarelli.

During this profit time a number of military sport researchers has contributed with their findings to improve physical training methods. Some significant examples are the Power Training and Total Training by Major Raul Mollet from Belgium, in 1954 and 1960, Altitude Training by Captain Lamartine DaCosta from Brazil, in 1966, and The Development of One Program of Physical Conditioning by Major Kenneth Cooper from USA, in 1968. Its practices transposed the military walls and remain until today as methods of training for both civilian athletes and military personnel. In short, the impacts from past CISM-based sport developments either for top level competitions or for warfare preparation in civilian or military grounds, had been a result of the leverage provided by scientists connected to CISM.

In 1986 the CISM Academy started to face financial problems for implementation of its projects. At the same time, after 32 years of mandate, the idealizer and responsible for the success of this outstanding project, Cdt. Raoul Mollet, said farewell to CISM General Secretariat. In 1991 the XLVI General Assembly, in Tanzania, Karibu, trying to maintain CISM Academy activities, voted in favour of a new structure.

Unfortunately, in 1998, after a profitable period of more than 40 years, CISM Academy finished its activities. Since then, CISM has not been completely away from science, but not so close as used to be.

To maintain the interactions between science and sports in Armed Forces, CISM Headquarters, developed on the web site the *Sports & Science Forum* in the end of 2006. This Forum, jointly managed by the CISM Sports Medicine Commission and the CISM Sports Commission, has the intention to be an exchange e-platform in the area of sport sciences. It is a free space not only for improvement of traditional knowledge in the field of training sciences, biomechanics, sports medicine and physiology, but also other areas, newly related to sports like marketing, communication and management that have increased its importance day-by-day.

### **Updating on the role of CISM Academy**

According to its history, CISM Academy should remains as a scientific body which has the aim to support CISM decision-making process.

In a current conception, science is a tool for management concerns, and military sports by definition cannot be apart of it. Indeed, management is in the core of military activities into which sports have a fundamental participation.

Furthermore, the supportive role of science increased and mixed its importance not only within sports related matters. For instance, the image rights of a famous athlete, the huge logistics aspects of a national football team and the management of financial resources by sponsors and partners are only few examples on how the knowledge grows from a variety of directions.

Concerning these historical evidences, operational questions might be placed alongside CISM growth: what is the importance of sports science towards military point-specific needs? Which are the best uniforms to be used in a specific battle considering the climate conditions? How hydrate could help soldier to remain fit for a long time and keep him fighting? How ergonomic evaluation of a pilot and the cockpit of his plane can delay fatigue and minimize vibration during a combat flight and increase his performance? All of these questions are examples related to typical military matters overlapped with sport advancements forwarded by labs all around the world.

Also other questions specifically related to CISM growth, and science could help to answer, like: which practical actions should be adopted by CISM to improve its visibility worldwide as an international organization compromised with peace and development? How Military World Games and Championships could impact sports within military and civilian societies? How can CISM develop Solidarity and Sport for Peace actions in order to contribute with human development? How science could help CISM to reach its new challenges?

According with this brief review, a pertinent platform for the military authorities and CISM decision-making process should be mostly based on science including sports researches. As far as “*Operational Research*”, “*Knowledge Management*” and other similar concepts are already being used as helpful instruments to improve the efficiency of nowadays military organizations. It is important to mention that these new technological tools are manly dependent of capable human resources, that means scientists if we focus research concerns.

### **CISM Academy in the context of Innovation**

To deal with this new management profile, a multidisciplinary group of researchers should compose a consulting body within CISM in order to update the scientific current approaches. This suggestion aims is provide a scientific-based organizational structure to guarantee a stable and long-term development.

Thus, the purpose of CISM Academy in the context of innovation should be strategically connected with continuity and stability. Taking into account the considerations above the updated CISM Academy should present the following purposes:

- a) Manage the knowledge originated among researches related to all sports manifestations within the armed forces;
- b) Raise awareness of scientific researches’ importance as an efficient tool to support administrative decisions on sports related matters within the armed forces.
- c) Create and manage a network to discuss scientific issues on sports related matters within armed forces, and create synergy with scientific sports institutions;
- d) Propose areas of research on sports related matters according to the CISM needs;
- e) Compile and spread scientific information on sports related matters within the armed forces;
- f) Administer CISM academic events;
- g) Establish cooperation with international institutions and create synergy on international & national level and between military & civilian structures; and
- h) Support different working CISM groups (commissions, committees, etc) with scientific findings.

### **CONCLUSION**

Conclusively, the lessons from the former CISM Academy suggest that scientific development is mainly referred to scientists not only to promotion of sciences. Notwithstanding, to improve the CISM capacity in operational process, decision-making, and management sciences and related methods that would enhance the quality and effectiveness of military sports is a matter of science and scientists.

Therefore, the purpose of this paper was to search additional means of updating CISM activities having past experiences on sport scientific developments as a basis. This mean that the updated CISM Academy should remain with its historical vocation supporting researches related to physical training and fitness test within armed forces worldwide, but also run in direction of new scientific approach using Operational Research and Knowledge Management to better develop other important questions which grows in the last years.

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## INQUIRY RESULTS CONCERNING THE CISM ACADEMY

*Analyse realised by Maj. Pedro Gagliardi (BRA), Deputy of Sports Director, CISM Headquarters*

During the CISM International Symposium in Prague – 2009, the Organizing Committee asked the participants to answer inquiry related the event and the CISM Academy re-birth proposal. Questions numbers 4, 5 and 6 are restricted to CISM Academy. The others are related to the Symposium. The results are summarized in the following explanation.

### 1. Some Numbers from Symposium

- 25 nations were represented during the Symposium; 42 participants; 20 different lectures; 13 PhD and 4 MSc.
- 30 inquire returned to CISM HQ: 13 from lectures and 17 from participants.

### 2. Question nr. 4

*Do you support the initiative to re-birth the CISM Academy?*

- ( ) *totally disagree*
- ( ) *disagree*
- ( ) *not agree nor disagree*
- ( ) *agree*
- ( ) *totally agree*

#### Answers

- *Totally agree* with CISM Academy re-births: 9 lectures and 11 participants.
- *Agree* with CISM Academy re-births: 4 lectures and 4 participants.
- *Not agree nor disagree*: 1 participant.
- *Disagree*: 1 participant.

### 3. Questions nr. 5 and 6

5. *What are your suggestions for CISM Academy?*
6. *What topics are you interested for future Symposiums?*

These topics were proposed as open questions. Since they have correlated meanings they were analyzed together. The participants answered without any kind of explanation to let them free to express themselves without influence. Each inquires open the opportunity to present more than one answer which were classified in groups in order to promote standardization and permit a better understanding. The groups and frequency of answers are described as following:

#### Answers

- *Physical Education & Sports Sciences*: 18 (8 lectures and 10 participants).
- *Network & Interaction*: 12 (8 lectures and 4 participants).
- *Knowledge Management*: 9 (5 lectures and 4 participants).
- *Others*: 13 (5 lectures and 8 participants).

Some answer couldn't be grouped in the three groups motioned because of their meaning and/or also their frequency (under 3). These answer were grouped in others, and the answers were: scientific journal, research in CISM interest, future of CISM, standardization, sport for peace, anti-doping, sport administration, workshops, branches at continental level, persons in CISM HQ full time only for CISM Academy, military and civilian interaction.

#### 4. Conclusion

The inquire answers was not obliged. That means that it's impossible to suppose what are the opinion from those who have not sent the answers to CISM HQ.

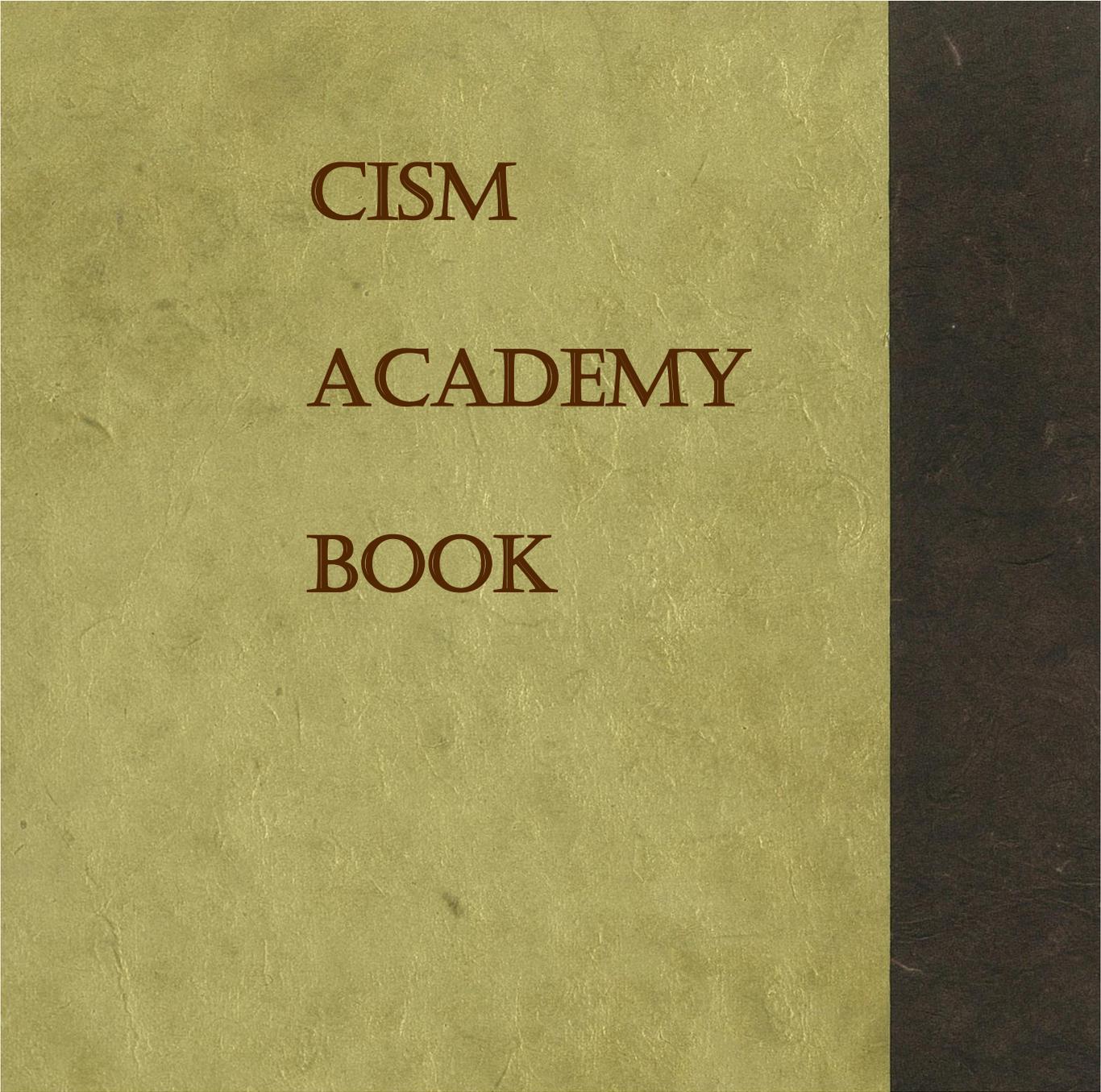
More than 90% from those who answered this inquire *agree* with the initiative of the CISM Academy re-birth. From those, more than 70% strongly support it. Only 3,33% don't support or not agree nor disagree with the CISM Academy.

According to the analysis of the answers related to questions 5 and 6, CISM Academy should maintain the subject that *Physical Educations & Sports Sciences (including military performance)* as one its main topics. This is probably related to the number of scientific works presented during the event concerning this subject, and also the natural vocation from scientific personal who works in military sports labs and institutions within Armed Forces worldwide.

However, other two topics have risen as other important issues which should be taking into consideration: *Network & Interaction* and *Knowledge Management*. In this sense, network don't means only an e-platform and a web site list, but a strongly tool capable to offer support to interact persons and data from a huge number of members and institutions.

In the other hand, Knowledge Management is better connected with the updated course of science and its connections. Both, Network & Interaction and Knowledge Management are inextricably linked and represent not only a modern trend of science, but also indicate to CISM an excellent way to go forward, in order to better manage future challenges.





CISM  
ACADEMY  
BOOK

*Remark: CISM Academy Book is a scanned version of the original book, which is kept at the CISM HQ, Brussels.*

**Title:** CISM Academy Book

**Published by:** CISM Headquarters, Rue Jacques Jordaens 26, 1000 Bruxelles, Belgium.

**Secretary General:** Colonel Alexandre Morisod, Master of Sports Management (SUI)

**Authors:** Lt-Colonel Suzana Tkavc, MSc (SLO)  
Major Pedro Gagliardi, MSc (BRA)  
Captain Mircea Lapadatescu, MSc (ROM)

**Editor:** Lt-Colonel Suzana Tkavc, MSc (SLO)

**Technical editor:** Captain Mircea Lapadatescu, MSc (ROM)

**Reviewers:** Col. Alexandre Morisod (SUI) and Lt-Col. Suzana Tkavc (SLO)

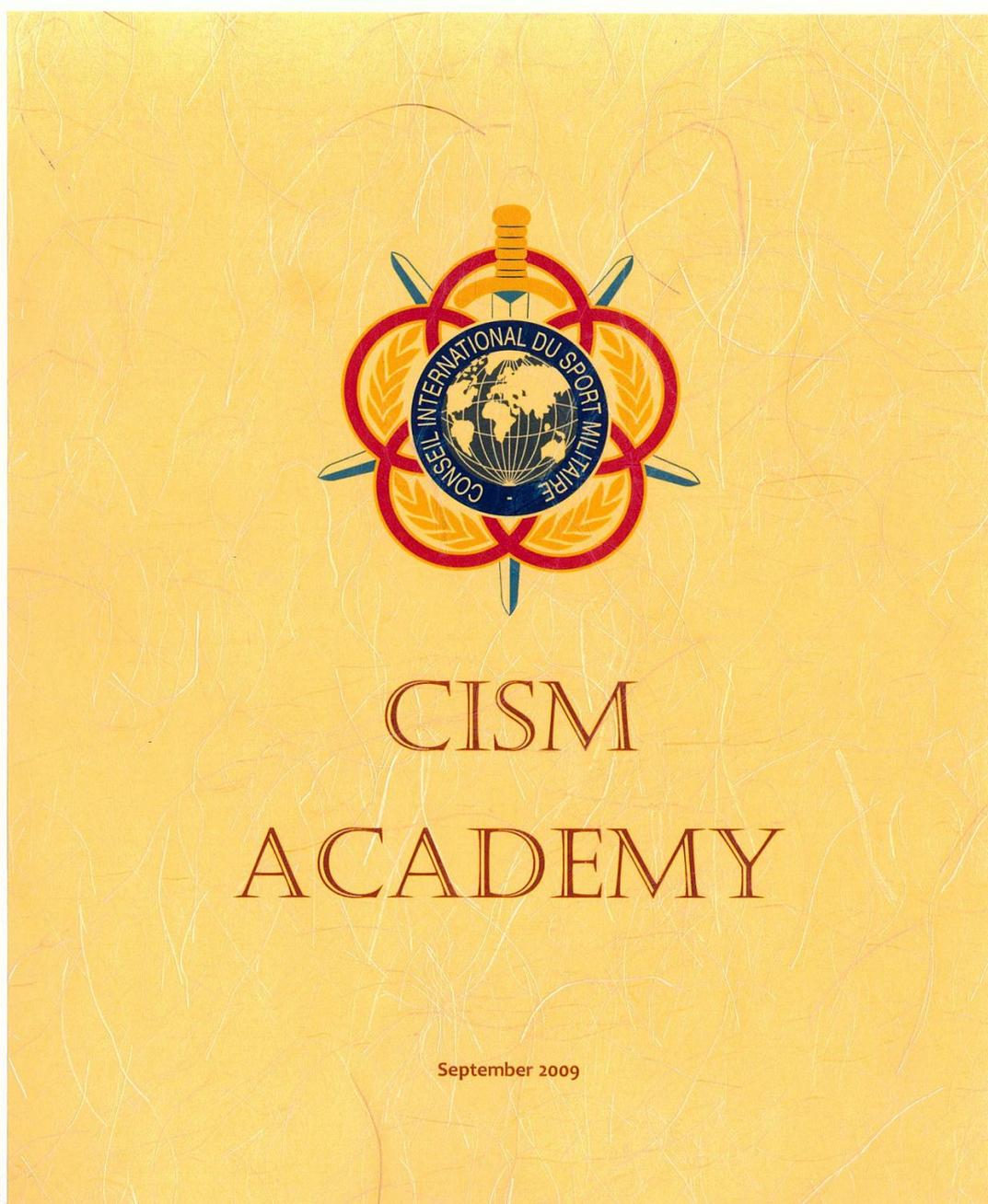
**Design:** Lt-Colonel Suzana Tkavc, MSc (SLO)

**Photo:** Maj. Cyril Schejbal (CZE)  
Wo Rajko Petek (SLO)

**January 2010**

The concept of the CISM Academy re-launching process created by Lt-Col. Suzana Tkavc, MSc (SLO), Maj. Pedro Gagliardi, MSc (BRA), Cpt. Mircea Lapadatescu, MSc (ROM) and Lt-Col. Roberto Correia (BRA). Academy History text in the book adapted from CISM archive sources and analyzes of Lt. Colonel Celso da Silva (BRA) and Lt. Colonel Roberto Correia (BRA).

*The CISM Academy Book is publication of International Military Sports Council. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior written permission of International Military Sports Council (CISM).*



*“It is a rough road  
that leads  
to the heights of greatness.”*

*Seneca*

# CISM ACADEMY

## HISTORY



**Previous Definition**

**“CISM Academy was a scientific and pedagogical study centre dedicated to research in all areas of physical activity and sport manifestation - high-performance, social, educational and military in the Armed Forces worldwide.”**



### **Previous Objectives**

1. Spread new methods of training used by troops around the world;
2. Keep a nucleus of military and civilian authorities in the field of sporting training, medicine and social inclusion;
3. Collect and file information on the modern methods of training;
4. Lead research in specific areas according to the necessity of CISM;
5. Lead symposia in which selected authorities could present studies and material brought up to date in all area of physical activity manifestation;
6. Spread new discoveries, methods and techniques of training for the countries members through technical booklets, symposia and clinics; and
7. Foment and divulge initiatives in the field of the social inclusion by sport.

### **Chronology**

**1951** - During the General Assembly in Cairo, according to the initiative of Captain Raoul Mollet (Belgium) and Captain Edmond Petit (France), it was decided to concentrate efforts on activities of physical training studies.

**1955** - During the II International Clinic in Portugal, Mafra, doctors and trainers from different countries requested CISM to create a specialized agency to assume the responsibility for the preparation and technical supervision of clinics and research, assuring anticipated compilation of data related to the physical and sports activity.

**1956** - Major Mollet was in charge of preparation of the final project for the creation of the CISM Academy, to be presented during the next General Assembly.

**1957** - On 8th September, in France, Cannes, the 11th General meeting unanimously approved the project to create the CISM Academy. It started a phase of intense participation for militaries in the scientific sport worldwide. Its aim was to study the different doctrines of physical training and sports training and to formulate theories that would enable armies to apply them as effectively as possible. It was divided into three sections: doctrines and research; sport medicine; training techniques and methods.

**1958** - With the creation of the C.I.S.M. Magazine, information about scientific CISM activities could be spread and shown to the world more regularly. In all its editions one may find articles written for military about different methods of training created during this period: Interval-Training, Circuit-Training, Cross-Promenade, Fartlek and Power-Training created by Raoul Mollet in 1954.

**1960** - The Director Committee of CISM created the organizational structure and statutes of the CISM Academy, which defined it as a scientific and pedagogical agency dedicated to research in all areas of the physical activity and sports training. The book "Medicine of the Sport" was launched in Italy. Chapter 39, "Military Sports Medicine", written by Colonel G. Tartarelli (Italy), considered articles developed by CISM Academy.

**1960** - In Rome the CISM and the Italian Federation of Sports Medicine organized a Congress about the topic "Interval Training". On this occasion Colonel Lartigue announced that the methods of emergency artificial breath in children, presented in the Clinic of Toledo some years before, had been approved by the French Academy of Medicine and had been sent to the Minister of Health of France as a proposal, so

that they were taught in the schools for young people aged between 12 to 13 years. The concept of "Total Training", created by Major Mollet, spread around the world with a help of elaborated plans of training for diverse sports. The method consisted of a set of factors and procedures that objectified the performance of the athlete. It described the development of the organic power in three periods; the physiological conditioning; acquisition of resistance; acquisition of endurance; development of neuromuscular power (strength x speed); technical improvement; psychological work - invisible Training (diet, habits of life, use of the Training Tables, etc.); support of the sports medicine - social intervention (action of school, head, family, headquarters).

**1963** - The CISM Academy innovated its activities and started to organize "study sessions" annually in a period of four years. These clinics congregating athletes and researchers had been developed with an increasing success. An important article about the influence of the altitude in the performance, published in the magazine Sport International n° 26 in 1965 called the attention of sports community for the Olympic Games of Mexico in 1968.

**1965** - The European winter was known for the great number of activities in the field of physical education and sport research. There were several events organized, such as the 1<sup>st</sup> International Congress of Sports Psychology in Rome with 400 participants from 34 countries; the 1<sup>st</sup> International Seminary on "Cinema, Television and Audiovisuals Means to Serve Sport" in Rome, represented by 16 countries; the International Meeting on Collective Sports in Franc, Vichy, and the International Congress on Physical Training and Rest for Workers in Spain, Madrid (30 represented countries). Results of the "sessions of study" and its conclusions were published in Technical Brochures edited by CISM and its member countries starting from 1966.

**1966** - Captain Lamartine from Brazil created a new method of training, Altitude Training. Basically, this method was not restricted to the training in a permanent altitude, but it was intended for passing from one altitude to another, decreasing the partial pressure of oxygen.

**1968** - Representative of 28 countries took part in the Symposium "The Military Methods of Physical and Sports training". Amongst the speakers there was a North American Major of the Air Force, the distinguished Kenneth Cooper, who presented the subject: "The Development of One Program of Physical Conditioning".

**1974** - Argentina hosted the International Days of Sport Studying. More than 1,300 participants and 22 speakers attended this event. The discussed subjects were - Sports Medicine, The Sport in Community, Military Physical Training. On average, annually they were 10 scientific-sports events organized, such as clinics and meetings of study during CISM World Championships. After many cases of doping, important articles had been published by militaries linked to the CISM Academy in the magazine Sport International, trying to alert on the harmful effect of these drugs on the organism. Also works in the area of the weight training, cycles of training, super circuit of training, and physical training for the sport orienteering had been published.

**1986** - The CISM Academy started to face financial problems for implementation of its projects. The Director Committee, which met in Jordan, decided that the few available resources would have to be directed for the technical assistance to the African countries that would organize CISM events in 1987 and 1988. At the same time, after 32 years of mandate, the idealizer and responsible for the success of this huge project, Raoul Mollet, said farewell to CISM General Secretariat.

**1991** - The XLVI General Assembly, in Tanzania, Karibu, voted in favour of a new structure of CISM. The Board of Directors assumed duties of the CISM Academy. Thus, the CISM President became also the CISM Academy President, Presidents of Sports, Medicine, and Finances Commissions became other members of the CISM Academy, and the Secretary was appointed by the Secretary General. This reorganization marked the beginning of the CISM Academy's disappearance.

**1998** - The Board of Director, during the 2<sup>nd</sup> meeting in Windhoek, Namibia (November) 1998, decided to finish CISM Academy activities.

**2008** - The CISM web site presents a "Sports and Science Forum" as an open and democratic space to discuss sports related matters in a scientific point of view and built a network to re-create an appropriated environment within CISM to re-launching the CISM Academy.

**2009** - CISM Academy re-births, in Prague, with the occasion of the CISM International Symposium, 21<sup>st</sup> September 2009.

*“The supreme aim of education is to develop  
the body in harmony with the spirit,  
in this way assuring the interior  
peace of men, in any situation.”*

*Pythagoras*

RE-BIRTH  
OF  
CISM ACADEMY



PRAGUE

21<sup>st</sup> SEPTEMBER 2009

*“An idea that is developed and put in action  
is more important than an idea  
which exists only as an idea.”*

*Buddha*

I DECLARE  
CISM ACADEMY  
RE-BIRTH!

Maj. Gen. Dr. Gianni GOLA - CISM President

*With pride & enthusiasm,  
for the historical moment.*

*Gianni Gola*

**An historical moment ...**



**CISM President and Symposium Official Representative,  
Major General Gianni GOLA, signing the CISM Academy Book!**



Colonel Bengt Ohlsson  
Vice President CISM  
"For the future of our Soldiers"



Colonel Alexanore  
STOKES  
SECRETARIE GÉNÉRAL  
DE C S S M



Lt Col Susan Jones, H. Se  
Symposium Director  
& CISM  
Sports Director

BOARD OF DIRECTORS  
COMMITMENT  
TO CISM ACADEMY  
RE-BIRTH



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**3<sup>rd</sup> Meeting, Ljubljana, Slovenia, 02-07 November 2009**

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**3<sup>rd</sup> Meeting, Ljubljana, Slovenia, 02-07 November 2009**

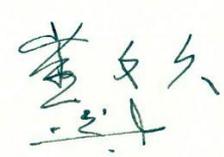
• Americas



Contraalmirante Don Roberto M. Marcelli (Chile)

• Asia

Maj. General Dong Weinju (China)



Lt-Col. A. Hakeem Al-Shino (Bahrain)

Commodore S.C. Joshi (India) (Co-opted)

• Europe

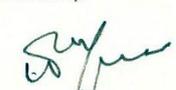
Maj. General Johann Pucher (Austria)

*Planning Commission President*

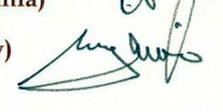
Maj. General Jean-Jacques Joss (Switzerland)

*Sports Commission President*

Col. Ștefan Mărginean (Romania)



Lt-Col. Walter Borghino (Italy)



**Presidents of the Commissions' - non-members of BoD**

Lt-Col. Steven Rosso (USA)

*Regulations Commission*

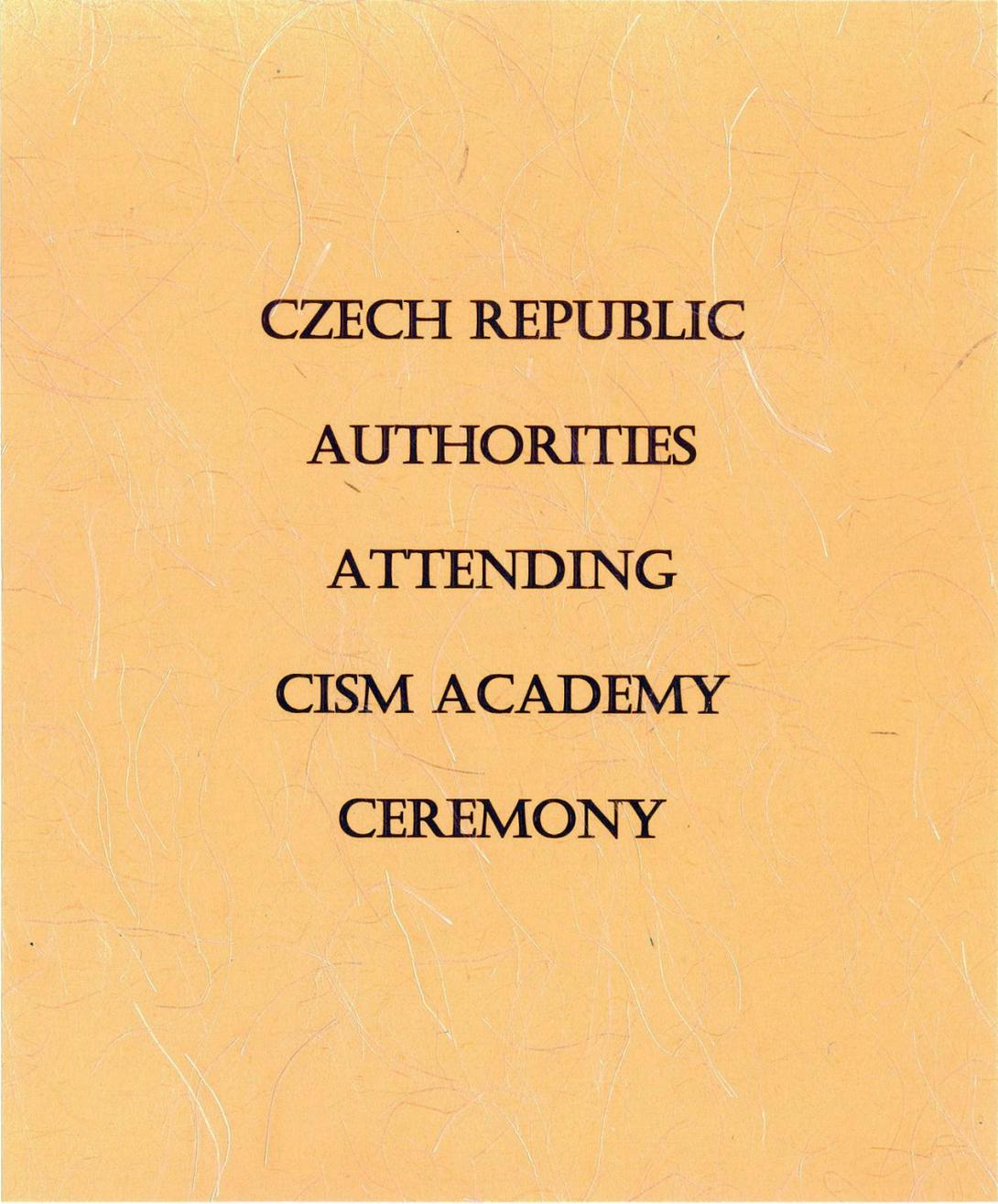


Col. Peter Jenoure (Switzerland)

*Sport Medicine Commission*

Lt-Col. Rinette Hulme (Namibia)

*Women in CISM Commission*

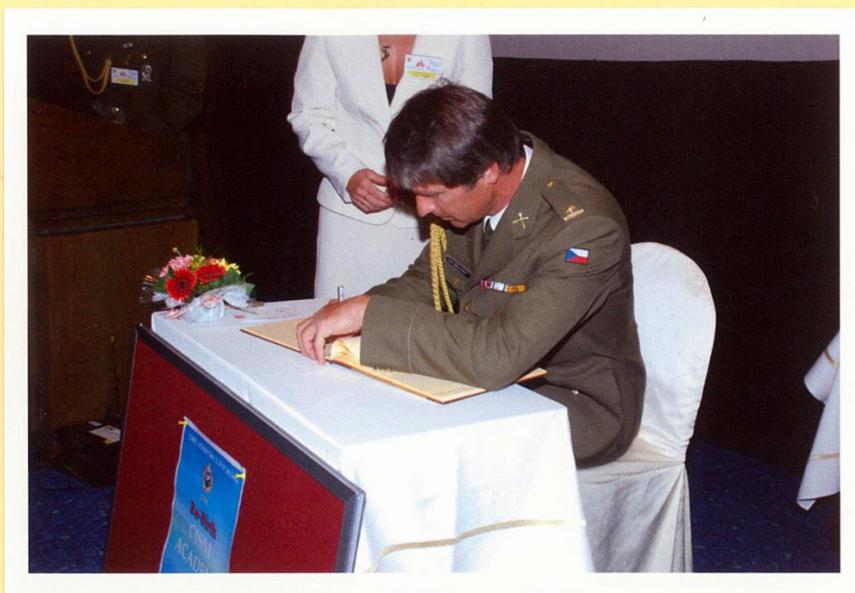
The image shows the front cover of a book. The cover is a vibrant orange color with a fibrous, paper-like texture. The text is centered and printed in a bold, black, serif font. The text is arranged in five lines, each centered horizontally. The overall appearance is that of a formal, commemorative publication.

**CZECH REPUBLIC  
AUTHORITIES  
ATTENDING  
CISM ACADEMY  
CEREMONY**

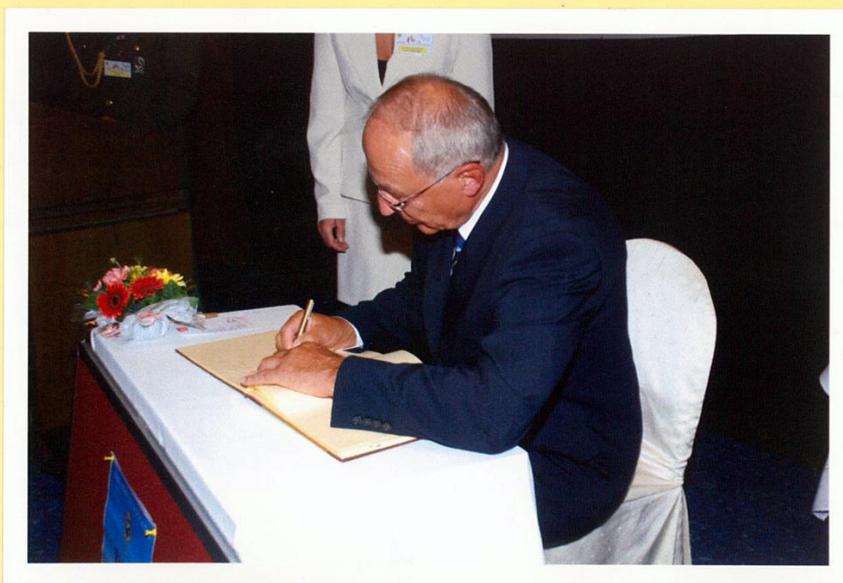
Hodnoú výpovědi CST7 věrnosti

Jan Š





mjr. Du Zuy  
Milan Jiránek



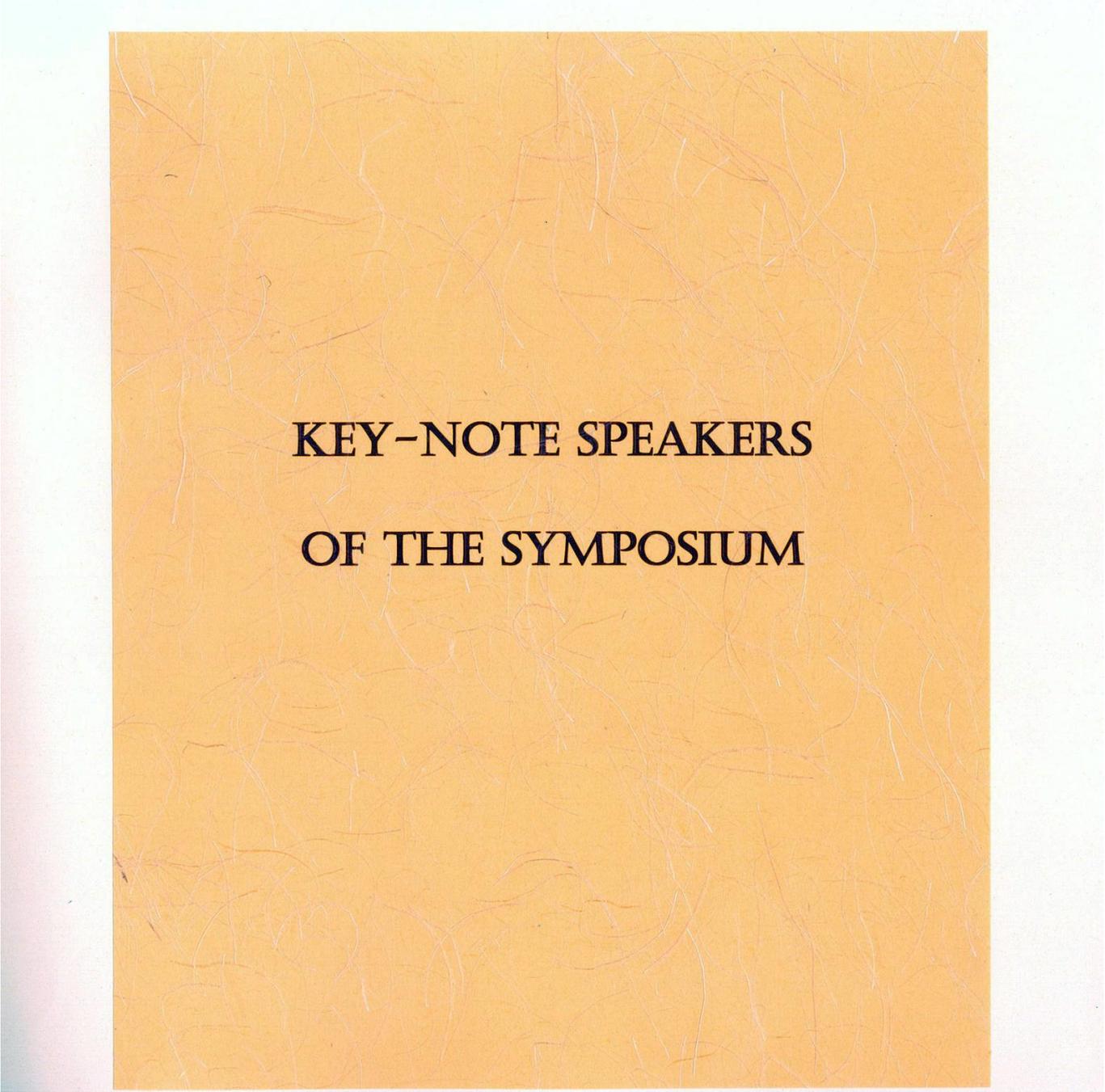


Col. Václav Roslowski

Col. Zdeněk Krátek

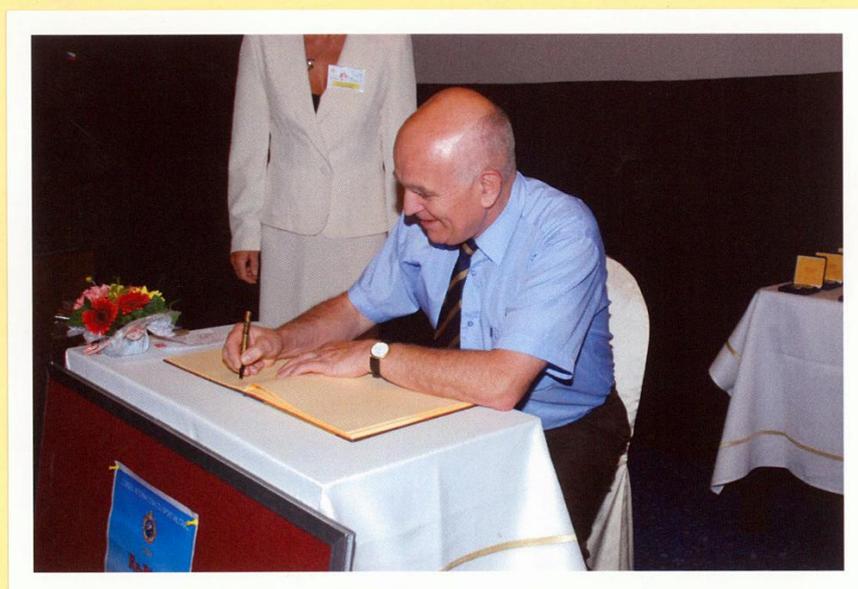
## LIST OF CZECH AUTHORITIES:

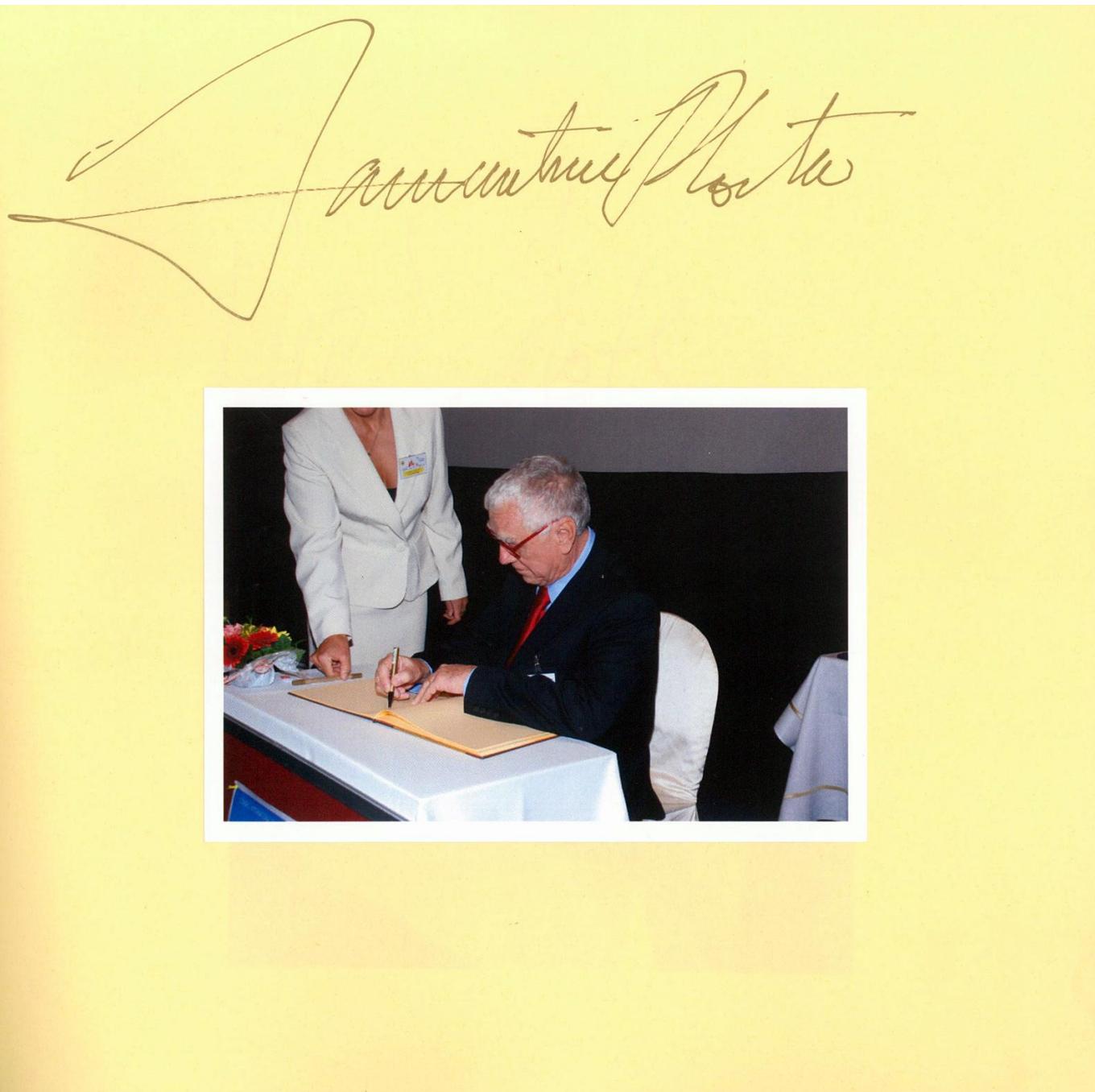
1. Major General Josef PROKŠ - First Deputy Chief of General Staff of the Czech Republic;
2. Maj. Jan Železný - Member of the IOC, three time Olympic Winner at javelin.
3. Mr. Milan JIRÁSEK - President of the Czech Olympic Committee;
4. Col. Viktor Podloucký - Chief of the Czech Delegation to CISM;
5. Col. Lubomír Přivětivý - President of the Organizing Committee of the CISM International Symposium 2009;



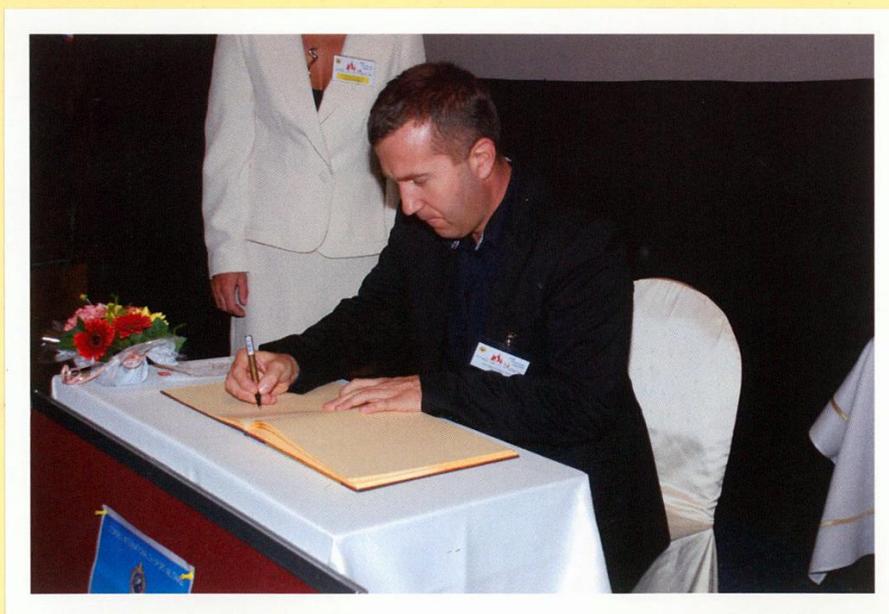
**KEY-NOTE SPEAKERS  
OF THE SYMPOSIUM**

*Václav Vláčil*

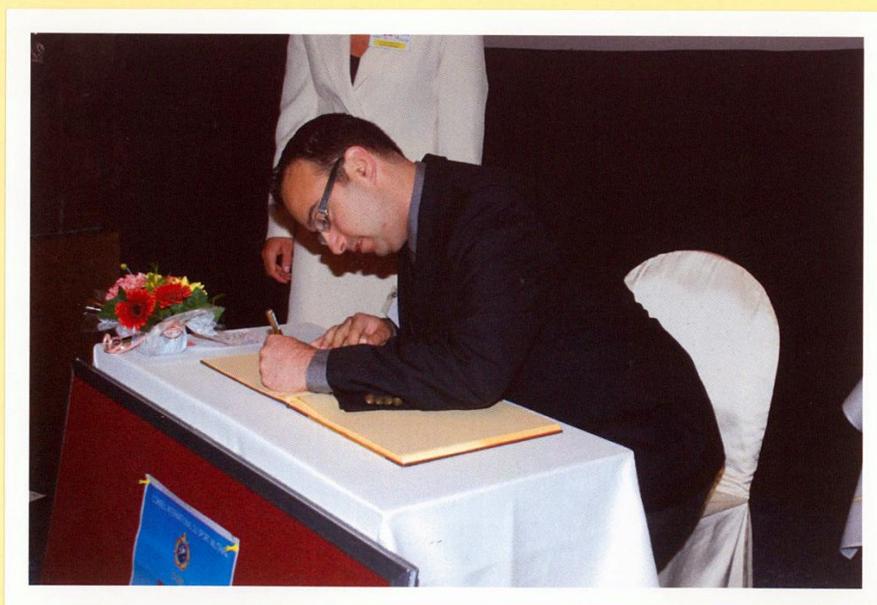




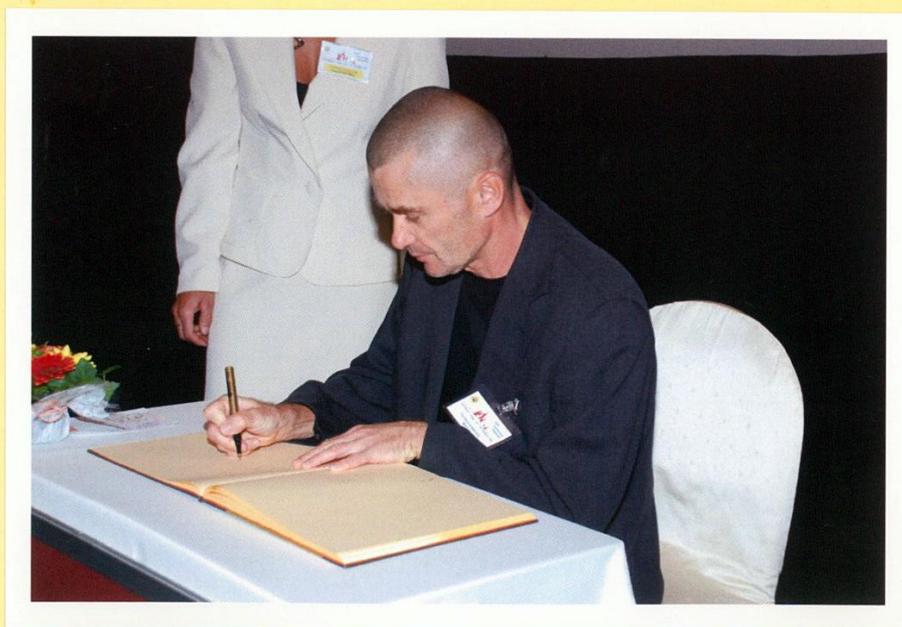
Paul Holtz



*Handwritten signature in gold ink.*



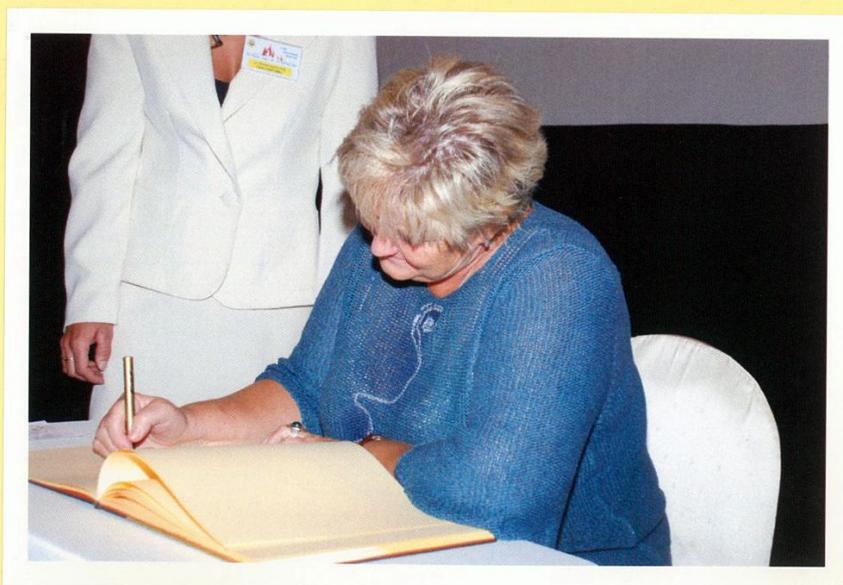
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L.G.



*Leand Lye*

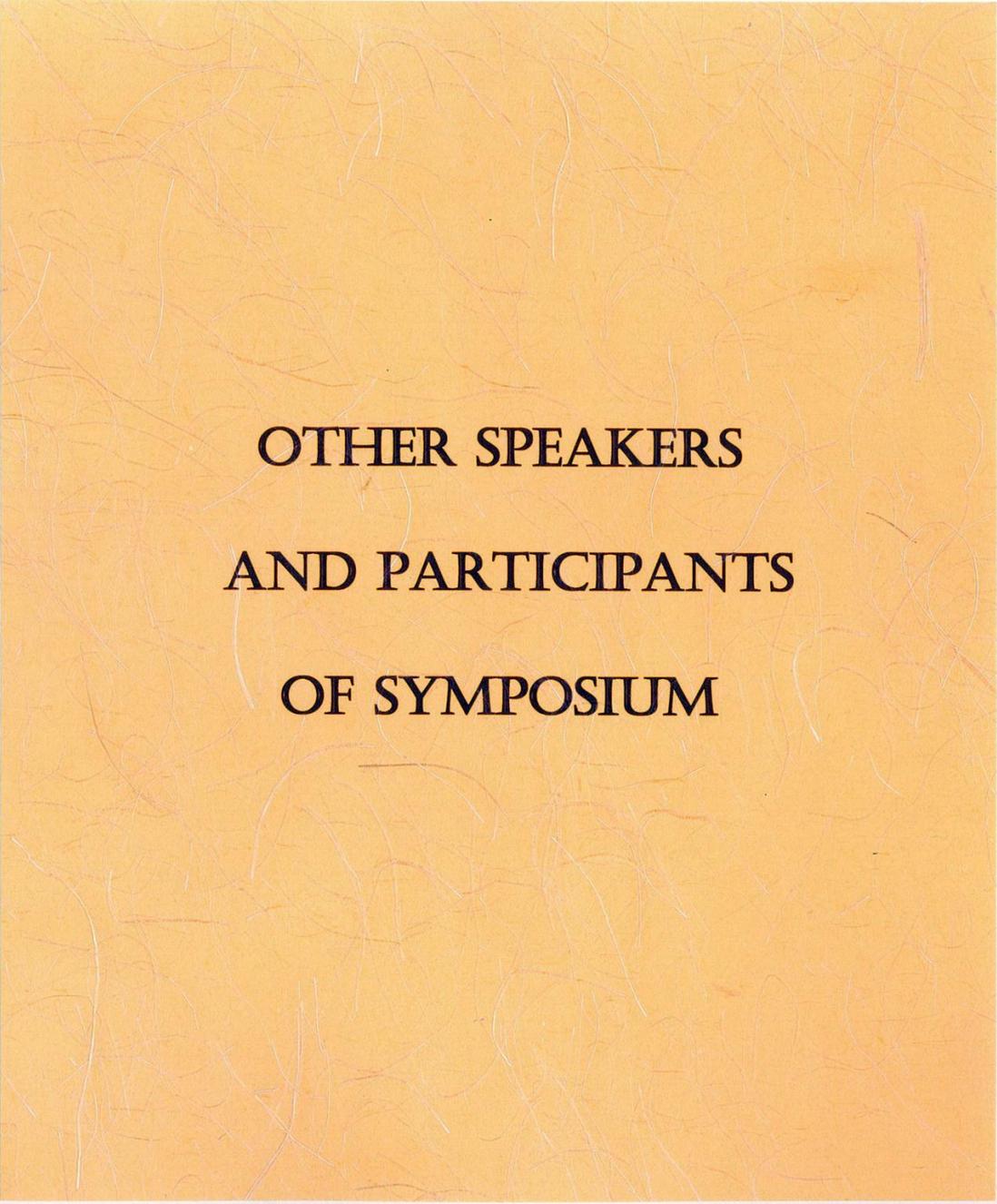


Don Johnson



## LIST OF KEY-NOTE SPEAKERS:

1. **Professor Václav Bunc, PhD** - Dean of the Faculty of Physical education and Sport - Charles University in Prague, **Czech Republic**;
  2. **Retired Navy Captain Lamartine DaCosta PhD** - University Gama Filho, Rio de Janeiro, **Brazil**;
  3. **Professor Matej Tušak PhD** - University of Ljubljana, **Slovenia** ;
  4. **Professor Michael Spivock PhD** - Personnel and Family Support Services, Ottawa, **Canada**;
  5. **Professor Damir Karpljuk PhD** - University of Ljubljana, **Slovenia** ;
  6. **Professor Heikki Kyröläinen PhD** - University of Jyväskylä, **Finland**;
  7. **Professor Ing. Eva Čáslavová PhD** - Charles University, Prague, **Czech Republic**;
- 
8. **Lt. Col. Suzana Tkavc MSc** - Symposium and CISM Sport Director, **Slovenia**;
  9. **Col. Lubomír Přívětivý PhD** - Charles University, Prague, **Czech Republic**.



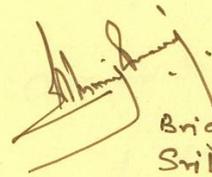
**OTHER SPEAKERS  
AND PARTICIPANTS  
OF SYMPOSIUM**



May CISM Academy sail to glory!

Dharmasiripala

Wishing the CISM Academy all the best in their endeavour.  
We pray that it will grow from strength to strength.

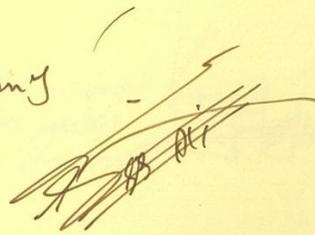


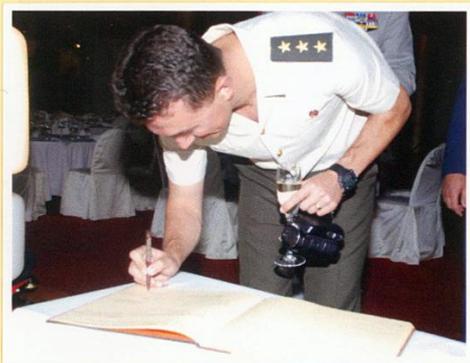
Brig Edward Thanjaratnam  
Sri Lanka Army.

FULL SUPPORT - GOOD WISHES

Yours for  
for Sri Lanka

I wish the best for Academy





Considero um grande sucesso o Simposio e  
que deve ser encorajado a prosseguir este  
trabalho.

Obrigado pela iniciativa

Thembinkosi Mgomezulu

IOANNIS LICINOS

George Mdsjoleka

Lt Col Desreux German Delegate to CISM

Eu apoio fortemente a Academia do CISM como  
um organismo gerador de sinergia entre os países  
membros e capaz de desenvolver nossos objetivos  
e desafios futuros. Coparticipations,  
D. L. A. L. D. Z.

THOKOZANI ALFORI GWAI

CAPT P.W. SANDERSON MR

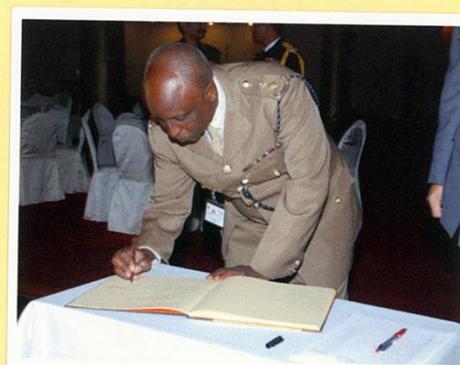
WO Robinson MSc

U.K. U.K.

Col Im Pyarngoo  
Uganda.

Lt Col Gilvan  
MSc. Brazil.

Maj PK. Kooe  
Kenya.



I wish all success and friendship with this fantastic  
re-birth of CISM Academy. BRAZIL

Officer (Capt RAFAEL SOARES PINHEIRO DA ANHA)

中国人民解放军军事情报学院

21.09.2009

Stefan Lele Răducan  
Chief of the Austrian  
Delegation to CISM

Mult succes cism Academy  
și viață lungă!  
Gen. Lăpădătescu Mircea  
Capt. - ROMANIA

BELGIAN DELEGATION  
TO CISM  
Maj Bart DE HOYACK.

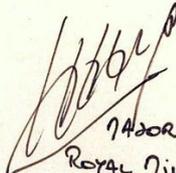
~~Kenya~~  
KENYA CISM DELEGATE  
LT COL SA MWANZI

Matti Miettinen  
CHIEF OF THE FINNISH  
DELEGATION TO CISM

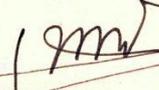
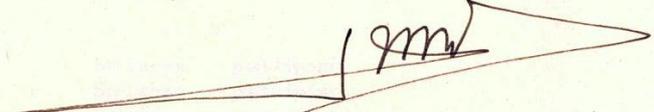
Murat ERDOĞAN  
Capt. TURKEY



La France s'associe à cette idée qu'elle souhaite voir  
soumise à votre assemblée générale en 2010

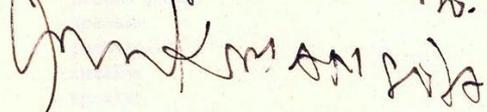
  
GABOR NICAUX  
ROYAL MILITARY INSTITUTE  
FOR PHYSICAL EDUCATION  
(BELGIUM)

général Jacques RENAUD  
Commissaire aux Sports Militaires  
chef de la délégation Française

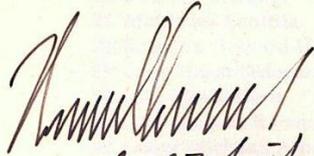
  


The USM Academy must be recognised by the GA.

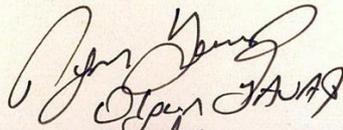
Major John R. Norway

A good welcome to all participants and staff.  


I wish good luck to CISM Academy

  
Chief of British Delegation to CISM

I hope, CISM will add not only knowledge but also  
spirit to the family of CISM...

  
Peter Young

Symposium Participants who supported CISM Academy  
with their attendance on Re-Birth Ceremony,  
on 21<sup>st</sup> September 2009 in Prague.





## Message of the CISM Sports Director

### Postface



**Dear friends,**

The end of one cycle is the beginning of another.

CISM International Symposium 2009 is behind us and it is also the beginning of the new cycle. This symposium has been very special one because we are rewriting the history of CISM. Just by looking at the Symposium sessions, we can assume that researches and themes were very interesting. Every new research means improvement and we have to follow it in the future.

To reach continuity in science and to improve the possibility of sharing different researches from Armed Forces to Armed Forces, we have to move on. With CISM Academy Re-birth Ceremony at the end of the Symposium and the commitment by the Board of Directors, we have got a “green light” to continue the process of this important initiative. Thanks to your great support and precious contribution you showed your strong will and encouraged us for the next steps.

If you breathe life into something, you give the people involved more energy and enthusiasm again. And this happened during the Symposium and CISM Academy Re-Birth Ceremony. We will follow your energy for dealing with science in CISM. It is known that when people move the goalposts, they change also the standards required for something to their advantage. Let’s rise up our advantages and reach better connections in this field.

At the end I would like to express my gratitude to the closest team players of Symposium and Academy who did remarkable work: to my team of the CISM HQ’s Sport Department, especially to my “right hand for the Symposium” Maj. Pedro Gagliardi and assistance of Capt. Mircea Lapadatescu. And finally to the key-players in the organization of the event Colonel Lubomir Privetivy and Captain Jana Senkova for all the arrangements, support, flexibility, effective cooperation and invaluable friendly hospitality. It was really incredible to see how much work on such a professional level can do so small team. Thank you very much, Mockrát děkuji.

I believe that these important steps which we took together will lead us to further ones and help to bridge the gap in this field of CISM.

*Lt-Colonel Suzana Tkavc, MSc  
CISM Sports Director*

A handwritten signature in dark ink, appearing to read 'Suzana Tkavc', written in a cursive style.

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