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Original Article

Investigation of the obstacle course performance at the Hellenic Military Academy

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Abstract:
Obstacle course is a series of challenging physical obstacles an individual should navigate. Obstacle courses include running, jumping, climbing, crawling, and balancing elements with the aim of testing speed and endurance. The purpose of the present study was to investigate the performance at the obstacle course by the cadets of the Hellenic (Greek) Military Academy. 233 cadets (208 males and 25 females) participated in the study. They were assessed four times, more specifically at the fifth, sixth, seventh and eighth semester of their studies. 198 out of 233 were participating at the General Military Training Group, in which they were trained once a week on obstacle course. 41 cadets were members of the Sports Orientated Military Training Group, and therefore were trained on obstacle course occasionally. Results showed that performance in obstacle course is in a high level among cadets in the Hellenic Military Academy. Furthermore male's results were significantly better than female's. In addition, cadets that participated in the course General Military Training Group received better results than those who were members of the Sports Orientated Military Training Group, with significant differences only at the seventh semester. Results show that specific training on obstacle course can enhance sport performance.
Key words: military, obstacle course, cadets.

Introduction

From the ancient times the use of obstacle courses in order to enhance and assess physical fitness in both military and physical education purposes was important, and it is well documented from the years of the Roman Empire (Mullins, 2012). Even earlier, in ancient Sparta, where military treatment was compulsory for all, boys from 11 years of life participated daily in physical exercises. The teenagers were taught to use various weapons and took part in marches, patrols, ambushes and mock battles. They also were trained in wrestling and other exercises related to the combat. It was given special attention to certain exercises as to climb with ease on the slopes and to descend safely from them, to run, to swim in the river, and to jump (Diamantopoulos, 1975).

In modern history many researchers proposed that obstacle course is a kind of performance that requires endurance, strength, coordination, balance, and strategy. As a result it is an important tool in the physical training and testing of military personnel. The contribution of the practice on obstacle course is very important, because it is a key tool of understanding of the kind of move and tactics used in the battle.

Furthermore, it contributes significantly to the development of the physical abilities of cadets, as requires aerobic and anaerobic power, muscle strength and endurance, flexibility, balance and neuromuscular coordination (Paxinos & Paxinos, 2014). Even practice on obstacle course develops mental skills such as perfect confidence, attention, concentration, perception and immediate decisions. Finally, it contributes to the development of skills related to strategic thinking and fostering team spirit, and team cohesion.

There are two types of obstacles in the Armed Forces. The first type, called Battle Obstacle Course, refers to the obstacles that improve self-confidence. It helps cadets to develop mental and physical abilities, and include higher and more difficult obstacles than the second type. Often it is made to focus on specific needs, such as night movement, assault, climbing and rappelling walls.

In contrast the second type, called Obstacle Course, refers to outdoor obstacles that improve fitness, and is used in the Hellenic Military Academy. Obstacle Course includes low obstacles in order to encourage cadets for effective crossing that should be done very quickly. Mainly assesses cadets' level on basic motor skills and fitness, and subsequently their self-esteem and perception. Its length is 500 m., and includes 20 obstacles consisting of running, crawling, balancing, climbing, and jumping. This type of Obstacle Course is used in International Military Pentathlon competitions that are organized by the International Military Sports Council.

Obstacle course challenges are very famous among cadets, even if involves participants in very vigorous and relatively risky events. The self-determination theory explains the motivational dynamics of human behaviour, and can give an answer to this contradiction. Efforts are being made in order for answers to be given concerning the causes of the individual's behaviour, as well as concerning the role of the social environment in

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the formation of the individual's performance and development (Deci & Ryan, 1985; Ryan & Deci, 2000, 2002, 2007). Self-determination refers to the perception that the individual has the possibility to make choices. When someone acts in order to satisfy his basic needs, in order to experience the feeling of ability and autonomy, then he develops this perception (Gdonteli & Gavriilidis, 2014). Especially in academic sports, both intrinsic motivations (participation for the pleasure that exercising gives, and to experience stimulation) as well as extrinsic ones (participation for social recognition) can be observed on people who exercise.

To extend a theoretical approach to the motivation and persistence of cadets to exercising on obstacle course, it is important to understand the role of sport commitments that underlie participation in such risky events. Entertainment, learning new skills and the challenge which someone feels through new experiences are some of the reasons for which individuals decide to continue participating in recreational and competitive sports (Weiss & Weiss, 2003). Sports commitment is a term which is used often in order to express the power of the motivations which is found behind the insistence on participation.

Many researchers have proposed factors that affect efficiency on obstacle course (Bishop, 1999; Bishop et al., 2008; Frykman et al., 2001; Kusano et al., 1997; Pandorf et al., 2002). The most important factors will be discussed below. There are many individual characteristics and capabilities that effect on high levels of performance, such as cardiorespiratory endurance, anaerobic capacity, muscular strength and resistance, ideal body composition and satisfactory mobility. The obstacle course requires speediness and high abilities in moving the body quickly over, under and through obstacles. For these reasons the ideal somatotype is the one with high ratio force / body weight, because it helps performance when required speed and acceleration (Harman, 2008). In contrast, large people are generally disadvantaged in activities requiring rapid moving (Bishop et al., 2008).

Proper running rhythm during obstacle course is particularly important for achieving high performance. It allows appropriate distribution of consumption energy (Abbiss et al., 2008) and also minimizes disturbance homeostasis of the organism (deKoning and al., 2011; Tucker, 2009; Tucker & Noakes, 2009)

Effective training on obstacle course involves interval effort. This form of exercise that characterized by short intervals exercise high intensity alternating with break liabilities intervals or exercise low intensity, allows to place larger volumes high intensity training with regard to continuous form exercise (Wilmore et al., 2008). The main aim of interval training is to improve speed and cardiovascular fitness. In addition interval training can be an effective means of enhancing a cadets' lactate threshold. Lactate threshold has been shown to be a significant factor determining performance for long distance running events.

The most common form of interval effort is to divide obstacle course in parts. (e.g., repeated passage of two or three obstacles, five obstacles, half course etc.). In case that exercise lasts 30 seconds, the rest should last 60 seconds. Repetitions are depending on the duration of exercise, and are ranging from 6 in order to pass two or three obstacles, 4 in order to pass five obstacles, and to 2 in order to pass half course (10 obstacles). Interval form of exercise is particularly tedious, and for this reason should not be used more than three times a week (Gibala, 2007).

Besides physical characteristics, cognitive skills are required for a good sport performance such as critical thinking, attention, and concentration. Anticipation, memory recall, situational probabilities, and visual function are shown that are related to high sport performance (Ward & Williams, 2003). In addition Faubert and Sidebottom (2012) emphasized how a perceptual-cognitive training approach may be useful as an integral component of sports training. Specific psychological characteristics are shown that support sport performance, especially in risky sports like obstacle course (Karageorghis & Terry, 2011). Successful obstacle course competitors should exhibit high levels of self-efficacy, self-regulation, internal motivations, and mental strength.

Finally, the influence of gender is an important factor in obstacle course performance. Women lag behind men in the force at the top of body, as men experience greater skeletal and muscle growth in the upper torso (Weiten & Lloyd, 2006) and therefore women should focus on practice obstacles that improve this parameter. In contrast, men should focus more on improving flexibility and balance skills, since these parameters are important in crossing of some obstacles.

In the Hellenic Military Academy the obstacles course is taught and examined in the context of the course "General Physical Education" at the third and fourth year of studies (fifth, sixth, seventh, and eighth semester). The course emphasizes both at the proper technique for crossing the obstacles, and at the tactics and general fitness. The performance on the obstacle course accounts the 30% of the total grade of cadets in General Physical Education course, demonstrating the importance of the training and assessment in the Armed Forces.

The length of the obstacle course is 500 m., and consists of 20 obstacles. The crossing of some obstacles requires mental strength. Some others need high capabilities in strength, and others in balance.

Havenetidis, Kardaris, and Paxinos (2009) conducted a study in the Hellenic Military Academy in order to find if there are any differences on exercise performance between General Military Training Group cadets and Sports Orientated Military Training Group cadets. Physiological and exercise performance parameters (pre and post the training period) were measured using the following tests: the sit and reach test (SRT), a range of jump testing, the 20m shuttle run test (LEGER), pulmonary measures, body fat estimation (BF), the Bench Press Endurance Test (BPET) and the hand dynamometry test (Dominant-non-dominant hand; DOM-NDOM). Findings showed that the General Military Program, which mainly focuses on military physical fitness test scores, is not advantageous over the Sports Oriented program.

Aim of the study

Considering the practical importance of research in the area of performance in the Hellenic Military Academy and the limited research in the specific field, this study was drawn to investigate the performance levels (in minutes and seconds) on the obstacle course and to ascertain if there are any significant differences in performance

a) Between the four consecutive semesters (fifth, sixth, seventh and eighth), b) Between the third and fourth year of studies, since in the third year cadets are assessed wearing sportswear, and the fourth year are assessed wearing camouflage outfit. c) Between males and females, and finally d) Among cadets who were trained in both academic years once a week participating in General Military Training and cadets that are participating in Sports Orientated Military Training (track and field, swimming, basketball, volleyball, fencing, tennis etc.), and did not receive the appropriate training on obstacle course.

Method

Sample-Procedure

The sample consisted of 233 cadets (208 males and 25 females). Performance was assessed in the four semesters of the third and fourth year of studies. In the fifth and sixth semester cadets were assessed while they were wearing sportswear, and at the seventh and eighth they were wearing camouflage outfit.

Of the total 233 cadets, 192 participated in the course "General Military Training", while 41 were members of the Sports Orientated Military Training. Cadets who participated in the course "General Military Training" were trained once a week on obstacle course.

Analyses

First, Descriptive Statistics were used to show the performance levels on the obstacle course. Second, t-test analysis was used to investigate any differences in performance between the four semesters and between third and fourth year of studies. Third, Univariate Analysis of Variance (ANOVA) was used to investigate differences in performance between males and females. Finally, Univariate Analysis of Variance (ANOVA) was used to investigate differences in performance between cadets participating in "General Military Training", and cadets from the "Sports Orientated Military Training".

Results

The statistical analysis shows a decline in performance from the third to the fourth year of studies. There are statistically significant differences between the fifth and seventh semester ($t = 7.495$, $p < .001$), fifth and eighth semester ($t = 5.807$, $p < .001$), sixth and seventh semester ($t = 7.198$, $p < .001$) and sixth and eighth semester ($t = 5.719$, $p < .001$).

In addition there is a statistically significant difference between the performance of the third in total and fourth year of studies. Cadets of the third year of studies showed higher levels of performance than fourth year cadets ($t = 9.216$, $p < .001$).

Regarding the differences between males and females, the performance in the Univariate Analysis of Variance (ANOVA) were shown to be statistically significantly superior to men in all four semesters. More specifically results were in the fifth semester ($F = 56.882$, $p < .001$), in the sixth semester ($F = 17.569$, $p < .001$), in the seventh semester ($F = 85.073$, $p < .001$) and in the eighth semester ($F = 59.042$, $p < .001$). Table I.

Table 1. Descriptive statistics, Differences-F, and p between males and females

Semester	Males M(SD)	Females M (SD)	Whole sample M(SD)	F	p
Fifth	4.10 (.70)	5.56 (1.25)	4.23 (.85)	56.882	.001
Sixth	4.24 (.57)	4.78 (.45)	4.30 (.58)	17.569	.001
Seven	4.44 (.68)	5.98 (.93)	4.58 (.84)	85.073	.001
Eighth	4.35 (.52)	5.44 (.73)	4.45 (.62)	59.042	.001

$p < .05$

Finally, the Univariate Analysis of Variance (ANOVA) showed that cadets' performance who participated in the course "General Military Training" were in all semesters better than cadets who were participating in "Sports Orientated Military Training", with statistically significant difference only in the seventh semester ($F = 2.980$, $p < .05$).Table II

Table 2. Descriptive statistics, Differences-F, and p between General Military Training and Sports Orientated Military Training

Semester	General Military Training M(SD)	Sports Orientated Military Training M (SD)	F	p
Fifth	4.21 (.77)	4.31 (1.13)	.456	.500
Sixth	4.27 (.58)	4.43 (.59)	2.362	.125
Seven	4.53 (.75)	4.79 (1.13)	2.980	.047
Eighth	4.43 (.56)	4.50 (.83)	.294	.588

$p < .05$

Discussion

It is very important for all professionals who provide sports in Military Academies not only to know how to train effectively cadets on obstacle course, but also to understand the peculiarities for even higher performance, as training in this discipline is recognized of great value. The present study showed that performance in obstacle course is in a high level among cadets in the Hellenic Military Academy, but gradually is declining as cadets move on to the last year of studies. This can be partly explained by the greater workload of the fourth class cadets'. Another explanation of the declination of performance is probably due to the fact that the camouflage outfits and boots make more difficult to cross the obstacles and the running between the obstacles. Furthermore it should be noted that the score, resulting basis of the performance time, differentiated between the third and fourth year of studies, due to clothing and footwear.

The differentiation between males and females was expected and consistent with the literature (Mullins, 2012).

Finally differentiation among cadets of the "Genera Military Training" and "Sports Orientated Military Training" shows that the specialized technical and tactical training improves performance in this subject. These findings are in contrast with Havenetidis et al. (2009) results that showed that cadets involving in the "Sports Orientated Military Training" are in advantage over cadets of the "Genera Military Training" in specific physiological and exercise performance tests.

The results show that, overall, the specialized training that develops all the parameters necessary for a good performance on the Obstacles Course is necessary.

Conclusions

In conclusion it is proposed in future studies to associate Obstacle Course performance with specific psychological dimensions such as sport motivation and sport commitments. Studies in this field showed that intrinsic motivation and identified regulation are important factors that allow individuals to experience satisfying participation in sports, and lead to higher levels of achievement, and thus interventions that promote these types of motivations have been found to be effective (Vallerand, 2007). Limited studies have shown that stress and rank are associated with lower performance in athletic activities among military personnel (Martins & Lopes, 2013). In the military context, where physical activity is of great importance, findings that associate motivation, commitments and stress with physical activity may offer input to institutional policies in order to enhance sport performance and create a more favourable sport environment.

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