Science & Sports (2017) xxx, xxx—xxx

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ORIGINAL ARTICLE

The effect of the pressure level of sports compression pants on dexterity and movement-related cortical potentials

Les effets des niveaux de pression des pantalons de compression sur les processus de préparation d'un mouvement volontaire

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Received 6 September 2016; accepted 13 March 2017

KEYWORDS
Compression pants;
Clothing pressure;
Agility;
MRCPs;
Response time

Summary
Objectives. — The present study sought to determine how basic motor skills, such as agility, and the brain's reaction to perception handling are affected by the pressure level of compression pants.
Equipment and methods. — Twelve subjects wore three different compression pants and undertook sidestep tests to evaluate agility. For the analysis of movement-related cortical potentials, electroencephalography was conducted while participants performed an exercise involving the pressing of a foot-operated switch in response to randomly repeated sound stimuli.
Results. — When wearing the CG2 model pants, the pant that applied the highest pressure among the three, enhanced agility ($P < 0.042$). Further, the amplitude of movement-related cortical potentials increased the most at Fz and Cz (Fz: $P = 0.020$ and Cz: $P = 0.027$). While there was no significant statistical difference in response time among the experimental pants, the average time was reduced. It can be conjectured that the pressure the compression pants applies on the skin and muscles affects the nervous system, increasing the agility and activity of motor-related information processing by enhancing the focus on the performance. It was therefore concluded that the pressure level of compression pants is a variable of influence on the motor branch of the nervous system.
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http://dx.doi.org/10.1016/j.scispo.2017.03.006
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Please cite this article in press as: Lee H, et al. The effect of the pressure level of sports compression pants on dexterity and movement-related cortical potentials. Sci sports (2017), http://dx.doi.org/10.1016/j.scispo.2017.03.006

MOTS CLÉS
Pantalon de compression ;
Niveau de pression ;
Agilité ;
Activité corticale

Résumé
Objectifs. — Cette recherche a pour but de montrer comment les compétences motrices basiques, comme l'agilité et la réaction cérébrale dans le processus de la préparation de l'action d'un mouvement volontaire, sont influencées par le niveau de pression des pantalons de compression.
Équipement et méthode. — Douze sujets ont porté trois types différents de pantalon de compression et ont procédé à des tests de type « pas chassés » dans le but d'évaluer l'agilité. En ce qui concerne l'analyse des mouvements liés aux potentiels corticaux, les sujets du test étaient sous électroencéphalogramme pendant la réalisation d'un exercice qui consistait en un changement brusque de mouvement de pied en réponse à des stimuli sonores émis au hasard.
Résultats. — Le modèle de pantalon CG2, modèle qui a appliqué le plus de pression parmi les trois testés, améliore l'agilité ($p < 0{,}042$). De plus, l'amplitude des mouvements liés aux potentiels corticaux a le plus augmenté à Fz et Cz (Fz : $p = 0{,}020$ et Cz : $p = 0{,}027$). Même s'il n'y avait pas de différence statistique signifiante pendant le temps de réponse, le temps moyen a été réduit. Nous pouvons supposer que la pression des pantalons de compression, appliquée à la peau et aux muscles, a un effet sur le système nerveux ce qui augmente l'agilité et l'activité du processus informatif lié à la motricité et améliore ainsi la performance. Il a donc été conclu que le niveau de pression des vêtements de compression varie selon son influence sur la branche motrice du système nerveux.
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1. Introduction

Compression garments have been increasing in popularity among the general public as well as among professionals because of their ability to enhance muscular power, strength, endurance, proprioception, and injury management [1—5]. Therefore, most previous research in this area concerns the kinetic, physiological, and psychological effects of wearing compression garments, such as enhancing lactate removal, reducing muscle oscillation, increasing torque, and positively influencing psychological factors. These experiments focused on particular activities, for example, exercise on a bicycle ergometer or cycling [2,6], vertical jump [3,4,7], running [5,8,9], repeated-sprint [10], netball [11], cross-country skiing [12], ball-throwing [10]. In consequence, the relationship between compression garments and basic motor skills were previously yet to be established.

Properties related to basic motor skills employed during sports activities include muscular power, endurance, agility, and elaboration. Of these, agility and elaboration fall within the purview of the nervous system, which perceives, identifies, recognizes, and decides, reacting according to the environment and situation [13]. Especially, agility is one of the main elements of strength concerned with the nervous system, and means the ability to perform a certain activity in the minimal time given. Therefore, it can be expressed as the latency of response, the time taken to perform a single activity, and the number of repetitions of an activity [14]. Generally, successful performances in many sports, including soccer, tennis, and basketball, require recognition and appropriate reaction. Therefore, facilitating agile changes of motion as that of an instantly reactive human body is an important strategy by which athletic performance may be enhanced. To test agility, individuals can select and refine movements based on task-relevant cues, including an opponent and/or external object [15,16].

In contrast, observation of brain activity during sports activities can be utilized as a source of basic data upon which to base methods for optimizing sports efficiency. Higashiura et al. (2010) recorded in mm/s units the changes brain activity related to motion prediction by using electroencephalogram (EEG) and event-related potentials (ERPs) [17]. Movement-related cortical potentials (MRCPs) are evoked potentials evident immediately prior to motor action performance and are defined as neural potentials associated with self-paced, voluntary movements. MRCPs are of great interest because they are expected to help identify the neural mechanisms underlying preparation, initiation, execution, and feedback control [18—20]. MRCPs are negative evoked potentials of the brain that could be utilized in the evaluation of cognitions underpinning the prediction of future activities through anticipation and recognition during action preparation [21]. However, research related to compression garments and the nervous system are scarce because of the difficulty of processing noise data in motion postures and the absence of appropriate experimental protocol.

Therefore, the purpose of this research was to measure the changes in basic motor skills and brain reaction that result from wearing compression pants. Using compression pants with different pressure levels, their effect on agility was determined. Furthermore, the cognitive processes occurring from when the motor reaction expectant stimulus was applied to when the action was performed were analyzed. The effects of compression pants' pressure levels on advanced central nervous system functions such as perception and recognition were examined in relation to external/internal event reaction times.

2. Research method

2.1. Subjects

Twelve university students of, on average, 24 ± 2.2 years of age, 178.9 ± 5.3 cm in height, 75 ± 4.9 kg in weight, and

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