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BRIEF NOTE

The use of two different methods of workload quantification in firefighters



Utilisation de deux méthodes de quantification de la charge de travail des sapeurs-pompiers

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KEYWORDS

Real conditions;
Subjective;
Firefighters;
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Summary

Aim of the study. – To measure firefighters' workload on real condition during a 10-hour guard with the use of two different methods: a method based on heart rate and a method based on the perceptive workload.

Synthesis. – Fourteen male professional firefighters performed a 10-hour guard with a heart rate monitor and their perceived exertion of the exercise intensity was recorded. The results showed significant differences for the total 10-hour guard workload between the two methods for daily tasks ($P < 0.01$) and for rescue interventions ($P < 0.01$) with greater values for the perceptive workload. For the workload compared within the same method, there were significant differences between the four tasks with the perceptive workload ($P < 0.01$) and with the heart rate method ($P < 0.0001$). However, no difference was found for the rescue interventions.

Conclusion. – The findings of this study suggest that the perceptive workload method is important to assess the workload of an activity like the firefighters work.

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MOTS CLÉS

Conditions réelles ;
Subjectivité ;

Résumé

Objectif. – Quantifier la charge de travail des sapeurs-pompiers professionnels au cours d'une garde de 10 heures en condition réelle de terrain en utilisant deux méthodes différentes : une méthode basée sur la fréquence cardiaque et une basée sur la charge de travail perceptive.

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Sapeurs-pompiers ; Charge de travail

Synthèse des faits. – Quatorze sapeurs-pompiers professionnels ont réalisé une garde avec un cardio-fréquencemètre et leur perception de la difficulté de l'effort par exercice suivant une échelle perceptive a été enregistrée. Il a été démontré une différence significative entre les valeurs totales de la charge de travail de la garde de 10 heures entre les deux méthodes pour les tâches journalières ($p < 0,01$) et pour les interventions de secours ($p < 0,01$). Des valeurs plus importantes ont été trouvées avec la méthode perceptive. Pour les charges de travail comparées à l'intérieur d'une même méthode, il existait une différence significative entre les quatre types de tâches journalières ($p < 0,01$ avec la méthode perceptive et $p < 0,0001$ avec la méthode basée sur la fréquence cardiaque). Aucune différence n'a été trouvée entre les quatre types d'interventions de secours. Les résultats de cette étude ont montré qu'il existait des différences entre les charges de travail des tâches journalières et des interventions de secours et suggèrent que la méthode de Foster est importante à prendre en compte dans l'évaluation des charges de travail de ce type d'activité.

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1. Introduction

The firefighters' mission is essential for civil society. Their occupational tasks comprise a high level of physical work activity in combination with external physical stress.

Studies based on firefighters' workload are mostly performed during simulated interventions. The assessment of the firefighters' workload in real condition during a guard appears interesting. The simulated tasks showed the link between sports exercises and firefighters activity [1]. The used of workload assessment method for sport exercise to quantify the firefighters' workload seems appropriate.

Banister et al. developed a field method of workload quantification from heart rate (HR) and exercise duration and defined an index called Training Impulse (TRIMP) [2]. This approach is of great interest for monitoring the training.

Foster et al. proposed a workload quantification method based on the rate of perceived exertion (RPE) [3]. Subjects had to give a global rating of the perceived exertion for the entire exercise session after the conclusion of the latter using a perceptive scale. This score was multiplied by the duration of the exercise to obtain the perceptive workload (PW). The validity and the reliability of this method were demonstrated with the use of the category ratio 10 scale (CR10), ranged from 0 "rest" to 10 "maximal workout".

Metabolic and respiratory demands during different simulated work-tasks of firefighters' activity have already been quantified. Differences between tasks were demonstrated and authors showed that HR and oxygen consumption were near their maximum values during simulated activity [1].

Considering the intense nature of the activity, the knowledge of the workload in real condition is important. According to Del Sal et al., firefighters would be able to better prepare themselves to possess the capacity to perform their job in a safe and efficient manner [4]. The aim of this study was to try two methods of workload quantification to assess the firefighters' activity under real conditions during a 10-hour guard.

2. Materials and methods

2.1. Subjects

Fourteen male subjects (age: 35.0 ± 5.8 ; height: 173.1 ± 6.0 cm; weight: 70.9 ± 7.2 kg) of different ranks and functions participated in the study. They were professional firefighters in Besançon (France). The health department and medical rescue committee approved this experimental procedure. All the participants were volunteers, informed about the experimental procedure and gave his written informed consent. For the experimental procedure, they carried out their usual activities.

2.2. Experimental design

Each subject performed a 10-hour guard using an HR monitor (Suunto Memory Belt, Valimotie Finland) and was asked to note the difficulty of each task and intervention performed during this guard by using the CR10 scale.

The four daily tasks analysed were: inventory (7:15 to 8:30 p.m.), physical training (8:30 to 9:30 p.m.), manoeuvre (9:30 to 12 p.m.) and service work (2 to 5 a.m.). Rescue interventions scores occurring during tasks were dissociated of the tasks scores and calculated separately.

The rescue interventions were grouped by four types: person rescue, firefighting, road accident and diverse operations.

Thus firefighters' workloads were calculated for the four physical daily tasks and for the four types of rescue interventions.

2.3. Procedure

PW was quantified with Foster's method [3] using the CR10 Borg Scale. Each daily task and intervention score was calculated from the product of the duration and the CR10 value.

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