

Prof. dr Lode GODDERIS  
Prof. dr Veerle HERMANS  
Toon BRAEYE  
Roeland MOTMANS  
Claire BAUKENS  
Dr Ronny VERHOOGEN

## A STUDY INTO THE DEVELOPMENT OF REQUIREMENTS CONCERNING THE PHYSICAL AND MENTAL SUITABILITY OF FIREMEN AND CANDIDATE FIREMEN

*commissioned by the Belgian Federal Office for Internal Affairs*

### Introduction

This report was compiled for the Belgian Federal Office for Internal Affairs. It contains a discussion of the creation and subsequent application of a test battery and questionnaires for assessing the physical and mental capacity of firemen. There are currently no uniform criteria for these in Belgium. They are coupled to a scientifically-based training programme.

### Wprowadzenie

Autorzy zamieszczonego poniżej artykułu udowadniają, że kwestia predyspozycji psychofizycznych strażaków ma wymiar uniwersalny – podobny w każdym kraju. Fakt, iż przydatność do służby determinowana jest w jednakowym stopniu sprawnością i wytrzymałością fizyczną oraz cechami psychiki, potwierdza zarówno praktyka, jak i badania naukowe.

Na zlecenie rządu Belgii (Federalnego Biura Spraw Wewnętrznych), grupa naukowców pod kierunkiem prof., prof. Lode Godderis'a i Veerle Hermans'a, opracowała jednolite kryteria oceny przydatności strażaków i kandydatów na strażaków. Ciekawy jest sposób podejścia do problemu. Diagnoza dokonana przez belgijską administrację rządową była jednoznaczna – brakuje jednolitych kryteriów oceny predyspozycji do pełnienia odpowiedzialnej i związanej z szeregiem ryzyk, służby w straży pożarnej. Celowo piszę „służby”, a nie „pracy”, bo nawet laik zdaje sobie sprawę, że strażak – to nie jest zawód podobny do innych. Wielu twierdzi wręcz, że trzeba mieć do niego powołanie.

Zostawmy metafizyczne rozważania. Nie sposób jednak zaprzeczyć, że w tej służbie sprawdzą się ludzie, którzy charakteryzują się odpowiednimi cechami ciała, umysłu i psychiki. Jakimi? Aby odpowiedzieć na to pytanie, wybrano najprostszy i najskuteczniejszy, moim zdaniem, sposób – zlecono wybitnym specjalistom (naukowcom i wspierającym ich praktykom) zrealizowanie projektu naukowo-badawczego. Jak im się to udało? Zachęcam do lektury.

**W imieniu Komitetu Redakcyjnego: dr inż. Eugeniusz W. Roguski**

**Keywords:** firemen, candidate fireman, requirements;

**Słowa kluczowe:** strażacy, kandydaci do służby, wymagania;

### Methodology

The specific physical and psychological requirements for fire service work were first assessed. These requirements were selected on the basis of a literature study and national and international experience. National experience was gathered in collaboration with different fire departments and with the organisation of two expert meetings. International experts were questioned via an online survey. Practical and feasible, functional tests were sought on the basis of the noted physical requirements. Validated psychological questionnaires were selected and indicator questions asked concerning the mental requirements. All the physical and mental requirements and the associated

tests and questionnaires were presented at a first experts meeting. The experts group consisted of experienced firemen, sports monitors, occupational doctors, Dutch experts and representatives from the client, the Belgian Federal Office for Internal Affairs.

Subsequently, a feasibility study was drawn up inviting the voluntary participation of adults from various Flemish and Wallonian fire departments and 3 schools. In the end, the test battery and questionnaires were distributed to and completed by 149 people, including 80 firemen and 69 'safety profession' students. The test population was mixed: 15 women and 134 men. The study took place on 5 different days and at 2 different locations. Firstly,

informed consent was given, and then the indicator questions and validated questionnaires were completed. These validated questionnaires were the Epworth Sleepiness Scale, Brief Symptom Inventory Fear/Phobia/Depression, Impact of Event scale, Need for Recovery scale, Post-traumatic Cognition Inventory, Emotional Load scale and Social Support. After this, the physical test battery was taken. The participants were personally supervised throughout the tests. The test battery consisted of 9 different tests; pull-ups, climbing, balance, squat walks, push-ups, tarp-dragging, hose-pull, hose-lift and stair-climb. Each test lasted no more than 1 minute, and was followed by 1 minute of recovery time. After completing the complete test battery, the firemen were given the chance to grade the relevance of the different components on a scale of 1 (completely irrelevant) to 6 (completely relevant).

With the data gathered from the feasibility study, a scoring system was developed to come up with a total score on the physical test battery and to be able to decide whether or not a fireman or candidate met the minimum requirements. In this scoring system, all the tests, except for the balance test, carried equal weighting. Individual results for the tests were subdivided as follows: a score lower than percentile 30 of all scores = 1 point, a score between percentile 30 and 80 = 2 points and a score higher than percentile 80 = 3 points. Since balance is an important minimum condition, no points were allocated for this part if it was not performed successfully.

All the data were entered into a database and statistically processed using SPSS. For the descriptive statistics we used means, standard deviations (SD) and percentiles. For the comparative statistics, we used the Spearman correlation coefficient when examining correlations. The populations were compared with each other using unpaired T-tests. Indicator questions were compared with validated questionnaires by means of Chi-square tests.

The training programme was compiled from the revealed functional requirements, the literature and existing training programmes, put together by experts from best practice.

## Results

*General characteristics:* For complete populations, the average age was 28 years (SD 11.1), height 179.3 cm (SD 7.6), weight 76.1 kg (SD 11.6). For the firemen, this was 35.6 years (SD 9.9), height 179.9 cm (SD 7.7), weight 79.7 kg (SD 11.3), and for the students 18.7 years (SD 1.8), height 178.5 cm (SD 7.4). A significant and clear correlation was found between age and BMI ( $R=0.44$ ,  $P<0.001$ ).

*Physical test battery:* 3 of the 9 different tests were not successfully completed. Of the complete study population, 11.4% could not do a single pull-up, 43% did not succeed in climbing once or twice over the beam, and 19.5% did not succeed in completing the balance test within the minute. The pull-ups occurred on average 7.1 times (SD 5.2). The climbing lasted an average of 18.9 sec

(SD 9.8) for successful candidates. When the balance test was successfully performed, it lasted on average 33.1 sec (SD 12.7). The squat walks lasted on average 17.3 sec (SD 5.3). There was an average of 33.7 press-ups (SD 12.8). The tarp-dragging lasted for an average of 28.5 sec (SD 10.2). Hose-pull lasted on average 8.8 sec (SD 3.8). The hose was lifted on average in 16.1 sec (SD 3.9). The stair-climb lasted on average 48.6 sec (SD 8.5). The various tests were scored on average as very relevant.

Of the significant correlations between general characteristics and results on the different tests, we note the correlations between age and hose-lift ( $R=-0.5$ ,  $P<0.001$ ), weight and hose-pull ( $R=-0.5$ ,  $P<0.001$ ) and tarp-dragging ( $R=-0.44$ ,  $P<0.001$ ), height and successful climbing ( $R=0.41$ ,  $P<0.001$ ). The previously self-estimated condition correlated positively with the results for the various test components. When comparing the test populations, we notice that students score a little lower on the different components. However, this is not significant if we compare male students with male firemen. Women scored significantly lower than men on all tests except weight and squat walks. The total score is significantly related to age and gender. But 23% of the women and 25% of participants over 50 reached the set limit of 15. Height is also correlated with a good overall score ( $R=0.31$ ,  $P<0.001$ ).

*Psychological questionnaires:* For the firemen population we saw no need to follow up for phobias (BSI-FOB=0); for sleepiness (ESS) only 2.5% follow-up was required. Complaints of depression (BSI-DEP) requiring follow-up were present among 7.5%. Anxiety disorders (BSI-ANG) were too high at 15.2%. A not yet fully processed traumatic event (SVL) was still affecting 15% of the firemen. Firemen experience more social support from colleagues than from management. For 35.8%, there was a compromising social capacity. 12.5% of the firemen have problems completely recovering from the current working rhythm of their work. For the psychological questionnaires we see a striking difference between the high scores of students and the low scores of firemen that cannot be explained by age. For this reason, these questionnaires only play a role in recruitment and periodic examination and not in selection. Men and women achieved similar scores. There was no clear relationship between the indicator questions and the questionnaires. Therefore it was decided not to continue working with these indicator questions. However, the PTCI clearly correlated with the different lists, which is interesting from the point of view of research, but there is currently no tool for interpreting this score.

*The training programme* was drawn up on the basis of the literature and an analysis of existing training programmes set up by experienced sports monitors and sports centres associated with fire departments. The training programme is also compiled to be of assistance in maintaining condition after a successful test battery and in preparing candidates for a test battery.

### **Conclusions**

In this project a validated, relevant and practically feasible physical test battery and psychological questionnaires were compiled. Since the job requirements for all firemen are the same regardless of age or gender, we retained the same criteria for all firemen. This test battery was supplemented with an endurance test: Cooper test and swimming diploma, min 100 m, must be

submitted. This is so that a comprehensive instrument can be found for assessing the physical suitability of firemen and candidate firemen. In addition to condition and strength of the candidate, the most significant influencing factors for the total score are gender, age and height. During recruitment and periodic check-ups, firemen can be screened for psychological problems using these questionnaires.