SHORT REPORT

Validity of occupational stress assessment using a visual analogue scale

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Background The visual analogue scale (VAS) is empirically used by occupational physicians to assess stress but very few studies have been published about its quantitative validation.

Aims To assess the external validity of the VAS for the assessment of stress in the clinical occupational health setting by comparing its scores with the Perceived Stress Scale (PSS) of Cohen.

Methods An anonymous self-completed questionnaire (PSS14) and the VAS were filled in by a random sample of 360 workers from several occupational health centres.

Results No difference between the mean scores of PSS14 and stress VAS was found. The equation of the linear regression was ‘VAS score = -0.18 + 1008 × PSS14 score’. A VAS score of 7.0 was identified as having the best sensitivity/specificity ratio (0.74 and 0.93, respectively) for identifying those with ‘high stress’ using the PSS cut-off score of 7.2, using a receiver operator curve approach.

Conclusions Our results support an acceptable agreement between the two tests, meaning that the two tools assess the same psychological construct. The good sensitivity/specificity ratio and the area under the curve close to 1 provide evidence that a VAS is suitable to help the occupational physician detect a high level of stress. The use of a VAS for stress assessment seems to be meaningful, suitable and useful for occupational physicians.

Key words Assessment; occupational health; stress; validation; visual analogue scale.

Introduction

‘Stress can be said to be experienced when the demands of the work environment exceed the employees’ ability to cope with (or control) them. Defining stress in this way focuses attention on the work-related causes and the control measures required’ [1].

This definition is coherent with the definition we use, which comes from transactional models [2].

The European Framework agreement on work-related stress (10/8/2004) highlights the necessity to assess and prevent stress in the workplace. Occupational health practitioners (OHPs) must now include assessment of the consequences of psychological risks in their clinical examinations in the same way that they assess other occupational-related disease [3].

Assessing this issue during a medical examination with limited time and without training in the use of psychometric tools may be challenging. Well-known and widely used stress questionnaires such as the Perceived Stress Scale (PSS) or Karasek’s scale are unsuitable in this context due to their length and complexity [4].

The visual analogue scale (VAS) is well-known in the clinical assessment of pain and is now used more and more for the assessment of stress and or occupational stress [5]. The VAS is a suitable tool for clinical activity because it permits the detection of worker distress, the assessment of stress in a rapid and simple way and allows for the detection of ‘collective’ stress in a group of workers or a high level of stress in a whole organization so that the employer can be alerted.

However, despite its widespread use and relevance to clinical examinations, very few studies have been published about its quantitative validation [6]. The aim of this study was to investigate its validity and to compare the VAS with another well-known and widely used stress measure, the PSS14 of Cohen.
Methods
The PSS14 items were anonymously completed by a random sample of volunteer workers drawn from five occupational health centres in four different administrative regions in France [7]. All workers in France have a yearly systematic medical examination. During the medical examination, the occupational physician asked the workers to score their psychological stress on the VAS. The occupational physician noted the VAS score on the last page of the PSS questionnaire and sent it anonymously to the promoter centre. For statistical analysis, we used linear regression, Pearson’s correlation coefficients and Lin’s concordance correlation coefficient (CCC) to study the relationship between the two tools [8]. A ‘high stress’ cut-off was specified by two different methods: the use of the linear regression equation and the receiver operating characteristic (ROC) curve. The capacity to detect a difference between two means was compared. All data were blinded.

Results
Demographics of workers who responded to our questionnaire are shown in Table 1.

Table 1. Descriptive data

<table>
<thead>
<tr>
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<th>n = 360</th>
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<tr>
<td>Age (95% CI)</td>
<td>40.0 years (38.8–41.1)</td>
</tr>
<tr>
<td>Genders (95% CI)</td>
<td>Male 49% (43–53)</td>
</tr>
<tr>
<td>Mean PSS (SD)</td>
<td>4.19 (1.54)</td>
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<tr>
<td>Mean EVA (SD)</td>
<td>4.06 (2.24)</td>
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There was no difference between the mean scores of PSS14 and stress VAS (Table 1).

The standard deviation, and the capacity to detect a difference between the two groups, was 32% better for the PSS14.

The correlation coefficient (r) between the two tools was 0.68 and the Lin’s CCC was 0.66.

The equation of the linear regression was ‘VAS score = −0.18 + 1,008 × PSS14 score’ (Figure 1). The calculated linear equation was close to the theoretical equation (the one for which the line crosses the y-axis is 0 and the slope is 1, called the line of equality).

The PSS14 cut-off was 7.2 [9]. Applying the calculated linear equation, the stress VAS cut-off was 7. Using the ROC curve, the better sensitivity/specificity ratio (0.74 and 0.93, respectively) was defined for the value 7. The area under the curve was >0.9.

Discussion
Our study found a high level of correlation between the VAS and another validated measure of stress. The VAS is therefore a useful tool to help the occupational physician detect a worker suffering psychological distress as well as provide a collective warning if there is a high level of stress in a workplace. The high level of correlation found is higher for instance than for prostatic-specific antigen used in screening for prostatic cancer [10]. Our findings support the use of the VAS in the assessment of stress during medical examinations by occupational physicians.

The standard deviation of the VAS was higher than the PSS14 so its capacity to detect a difference between...
two groups is inferior and may represent a reduced ability to detect group stress. However, its qualities as a quick use clinical tool offset this weakness if sample sizes are large enough.

We chose to evaluate perceived stress and not just work-related stress because different life spheres cannot be separated and stress can be a sum of personal life and work events. If the OHP finds that the worker is stressed, the medical examination should then explore the relationship with occupational or private stressors.

The VAS still requires external validation using psychological, biological (salivary cortisol) or epidemiological (looking at outcomes prospectively) approaches. However, the use of a VAS for stress assessment still seems to be a suitable and useful way for occupational physicians to assess stress during clinical examinations.

Conflicts of interest
None declared.

References