Bedford Workload Scale

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HP Activity Categories:
Assessment of workload [1]
Resource Type:
Method
Abstract:

The Bedford Scale is a uni-dimensional rating scale designed to identify operator's spare mental capacity while completing a task. The single dimension is assessed using a hierarchical decision tree that guides the operator through a ten-point rating scale, each point of which is accompanied by a descriptor of the associated level of workload.

References

Developer and source:

Year of development / publication, updates etc:

General Description

Purpose:

The Bedford Workload Scale is a modification of the Cooper-Harper rating scale. It is a uni-dimensional scale that ranks whether it was possible to complete the task, if workload was tolerable for the task, and if workload was satisfactory without reduction (Rehmann, 1995). The Bedford scale was originally developed for pilots.

Type (e.g. observation, questionnaire, interview, checklist, measurement instrument, etc.):
Questionnaire
Roscoe (1984) described a modification of the Cooper?Harper Rating Scale created by trial and error with the help of test pilots at the Royal Aircraft Establishment at Bedford, England. The Bedford Workload Scale retained the binary decision tree and the four- and ten-rank ordinal structures of the Cooper?Harper Rating Scale. The three-rank ordinal structure asked pilots to assess whether (1) it was possible to complete the task, (2) the workload was tolerable, and (3) the workload was satisfactory without reduction. The rating-scale end points were: workload insignificant to task abandoned. In addition to the structure, the Cooper?Harper (1969) definition of pilot workload was used: ?? the integrated mental and physical effort required to satisfy the perceived demands of a specified flight task? (Roscoe, 1984, p. 12?8). The concept of spare capacity was used to help define levels of workload.

Technical requirements for using the method, tool, etc:

Rating scale available as paper and pencil version

Measure/Response Type:

The operator has to rate his/her workload on a uni-dimensional rating scale from 1 to 10. The operator is asked on a three-rank ordinal structure wether 1) it was possible to complete the task, (2) the workload was tolerable,or (3) the workload was satisfactory without reduction and after this first decision the operator has to rank his workload on the respective rating scale end points (1-10) from workload insignificant to task abandoned.

Results obtained and interpretation:

As with all subjective scales, there may be an influence from the tester, as the instructions and the subjects´ training with the scale are not exactly specified. As well, no norms for data interpretation exist. But Wainwright (1987) gives some aids for interpretation of results. According to him "a satisfactory workload is not only demonstrated by all ratings falling in the range 1 to 3, but also when mean workload is in that range, with some deviations into the acceptable bracket”.

Evaluation

Advantages:

It is simple, quick and easy to apply in situ to assess task load in high workload environments,

- The Bedford Scale works for global workload assessment.

- The scale is simple. It also works well for explaining test results to the uninitiated.

- The Bedford Scale is well accepted by most pilots/operators.

- The decision tree makes the rating easier by making sequential decisions.
The rating is very time economic and can also be used while performing a task.

Disadvantages:

- Database for validity and reliability of the method is insufficient.
- The scale is simple. Each respondent attaches different meanings to the ratings and their descriptions.
- Pilots tend to provide low ratings on any flying task they perform.
- Poor sensitivity in the lower range of the scale. It does not distinguish workload well in the 1 to 3 rating range.
- Diagnosticity is a problem. Once a problem is identified, it is difficult to pinpoint what the exact problem may be. Additional techniques are required.
- Measurement is on ordinal scale level.

Alternative Methods:

NASA TLX

SWAT

Usability (ease of use, efficiency, effectiveness)

Ease of use:
high
Efficiency:
high
Effectiveness:
high

Constraints concerning conditions of use:

n/a

Reliability:

No data on reliability of the Bedford Scale could be found.

Validity:
The Bedford Scale was mostly utilised in applied settings (Lysaght et al., 1989). Lidderdale (1987), e.g., measured workload of aircrew during a low level flight in an advanced combat aircraft at night or in poor weather. The mission was subdivided into ten sections. In-flight measurement of workload was done with the Bedford Scale, whereas the Analytic Hierarchy Process method (Saaty, 1980) was used for post-flight measurement. There was a high correlation between the results from both methods. Seen away from one experiment (Tsang and Johnson, 1987) having a too small data base, Lysaght et al. (1989) could not find other studies using the Bedford Scale in controlled settings with defined levels of task difficulty. This means that there are not enough data on validity of the Bedford Scale available (NATO Guidelines on Human Engineering Testing and Evaluation, 2001).

Required effort (to conduct & to analyse):

n/a

**Level of HF expertise needed (required user qualification)**

Medium: limited level of expertise required, some training required

**Cost Information**

Very low: (<100 €) low costs to purchase or free license, no special devices necessary

Experiences of use by SESAR partners (including references):

NATS xxxxxxx

Reported and/or published experiences of use (including references):


*The practical assessment of pilot workload, AGARDograph No. 282* (pp.78-82). Neuilly sur Seine, France: AGARD.


Applicability to lifecycle phase (E-OCVM):

V2-V3

Application Area:

Aviation-ATM -Transport

Keywords:

workload, ATM , aviation, pilot, controller, operator

Short Description:

The Bedford Scale is a uni-dimensional rating scale designed to identify operator's spare mental capacity while completing a task.

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