Supported scales

The SAFE predictive model suite includes seven scales: one for fatigue, two for sleepiness, and four dedicated to performance metrics.

The Samn Perelli scale (Fatigue)

In their original paper on linking scores to fatigue, (Samn, SW and Perelli, LP. Estimating Aircrew Fatigue: A Technique with Application to Airlift operations. Report SAM-TR – 82-21. December 1981. USAF School of Aerospace Medicine.) authors Samn and Perelli classified their Samn-Perelli (SP) scores between 5 and 6 as being associated with moderate to severe fatigue with some performance impairment possibly occurring. They considered flying duties permissible but not recommended.

Initially designed for military pilots, the scale was based on data gathered during computer-simulated airline operations. The scale is shown below.

Samn Perelli Subjective Fatigue Scale

```
1. Fully Alert, wide awake
2. Very lively, responsive, but not at peak
3. Okay, somewhat fresh
4. A little tired, less than fresh
5. Moderately tired, let down
6. Extremely tired, very difficult to concentrate
7. Completely exhausted, unable to function
```

The advantage of using this scale is that the scale is validated with studies of tired aircrew in simulators. Moreover, the descriptions are easy to understand.

The Karolinska Sleepiness Scale (Sleepiness)

Designed by the Karolinska Institute in Stockholm, the Karolinska Sleepiness scale (KSS) started its life as a 9-point scale but with definition covering only alternative levels as follows:

```
1. Extremely alert
2.
3. Alert
4.
5. Neither sleepy nor alert
6.
7. Sleepy - but no difficulty remaining awake
```

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8.
9. Extremely sleepy - fighting sleep
```

In time, the definitions of each level were revised and published with the missing levels completed.

Karolinska Sleepiness Scale Definitions

```
1.  Very alert
2.  Very lively, responsive, but not at peak
3.  Alert, normal level
4.  Okay, somewhat fresh
5.  Neither alert nor sleepy
6.  Moderately tired, let down
7.  Sleepy, but no effort to keep awake
8.  Extremely tired, very difficult to concentrate
9.  Very sleepy, great effort to keep awake
```

More recently, a 10th level was included to match level 7 on the Samn Perelli scale.

```
10. Extremely sleepy, cannot keep awake
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The advantage of using the KSS scale is its validation in studies using an electroencephalogram (EEG) to measure brain activity.

As the SP scale is a 7-point scale and the KSS is a 9/10-point scale, some users believe the two to be interchangeable when measuring either fatigue or sleepiness in a fatigue management programme. However, SP scale is a fatigue scale and the Karolinska Scale is a sleepiness scale.

The 100-point alertness scale

Use SP scale

We suggest clients to use SP fatigue scale.

Score comparison

0 on the AS is not the same as 1 on the SP scale. Similarly, 100 on the AS is not the same as 7 on the SP scale.

FRMSc team developed this scale in the 1970s to identify and measure the fatigue experienced by aircrew of (initially) military aircraft. Since then, the range of alertness

challenges has changed. This is a linear 0-100 scale where 0 indicates low alertness, and 100 indicates high alertness.

Karolinska Probability Scale (Sleepiness)

Some biomathematical models have only one score for each duty. In these circumstances it is useful to know the sleepiness at the end of the duty is at the higher levels. The Karolinska probability scale has been created to indicate whether the stated duty sleepiness metric is likely greater or equal to 8 at the end of the duty.

Vigilance Degradation scale

Vigilance Degradation scale measures visual vigilance degradation. It shows the likely performance at the CRD under the level of fatigue calculated by SAFE. The SAFE model provides an indication of how much visual vigilance is degraded by fatigue when using that test.

Complex Reaction Degradation scale

The Complex Reaction Degradation scale compares the speed of reaction during a standard laboratory test to that of the personnel when fatigued. The SAFE model indicates degradation when using that test by declaring, “At this level of alertness, the response time on a warning light on a complex task is degraded by 36.1% compared with a typical rested value”.

Percentage Missed Response scale

Like the Vigilance Degradation and Reaction Degradation scales, the Percentage Missed Response scale is based on a standard laboratory test and indicates the likely general degradation of human performance.

The SAFE model provides an indication of likely degradation when using that test, “At this level of alertness, the percentage of missed responses in a sustained attention task is 17.64%. This compares with a typical rested value of 6%”

There is also an 8th scale for comparing human performance when fatigued with alcohol impaired performance. This scale was removed from the SAFE models after consideration of its overall value given that the performance degradation due to alcohol intoxication or fatigue are not adequately coherent.