In a 30-second test, PMI’s FIT 2500 Fatigue Analyzer measures the speed with which the eye jumps through a defined arc, or saccade (“saccadic velocity”).

The effectiveness and accuracy of saccadic velocity in assessing changes in alertness levels has been validated by a number of leading U.S. research laboratories for human impairment. To summarize their research:

- Changes in saccadic velocity correlate significantly to degraded alertness due to factors such as sleep deprivation and time-on-duty.
- Saccadic velocity shows strong-to-moderate correlation with other fatigue-measuring techniques (which, themselves, also show strong-to-moderate correlation to each other).
- The presence of alcohol, impairing medications and illegal drugs can also affect saccadic velocity.

### What FIT can do

<table>
<thead>
<tr>
<th>What FIT can do</th>
<th>What FIT cannot do</th>
</tr>
</thead>
<tbody>
<tr>
<td>Track changes over time in an individual’s alertness levels</td>
<td>Compare one individual’s alertness level against another’s</td>
</tr>
<tr>
<td>Create a profile of how fatigue is generated within a particular operating schedule</td>
<td>Determine whether a particular operating schedule is acceptably safe</td>
</tr>
<tr>
<td>Measure the overall impact of fatigue countermeasures on alertness levels</td>
<td>Be dropped into a setting to quickly determine whether fatigue countermeasures are working</td>
</tr>
</tbody>
</table>

### Validation

Various research studies have validated the accuracy of the FIT’s measurements of fatigue and impairment, including:

- Addiction Research Center (Johns Hopkins), Controlled-dose FIT tests for cocaine, unpublished, 1993.
- Addiction Research Center (Johns Hopkins), Controlled-dose FIT tests for marijuana, unpublished, 1993.

Additional research not involving the FIT instrument has corroborated the relation between saccadic velocity and degraded alertness. Some studies include:

• Continuous sleep deprivation study; Rowland, Krichmar, et al; *Sleep Res.* 1997 26:626.

**Research uses**

Because of the FIT’s accuracy and field-practicality, a variety of research studies have incorporated the FIT into their protocols in order to collect data on physiological changes under different conditions:

• Submarine watchstanding schedules; Miller; Air Force Research Laboratories (2001)
• Locomotive alerter evaluation; Popkin; Volpe for Federal Railroad Administration (2001)
• Caffeine and sleep deprivation study; Kamimori, Walter Reed Army Institute of Research (1999)
• Police officer fatigue study; Vila for Police Executive Research Forum (1999)
• Canalert; Moore-Ede for Canadian railroads (1996)
• Engineman Stress and Fatigue II tests; Volpe for Federal Railroad Administration (1995)
• Measures Over 30-Hours of Continuous Wake with and Without Caffeine; Yu, Russo, Johnson and Kamimori; USA Aeromedical Research Lab and Walter Reed Army Institute of Research (WRAIR) (2004)