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# Understanding the Desktop Risk Score

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## Desktop Risk

Desktop risk is a statistic that estimates a user's risk of developing discomfort. It is a function of:

1. Time spent using mouse/pointer (PT)
2. Time spent using keyboard (KT)
3. Strain exposure from using the mouse/pointer (PS)
4. Strain exposure from using the keyboard (KS)
5. Overall break compliance (BC)
6. Microbreak compliance ( $\mu$ BC)

Risk is calculated as a function of these statistics according to the formula (where day 1 to day 30 corresponds to a block of 30 calendar days):

$$\begin{aligned} DesktopRisk = & \alpha_1 \sum_{day=1}^{30} PT_{day} + \alpha_2 \sum_{day=1}^{30} KT_{day} + \alpha_3 \sum_{day=1}^{30} PS_{day} + \alpha_4 \sum_{day=1}^{30} KS_{day} \\ & + \alpha_5 \left( \overline{BC_{day1}, \dots, BC_{day30}} \right) + \alpha_6 \left( \overline{\mu BC_{day1}, \dots, \mu BC_{day30}} \right) \end{aligned}$$

These 6 statistics were chosen based on research suggesting they are associated with risk of developing discomfort and empirical evidence that they have statistically significant association with discomfort. The empirical evidence is from an unpublished Enviance, Inc. study from approximately 14,000 employees from a California power company over the course of 2 years.

The 6 coefficients ( $\alpha_1$ - $\alpha_6$ ) were derived using a statistical optimizer to optimize the predictive value of DesktopRisk's association with discomfort.

The resulting values for DesktopRisk are compared to thresholds  $T_{low-moderate}$  and  $T_{moderate-high}$ .

- If  $DesktopRisk < T_{low-moderate}$ , the risk category is low
- If  $T_{low-moderate} \leq DesktopRisk < T_{moderate-high}$ , the risk category is moderate
- If  $DesktopRisk \geq T_{moderate-high}$ , the risk category is high.

## Calculating the source statistics

With the exception of "Overall Break Compliance", which is described below, the factors that comprise Desktop Risk are described in the DataLogger Analysis document at <http://www.rsiguard.com/documents/help/DataLoggerAnalysis.pdf>

Overall Break Compliance is itself based on a number of factors and is described below.

## Calculating Break Compliance

RSIGuard calculates 2 types of break compliance, "Basic Break Compliance" and "Overall Break Compliance". "Basic Break Compliance" is a function of how you respond to BreakTimer break suggestions. "Overall Break Compliance" additionally considers the breaks you take on your own accord (i.e., natural breaks).

### “Basic Break Compliance”

If BreakTimer is enabled, BreakTimer suggests breaks on a schedule that is based on your BreakTimer settings. This can include breaks based on activity level, amount of time spent using the computer, “minute-by-minute” work restriction breaks, and scheduled breaks.

“Basic BreakTimer Compliance” is a simple ratio of the number of breaks you complete divided by the number of breaks suggested. So, if RSiGuard suggests 4 breaks, and you complete 3 of them and skip 1, your BreakTimer break compliance would be  $\frac{3}{4}$ , or 75%.

This statistic tells how you respond to BreakTimer break suggestions, but it does not describe your overall break-taking pattern, which is better characterized by the “Overall Break Compliance” statistic described below. Although the OES reports on “Basic BreakTimer Compliance”, this value is not part of the Desktop Risk score.

RSiGuard also allows you to take a break “on-demand” via the Tools menu. However “on-demand” breaks are considered natural breaks (see below) and do not affect “Basic BreakTimer Compliance”.

### Natural Breaks

RSiGuard considers natural breaks to be any period of time you spend not using the mouse or keyboard of 15 seconds or longer. RSiGuard tallies 5 types of natural breaks.

- Breaks of at least 15 seconds
- Breaks of at least 1 minute
- Breaks of at least 4 minutes
- Breaks of at least 16 minutes
- Preemptive breaks

A preemptive break is a break in which you rest long enough that your mouse and keyboard strain exposure levels are lowered similarly to what might occur during a BreakTimer break. In other words, if you would likely have gotten a BreakTimer break suggestion soon (based on activity level) and you rest long enough that now you won't, RSiGuard gives you credit for having taken a “preemptive break”.

BreakTimer is designed to encourage you to take preemptive breaks (instead of suggested ones) because doing so suggests you are naturally following a healthier work pattern by taking breaks when you need them without even needing a reminder. A break is considered preemptive if your strain level was over 50% before your natural break, and under 50% after, and dropped by at least 35% (where strain level is the greater of mouse or keyboard strain as shown on gauges on the main control panel).

### Overall Break Compliance

“Overall break compliance” is a statistic that gives a more holistic view of your break taking patterns. It is calculated based on both your BreakTimer breaks (if BreakTimer is enabled) and your natural breaks.

It is calculated as: **Overall Break Compliance =  $\frac{\text{(the number of breaks you took)}}{\text{(the number of breaks you needed to take)}}$**

The number of breaks you took is the sum of: BreakTimer breaks that you took, preemptive breaks you took (defined above in Natural Breaks section), 1/3 of other natural breaks of at least 4 minutes.

The number of breaks you needed is the sum of the BreakTimer breaks that were suggested (or would have been suggested\*) and the number of preemptive breaks you took (i.e. the additional number of breaks BreakTimer would have suggested had you not taken them preemptively). If BreakTimer is disabled, then the number of breaks needed is instead estimated based on the duration of time you spent on the computer – roughly 1 break per 45 minutes of activity.

\*Possible reasons why BreakTimer might not be able to suggest a break include:

- You clicked “Postpone Break” from the break window
- A BreakTimer filter is blocking a break from appearing
- You turned the BreakTimer off (temporarily or permanently)
- You are in polite mode (i.e. using the “Break Needed” button which you click to start a break) and the system is waiting for you to click the Start Break button
- A BreakTimer blackout period is in effect

As of RSIGuard v5.0.3SB and 5.1.0hCW/CM/CG, when BreakTimer is unable to suggest a break for one of the above reasons, it still increases the “breaks needed” value. Thus, break delays can reduce your Overall Break Compliance score. If you remain in a state where a break is needed, but can’t be suggested, for over 5 minutes, BreakTimer starts counting “non-compliant minutes” (i.e. minutes past 5 minutes of delay in starting your break).

When calculating Overall Break Compliance, the ratio of (non-compliant minutes)/(average time between breaks) is added to the number of breaks the model believes you needed. Since Overall Break Compliance=(breaks taken/breaks needed), this has the effect of lowering Overall Break Compliance (by increasing the breaks needed denominator).

Here are some examples:

- Let’s say you postpone a break 10 minutes, and keep working until the break window pops up again (in 10 minutes). You’d accrue 5 minutes of non-compliant time. If you clicked postpone 10 again, and kept working, you’d end up with 15 minutes of non-compliant time (the first 5 minutes of delay are not considered non-compliant time).
- Let’s say at 10:30AM you click the “Postpone 10 minutes” button. Two minutes later (at 10:32AM) you stop using the computer. After resting 2 more minutes (now 10:34AM), let’s say the break model determines you can continue working without additional break time. Even though you requested a 10-minute postponement, you only spent 4 minutes in a state of needing a break. Since that is under the 5-minute threshold, that wouldn’t impact your compliance score.
- Let’s say you have a PowerPoint presentation running for 3 hours, and this blocks all break suggestions. However, your usage is low, and no breaks would have been suggested during this time. This would not affect compliance.

- Let's say you have breaks set to "every 45 minutes". The "Break Needed" button pops up, and you keep working for 50 minutes before finally clicking it to take a break. This would add 45 minutes of non-compliant time, and would be equivalent to you having skipped an entire break (e.g. you clicked on the Break Needed button, the break started, and you clicked Skip Break).
- Let's say you disable BreakTimer for 4 hours from the main RSIGuard window. If during that time you take breaks as needed, compliance won't be affected. But if you spend over 5 minutes in a state where the BreakTimer, were it to be enabled, would suggest a break, then that time will be added to your non-compliant time and reduce your Overall Break Compliance accordingly.

If BreakTimer is enabled less than 25% of the time you are actively working (or in older versions if BreakTimer is disabled) then the Breaks Needed value is more simply calculated as the number of minutes of activity divided by 45.

### Using the Desktop Risk Statistic

Within the OES, Desktop Risk is, by default, presented as a risk category: low, moderate, or high.

Within RSIGuard, Desktop Risk is, by default, presented as a continuous value. A lower number is associated with lower risk, and a higher number with a higher risk. If you can lower the Desktop Risk value without creating adverse effects (e.g. lowered productivity), then doing so is recommended.

When presented as a continuous value, it is scaled so that 95% of users will have a Desktop Risk score from 0 to 100. As a general guide, 0-25 is low, 25-50 is reasonable, 50-75 is potentially high, and 75+ is considered higher risk. The score can be lowered by reducing exposure, or improving break patterns.

Approximately 75% of users who report discomfort will also be found to have historically moderate or high risk levels (risk levels drop when discomfort starts in response to behavioral changes associated with the discomfort). So it is reasonable to treat asymptomatic people with moderate or high risk levels as being at potentially significant risk of developing discomfort.