Movement Risk Index (MRI)

Algorithm Explanation

1. What the Algorithm Does

The MRI algorithm converts **multiple observed exposure factors** into **one standardised risk score out of 100**.

Each factor:

- Represents a **known driver of musculoskeletal and fatigue risk**

- Is scored consistently on a **0–4 scale**

- Is weighted to reflect its **relative contribution** to overall exposure

The result is a **single, comparable number** that reflects cumulative movement-related risk for a role or task.

2. Why the Score Is Out of 100

Multiplying the final value by **100** produces a **percentage-style score**.

This:

- Makes results intuitive for non-technical audiences

- Allows easy comparison between roles, teams, and time periods

- Aligns with common WHS and enterprise risk scoring conventions

A higher score indicates **greater accumulated exposure**, not injury or non-compliance.

3. Why Each Input Is Divided by 4

Each domain is initially scored from **0 to 4**.

Dividing by **4**:

- Normalises each score to a **0–1 range**

- Ensures all domains are mathematically comparable

- Prevents any domain from dominating purely due to scale

Example:

- A score of **2 ÷ 4 = 0.50**

- A score of **4 ÷ 4 = 1.00**

This converts subjective observations into **proportional exposure values**.

4. Why Weighting Is Applied

Not all exposure drivers contribute equally to cumulative risk.

Weighting:

- Reflects **evidence strength**

- Reflects **frequency in desk-based work**

- Reflects **impact on cumulative load over time**

Each coefficient (0.25, 0.20, etc.) represents the **maximum proportion** that domain can contribute to the final MRI score.

5. Domain-by-Domain Explanation

5.1 Sustained Sitting (Weight = 0.25)

`0.25 × (Sustained Sitting ÷ 4)`

What it represents
 The proportion of work time spent in uninterrupted sitting or static postures.

Why it has the highest weight
 Sustained sitting:

- Affects nearly all desk-based roles

- Drives cumulative spinal and hip loading

- Amplifies the effect of all other exposure factors

Impact on score
At maximum exposure, sustained sitting alone can contribute **25 points** to the MRI.

5.2 Movement Variation (Weight = 0.20)

```
0.20 × (Movement Variation ÷ 4)
```

What it represents
How often static load is interrupted by standing, walking, or posture change.

Why it is heavily weighted
Movement frequency:

- Directly moderates the effect of sitting

- Is one of the most effective administrative controls

- Is highly influenced by workflow design

At maximum exposure, limited movement can contribute **20 points**.

5.3 Upper Limb Load (Weight = 0.15)

```
0.15 × (Upper Limb Load ÷ 4)
```

What it represents
Repetitive keyboard, mouse, and sustained arm/hand load.

Why it is weighted lower than sitting
Upper limb load:

- Is more task-specific

- Varies more between roles

- Still significantly contributes to fatigue and discomfort

Maximum contribution: **15 points**.

5.4 Neck / Shoulder Demand (Weight = 0.15)

$$0.15 \times (\text{Neck/Shoulder Demand} \div 4)$$

What it represents
Sustained neck and shoulder loading from screens, phones, and documents.

Why it matters
Neck and shoulder loading:

- Accumulates even without high force

- Is exacerbated by multi-screen setups and document switching

Maximum contribution: **15 points**.

5.5 Work Organisation (Weight = 0.15)

$$0.15 \times (\text{Work Organisation} \div 4)$$

What it represents
How deadlines, autonomy, and task blocks influence exposure.

Why it is critical
Work organisation:

- Determines whether movement occurs at all

- Multiplies exposure across all physical domains

Maximum contribution: **15 points**.

5.6 Workstation Fit (Weight = 0.10)

$$0.10 \times (\text{Workstation Fit} \div 4)$$

What it represents
 Whether the physical setup reliably supports neutral work.

Why it has the lowest weight
 Workstation setup:

- Sets a baseline level of exposure

- Rarely offsets poor work organisation or movement patterns alone

Maximum contribution: **10 points**.

6. Why the Weights Sum to 1.00

All weights together equal **1.00 (100%)**.

This ensures:

- The MRI score always falls between **0 and 100**

- Each domain's contribution is explicit and transparent

- Adjustments to weights can be justified and audited

7. How the Final Score Is Formed

The algorithm:

1. Converts each observation into a proportional exposure value

2. Applies evidence-based weighting

3. Sums all weighted values

4. Scales the result to a 0–100 range

This produces a **single, defensible exposure-risk score**.

8. Example (Simplified)

If a role scores:

- Sustained Sitting = 4

- Movement Variation = 3

- Upper Limb Load = 2

- Neck Demand = 2

- Work Organisation = 3

- Workstation Fit = 1

The MRI would be:

```
MRI = 100 × (
0.25×1.00 +
0.20×0.75 +
0.15×0.50 +
0.15×0.50 +
0.15×0.75 +
0.10×0.25
)
= 62.5
```

9. Why This Algorithm Is Defensible

- Transparent inputs

- Fixed scoring criteria

- Evidence-informed weighting

- Repeatable across time and roles

- Directly linked to control selection

10. One-Sentence Summary

"The MRI algorithm converts observed work exposure into a weighted, standardised score that shows how much movement-related risk is created by the way work is designed and performed."