# Scoring the free-form assessment using Network MR

Discovering the optimal intervention using Network MR

Network MR is performed to discover the optimal interventions. The network MR method is detailed in full in Moreno-Stokoe and colleagues. The MiRANA JavaScript library (Moreno-Stokoe, Haworth, Davis) includes a method for conducting Network MR which can be used to estimate the effects of interventions. It is used here to score interventions, and will be detailed in full in the original paper describing the development of the game where it was also applied (Moreno-Stokoe, Haworth, Davis). Application of Network MR will discover all possible interventions and estimate their effects on all public health traits.

Scoring effects

The magnitude and valence of each individual effect that an intervention has on each trait in analysis will be used to score each individual effect.

The magnitude is the amount the prevalence of the trait will be changed by the effect (i.e., the beta weight β):

The valence refers to the amount of ‘good’ that the effect will have considering whether the trait is good or not. Interventions which have good effects (such as reducing smoking) receive positive scores but interventions which have a bad effects (such as reducing wellbeing) receive negative scores. To score this, each trait in analysis was categorised whether it is good, neutral, or bad (see Table 2 for traits valences).

A valence multiplier (*vm*: table 3 for values) determined whether the score is positive or negative based on whether it effects a good or bad trait.

The valence and magnitude of an effect were multiplied to give its score, broadly representing the amount of ‘good’ it did.

**Table 2.** Trait valence categories

|  |  |  |
| --- | --- | --- |
| **Bad** | **Neutral** | **Good** |
| Depression | Coffee intake | Exercise |
| Worry | BMI | Sleep |
| Loneliness | Eveningness | Wellbeing |
| Insomnia |  | Education |
| Neuroticism |  | Intelligence |
| Alcohol |  | Socialising |
| Smoking |  |  |
| Heart disease |  |  |
| Diabetes |  |  |

**Table 3.** Valence multiplier (*vm*) values

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Trait affected** | | |
| **Effect magnitude** | **Good trait** | **Bad trait** | **Neutral trait** |
| >0 (an increase) | 1 | -1 | 0 |
| <0 (a decrease) | 1 | -1 | 0 |

*Worked example*

For example, an intervention reduced smoking by 5 units would be scored thusly:

**Effect score**

Formula

Calculation

Scoring interventions

Interventions were given total scores in two ways.

First, its primary effect was scored. Interventions were designed by participants to achieve an objective. For example, the first question asked participants to: “Select intervention(s) to **most increase wellbeing,** whilst most improving the overall physical and mental health of the network”. The intervention’s effect score on the objective trait (*OT*) gave the primary effect score.

Second, its side effects were scored. Interventions can have many effects, such as reducing smoking as well as reducing heart disease. Effect scores were calculated for every trait in analysis that the intervention effected. These were summed to give an estimation of the total ‘good’ done by the intervention. This comprised the side effect score.

*Worked example*

For example, consider an interventions which reduces smoking, the objective trait, by 5 units and has a side-effect which increases wellbeing by 5 units as well. This would be scored as so:

**Primary effect score**

Formula

Calculation

**Side effect score**

Formula

Calculation

\* 1

Total scores

Scores will be ranked. All possible interventions will be ranked in their primary effect and side effect scores (separately). Participants will score their ranking. For example, an individual who selects the optimal intervention would receive a rank of 1, and an individual who selects the 5th most optimal intervention would receive a rank of 5.

Individuals will receive total primary scores simply by summing their primary effect scores for all 4 questions.

Total side effect scores will be summed in the same manner.