**Table 1: The MDD-Rumination Model**

|  |  |
| --- | --- |
| Formulations  | Units |
| *Adjusted Stressor0=Stressor0\*Memory Time Constant/Measurement time* | *engram* |
| *Change in PinkNoise MDD=(WhiteNoise MDD-PinkNoise MDD) / Ɵ12* | *DepScore/Month* |
| *Change in PinkNoise Rum= (WhiteNoise Rum-PinkNoise Rum) / Ɵ12* | *RumScore/Month* |
| *Effect of Rumination on Time Constant=1.4741* | *1/RumScore* |
| *Fraction of Stimuli Negatively Perceived= 1* | *Disruption/engram* |
| *Gender=GET XLS CONSTANTS( 'AdolescentData.xlsx' , 'Sheet1' , 'B2')* | *Dmnl* |
| *Indicated MDD=max(0, (Ɵ6+Ɵ7\*Rumination) /(1-Ɵ8) + PinkNoise MDD\*MDDSwitch)* | *DepScore* |
| *Indicated Rumination=max(0, (Ɵ1+Ɵ2\*MDDsymptoms+Ɵ3\*Gender+Ɵ4\*Perceived Negative Stimuli)/(1-Ɵ5) +PinkNoise Rum\*RumSwitch)* | *RumScore* |
| *Let it go=Stressor Memory/Memory Time Constant* | *engram/Month* |
| *MDD symptoms=* *SMOOTHI(Indicated MDD, Minimum Adjustment time/(1-Ɵ8) , MDD0)*  | *DepScore* |
| *MDD0=GET XLS CONSTANTS( 'AdolescentData.xlsx' , 'Sheet1' , 'B4')* | *DepScore* |
| *MDDResidualMean=0* | *DepScore* |
| *MDDSwitch=0* | *Dmnl* |
| *Measurement time=6* | *Month* |
| *Memory Time Constant=Minimum Memory Time Constant\*Rumination\* Ɵ9* | *Month* |
| *Minimum Adjustment time=1* | *Month* |
| *Minimum Memory Time Constant=1* | *Month* |
| *NoiseSeedMDD=3* | *Dmnl* |
| *NoiseSeedRum=2* | *Dmnl* |
| *Perceived Negative Stimuli=* *Stressor Memory\*Fraction of Stimuli Negatively Perceived* | *Disruption* |
| *; PinkNoise MDD(0)=0*  | *DepScore* |
| *; PinkNoise Rum(0)=0*  | *RumScore* |
| *Rum0= GET XLS CONSTANTS( 'AdolescentData.xlsx' , 'Sheet1' , 'B3')* | *RumScore* |
| *Rumination=SMOOTHI(Indicated Rumination, Minimum Adjustment time/(1-Ɵ5) , Rum0 )* | *RumScore* |
| *RumResidualMean=0* | *RumScore* |
| *RumSwitch=0* | *Dmnl* |
| *Stressor Increase=GET XLS CONSTANTS( 'AdolescentData.xlsx' , 'Sheet1' , 'B6')* | *engram/Month* |
| *; Stressor Memory(0)=Adjusted Stressor0* | *engram* |
| Stressor0=GET XLS CONSTANTS( 'AdolescentData.xlsx' , 'Sheet1' , 'B5') | engram |
| TIME STEP = 0.03125 | Month |
| *WhiteNoise MDD=RANDOM NORMAL( -10 , 10 , MDDResidualMean , 1 , NoiseSeedMDD )\*(( Ɵ11^2)\*(2-(TIME STEP/ Ɵ12)) /(TIME STEP/ Ɵ12))^0.5* | *DepScore* |
| *The formulation of white noise and pink noise are taken from Sterman (2000).* |  |
| *WhiteNoise Rum=RANDOM NORMAL( -10 , 10 , RumResidualMean , 1 , NoiseSeedRum )\*(( Ɵ10^2)\*(2-(TIME STEP/ Ɵ12)) /(TIME STEP/ Ɵ12))^0.5* | *RumScore* |
| *Ɵ1=-1.2504* | *RumScore* |
| *Ɵ2=0.4236* | *RumScore/DepScore* |
| *Ɵ3=2.5152* | *RumScore* |
| *Ɵ4=0.2518* | *RumScore/Disruption* |
| *Ɵ5=0.1639* | *Dmnl* |
| *Ɵ6=0.3730* | *DepScore* |
| *Ɵ7=0.0699* | *DepScore/RumScore* |
| *Ɵ8=0.8894* | *Dmnl* |
| *Ɵ9=1.4741* | *1/ RumScore* |
| *Ɵ10=7.8735* | *Dmnl* |
| *Ɵ11=0.0002* | *Dmnl* |
| *Ɵ12=1.6008* | *Month* |

**Estimation of the inflow of Stressor Memory from the Stressful Life Events by using a fixed delay for “deleting after 6 month”**



For determining the *Stressful Events Happening*, we minimized the squared of the difference between simulated *Stressful Life Events* and the empirical Stressful Life events at T3 (Time=7) by changing the *Stressful Events Happening* rate for each individual and starting from the individuals *Stressful Life Events* at T1. Then we set *Stressor Increase* equal to the *Stressful Events Happening* and used that rate as exogenous input into our simulations to form the *Stressor Memory* stock.