# Final Assignment: Creating models for a stress prevention system

Introduction:

Stress is a common issue in the 21st century. A numerous number of people across the world struggle to cope with it. As a result of the increasing number of stressed individuals the study for the cause and process of stress has become a common research. Therefore, throughout the course of this report, the domain, support and analysis models of processing stress will be discussed and researched upon as well as the hypothesized effects of the proposed solutions.

Question #1
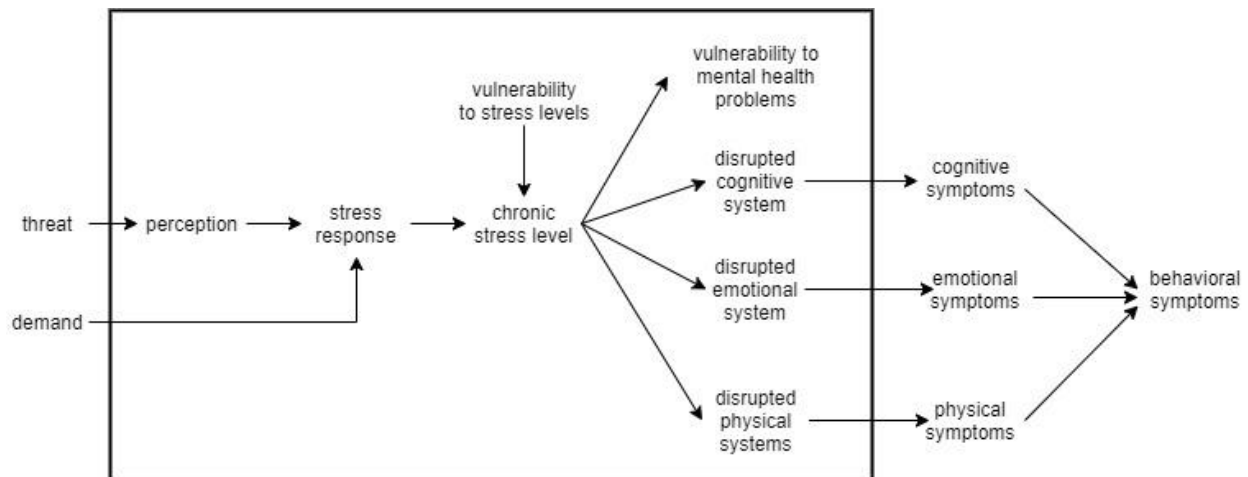
Figure 1.0 Graphical representation of the process of stress in humans

Demand has been assumed that no perception is needed for a stress response to be measured, whereas a threat will be perceived and then produce a stress response.

Assumption made that vulnerability to stress levels has an impact on the chronic stress level, as a result of the stress response by increasing or decreasing the chronic stress level.

Vulnerability to mental health problems does not lead to the behavioral symptoms, because it has no affect on it.

Question #2

If the vulnerability of stress level is low the amount of chronic stress gained will decrease. However, when the vulnerability of stress level is rated as high the amount of chronic stress gained will increase.

Question #3

Formalisation of Concept	Explanation	Justification
demand(A: AGENT, R: REAL)	Agent A encounters demand at level R	Using real numbers makes displaying the different intensities of the demand/threat possible.
threat(A: AGENT, R: REAL)	Agent A encounters threat at level R	
perception(A: AGENT, L: LEVEL)	Agent A encounters perception of threat level R	Expressing perception of threat in levels will portray the various stages of perception, because it takes in threat as an indicator for its level.
stress_response(A: AGENT, B: BOOLEAN)	Agent A encounters stress response is R	Stress response has to be a boolean to show its presence.
chronic_stress_level(A: AGENT, R: REAL)	Agent A has a chronic stress level is R	Chronic stress level has to be a real number because the vulnerability stress level is capable of increasing or decreasing its level.
vulnerability_stress_level(A: AGENT, L: LEVEL)	Agent A has a vulnerability stress level is L	The vulnerability of stress level is represented as high, mediocre or low to distinguish its impact on the chronic stress level.
vulnerability_mental_health(A: AGENT, B: BOOLEAN)	Agent A experience with vulnerability of mental health is B	A boolean value is used to display the presence of any mental health issues by stating that it is true or false.
disrupted_cognitive_sys(A: AGENT, B: BOOLEAN)	Agent A has been disrupted cognitive system is B	A boolean value is used to display the presence of the disrupted system, since there are only two outcomes possible.
disrupted_emotional_sys(A: AGENT, B: BOOLEAN)	Agent A has been disrupted emotional system is B	
disrupted_physical_sys(A: AGENT, B: BOOLEAN)	Agent A has been disrupted physical system is B	
cognitive_symptoms(A: AGENT, B: BOOLEAN)	Agent A has been showing of cognitive symptoms is B	The symptoms are a result of the disrupted systems, which can be either present or not, thus a boolean value seemed to be the most appropriate to use.
emotion_symptoms(A: AGENT, B: BOOLEAN)	Agent A has been showing of emotion symptoms is B	
physical_symptoms(A: AGENT, B: BOOLEAN)	Agent A has been showing of physical symptoms is B	
behavioral_symptoms(A: AGENT, B: BOOLEAN)	Agent A has been showing behavioral symptoms is B	The behavioral symptoms are the outcome of all symptoms being present. Thus, it can be displayed as a boolean to indicate its existence.

Figure 1.1 Table of predicates, explanation and justification of choices

| Sorts	Elements
REAL	all real numbers
BOOLEAN	0, 1
LEVEL	low, normal, high
AGENT	A

Figure 1.2 Table of sorts for Figure 1.1

Question #4

CSL: Chronic Stress Level | SR: Stress Response | V: Vulnerability

RF: Growth Factor | t: Time | DF: Decay Factor

$$CSL(t + \Delta t) =$$

$$min(1, \; CSL(t) + [\{(1 - CSL(t)) \times SR(t) \times V \times RF\} - \{(1 - SR(t)) \times DF\}] \times \Delta t$$

By using the min function it will allow the formula to never exceed the value of 1 for the chronic stress level being calculated. The $CSL(t)$ at the start of the formula displays the time step t for chronic stress, which is followed by the first curly bracket that calculates the gain. The parentheses with 1-CSL(t) multiplied by RF calculates the gain factor. The $SR(t)$ within the gain formula will allow the gain value to become 0 when there is no stress response at the specified timestep. Moreover, the V can attribute based on its high value, thus adding on to a larger value for the gain. After the minus sign the other curly bracket formula calculates the loss. The parentheses calculates the amount of stress at the given timestep t. In order, to calculate the total gain of chronic stress the gain and loss are subtracted. Finally, the delta t finalizes the formula by multiplying its time factor to the total gain calculated.

Question #5
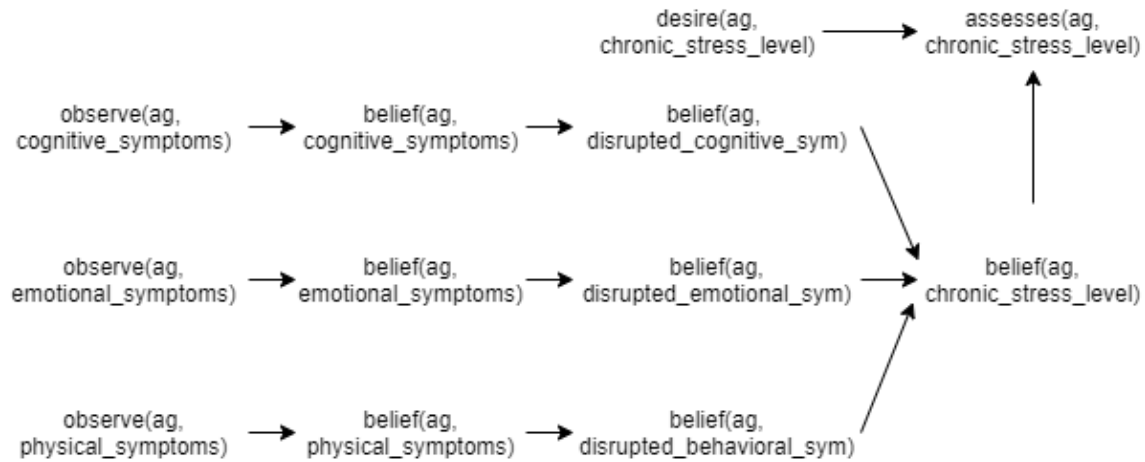
Figure 1.3 Graphical representation of backwards analysis model for Figure 1.0

Please refer to Figure 1.1 for the predicates table.

Figure 1.3 is a backwards analysis model to illustrate the impact from the effect given moving onwards to the source of the effect based on the observations that have been made. It is assumed that breaking down the symptoms into cognitive, emotional and physical symptoms will allow the agent to become more likely aware, thus observing them, due to the individuality and certain aspects of the symptoms. As a knock on effect, the observation will lead to a belief that A has the symptom or symptoms resulting in the belief of having a disrupted system. Moreover, causing the agent to believe that A has a certain chronic stress level making it an undesirable fact that A has a certain level of chronic stress.
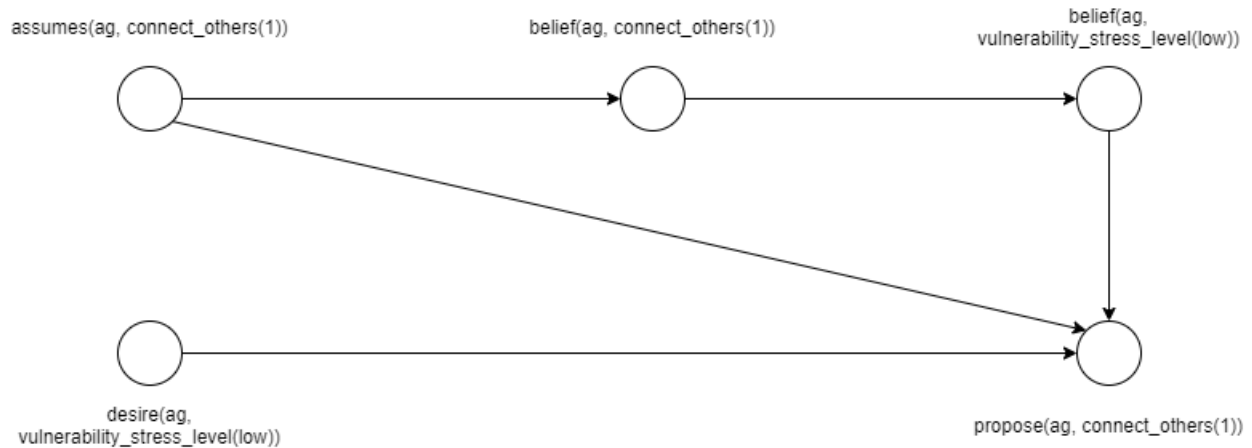
Question #6
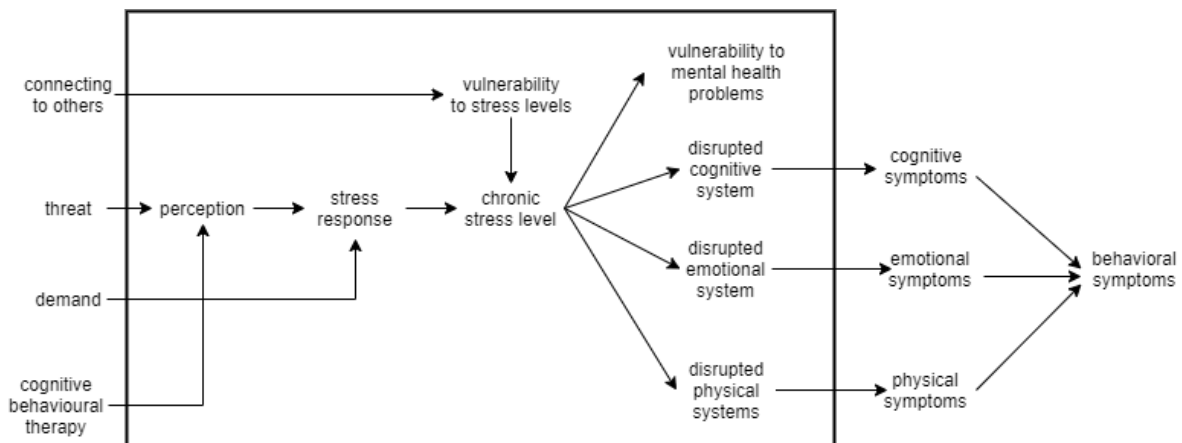
Figure 1.4 Graphical representation of extended domain model

Connecting to others and cognitive behavioural therapy are indicated as external factors, because they can be observed with the bare human eye, thus visible to others that the agent is interacting with others.
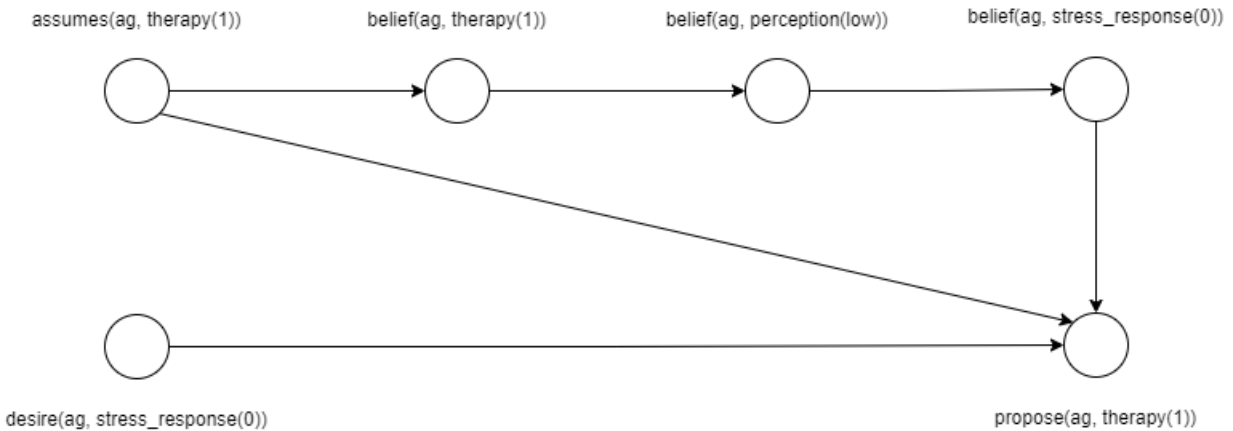
Figure 1.5 Forward reasoning support model of cognitive behavioural therapy

Figure 1.6 Forward reasoning support model of connecting to others