# The Dynamic Transmission of Anxiety Disorder under Emotional Infection

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## Abstract

In previous studies, we noted that by comparing anxiety and depression and co-morbidity natural mortality, and unnatural mortality, we concluded that anxiety disorders have an investigability independent of depression. Also, previous studies have concluded that emotional infection significantly transmits negative emotions. This paper proposes a compartmental model including the population in a mildly anxious and severely anxious environment. The propagation of anxiety in the population in response to emotional contagion is investigated in different fixed settings.


**Keywords:** Anxiety; Depression;Anxious Environment

## 1. Introduction

Anxiety, also known as anxiety neurosis, is the most common of the broad category of neurological disorders and is characterized by the experience of anxious emotions. It can be divided into two forms: chronic anxiety, i.e. generalized anxiety, and acute anxiety, i.e. panic attack. A recent meta-analysis indicated that approximately five million deaths worldwide are attributable to mood and anxiety disorders each year. One study showed that approximately 40% of deaths among individuals with anxiety disorders were due to unnatural causes. Second, we found evidence that anxiety disorders are a significant risk factor for premature death independent of comorbid depression. So it is concluded that it is necessary to study the causes of death in anxiety disorders alone [1].

Genetics may play a part in anxiety disorders, however while your genes may make you more vulnerable, your environment may be the trigger that sets the disorder off, and a series of stressful events can intensify feelings of anxiety. [2] The brain chemicals serotonin and norephinephrine may be linked to anxiety disorders, and the same medications which ease depression may also be useful in the treatment of anxiety. While more women than men will typically suffer from anxiety, the disorder can strike anyone at any time in their life.

Because anxiety disorders are related to all aspects of a person's life, and a study by the Department of Medical Psychology of the University of Craiova, Romania, summarizes the causes of anxiety disorders as family, life background, region, and many indeterminate causes. Among them, we found that the causes of anxiety disorders are inseparable from emotional contagion. Emotional contagion, first characterized by Elaine Hatfield, describes how people who observe the emotions and behaviors of another tend to copy those For instance, when someone smiles happily around others, those around them are more likely to smile and feel happy. Those data suggest that negative emotions are particularly transmissible among people [3].

Based on these data and comparisons, we conclude that negative emotional contagion is one of the causes of anxiety disorders.

In this paper we propose a compartmental model which includes mildly anxious environment and severely anxious environment individuals and examines the effects of emotional infection on anxiety disorders within different fixed environments.

## 2. Preliminaries

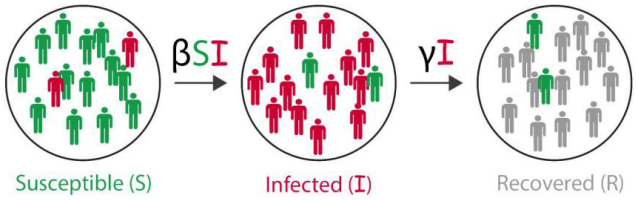


**FIGURE 1: the scheme**

In the SIR model, the entire population is divided into three categories: Susceptible, who are not yet infected, Infective, who are infected and have the ability to transmit, and Recovered, who have recovered from infection and are immune. The initials of these three groups are the origin of the model name SIR. My idea can be related to the SIR model because we consider emotional infection as a transmission route for anxiety disorders, and emotional infection can be considered as a basic model of SIR. However, the basic model of SIR does not fit well with this study because he lacks the population exposed to

anxiety, so we built the model on the basis of the SEIR model, where E refers to the exposed person , meaning a person who has been exposed to an infected person but is not infectious, and can be used for infectious diseases in the presence of an incubation period.

The model in this paper is altered from SEIR because we see both mild or severe anxiety disorder patients as chronic anxiety patients, denoted by C.

**TABLE 1: Parameter interpretation**

| | | | |
|---|---|---|---|
| $\beta_1$ | Proportion of people exposed to mild anxiety disorders | Assumption | Assumption |
| $\beta_2$ | Proportion of people exposed to severe anxiety disorders | Assumption | Assumption |
| $\alpha_1$ | Rate of development of mild anxiety disorder environment into severe anxiety disorder environment | Assumption | Assumption |
| $\gamma_1$ | The rate at which people exposed to mild anxiety disorders develop mild anxiety disorders as a result | Assumption | Assumption |
| $\alpha_2$ | Rate of development of severe anxiety disorder environment into mild anxiety disorder environment | Assumption | Assumption |
| $\gamma_2$ | The rate at which people exposed to severe anxiety disorders develop anxiety disorders as a result | Assumption | Assumption |
| $\gamma_3$ | Recovery rate of people with mild anxiety disorder | Assumption | Assumption |
| $\gamma_4$ | The rate at which people exposed to mild anxiety disorders move to a healthy (regular) environment | Assumption | Assumption |
| $\gamma_5$ | The rate at which people exposed to severe anxiety disorders move to a healthy (regular) environment | Assumption | Assumption |
| q | Average probability of a person development mild anxiety from exposure to a severe anxiety disorder | Assumption | Assumption |
| 1-q | Average probability of a person developing severe anxiety from exposure to a severe anxiety disorder | Assumption | Assumption |
| $\sigma_1$ | The probability of people going from mild to severe anxiety disorder | Assumption | Assumption |
| $\sigma_2$ | The probability of people going from severe to mild anxiety disorder | Assumption | Assumption |
| b(N) | Birth rate | | |
| $\eta_0$ | Natural mortality rate | | |

## 3. Model

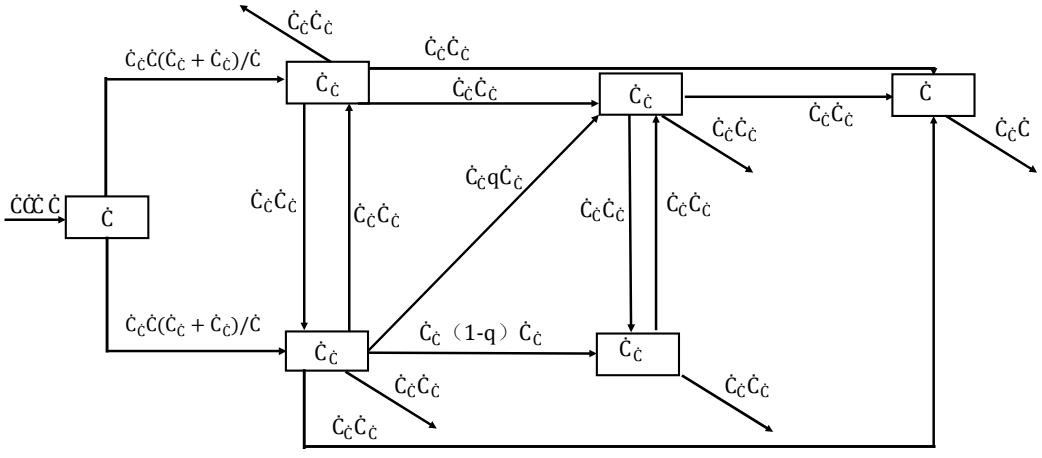

**Figure 2: the schematic diagram of model**

S is the susceptible population, E1 is the population exposed to mild anxiety disorder, E2 is the population exposed to severe anxiety disorder, C1 is the population exposed to mild anxiety disorder, C2 is the population exposed to severe anxiety disorder, and T is the population that has been cured

$$\begin{cases} \frac{dS}{dt} = b(N) - \frac{S}{N}(\beta_1 C_1 + \beta_1 E_1 + \beta_2 C_2 + \beta_2 E_2) \\ \frac{dE_1}{dt} = \frac{\beta_1 S(E_1 + C_1)}{N} - (\gamma_1 + \gamma_4 + \alpha_1 + \mu_0)E_1 \\ \frac{dE_2}{dt} = \frac{\beta_2 S(E_2 + C_2)}{N} - (\gamma_2 + \gamma_5 + \alpha_2 + \mu_0)E_2 \\ \frac{dC_1}{dt} = \gamma_1 E_1 + \gamma_2 q E_2 + \delta_2 C_2 - C_1(\delta_1 + \gamma_3 + \mu_0) \\ \frac{dC_2}{dt} = \gamma_2(1-q)E_2 + \delta_1 C_1 - (\delta_2 \mu_0)C_2 - (\gamma_5 \mu_0)E_2 \\ \frac{dC_2}{dt} = \gamma_4 E_1 + \gamma_3 C_1 + \gamma_5 E_2 - \mu_0 T \end{cases}$$

Through the above table and calculation formula, we can discuss the mechanism affecting emotional anxiety from the following Angle.

From the perspective of personality traits, neuroticism is significantly positively correlated with emotional anxiety, and neuroticism can significantly positively predict emotional anxiety, which indicates that emotionally unstable individuals are more prone to depression, and there are individual personality differences.

From the perspective of individual psychological characteristics, emotional anxiety and self-efficacy have significant negative correlation; Emotional anxiety is positively correlated with perfectionism. There was a significant negative correlation between resilience and emotional anxiety, and emotional regulation strategy played a mediating role in the mechanism of the influence of resilience on emotional anxiety.

From the point of the way of individual to cope with anxiety, Qin Jie study of medical students, found that positive coping styles can significantly reduce the anxiety, and negative coping styles will aggravate anxiety, hui-hui wang and others found that self-blame, fantasy, and retreat (immature coping styles) significantly positively predict anxiety, However, problem solving (mature coping style) significantly negatively predicted emotional anxiety [4].

Eeg studies have also verified the physiological phenomenon of emotional anxiety: the abnormal alpha wave (8-12Hz) may be closely related to the cognitive impairment of anxious individuals, and emotional anxiety is also related to the external environment in alpha-1 (8-10Hz) and alpha-2 (10-12Hz) indicators.

## 4. The calculated

General self-efficacy can not directly affect mental health, but can also be indirectly realized through coping styles. It is feasible to discuss the influence of self-efficacy and coping styles on mental state. In the process of hypothesis and deduction of the above table, We can find that the mediation effect showed that coping styles of problem solving, remorse and moved between self-efficacy and anxiety = partial intermediary effect, shows that people's self-efficacy not only directly affect their anxiety, you can also through the ways of solving problems, self-accusation, retreat to influence the registration of anxiety, and studies have shown that People's own self-confidence can not only directly negative predict anxiety, can also plays a role of indirect through coping styles, that the more confident in myself in a strange environment, to take effective coping behavior, this behavior is good for its ability to adapt to the environment and effect, leading to the individual perceived less anxiety level.[4-5]

Hypothesis 1: Self-efficacy significantly negatively predicts emotional anxiety

Hypothesis 2: Self-efficacy significantly positively predicts positive coping styles and significantly negatively predicts negative coping styles

Hypothesis 3: Positive coping style significantly negatively predicts emotional anxiety, while negative coping style significantly positively predicts emotional anxiety

Hypothesis 4: Coping style plays a mediating role in the relationship between personal self-efficacy and emotional anxiety

## 5. Research ideas

First through the thinking of "top-down", literature analysis to the above form, the summary anxiety, anxiety research, through the "bottom-up" of contemporary young individual sampling ten semi-structured interviews, and interviews based on grounded theory USES encryption model to text encoding, through continuous summary and refining, build the conceptual model anxiety.[6] On the basis of the model, a database of items affecting anxiety was constructed.

Secondly, a student group, a psychology research group and an expert group were formed to evaluate the item database in turn, examine the expression of the questions and the division of dimensions, and further optimize the questions to form the initial version of the anxiety scale.

Then, the initial test of the online scale was conducted. After retrieving the data, SPSS25.0 was used for data analysis, including item analysis, exploratory factor analysis, reliability and validity teaching and research, and the results that did not conform to this study and calculation were excluded.

Finally, the online test was conducted again. After retrieving the data, SPSS25.0 and Amos24.0 software were used for confirmatory factor analysis, reliability and validity analysis, and the structure and scientificity of the formal scale were tested.

## 6. Calculation process and results

**TABLE 2: The detail of coding**

| The first Level of coding | The second Level of coding |
|---|---|
| Physiological emotional arousal | Physiological reaction<br>Emotional response |
| Independent behavior in the environment | The ability to learn<br>Pay attention to the scattered |
| Social concerns | Others belittled<br>Other people disappointed |
| Self assessment | Social competition<br>Social comparison<br>Self criticism |

The anxiety model was established in this study, which was based on the latest theory and the actual calculation, which not only conforms to the theoretical view, but also carries on the local optimization and supplement. The formal scale was built on the model, and conforms to the view of the five dimensions of the model.

Specifically, the physiological emotional arousal dimension includes physiological response and emotional response. Physiological reactions express a series of uncomfortable physiological reactions of people, such as headache, chest tightness and shortness of breath, while emotional reactions represent people's emotional fluctuations in a certain period of time.

In general, the research has constructed new theoretical models and representative psychometric tools, which provide clear definitions and effective tools for understanding and measuring emotional anxiety. It helps that people with any level of anxiety will eventually get over it.

We can also extrapolate different levels of emotion into the following formula.

Suppose D is a fixed factor affecting the degree of anxiety, S is the initial prototype, E1 is mild and lover patients, E2 is severe anxiety patients, we can find that they are closely related to the environment, and severe anxiety patients are affected by a wider range of factors, and are more difficult to heal. C1 refers to the coping measures adopted for patients with mild anxiety, and C2 refers to the coping measures adopted for patients with severe anxiety. T patients who have been cured without a series of treatments.

$$\begin{cases} \frac{d_S}{d_t} = b(N) - \frac{S}{N}(\beta_1 C_1 + \beta_1 E_1 + \beta_2 C_2 + \beta_2 E_2) \\ \frac{dE_1}{dt} = \frac{\beta_1 S(E_1 + C_1)}{N} - (\gamma_1 + \gamma_4 + \alpha_1)E_1 - \theta E_1 \\ \frac{dE_2}{dt} = \frac{\beta_2 S(E_2 + C_2)}{N} - (\gamma_2 + \gamma_5 + \alpha_2)E_2 - \theta E_2 \\ \frac{dC_1}{dt} = \gamma_1 E_1 + \gamma_2 q E_2 + \delta_2 C_2 - C_1(\delta_1 + \gamma_3) - \theta C_1 \\ \frac{dC_2}{dt} = \gamma_2(1-q)E_2 + \delta_1 C_1 - \delta_2 C_2 - \gamma_5 E_2 - \theta C_2 \\ \frac{dT}{dt} = \gamma_4 E_1 + \gamma_3 C_1 + \gamma_5 E_2 - \theta T \end{cases}$$

## 7. Conclusion

In general, through the analysis and calculation of patients with anxiety regardless of degree, we improved people's anxiety level through three steps of "measure-perception-coping". Firstly, we measured the degree of anxiety and the performance intensity of different dimensions through the scale. By measuring results, the relevant personnel and professionals can clearly aware of the degree of anxiety and specific performance, such as mood swings on environment independent behavior dimension is bigger, normal in other dimensions, as some on the one hand, the behavior of the table for the channel and improve, in the end, through a series of actions to cope with the listing, To improve positive coping behaviors and avoid or reduce negative coping behaviors by referring to some clinically effective coping suggestions and successful cases of solving anxiety disorders.

In summary, we aimed to classify people with emotional anxiety into those with mild anxiety and those with severe anxiety according to their level of anxiety. Through the analysis of the factors affecting their anxiety degree, the formula calculation is carried out, so that in the process of compiling the scale, through the calculation process and the results of the discussion, the deepest content of the study is expanded, and the emotional anxiety group is diversified. Further research will be made on the measurement of these groups, and subsequent research can also be further explored on the basis of the theoretical framework of this study. Different levels of anxiety may have different effects on mental health. Future studies can discuss the extent to which different levels of emotional anxiety affect mental health, so as to more accurately understand and solve the effects of emotional anxiety. The ultimate goal is to cure patients with different degrees of anxiety.

Highlights

·Emotional contagion is an important way of spreading anxiety

·Proposed a compartmental model including vulnerable

people who stay in a mildly anxious environment and those who stay in a severely anxious environment
·Study of the effect of emotional infection on anxiety disorders when staying in different fixed environments

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