

## Study of the Subjective Aspects of Anxiety by the Means of Modal Logic

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### Abstract

Anxiety may cause so many physical symptoms that it confused classical authors, until a specific category called “Generalized Anxiety Disorder” (GAD) was set up.

The aim of this study is to unveil the subjective aspects that provoke and remain the symptoms of anxiety. To achieve this, we have selected a sample of patients diagnosed with GAD and applied them the *Categories of modal logic*. As a result, participants went through these categories, fulfilling what we have named the “*Modal circuit of anxiety*”. It is a path that leads them to “*The impossible*”, a place where the most disturbing symptoms appear. Understanding this and avoiding fall into the lure of physical manifestations (as classical authors did) provides a new vision that allows us: a) the return to the starting point b) to work on the prophylaxis of this disorder in individuals who undergo excessive burden.

**Keywords:** Anxiety symptoms; Modal categories; Diagram of apuleius; Square of opposition; Neurosis of anxiety; Generalized anxiety disorder; Modal circuit of anxiety

### Introduction

It is known that anxiety is a disorder that may cause a wide range of physical manifestations. These symptoms deceived classical authors (Da Costa, Mc Lean, Osler, Barlow, Wilson, Mc Kenzie, etc.) into believing that they were dealing with cardiac, neurological or endocrine disorders [1]. Therefore, they gave different names to this condition such as neuro-circulatory asthenia, topology, soldier’s heart, neurasthenia, irritable heart, etc. Consequently, the term “anxiety” had a late inclusion in the psychiatric terminology.

These approaches led to a number of theories and mixed diagnoses (both organic and psychic), being present during this period, a lack of truthful knowledge about the inception of this state. It was not until 1894 when Freud settled the term “Anxiety Neurosis”, replacing previous denominations [2]. He conceived it as a differentiated disease, establishing a diagnosed condition that has lasted till now-a-days [3].

In the decade of the 1960’s, Klein [4] distinguished two categories within the Freudian anxiety neurosis: “*generalized anxiety*” and “*panic attack*”. This differentiation was an innovative approach that had his consequences in the publishing of the DSM-III (in 1980) where first appeared the “Generalized Anxiety Disorder” (GAD). Initially it was a residual category but in later editions it was introduced as a well differentiated diagnostic entity [5,6]. Doubts were raised around its validation as an isolated category in respect of other anxiety and mood disorders, and also about its high level of comorbidity [7].

Still more, It is been differentiated between anxiety as a “feature” and anxiety as a “state” [8]. The first refers to personality or anxious nature [9] where the patient acts together around these manifestations which become their guiding axis, even if it is not their will [10]. Anxiety as a “state” makes reference to the presence of the symptoms at a certain clearly defined point and it is included in the frame of “*the generalized anxiety*”.

This second case is characterized by the existence of various manifestations, both mental (worry, apprehension, restlessness, feeling to the limit, derealization, difficulty concentrating, insomnia, irritability, etc.) and somatic. The somatic manifestations are related to the muscular system (tension, headache, tremor, anxiety, etc.) or the autonomic nervous system (dry mouth, sweating, urinary frequency, nausea, diarrhea, bloating, hot flashes, etc.). All these modifications

are usually associated to certain circumstances, activities or life events considered minor, but they are reason for excessive suffering to the patient. Among them, we find: work or school performance, domestic economy, social relationships, health and safety of loved ones [7]. As a distinctive trait, there is a loss of control over the symptom which seems to take over them.

We are aware of the great extent that “anxiety” presents in clinic, as it cannot practically be named a single psychiatric condition in which it does not appear. We do not intend being drawn into the “extension” of this disorder, but by its “intension” to gain in-depth study. Hence we will focus on those clinical profiles where the clinical manifestations of anxiety are practically exclusive. For this approach, we have selected a group of patients diagnosed with GAD whose symptoms show a testable diachrony and have not experienced a critical or paroxysmal state. We have always taking into account that, at some points, symptoms of anxiety may reach such levels of intensity that can be mistaken for panic attacks.

In this project, we will not only stay in the symptoms of anxiety but also we will seek those (subjective) elements that cause, stabilize and/or aggravate them. To achieve this, we will apply the “*Modal logic*” as analysis approach. This method is a current branch of the aristotelian paradigm, denominated “*Classical logic*”, and also implies an extension of it [11]. Indeed, while in the *Aristotelian logic* propositions can only be “true” or “false”, in “*Modal Logic*” there are more than two truth-values [12]. The beginning of “*Modal logic*” are found in a work published by Lewis in 1918, titled “*A survey of symbolic logic*” [13] in which his author draws up a real “*Modal calculation*” that set the basis for later developments as the works of Carnap, based on semantics [14], or those from several theorists that presented the modal calculation as we know it today. [15-17].

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## Material and Methods

The material consists of a series of patients diagnosed with GAD (Total: 12 cases, between 23 and 50 years) with which we have performed a psychotherapeutic approach at the Psychopathology and Psychoanalytic Association of Seville (APPS). None of them consumed toxic substances or showed organic pathology that justified the medical profile. We will present only 2 cases from these series in order to shorten the exposure, considering that all expounded of them can apply to the rest.

### Case no 1 (P-1). Male, aged 26

He displays constant nervousness, restlessness, insomnia, breathlessness and headaches. He works in a law firm since completing his law studies. He feels that he is learning the practice of his profession, but has to spend many hours a day and cannot leave without finishing any of the tasks entrusted to him. In addition, he has enrolled in a course on tax legislation, attending daily after leaving the firm (20 to 21.30 h.). He is also busy on weekends with a master that involves fulfilling readings and homework. In the latest months he has presented a worsening of the symptoms.

### Case no 2 (P-2). Female, aged 40, married, a 15 years old son

She is a cashier at a supermarket. She is nervous all day, always tense, irritable, and unable to sleep. When she gets worse, she feels pain in the “pit of the stomach” and inability to relax muscles. She complains about having to do too many chores at home without the help of her husband or son. She feels “Like a robot” doing these chores and cannot stop to rest. In addition, on weekends she has to help out at her parents’ house as “They are quite old”. Lately, she is getting worse and cannot understand why she is incapable of doing those tasks that earlier she used to perform “perfectly”. She sees herself as a quite clean person who does not tolerate untidiness, always need to be doing something, does not like asking for things, always take things to heart and feels that never gets anything in return to her devotion to others.

Patients treated, declare not to know what their symptoms are due to. Only after a psychological work, they are able to connect anxiety with the circumstances they are involved in.

Our approach is based on the analysis of the cases by applying the “Modal logic”. We start the process with the attentive listening to the patient, free of critical or evaluative aspects by the observer, like we set out in other work [18]. We will apply the “Modal categories” to the verbal expressions of patients in the same way they are defined in the Modal Logic theory (11). These categories are: “Necessary”, “Possible”, “Impossible” and “Contingent”, and they can be located in the so-called “Square of opposition” or “Apuleius diagram” (Figure 1).

Next we will expound the definition of these four categories [19]:

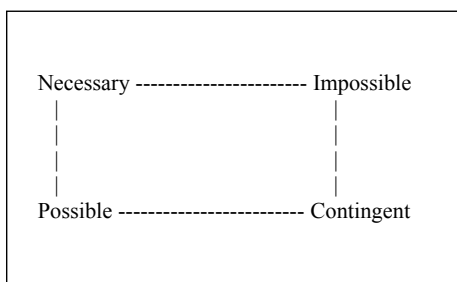


Figure 1: Apuleius diagram.

**-Necessary:** What unavoidably has to happen and/or cannot happen otherwise. Its also said that it is necessary what “is always true” and cannot stop being despite the changes.

**-Impossible:** What cannot be/exist in any way. Also what “is never true” although the conditions are amended.

**-Possible:** What can exist/happen, but not unavoidably. What “is sometimes true”

**-Contingent:** What is neither necessary nor impossible, Both propositions may happen (exist) or not (exist). Their realization, so as their lack of realization, is possible. It can be expressed as “what may be true or not.”

Next, these four categories will be applied to the verbal expressions of patients and we will see how findings are useful both for the understanding of the cases and the psychological treatment provided.

## Results

As we have seen, patients follow a characteristic route through these four categories. However, for them is not obvious and it is performed as follow:

### Starting from “the possible”

At the beginning, the subject locates themselves in the “possible pole”. It means that they can do certain activities because they have time, energy, occasion and they feel comfortable enough when doing them, without any disturbance appear (P-1: “When I was at college, I used to study a lot and I got good marks, but I didn’t feel like this. By that time, I wasn’t breathless like now nor had such a bothering unease, neither I felt the punch that I have on my breast now. In a few words, I was comfortable with what I used to do”. P-2: “In the past, I didn’t use to feel as bad as now. I used to do the housework but I wasn’t overwhelmed neither exhausted. I had time for everything and I was happy”).

### Continuation to “the necessary”

In a second stage, a movement towards the “necessary pole” occurs and everything that used to be carried out because it was doable now becomes self-imposed. They no longer operate within the scope of will but within the scope of obligation, disappearing any kind of spontaneity in their acts. This comes accompanied by some loss of inner freedom which, under normal conditions, would lead to make decisions without too much pressure. Hence the constant need to take action, feeling bad if they do not act as they think they should (P-1: “Something inside, I don’t know what it is, tells me that I have to go on without losing strength. P-2: “It seems as if I am being told to go on, and nonstop”).

Under these conditions, the individuals involved are ruled by an “inner law” from which they cannot escape, and that makes pressure from their inside, preventing them from stop doing what they “have to do” (P-1: “I can’t live in peace... I can’t, because I have so many things to do. That it’s impossible for me. I can’t stop.” P-2: “I can’t stop doing what I’m working on. I ask myself: would I like to be calm, and I answer that I would. But I can’t. Do you understand me? It seems something contradictory”).

Those tasks that might be pleasant or enjoyable turn into a burden, with their consequences. Besides, we found a mismatch between their expectations and their achievements, as they always want to do more than they can. This characteristic can drive them from a non-irritating level of activation (that sets them in motion and is useful) to a different mode characterized by preventing them from doing their tasks

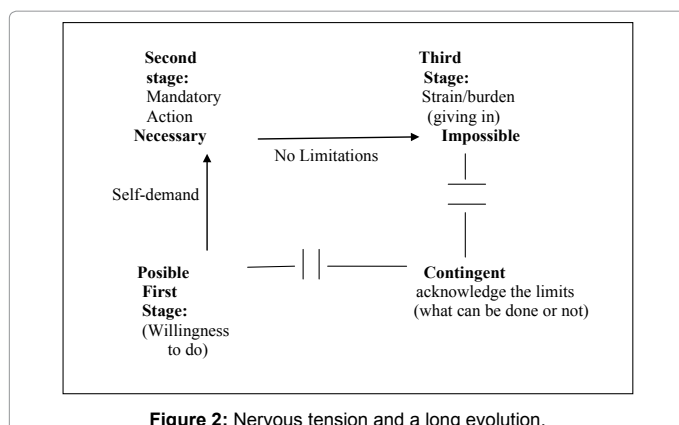


Figure 2: Nervous tension and a long evolution.

properly. The latter, is the special moment in which the symptomatic manifestations hatch out. Nevertheless, it is possible (and so we have verified) that patients may learn to live with nervous tension and suffer a long evolution, tolerating beyond words (Figure 2).

### Arrival to “the impossible”

In a third stage, the patients approach to “the impossible” what implies they cannot stand the situation any more. Then, the overload (the giving in) mentioned above appears, in which we are going to stop. The move from the second stage (“the necessary”) to the third one (“the impossible”) is based on the fact that the subject is unable to stop this process and this happens due to, at least, three reasons: a) a self-pressure without control, so that very often it turns out to be merciless, given the deplorable state in which they are. b) They are incapable of identifying the physical signs of weariness as they are too much involved in their duties. This physical signs cannot be revealed as conscious. The latter makes contrast with the fact that patients remain hyper-alert and they barely get to sleep. c) They do not notice fatigue and do not rest. In addition, since its own demand, any kind of resting (laying down, sleeping, watching a movie, stop for a while, etc.) is a lamentable waste of time (P-1 “I think that today’s world is very competitive and, if I stay still, I’ll be overtaken, so I can’t waste a second”. P-2. “Resting? ... I’ve never done it, because I have much to do... If I stop, I have time for nothing... with all I have to do, I can’t afford to take a nap, though I know it’d make me good”). Not even sleeping is restful, as they continue in bed mulling over their remaining tasks to be done; it is an effect of “non-completion” (Zeigarnik) or a pending-final story (cliffhanger) that does not allow them to rest.

Concurrently, they face so many tasks to accomplish that they struggle with a great difficulty to process them mentally, as there is no time to represent and give them meaning and order. This causes an overload that can be extended to the muscular and / or visceral level. In other words, there is no a neutralization of stress by the means of thinking, that allows them to prioritize and allows to stop. Thus, there is a loss of control over actions and thoughts. Therefore, reaching “the impossible” means that the person involved has not set the limits of their own excesses, prevailing the presence of a beaten body whose owner has no mercy with themselves. It is not infrequently that this state is accompanied by irritable and/or depressive dysthymias, time in which, unfortunately, many patients attend to therapy after many months of tension and struggle (P1: “I Wish I could go on, but it is not possible. I’d say I can’t stand it anymore. I’m really exhausted ... There are times of the day that I can’t move a muscle”. P-2: “It’s impossible to carry on. I can’t go on anymore. I’ve been so long like this, that my

body doesn’t respond. Although they see me in this state at home, they don’t give me a hand. This makes me feel more nervous, and can’t go out of that).

Vallejo [20] has expounded the symptoms that appear by that time (sadness, apathy, fatigue, lack of interest, loss of vital impulse, etc.), which reveal the “give in” of the protagonist of this sad story, showing a great closeness to the clinic manifestations of depression. Therefore, if all the elements that we are considering are not taken into account, the diagnose may be erroneous. The dysthymic manifestations (irritable or depressive) also have a powerful support on the fact that these individuals cannot tolerate being unable to face their duties (P-1: “When I realize that I can’t do a writing because I’m exhausted, or I can’t pay attention, or I’m sleepy ...I get really sick...very nervous”. P-2: “Seeing all the things untidy makes me get bad, I think I feel more uneasy ... Finding out that I can’t do things as I used to do them before, makes me feel terrible ... anyone who saw me with everything undone would say I’m worthless”).

Confronting the sad situation of “I can’t stand any more” and having to admit they are not as powerful as they thought, is unbearable. Likewise, not accepting the signs of tiredness implies they are not allowed to get tired. If it happens, they are worthless or useless. It is a mordant ruthless self-criticism.

Just at the time of “giving in”, they face impotence. That is to say, despite their efforts, they cannot get what they had set in their mind (P-1: “I’m thinking about leaving everything cause, being incapable of doing anything right, is the end”. P-2: “There’s a time when I see that I can’t do anything right and, then, I wish to die”). Behind those attitudes, we see individuals with a great omnipotence that have the idea of being all-powerful. Before such high expectations, it is easy to fall, after certain bearing mechanism.

An additional characteristic that aggravates this process is that they feel self-sufficient and, although they complain constantly, they reject any kind of help or support. Asking for help might indicate they are able to do nothing, calling into question their worth (P-1: “Sometimes my brother has offered me help with some of my activities, since he has free time, but I have refused”. P-2: “I’ve never asked for help to anybody. On the contrary, I’m more like helping others. I know this is contradictory because I’m always complaining that no one helps me”).

Their display of activity turns others into inactive or useless beings, so that they gain the benefit of feeling magnificent, as they reinforce the idea that they can do everything without help. It can be said that they complain about what they really search for: to do everything without downloading weight, thinking that they do everything better than anyone (P-1: “I think that, if my brother helped me, he’d do it badly. He’s a little bungler “. P-2: “At home, nobody knows how to do anything. I have to do everything, and that annoys me.” “Every time my husband has helped me out, he has left things everywhere”). It is no wonder that they transmit such contradictory messages to those who live with them.

In addition, they give importance in excess to all they do, so that their tasks result crucial and nobody is able to do them, when actually, they could be done by anyone.

### The impossibility of “the contingent”

Remains to add that, in the categories of “necessary” and “impossible”, the anxious person is unable by themselves to return to that initial position (“the possible”) where there is no such self-demanding. This implies the spontaneous irreversibility of the clinical profile (P-1: “What is happening to me now is terrible, and I miss those

times when I was calm and I could clear my head. I don't know why I can't do it now". P-2: "In the past, I was able to stop and I used to do it. I used to go to my neighbour's home, sometimes, to have a coffee with her, and I got relaxed a little, but now I can't get it").

An important detail that characterizes these patients is that they can never reach the fourth category, denominated in *Modal Logic* "Contingent". Such a phenomenon can be explained by the definition itself of this fourth position: "what is neither necessary nor impossible", i.e. a place where there is freedom of action because the two poles (necessary-impossible) are not present. In that position, individuals can identify what they are able to do or not, and set the limits.

We get an important therapeutic consequence from this analysis: psychotherapy should drive the patient to this place (contingent), which prevents them from following the route studied.

### The "modal circuit of anxiety"

We have named "*Modal Circuit of Anxiety*" the route that the patient follows through the *logical categories* and it allows us to explain: a) the state in which the patient attends to consultation, and b) how they have come to that state. This circuit connects well with the structure of *Modal Logic* since the latter allows us to study the changes or transitions from one state to another (11); hence the model we have created for understanding anxiety is dynamic.

### Discussion and Conclusions

In this research, we aim to clarify some clinical phenomena related to anxiety by applying the *Modal Logic*. They are two distant territories *a priori* that, after the route followed, we have been able to match each other. This distance is due to Logic has traditionally dispensed with Psychology. However, the contemporary epistemology favors the intersection of fields. Moreover, it is considered that one discipline can advance more effectively in their development by using elements from the other [21].

The study undertaken has been possible since patients diagnosed with GAD show very similar subjective processes. This similarity was verified by the statements obtained from the sessions. We observed then that these statements match up quite well with the categories described by *Modal Logic*, and this enabled us to understand how patients move in a dynamic circuit.

The modal logic was revealed as an excellent method for dealing with anxiety due to: a) Anxiety is not a static phenomenon, but it shows fluctuations since its beginning. b) With this type of logic, a succession of states can be studied and even can be represented the middle or final conditions of a process. In fact, the *Calculation Situations* was developed from *Modal Logic*, as the transformation of one "state of the world" into another different [22].

It draws attention the fact that, despite the clinical evidences that support these moves and the elements that drive them, the patients were unable to recognize the reasons of their symptoms at the starting interviews. An unknown that becomes clear, as sessions go by. Meanwhile, we listen to the most varied explanations relating to the organism ("this must be geneti,", "I have a brain damage", "I need a checkup" etc.) which actually are very similar lures to those that confused pioneers when they described anxiety presenting it as an organic phenomenon [1].

The anxious person follows a characteristic route that starts at the pole of "possible" from where they forced themselves to take actions

and get involved in more than they can afford. Anyway, they are still the owner of their will. But things do not remain there, as the subjective organization of the anxious person pushes them to follow the complete route.

The translation towards "the necessary" is in the scope of self-imposition, which moves the axis of their actions from "voluntary" to "mandatory". This means keep "pushing de machine", due to their own idiosyncrasies. Obviously, the individual is not aware of the high demands that they self-impose and that, at the end, will lead to "pathos". If they were conscious, they would (voluntarily) stop the move along the different poles and the process would not escape their control.

Hence it has been said that the anxious person does not know the "object" of their emotional response, while the phobic person knows it well. The latter are able to use avoidance maneuvers. This does not happen with anxious individuals, as their true basis is "internal" and that results in performing at their best, even if the body blows up.

By being subjected to such "self-demanding", patients reach "the impossible". This means a crash with the physical reality of their body, now unable to respond. Even so, it is surprising the great endurance of these people, after so much time of relentless struggle. Anxiety makes its appearance when they are overwhelmed, while facing the "I can't stand no more". This feeling (impotence) does not please them because it makes them feel useless, incapable, weak, lazy, etc. This leads to attack themselves implacably what, obviously, worsens the symptoms.

They are constantly attempting to "do it all" and showing themselves that are all-powerful, over their capabilities, and never delegating in anyone - by thinking (overestimating) they make things better than anyone-. A deeper analysis of this phenomenon would lead us to include the role that play on it the "ideal" and "metaideals" [23].

The "contingent" category is just the place they cannot access to. This is because they do not know their own limitations. They do not know how many tasks they can perform, how much energy they can put in them, or how long they can afford making them relentlessly. Admitting their own limitations implies, within their subjective coordinates, questioning their self-worth by connecting their realizations with their high expectations. It is no wonder that, those who are around them, are deceived by their "staging", the strength they display and their "not accepting" they can be exhausted as anyone.

If we take into account this fourth stage, it seems that we are talking about the structural failure of a concept ("limit") or a category ("contingent"). This raises the question of whether, in many of these cases, we are before a personality disorder. The presence of those ones (concept/category), involves a real milestone in the disappearance of the clinical anxiety. In any case, this point opens up the possibility, within the framework of psychotherapy, of representing subjectively the limit and disconnecting it from any wrong meaning ("useless", "disability", "laziness", etc.). Technically, this work is not easy, as the patient usually justifies their behavior, on the grounds that it is necessary for that place and for that activities, because the others do not do it well. Obviously, it is better, for the ego of an anxious person, to believe that they can do everything or that they have the gift to fight on all fronts [24,25].

In this context, we must be careful with the use of psychotropic drugs. Sometimes, they may come to be counterproductive because they can allow patients to follow the same routine and even trying to do a lot more, as they feel more relaxed; if not, they persist in their attitude, evidencing that the drug is not useful. However, admitting the underlying mechanisms and, more than anything, how far they can get,

causes a surprising clinical improvement but, in this work, we have to be patient because, as Anatole France said, "All changes, even the most desired, imply a certain melancholy, because, what we leave behind, is a part of ourselves".

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