Dentre os distúrbios psiquiátricos, a ansiedade é o mais prevalente ao longo da vida. Diante deste transtorno ocorrem mudanças nas particularidades comportamentais e neurológicas dos acometidos. A variabilidade da frequência cardíaca (VFC) e seus índices buscam compreender as oscilações entre os intervalos R-R dos batimentos cardíacos, que são resultado da forma atuante do Sistema Nervoso Autônomo (SNA) sobre a FC. A análise da relação da ansiedade e variabilidade da frequência cardíaca (VFC) em graduandos na apresentação de trabalho de conclusão de curso (TCC). Trata-se de um estudo quase experimental com características quantitativas. A pesquisa foi realizada em uma instituição de ensino superior, na cidade de Juazeiro do Norte, Ceará, antes e após apresentação de trabalho de conclusão de curso. Os sujeitos da pesquisa foram 30 alunos de ensino superior do curso de Farmácia. A VFC foi medida posicionando no tórax dos voluntários, na região do terço distal do esterno, a cinta de captação e, no punho, o receptor de frequência cardíaca Polar RS800CX (Polar Electro, Finlândia). Para análise dos índices de VFC a frequência cardíaca foi registrada batimento a batimento durante todo o procedimento da coleta de dados com uma taxa de amostragem de 1000 Hz. Foram utilizadas séries com 256 intervalos estáveis. Os índices do domínio de tempo e frequência permaneceram inalterados, o que indica boa adaptação fisiológica do organismo frente às situações de estresse. Os alunos não apresentaram mudanças significativas na VFC antes ou após as apresentações, o que sugere um condicionamento para a influência da ansiedade no controle do SNA sobre o coração. As apresentações dos TCCs não causaram alterações na modulação autonômica cardíaca dos estudantes. Entretanto, verifica-se aumento das pressões arteriais sistólicas após as apresentações dos TCCs quando comparadas aos valores iniciais antes das apresentações.

Palavras-Chave: Ansiedade; Frequência cardíaca; Sistema nervoso autônomo.

ABSTRACT

Among psychiatric disorders, anxiety is the most prevalent throughout life. Before this disorder occur changes in neurological and behavioral characteristics of affected infants. The heart rate variability (HRV) and their indices seek to understand the oscillations between the R-R intervals of heartbeats, which are a result of the active form of the Autonomous Nervous System (ANS) on the HF. To

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analyze the relationship of anxiety and heart rate variability (HRV) in graduate students in the presentation of course completion work (TCC). This is a quasi-experimental study with quantitative characteristics. The research was conducted in a higher education institution, in the city of Juazeiro do Norte, Ceará, before and after presentation of work on completion of the course. The research participants were 30 students of higher education in the course of Pharmacy. The HRV was measured by placing on the chest of volunteers, in the region of the distal third of the sternum, the strap of capture and, at the fist, the cardiac frequency receiver RS800CX Polar (Polar Electro, Finland). For the analysis of the HRV indices of the heart beat-to-beat was recorded during the whole procedure of data collection with a sampling rate of 1000 Hz. There were applied series with 256 stable intervals. The indices in the time domain and frequency remained unchanged, which indicates good physiological adaptation of the body before situations of stress. The students showed no significant changes in HRV before or after the presentations, what suggests an air conditioning for the influence of anxiety in the SNA control on the heart. The presentations of TCC did not cause alterations in the cardiac autonomic modulation of the students. However, there is an increase of the systolic pressure after the presentations of TCC, when compared to initial values before the presentations.

Key words: Anxiety, Heart rate, Autonomous nervous system.
INTRODUCTION

Anxiety has the highest lifetime prevalence among all psychiatric disorders. This condition is described as a state of emotional discomfort that changes the neurobehavioral characteristics of individuals. It is triggered by external factors, such as stress, but is linked in its entirety to the internal factors as experiences, fears, personal ideas, among other things.

In this way both the exaggeration in the planning of future scenarios, and the reissue of past situations that were taken as trauma may trigger anxiety. Depending on the levels achieved by this disorder, some individuals tend to acquire difficulties with social activities, even the most simple as dialog. This inhibition generates a framework of inability to perform daily activities, which causes a detrimental impact on quality of life, becoming a lock for personal development.

The higher education students go through a process of teaching and learning that is directly connected to cognitive and emotional characteristics. Thus are likely to trigger anxiety in certain moments, before independence in the resolution of the academic demands and possible doubts and disappointments about the chosen career.

Because anxiety is also characterized by a feeling of tension, it can intervene in the modulation of the autonomic nervous system (ANS) on the electrical conduction system connected to the heart, which will determine the intensity of the heart beats.

In this context, the heart rate variability (HRV) is presented as an indicator for the screening of some normal and pathological conditions. The HRV indices comprise the oscillations between the R-R intervals of heartbeats that are a result of the active form of the Autonomous Nervous System (ANS) on the performance of the heart.

Thus, the ANS exercises control of the cardiovascular system by means of transmissions by the nerves connected to the heart, the ANS uses the information sent by the baroreceptors and chemoreceptors, atrial and ventricular receptors, and from them, handles and triggers changes in various compensation systems: changes in the respiratory system, vasomotor system, renin-angiotensin-aldosterone system and thermoregulatory system.

The heart rate (HR) is connected next to the baroreceptors’ activities, to this neuronal control. The sympathetic nervous system is related to the increase of HR, while the parasympathetic nervous system with the decrease of frequency. The heart rate variability (HRV) reported variations in the intervals between consecutive heartbeats (R-R intervals). These beats are related to the influence of the ANS over the control of the sinus node.

What is the relationship between heart rate variability (HRV) and anxiety in students in the presentation of course completion work (TCC)?

Anxiety leads individuals to a state of tension and causes changes in the indices of heart rate variability compared to a healthy individual and that is not in that condition, linking this to a state of alert, and thus causes the prevalence of sympathetic conduction. The method to analyze the HRV can become promising to correlate anxiety in studies that seek to diagnose and treat it. Since the HRV is a noninvasive method and popularly the diagnosis of this disorder is given a verbal form, based on what the person under this condition responds.

Thus, the HRV can be a method of diagnosis in individuals with anxiety disorder.

The objective of this study was to analyze the relationship of anxiety and heart rate variability (HRV) in graduate students in the presentation of course completion work (TCC). In addition, to describe major changes in the autonomic indices analyzed during the presentations.

METHOD

It is a quasi-experimental study with quantitative characteristics. The research was conducted in a higher education institution, in the city of Juazeiro do Norte, Ceará, before and after work presentation of completion of undergraduates. The study took place in 3 times (T1, T2 and T3), being T1 at least two days before the presentation, T2 between one and two hours before and T3 shortly after the presentation of the TCC.

The research participants were 30 students, 26 women and 4 men of an average age of 26 years old, enrolled in higher education in the course of Pharmacy of an Institution of Higher Education, having as inclusion criterion: students aged 18 to 50. Exclusion criteria included patients smokers, overweight, and obese, and patients with allergic disease. Because these conditions alter the cardiac autonomic modulation, having in view that have the ability to change the heart rate, acting on the sympathetic and parasympathetic nervous system, influencing the HRV. As well as individuals with cardiorespiratory disorders, neurological and other commitments known to prevent the subject performing the procedures. Before data collection, the research participants were instructed not to eat alcoholic beverages and caffeine approximately 24 hours prior to the assessment.

The collection was performed individually in different times of the day, according to availability of participants, and the volunteers were guided to remain at rest and avoid conversations during data collection. After the initial procedures, there was placed on the chest of volunteers, in the region of the distal third of the sternum, the strap of capture and, at the fist, the cardiac frequency receiver RS800CX Polar (Polar Electro, Finland). After placing the strap and the monitor, there was initiated the protocol.

For analysis of the HRV indices of the heart frequency there was recorded beat-to-beat during the whole procedure of data collection with a sampling rate of 1000 Hz. There were used series with 256 stable intervals, as recommended by the Task Force of the European Society of Cardiology and the North American Society of Pacing and Electrophysiology (1996). In these series there were performed digital filtering and manual for elimination of premature ectopic beats and artifacts, and only those with more than 95% of sinus beats will be included in the study.

For HRV analysis in the frequency domain there were used for the spectral components of BF (0.04-0.15 Hz) and AF (0.15-0.40 Hz), in ms^2 and standard units. The spectral analysis was calculated using the algorithm of Fast Fourier Transform. The analysis in the time domain was performed by means of the indices SDNN (standard deviation of the average of normal RR intervals) and RMSSD (square root of the average square of differences between adjacent normal RR intervals). After collection, the RR intervals were exported to the HRV analysis.
Participants who agreed to participate in the study signed an Informed Consent Form (ICF), where they were informed about the objectives and stages of research. This study was submitted to/and approved by the Human Research Ethics Committee of the Faculty of Juazeiro do Norte/FJN (CEP/FJN), and complied with the ethical principles of Resolution 466/12 of the National Health Council, the Ministry of Health.

There was determined initially the normality of the data through the Shapiro-Wilk test. Being accepted the normal distribution; we used the Student's T test. In situations in which the normal distribution is not accepted, it will be used the Wilcoxon test. Differences in these tests were considered statistically significant when the value of "p" it was less than 0.05. The statistical program used was the software Biostat® 2009 Professional 5.8.4 for Windows.

The physiological measures, blood pressure and heart rate variability were used to measure anxiety, the latter being markers for discovery of disorders of our body.

**RESULTS AND DISCUSSION**

Table 1 shows the average and standard deviation of systolic blood pressure (SBP) and diastolic blood pressure (DBP) before and after the presentations of CBT by volunteers.

Table 2 shows the average and standard deviation of RR intervals and linear indices of VFC.

**TABLE 1. Average values and standard deviation of systolic blood pressure (SBP) and diastolic blood pressure (DBP).**

<table>
<thead>
<tr>
<th>TIMES</th>
<th>SBP</th>
<th>DBP</th>
<th>AFTER</th>
<th>SBP</th>
<th>DBP</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>114.66±</td>
<td>74.0±</td>
<td></td>
<td>113.66±</td>
<td>75.33±</td>
</tr>
<tr>
<td></td>
<td>8.19</td>
<td>6.74</td>
<td></td>
<td>8.08</td>
<td>6.81</td>
</tr>
<tr>
<td>T2</td>
<td>122.33±</td>
<td>79.66±</td>
<td></td>
<td>123.0±</td>
<td>80.66±</td>
</tr>
<tr>
<td></td>
<td>10.72*</td>
<td>7.64*</td>
<td></td>
<td>10.55*</td>
<td>9.44</td>
</tr>
<tr>
<td>T3</td>
<td>118.66±</td>
<td>80.66±</td>
<td></td>
<td>118.33±</td>
<td>79.66±</td>
</tr>
<tr>
<td></td>
<td>9.73</td>
<td>8.27*</td>
<td></td>
<td>9.12</td>
<td>7.64</td>
</tr>
<tr>
<td>P Value</td>
<td>0.001</td>
<td>0.0002</td>
<td></td>
<td>P&lt;0.0001</td>
<td>0.0207</td>
</tr>
</tbody>
</table>

**NOTE:** The values of systolic blood pressure are in mmHg.

*p<0.05: vs. T1.

**TABLE 2. Averages and standard deviation of R-R intervals and linear indices of VFC.**

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
<th>P VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average RR (ms)</td>
<td>600.44± 181.85</td>
<td>554.32± 218.59</td>
<td>531.4± 132.08</td>
<td>0.0658</td>
</tr>
<tr>
<td>Average HR (ms)</td>
<td>107.23± 23.52</td>
<td>116.90± 23.21</td>
<td>117.55± 18.56</td>
<td>0.0567</td>
</tr>
<tr>
<td>SDNN (ms)</td>
<td>41.95± 80.67</td>
<td>17.14± 19.81</td>
<td>25.75± 44.03</td>
<td>0.0626</td>
</tr>
<tr>
<td>RMSSD (ms)</td>
<td>21.09± 24.18</td>
<td>9.71± 10.70*</td>
<td>14.28± 24.77</td>
<td>0.0232</td>
</tr>
<tr>
<td>NN50 (ms)</td>
<td>13.03± 18.30</td>
<td>4.13± 8.27</td>
<td>3.53± 5.5</td>
<td>0.0122</td>
</tr>
<tr>
<td>pNN50 (ms)</td>
<td>7.63± 2.04±</td>
<td>2.1±</td>
<td></td>
<td>0.022</td>
</tr>
</tbody>
</table>
The volunteers presented changes in physiological indices, showing significant changes in BP, as shown in Table 1, which is indicative of the feeling of tension caused by the presentation of the CBT. This state of tension caused by anxiety is responsible for physiological changes, including the cardiac frequency. In addition, the HRV indicates the ability of the heart to adapt to external stimuli. These changes occur due to the influence of anxiety in the control exercised by the SNA on our body.

The social inhibition caused by nervousness presentation modulates the cardiac vagal control, this being the main regulator of capacity for participation and social communication, with a reduction of the indices that represent the parasympathetic activity in the presence of anxiety. In analogy, Alvares et al., reported that anxiety is associated with a reduced HRV, pointing this factor as an explanation for the difficulty of social engagement in cases of anxiety.

In contrast, the results found in Table 2 highlight that this study did not detect a significant alteration in heart rate variability of students undergoing presentation of CBT. Suh et al., say that anxiety is not affected in a direct control of the autonomous nervous system on individuals with chronic obstructive pulmonary disease (COPD), which suggests that conditioning the influence of anxiety about the SNA.

Suh et al., reported that the HRV could vary for each individual; there is a difference between gender, age, diet, physical capacity, among other factors. This fact may also justify the non-modification of the HRV in this study.

The anxiety favors the cardiovascular aging; the reduction of HRV by this problem equates young individuals with such disorders to individuals with a more advanced age under normal conditions. No change in the indices of HRV means good physiological adaptation of the body forward to situations of stress. Which demonstrates the good cardiac reactivity of students who participated in the survey.

According to Alvares et al., the markers in the domain of time that represent the parasympathetic activity (RMSSD) are reduced in the presence of anxiety. What was not evidenced in this study. In the same line of thought, Chen et al., analyzed the marker of HF frequency, which in turn also assesses the performance of the vagus nerve and even found themselves reduced in situations of anxiety.

**FINAL CONSIDERATIONS**

The presentations of TCC did not cause alterations in the cardiac autonomic modulation of the students. However, there is an increase of the systolic pressure after the presentations of financial obligation when compared to initial values before the presentations.

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