

1 **Analysis of computer science newcomers**
2 **student's motivation**

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36 1 Abstract

37 Depression and other mind diseases are currently being reported
38 at universities. Due to it, this research was proposed to observe
39 a group of newcomer students of the Federal University of
40 Uberlândia (UFU) along two semesters. Furthermore ,using
41 resources provided by BCI(Brain computer interface) technology,
42 to collect an amount of data about their emotional state.

43 Data collecting were made on 3 points of semester and each one
44 was proposed to the volunteers to do a same activity related to
45 computer science course. They executed those activities while
46 wearing a EEG based equipment, Epoc+, which was responsible
47 for collecting their emotional data.

48 The results were satisfying, students became more stressed along
49 time and their excitement decreased. Surprisingly relaxation has
50 increased, different from what was expected. The other feelings
51 had no great changes, though.

52 2 Significance Statement

53 Mental diseases such as depression, stress, anxiety and others,
54 had increased in our society nowadays. According to World
55 health organization (WHO) more than 300 million people of all
56 ages suffer from the disease, furthermore, as cited in G1 between
57 2005 and 2015 in Brazil anxiety cases increased 14,9% and the
58 country is the first one in related cases of the illness on Latin
59 America, with 5,8% of the population affected.

60 The researcher Michelle Guimarães believes that detecting
61 mental disorders can be a indicator of mental healthiness on
62 young students and also she defends that those diseases reduces
63 students productiveness. Due to it, this paper intend to detect
64 the mental mood of students using Brain computer interface and
65 appraise changes along time.

66 3 Introduction

67 Due to the recent increase of mental illness cases in universities,
68 such as depression, anxiety and other. This paper main goal is
69 to get a emotional mood change of newcomers university
70 students along the first two semester of their course. The course
71 analyzed was computer science in Federal University of
72 Uberlandia and the data collecting was done while the
73 volunteers were doing same activities related to the course, for
74 example programming and mathematics exercises.

75 A brain activity detection can be done by two kind of methods,
76 invasive and non-invasive. The invasive are base in physical
77 implants of electrodes for brain waves detection, a non- invasive
78 involves using, for example, Magnetic resonance or
79 Electroencephalogram (EEG) to measure brain activities. This
80 methods detect different waves types, such as, Gamma in
81 frequency range of 31Hz an up, Beta waves in range of 12 and 30
82 Hz, Alpha waves ranging from 7.5 to 12 Hz , Theta waves from
83 3.5 to 7.5Hz and Delta waves frequency from 0.5 to 3.5 Hz. The
84 Beta and Gamma waves are related to cognition activities and
85 perception, the Alpha is associated to relaxation and
86 disengagement, Theta wave is related to stress, frustration and
87 in the end Delta waves are related to physical defects in the
88 brain (Larsen, 2011).

89 Researches about identifying emotion based on EEG, technology
90 used on this paper, are relatively new and many researchers use
91 beta and alpha waves to do it (Matlovic, 2016). The equipment
92 used was Emotiv EPOC+, which is EEG based and has support
93 to same emotional states detection, those are stress, Focus,
94 engagement, Relaxation, Interest and Excitement, the software
95 used were Emotiv Xavier control panel (Emotiv Github, 2019)
96 and the EmotivBCI (Emotiv, 2019). Both makes possible to
97 calibrate the device to each student and build a percentage
98 result of it emotion through time.

99 4 Materials and Methods

100 4.1 Experimental desing and statistical Analyses

101 5 Results

102 The research has shown satisfactory results. As well as expected,
103 the students stress increased and excitement values of volunteers
104 N1 and N2 reduced along time. The student N3 showed to be a
105 outlier, due to it, the results will be divided by calculus counting
106 with N3 and not counting with it.

107 Observing each emotion individually it's possible to realize that:

- 108 • Stress: It's one of the most important emotions on this
109 paper and it has shown expected results. Furthermore, its
110 values raised constantly along data collecting with a
111 standard deviation around 33% including student N3 and
112 23% without N3 values.

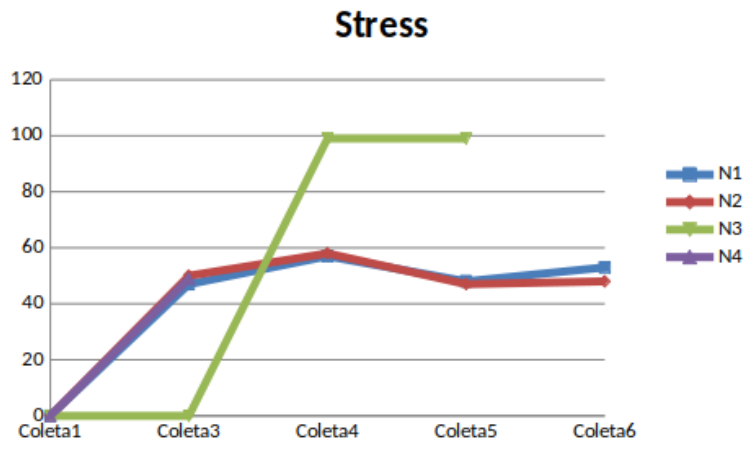


Figure 1: students stress values along data collecting

- 113 • Focus: The Behavior of Focus was different on each
114 participant, it presented low values variance from the

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beginning of the research until its end, as it is able to be concluded by standard deviation of 11%.

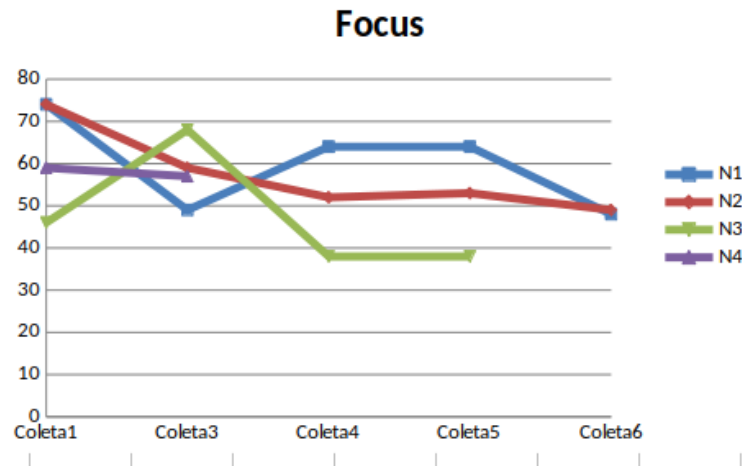


Figure 2: students focus values along data collecting

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- Relaxation: Another important emotion to this paper, which has shown controversial feedback, due to its constant rise of values along data collecting. The emotion has not shown high differences of values, hence standard deviation of it was approximately 7% without student N3 and around 14% within N3.

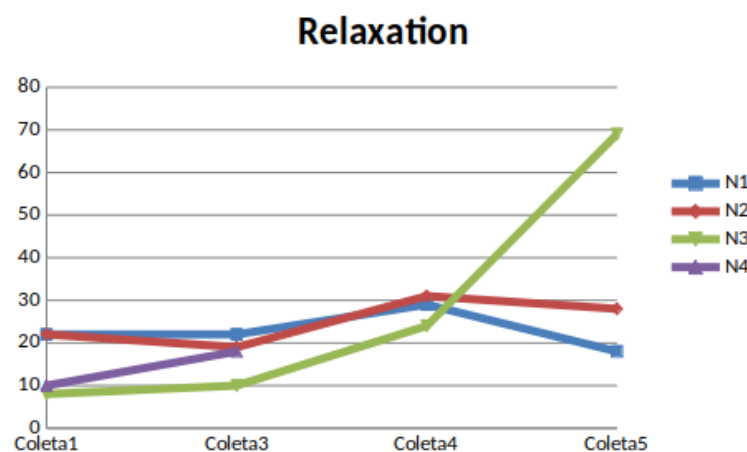


Figure 3: students relaxation values along data collecting

- Interest: Interest behavior was quite the same through all data collects. The values of it had little variances and the lowest standard deviation of all emotions, under 7% even considering N3 in calculus.

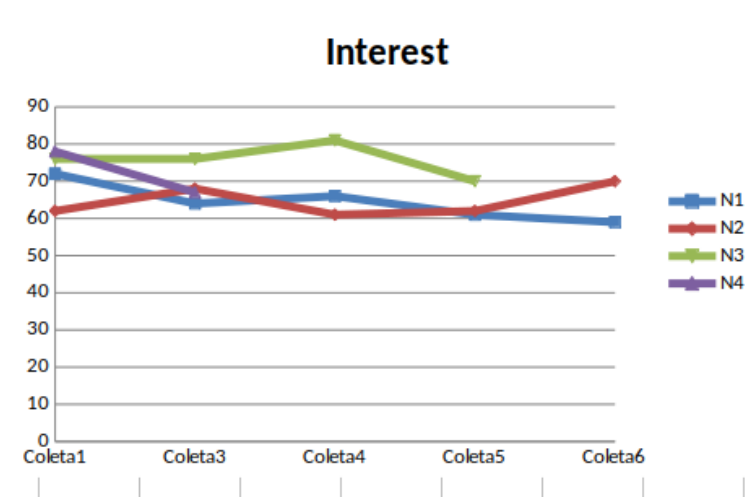


Figure 4: students interest values along data collecting

- Excitement: This feeling presented high alterations on student N3, a big increase from first data collect to last one, it has shown same lower values in mid term collects though. The standard deviation values was around 14% considering participant N3 and 12% without him.

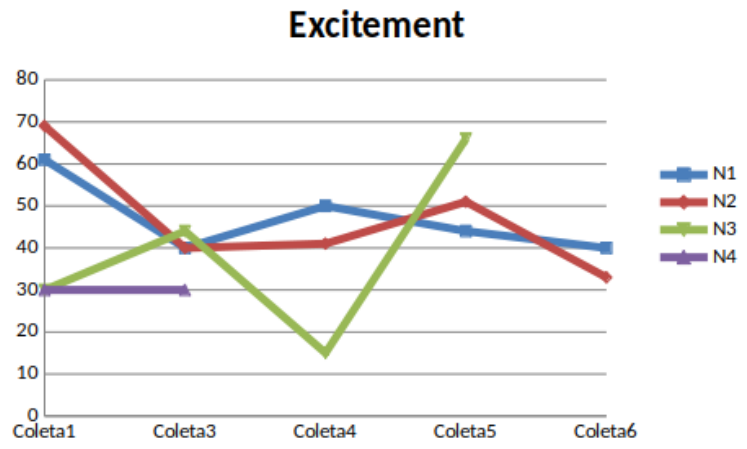


Figure 5: students excitement values along data collecting

- Engagement: Students N2 and N4 presented a high difference from collect 1 to 3, that increase was around 56%. while that, students N1 and N3 did not show significant changes in them values. The general Standard deviation was 21%, however building groups of students with N1 and N2 being first group and N2 and N4 a second, it makes possible to notice that N1 and N3 had no big changes, since standard deviation of the group was 6%. It is not possible to say same of N2 and N4, because their standard deviation was around 30%.

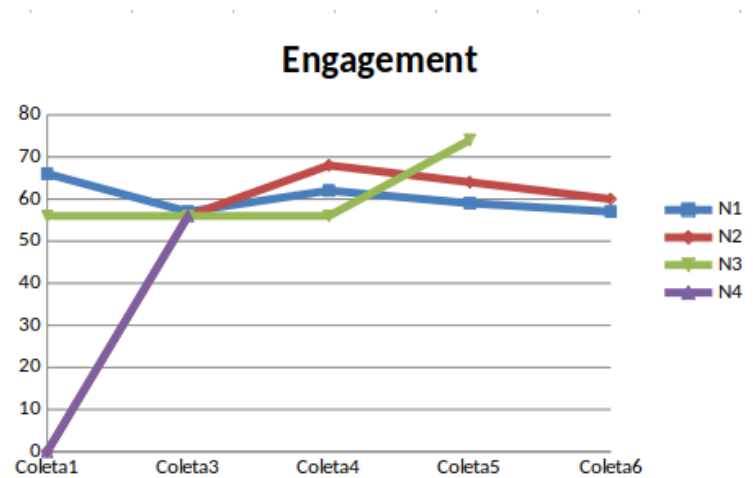


Figure 6: students engagement values along data collecting

142 6 Discussion

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