I would like to start by reading you a quote by the scientist Neil deGrasse Tyson which hints at why I am so excited about this research…

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| *Everything we do, every thought we've ever had, is produced by the human brain. But exactly how it operates remains one of the biggest unsolved mysteries, and it seems the more we probe its secrets, the more surprises we find.* |
| My title has not changed from last time, it is still Exploring event-related potential patterns in a complex, sequential, decision-making environment |
| My research question and primary objective have not changed except that I am now using 1-, 5- and 10- minute blitz chess games. The reason for this is that I found no justification for using 3- minute chess, whereas the 5- minute chess game is the median between the 1 minute and the 10- minute games and includes features of both games coming into play.  |
| The secondary objectives are:1. To explore the temporal and spatial ERP patterns that may exist in the chess context described above;
2. To explore the cognitive load correlates associated with the chess context described above;
3. To explore the emotions associated with the decision making linked to the chess context described above, incorporating both the participant’s subjective experience and the neural correlates linked with these emotions;
4. To attempt to identify a moment of realisation (an “AHA” moment) of success or failure associated with the chess context described above, both from a participant’s subjective experience and the neural correlates linked to the moment or realisation;
5. To explore if any found patterns differ between male and female participants;
6. Based on the insight gained from the above secondary objectives a descriptive model of the patterns identified in the context above will be constructed
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| The information I require remains largely the same as last time |
| With respect to the method of information gathering. I have decided that this study will use a mixed methods approach where quantitative and qualitative data support each other to facilitate understanding of what is being measuredQUANTITATIVELY1. EEG measurements from ERPsLow resolution Tomographic Analysis LORETA or BRAINSTORM will provide spatial data2. Psychophysiological measurements GSR, HRV, eye trackingQUALITATIVELY1. Expert group interviews pre- and post-test.
2. Furthermore, participants’ insights on the games they have played will be obtained immediately after the games and integrated with the quantitative measurements obtained from the psychophysiological instruments.
3. My own interpretation of the quantitative results will be crucial

PILOT STUDY IS THE CRUX OF THE DESIGN |
| 1. The mathematical fields of time-series data, signal processing and pattern-recognition. I have contacted the UNISA statistician and discussed this with him.
2. Main source of data is the EEG. 3 areas of interest related to ERPs
	1. One second before and after a decision made by the participant
	2. One second before computer makes a move (anticipation on the part of the participant)
	3. Time between the (a) and (b)

A and B are time-locked to easily discernible event namely moving a chess piece which is a proxy for a decision having been made1. Pattern recognition and feature extraction algorithms can be used and I have isolated several techniques including Fourier Transform (which breaks waves down into their features), as well as Wavelet Transform, Change-point analysis and Independent Component Analysis. I will need assistance to make the right choices here, but fortunately we have a leader in the field in the Department of Decision Sciences that I will turn to for assistance.
2. Part c above contains ERPs that will be difficult to establish and that’s where qualitative information obtained from the participants will be obtained as to what they experienced. Also expert group will assist me in interpreting what could be involved in this section namely between decisions.
3. Spatial analysis using low resolution tomographic analysis or brainstorm can help me isolate the relevant areas in the brain that are being activated
4. Filtering of the EEG data to remove unwanted noise which can corrupt the data will be done with WinEEG and MatLab
5. Other physiological data will be incorporated into the EEG data.

Intensity of waveform – horizontal varianceAmplitude – vertical variance |