Automatic detection and inhibition of neutral and emotional stimuli in post-traumatic stress disorder: an eye-tracking study

Eye-tracking data of an original antisaccade task

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ABSTRACT

This research project addresses the understanding of attentional biases post-traumatic stress disorder (PTSD). This psychiatric condition is mainly characterized by symptoms of intrusion (flashbacks), avoidance, alteration of arousal and reactivity (hypervigilance), and negative mood and cognitions persisting one month after the exposure of a traumatic event (APA, 2013). Clinical observations as well as empirical research highlighted the symptom of hypervigilance as being central in the PTSD symptomatology, considering that other clinical features could be maintained by it (Ehlers and Clarks, 2000). Attentional Control theory has described the hypervigilance in anxious disorders as the co-occurrence of two cognitive processes : an enhanced detection of threatening information followed by difficulties to inhibit their processing (Eysenck, 2007). Nevertheless, attentional control theory has never been applied to PTSD. This project aims at providing cognitive evidence of hypervigilance symptoms in PTSD using eye-tracking during the realization of reliable Miyake tasks (Eysenck, 2011). Therefore, our first aim is to model the co-occurring processes of hypervigilance using eye-tracking technology. Indeed, behavioral measures (as reaction time) do not allow a clear representation of cognitive processes occurring subconsciously in a few milliseconds (Felmingham, 2016). Therefore, eye-tracking technology is essential in our studies. Secondly, we aim to analyze the differential impact of trauma-related stimulus vs negative stimuli on PTSD patients, by conducting scan paths following both of those stimuli presentation. This research project is divided into four studies. The first one will be described is this doctoral symposium.

CCS CONCEPTS

• **Social and professional topics** → **People with disabilities**;
• **Human-centered computing** → *Human computer interaction (HCI)*;

KEYWORDS

PTSD, Attentional biases, Antisaccade, Eye-Tracking, Attentional Control

1 RESEARCH OBJECTIVES

The primary research of my doctoral project aims at evaluating the efficiency of two processes underlying hypervigilance symptoms of patients suffering from PTSD. Specifically, this study will evaluate (1) the automatic orientation of attention, either on neutral stimuli (arrow) or emotional (positive, negative or trauma-related pictures); and (2) the control of such automatic attention reflecting inhibition abilities. Those evaluations will allow us to answer several essential questions on PTSD area. First, it will allow us to determine whether automatic attention orientation is enhanced for every stimulus encountered by PTSD patients, or if such bias is triggered only by emotional / negative stimuli. Second, the same question is asked regarding the inhibition of the automatic attentional orientation. Is the hypervigilance symptomatology of PTSD patients affects every environmental stimulus encountered or is it limited to emotional and / or only negative information ?

2 HYPOTHESIS AND PROBLEM STATEMENT

We hypothesize an enhanced attention orientation in PTSD patients for emotional stimuli, in comparison with neutral stimuli and control groups. Furthermore, this attentional bias will concern negative pictures, including trauma-related pictures and not positive pictures. In order to observe those cognitive processes, we adapted a task in which participants need to identify as soon as they can the stimulus (prosaccade condition), or need to look on the opposite side of the stimuli as soon as they can (antisaccade condition). Specifically, we expect to observe a quicker first saccade toward negative pictures as compared to neutral stimuli or positive picture in the prosaccade condition. In the antisaccade condition, we hypothesize a wrong first saccade toward the trauma-related stimuli followed by correctional saccades toward the blanc side of the screen. This behavior (automatic first saccade toward the picture even though it is not allowed in this condition) would translate
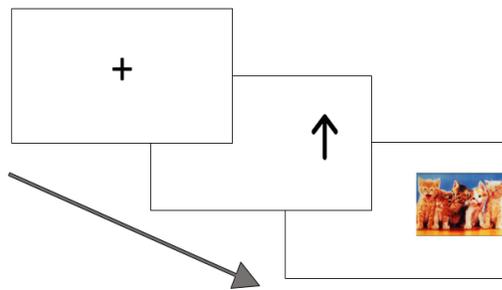
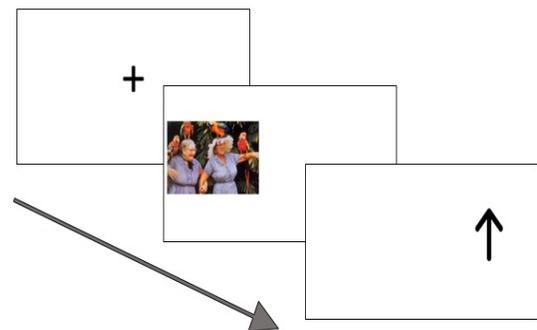**Figure 1: Example of a prosaccade condition in neutral antisaccade task**

Figure 2: Example of an antisaccade condition in emotional antisaccade task

specific difficulties for the inhibition of those stimuli. We do not expect differential reaction time on the behavioral measurements of the task.

3   APPROACH AND METHOD

Two original antisaccade tasks have been developed. The first one investigates orientation an inhibition of neutral information (arrow). Two conditions were established: a prosaccade condition and an antisaccade condition. In the prosaccade condition, the participant is asked to look as quick as he can toward the stimulus (an arrow), presented for 500ms. A picture replaces the arrow, which the participant needs to categorize (positive or negative) as quick as he can. Fig. 1 presents an illustration of the prosaccade condition. In the antisaccade condition, the participant is asked to look as quick as they can on the opposite side of the stimuli (an arrow), presented for 500ms. A picture replaces the blank side of the screen, which the participant need to identify (positive or negative) as quick as he can. The second antisaccade task investigates orientation and inhibition of emotional information (positive, negative and trauma-related pictures). Two conditions were established: a prosaccade condition and an antisaccade condition. In the prosaccade condition, the participant is asked to look as quick as he can toward the stimulus (a picture), presented for 500ms. An arrow replaces the picture, and the participant needs to identify its orientation (up or down) as quick as he can. In the antisaccade condition, the participant is asked to look as quick as he can on the opposite side of the stimulus (a picture), presented for 500ms. Fig. 2 presents an illustration of the antisaccade condition.

4   PRELIMINARY DATA AND PLANS FOR FUTURE WORK

The participants recruitment has already started, and preliminary data will be recorded from April to June 2018. In order to be selected for the study, participants will need to (1) suffer from PTSD due to physical aggression (2) have no other history of traumatic events (3) have no other clinical or medical condition and (4) be older than 18 years old. Those features will be controlled with different scales : the Posttraumatic Stress Disorder Checklist for DSM 5 (PCL5),

the Life Event Checklist for DSM ((LEC5), the Beck Depression Inventory (BDI) and the State-Trait Anxiety Inventory (STAI). The ETRA doctoral symposium will allow to highlight possible methodological issues and launch the best analysis path regarding to this experiment. The feedback received will be transposed in our future studies, in order to conduct high-quality eye-tracking studies.

REFERENCES

[1] American Psychiatric Association. 2013. *Diagnostic and statistical manual of mental disorders: DSM-5* (5th ed. ed.). Autor, Washington, DC.
[2] Anke Ehlers and David M Clark. 2000. A cognitive model of posttraumatic stress disorder. *Behaviour research and therapy.* 38, 4 (2000), 319–345.
[3] Michael Eysenck, Nazanin Derakshan, Rita Santos, and Manuel G Calvo. 2007. Anxiety and Cognitive Performance: Attentional Control Theory. 7 (06 2007), 336–53.
[4] Michael W. Eysenck and Nazanin Derakshan. 2011. New perspectives in attentional control theory. *Personality and Individual Differences* 50, 7 (2011), 955 – 960. https://doi.org/10.1016/j.paid.2010.08.019 Special Issue on Anxiety (dedicated to the memory of Professor Blazej Szymura).
[5] K Felmingham. 2016. *Comprehensive guide to post-traumatic stress disorders.* Springer International Publishing, Switzerland.