The Influence of Emotional Stimuli on Response Inhibition

Honors Thesis

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Preface

I was in my first year at Nova Southeastern University when I became interested in research. It was exciting to learn the materials thought in class, but I thought it would be more enriching to actually conduct a study about the topics I found interesting. At the end of my second semester, Dr. Jaime Tartar encouraged me to visit her so she can tell me more about getting involved in research. Once I met with Dr. Tartar, I decided that I wanted to complete a Divisional Honors Thesis that involved electroencephalogram (EEG). I was introduced to Dr. Leanne Boucher a few months later and was fascinated in her interest of response inhibition. I met with Dr. Tartar and Dr. Boucher regularly, and we decided to investigate how emotion affects reaction times. Through their guidance, I was able to develop a focused thesis proposal, and was able to successfully present a thesis to Dean Rosenblum and Dr. Fagan.

Once I received approval to conduct this study, I met more regularly with Dr.Tartar and Dr. Boucher, and they made sure I was comfortable with my duties as a researcher. I was trained by Dr. Tartar on how to record and analyze brain waves using an electroencephalogram, and Dr. Boucher taught me how to interpret and analyze the behavioral results. It was exciting to test participants. Even more exciting was analyzing the results of this study. While I was responsible for testing participants and analyzing the results, Dr. Boucher and Dr. Tartar encouraged me to visit them where they would help me interpret findings from results, and they made sure I could handle the pressures of conducting the study.

After testing participants and analyzing results, I was able to present the study at the Society for Neuroscience Conference in Washington of 2011. Both Dr. Boucher and

Dr. Tartar helped me in practicing for the conference, and they were there with me throughout my time at the conference. Going to the Society for Neuroscience conference was a remarkable experience for me, and I was able to share my research with members, as well as learn of new studies that are being done.

Nearing the completion of the thesis, Dr. Boucher and Dr. Tartar guided me on how to write a vibrant and comprehensible thesis. The results of the study ended up being different from what was originally hypothesized, and they were able to offer their expertise on possible reasons for this. They also trained me on how to best orally present my defense to Dean Rosenblum and Dr. Fagan.

Being able to conduct a study like this is such an honor, and one that few students can say they have done. I have gained a lot of experience in conducting research and have grown more confident in myself and my abilities. This experience will definitely help me in my future endeavors. I am sincerely grateful for having being given this opportunity.

Abstract

It has been shown in numerous studies that emotion affects cognition. This study examines the interaction between emotion regulation and response inhibition. Specifically, it examines how negative pictures impact one's performance on a complex task that requires inhibition of an on-going response. This was tested by presenting negative and neutral pictures within the context of a stop signal task while measuring electroencephalograph (EEG) Event Related Potentials (ERPs). We found that there was an increase in the amplitude of an ERP measure of attention to emotional stimuli (the LPP) to negative pictures compared to neutral pictures. We further found that neural processing to subsequent target stimuli increased (as evident in the increase in amplitude of the late processing negativity component). However, it seems that due to several limitations of this study, behaviorally significant differences were not found, and no significant ERP findings to the stop signal was found. Thus, this study provides evidence that suggests that emotional stimuli work to prime a physiological measure of attention to a subsequent visual target, but this emotional priming effect does not influence behavior to the auditory stop signal.

Acknowledgements

I would like to thank my amazing faculty advisors Dr. Tartar and Dr. Boucher. It was an honor to work with them, and I am truly grateful for all the knowledge on research and life I have gained through them. I would also like to thank the University, Dean Don Rosenblum, and Dr. Fagan for giving me this great opportunity to do research. Also, I am grateful to the numerous students who participated in the study. Lastly, I would like to thank my family and friends for their support throughout this project.

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I: Review of the Literature

a. Response Inhibition

When the current course of thought and action is inappropriate, new goals are formed that take priority over current ones (Logan, 1994). The process of redirecting to new goals is called stopping, and is a form of executive function. Controlling thought and action is important since it aids in survival by directing and fulfilling goals (Logan & Cowan, 1984). Theoretically, stopping is interesting since it is an act of control that is generated internally (Logan, 1994). Data from young adults indicate that the ability to inhibit a response is a result of a single general mechanism (Logan, 1994). Current neurophysiological studies have even suggested that inhibitory motor control is instigated from the frontal cortex, and is explained in terms of a single, centrally located inhibition mechanism (Boxtel, Molen, Jennings, & Brunia, 2001).

Stopping has been studied on numerous populations such as the elderly and children with attention deficit hyperactivity disorder (ADHD). Older adults and young children were found to have different stopping time than young adults, suggesting that the stopping process is the same over the life span but increases in speed during young adulthood and decreases in old age (Schachar & Logan, 1990; Kramer, Humphrey, Larish, Logan, & Strayer, 1992). These findings support developmental and aging theories that attribute the cognitive difficulties in the young and elderly as deficits in the inhibitory process (Logan, 1994). In addition, longer stopping times were found for children with attention deficit hyperactivity disorder (ADHD) as opposed to children

without ADHD, suggesting that response inhibition may be implicated in inhibitory psychopathology (Schachar & Logan, 1990; Overtoom, et al., 2002).

b. Stop Signal Paradigm

Stopping, or response inhibition, can be studied using the stop signal task. An advantage of using this task is that it allows for the calculation of an indirect measure, the Stop Signal Reaction Time (SSRT) which is the time it takes to stop an action. In the stop signal paradigm, participants engage in a primary task which is usually a visual choice reaction time task. As they engage in this task, a stop signal is presented occasionally after the response stimulus that instructs participants to stop responding to the primary task. The stop signal is presented at various delays after the presentation of the primary response stimulus. With short stop signal delays (SSD), participants can easily suppress their responses; with long SSDs, stopping becomes more difficult. The inhibition function describes this relationship between SSD duration and the ability to inhibit a response (Logan, 1994).

c. Theory behind Stop Signal Inhibition

To account for stop signal inhibition, a horse race model was proposed that involves the stop process working against the go process. Logan and Cowan (1984) state that if the stop process finishes before the go process, the response is inhibited (signal-inhibit trials), and if the go process finishes before the stop process, there will be a response (signal-respond trials). The outcome of the trials is nondeterministic since the finishing times of both processes are independent (Logan & Cowan, 1984). The go process is easy to understand since much of the experimental psychology literature is devoted to it. It is merely the time needed to make a response. However, the stop process

is not directly observable since when the stop process finishes before the go process, there is no observation and latency (Logan, 1994). Thus, using the logic of the horse race model, one can infer the time needed to stop in response to the stop signal using the overt measures obtained in this task, namely the inhibition function and the reaction times to the primary task when no stop signal is presented. This is referred to as the Stop Signal Reaction Time (SSRT), a measurement that has been shown to be impressively accurate and useful (Band, van der Molen, & Logan, 2003)

d. Emotional Stimuli and Cognition

It has been shown in numerous studies that emotional stimuli capture attention automatically and interrupt ongoing cognitive activities (e.g.,Verbruggen & De Houwer, 2007; Schimmack, 2005; Buodo, Sarlo, Palomba, 2002). For example, Verbruggen and De Houwer (2007) found that the response and stopping latencies were prolonged in the presence of an emotional stimulus. Meanwhile, longer reaction times were found when pictures of blood and injury and erotic couples were presented, compared with other negative and positive scenes of sport and adventure (Buodo, Sarlo, & Palomba, 2002). To explain why emotional stimuli has such an influence on ongoing cognitive activities, it is believed that emotional stimuli draw attention away from ongoing activities, so fewer attention resources are left for processing the previously attended activities (Schimmack, 2005). The capture of attention by emotional stimulus is referred to as a natural state of selective attention (Lang, Bradley, & Cuthbert, 1997). From an evolutionary perspective, this form of attention control is important for survival. Bradley, Codispoti, Sabatinelli, and Lang (2001) proposed two systems by which emotion is essentially organized. It includes the appetitive and defensive systems that have evolved to aid in survival of

humans. The appetitive system is accompanied by affectively pleasant states, and the defensive system is associated with unpleasant experiences (Schupp, Flaisch, Stockburger, Junghofer, 2006).

Additionally, it has been found that the presentation of emotional pictures (particularly negative pictures) influence the processing of subsequent stimuli (Tartar, Almeida, McIntosh, Rosselli, & Nash, 2012). This is reflected both physiologically and behaviorally. However, it is not clear whether the presentation of emotional stimuli primes or diminishes processing of subsequent stimuli (Tartar et al., 2012). Tartar et al. (2012) found that negative pictures lead to a general enhancement in the processing of subsequent stimuli when rarely occurring tones occurred. This was evident in the electroencephalographic components N1 and LPN and an increase in reaction time when negative pictures were presented.

e. Emotional Stimuli and Response Inhibition

Most research on emotion and attention has employed stimuli from the International Affective Picture System (IAPS). The images are rated with regards to their valence category and level of arousal on a nine point scale by both female and male young adults. Valence category describes ranges from unpleasant to pleasant, whereas, arousal level ranges from low to highly arousing (Lang, Bradley, and Cuthbert, 1997). When rating affective stimuli, it is important to take the gender of the rater into account since there are differences between males and females in emotional response. Bradley et al., (2001) found that females showed greater defensive response to aversive pictures regardless of content, whereas, only when viewing erotica, increased appetitive activation was found in males. Biological and sociological factors that lead to different emotional

experience and expression may contribute to the sex differences in emotionality (Bradley et al., 2001).

The effect of emotional stimuli on response inhibition was thought to be the result of the stimulus's valence (Pratto & John, 1991). Pratto and John (1991) argued that only negative stimuli attract attention whereas positive stimuli have no effect. In contrast, several studies have supported the arousal hypothesis which states that arousing stimuli attract attention regardless of their valence. One such study was conducted by Verbruggen and De Houwer (2007) who found high arousing stimuli to interfere more with response inhibition than low arousing stimuli, while the valence of the stimuli had little or no effect.

f. Event Related Potentials and Emotional Stimuli

Event related potentials (ERPs) reflect brain activity from synchronously recorded populations of active neurons that occurs in preparation for or in response to discrete events that may occur internal or external to the subject (Fabiani, Gratton, & Federmeier, 2007). Event related potentials (ERPs) allow the assessment of neural responses to stimuli with millisecond temporal resolution (Olofsson, Nordin, Sequeira, & Polich, 2008). This measure provides data on the brain's processing of emotional stimuli at distinct temporal stages (Schupp et al., 2006), and measurements of neural activity recorded form multiple scalp regions (Birbaumer, Elbert, Canavan, & Rockstroh, 1990). ERPs occur in preparation for or as a response to a specific event (Coles, Gratton, & Fabiani, 1990). Psychophysiological measures such as heart rate, skin conductance, fMRI, and PET also provide accurate measures of emotional reactions, but with ERPs, the best temporal resolution of the electrophysiological process can be attained. Thus,

ERPs offer a powerful means to characterize the processing of emotional stimuli in the human brain over time (Batty, & Taylor, 2003).

To garner the event-related potentials (ERPs) from EEG involves averaging of EEG activity time-locked to the presentation of a specific stimulus. When similar presentations of auditory or visual stimuli are repeated, averaging across presentations effectively reduces the portion of activity in the electroencephalogram (EEG) unrelated to stimulus processing; therefore, ERP reflections of mental processes elicited by stimulus presentations will be relatively enhanced (Schupp et al., 2006).

Some ERP components are referred to by acronyms such as Late Positive Potential (LPP), but most components are referred to by a letter followed by a number. The letter indicates polarity (negative or positive) while the number represents the latency in milliseconds. The stated latencies for ERP components vary; for instance, the latency of the component N400 may range from 300ms to 500ms (Cacioppo, Gardner, & Berntson, 1999). ERP components vary in preparation for or in response to a stimulus. The strength and duration of specific ERP components are reflected in their amplitude and latency respectively, and the neural generator sites of ERP components can even be estimated given appropriate spatial sampling. It has been suggested that large-amplitude ERP components reflect widespread, synchronous sources in cortical regions (Schupp et al., 2006). Short latency components (>100ms) are generated during the processing of sensory stimulus, whereas, longer latency components (>100ms) represent the cortical processing stages, which are less influenced by the physical features of the stimulus (Crawford, & Cacioppo, 2002; LeDoux, 1995).

Emotional stimuli mainly modulate the amplitude in ERP components, with hardly any change in peak latency. The temporal course of ERP valence and arousal effects differ: arousal effects commonly occur at longer latencies (200-1000ms), whereas, several latency ranges were reported for valence effects which included early components (100-250ms) (Codispoti, Ferrari, & Bradley, 2007; Olofsson & Polich, 2007). Several studies have shown that negative stimuli generally produce stronger emotional effects in the ERP than positive stimuli (Cacioppo, Gardner, & Berntson, 1999; Crawford & Cacioppo, 2002; Ohman & Mineka, 2001), and this "negativity bias" may reflect the amygdala's (a structure of the brain involved in fear processing) rapid processing of the threatening stimuli (LeDoux, 1995).

g. ERP Measures of Emotion

The amplitude of certain ERP components are modulated when presented with highly arousing stimuli. Affect-related ERP modulations have been reported at short latencies (100-200ms) for picture stimuli. The ERP components P1 and later N1 are perceptive to the physical feature of the stimulus and indicates early sensory processing within the extra striate visual cortex. Several studies have found that unpleasant stimuli generate larger P1 (150-165ms) amplitudes than pleasant and neutral stimuli (Cacioppo, Gardner, & Berntson, 1999; Crawford, & Cacioppo, 2002; LeDoux, 1995). Also, the N1 component has been found to be resistant to habituation: it increases in amplitude to time-on-task for high arousing unpleasant images compared to pleasant and neutral ones (Carretie, Hinojosa, Mercado, 2003).

In addition, middle latency (200-300ms) ERP components reflect response selection processes and early stimulus discrimination. At 200-300ms, an Early Posterior

Negativity (EPN) has been observed for arousing compared to neutral stimuli (Schupp et al., 2006). Theoretically, EPN is said to reflect natural selective attention, such that affectively arousing stimuli are selected for further processing (Schupp et al., 2006). The middle latency N2 component has also been affected by stimulus valence. Unpleasant stimuli have been found to elicit a decreased N2 negativity compared to pleasant stimuli; however, this finding has been inconsistent with other studies (Carretie at al., 2003).

Longer latency (greater than 300ms) ERP components are the Late Positive Potential (LPP) and extended positive slow wave. LPP occurs over centro-parietal regions and is specifically enhanced for pictures that are highly arousing. Pictures depicting high evolutionary significance such as photos of sexual contents and contents of threat and mutilations generally produce greater LPP amplitudes compared to pictures of same valence but less evolutionary significance (Schupp et al., 2006). In addition, the P300 component is elicited by infrequent, task-relevant stimuli. Its occurrence has been linked to a person's reaction to the stimulus, and not to the physical attributes of a stimulus. It has been thought to reflect sustained perceptual operations and memory processes (Ritter & Ruchkin, 1992). In Schupp et al. (2004) study, it has been found that the probe P3 response was inhibited for all unpleasant pictures compared to neutral pictures, suggesting that attention resources are highly allocated to negative stimuli so less attention was paid to the secondary stimulus.

In line with previous research (reviewed below), three hypothesis are made. Firstly, it is hypothesized that the Late Positive Potential (LPP) component that is related to attention to intrinsic stimuli will increase when presented with highly arousing negative pictures compared to neutral ones. Secondly, it is hypothesized that the P3

component that is related to sustained perceptual operations and memory processes will decrease in amplitude when presented with stop signals on negative trials compared to neutral trials. Thirdly, since the P3 component may decrease when presented with a stop signal on negative trials due to the allocation of attention resources to arousing stimuli, it is hypothesized that the stop signal reaction times (SSRTs) will be longer on negative trials compared to neutral ones. This study will represent a new avenue of research on the influence of emotion on cognition as it is the first study, to our knowledge, to investigate ERP components associated with successful and unsuccessful stopping on trials involving emotional pictures.

II: Methods

a. Participants

Seventeen female Nova Southeastern University students participated in this study. EEG data from seven participants were not analyzed due to technical problems. Behavioral data from three participants were not analyzed due to participants not being able to carry out the task. All participants that had their EEG analyzed also had their behavioral data analyzed. The age of participants ranged from eighteen to forty eight, and all had normal or correct-to-normal vision. Each participant received a forty dollars gift card as compensation or their time. The testing procedures were carried out according to a protocol approved by the Nova Southeastern University Institutional Review Board (IRB).

b. Procedure

Before the testing session, participants completed a practice session that lasted fifteen minutes to make sure they understood the task. Both stop signal and no-stop signal trials were presented. Stop signals were presented on thirty percent (30%) of the trials, and the other seventy percent (70%) of trials were no-stop signal signals. During the practice session, only highly arousing positive and neutral pictures were presented instead of highly arousing negative and neutral pictures.

Each trial started with the presentation of a fixation sign for 500ms, immediately followed by a photo (negative or neutral) that was presented for 1000ms. After picture presentation, the target stimulus was presented on a blank screen and required a response within 1600ms. The target stimulus was either a square or circle, and participants responded by pressing the key "Z" or "M" respectively. On stop signal trials, just after

the presentation of the target stimulus, an auditory stop signal (tone) was presented and participants had to withhold their response. The stop signal delay (SSD) (time between presentation of target stimulus to stop signal) varied so as to prevent participants from learning when the stop signal is presented. The three fixed stop signal delays were short latency SSD (300ms), medium latency SSD (450ms), and long latency SSD (600ms).

The study lasted about three hours, and all trials were presented during one session. A total of 1280 trials were presented, with 80 trials per block. After one run (two blocks), a break of five minutes was given if needed. The stop signal reaction time (SSRT) was calculated by subtracting the mean of the inhibition function from the mean of the no- stop signal reaction times.

c. Electroencephalographic Apparatus

Contact Precision Instruments' "Psylab" EEG amplifying and recording equipment were used to perform EEG evaluations. The electrodes were placed in accordance with the international Ten-Twenty System on locations of Fz, Cz, C3, C4, Pz, O1 and O2 (Tartar et al., 2004). Electrode impedance was maintained at less than 5 MΩ. Procedures specified by the Society for Psychophysiological Research for infection control was followed while attaching and removing electrodes. High pass filters were set to .1 Hz, and low pass filters were set to 40 Hz and a 60 Hz notch filter was active. The EEG amplifier was set at gain of 30,000 and the sampling rate was 500 Hz.

III: Results

a. ERPs Aligned to Picture Onset

A 7 (electrode location) x 2 (emotion type) repeated measures ANOVA was conducted on the LPP with paired samples t-tests as post-hoc analyses. Consistent with previous findings on emotional and motivational priming, we found that compared to neutral pictures (mean = 1.92 μV, SE = 1.93), negative pictures (mean = 4.41 μV, SE = 1.37), resulted in a significantly enhanced LPP ($p < 0.05$). Post-hoc tests revealed that this effect was significant (see figure 5) at Cz, Pz, C3, C4, and O2 electrode locations (all p's < 0.05).

b. ERPs Aligned to Target Onset

A 7 (electrode location) x 2 (emotion type) repeated measures ANOVA was conducted on the late processing negativity (LPN) with paired samples t-tests as post-hoc analyses. There was increased attention (larger LPN) when the target followed negative (mean = -1.16 μV, SE = 0.36), compared to neutral (mean = 0.05 μV, SE = 0.36) pictures. Post-hoc tests revealed that this effect was significant (see figure 6) at Cz, Pz, C3, C4, and O1 electrode locations (all p's < 0.05). No significant differences in N1.

c. ERPs Aligned to Stop Signal Onset

Negative compared to a neutral pictures did not affect auditory ERP differences (N1 or late processing negativity) to a subsequent stop signal collapsed across stop signal delays (or any individual stop signal delay, data not shown) for trials in which the participant canceled her response (see figure 7).

d. Behavioral Data

The mean reaction times on no-stop signal trials, mean stop signal reaction times, and the inhibition functions as a function of emotion type were analyzed. A paired t-test was conducted on no-stop signal reaction times by emotion type and no significant difference was found ($t(13) = 0.39$; $p > .05$). A paired t-test was done on stop signal reaction times by emotion type and no significant difference was found ($t(13) = 0.10$; $p > .05$). Also, a 3(stop signal delays) x 2 (emotion type) two-way repeated measures ANOVA was conducted on stop signal delays to emotion type. No significant main effect of emotion as found ($F(1, 78) = 0.004$; $p > .05$) and there was no significant interaction effect found ($F(2, 78) = 1.00$; $p > .05$), but there was a main effect of stop signal delays ($F(2,78) = 17.98$; $p < .05$) (see figure 3).

IV: Discussion

a. Behavioral Response

We found no differences in mean reaction time on no-stop signal trials, mean stop signal reaction times (SSRTs), or the inhibition functions as a function of emotion type. The significant effect of stop signal delays shows that as the delays increase, the probability of response also increase, but no effect of emotion was found. This is contrary to the findings of Verbruggen & De Houwer (2007). One reason for the difference in results may be that the participants in the Verbruggen & De Houwer study exhibited RTs that were 300 ms faster and SSRTs that were 100 ms faster than our participants, perhaps because of an explicit training procedure Verbruggen and De Houwer employed. It's possible that since our participants took so long to respond to the target, any difference in the emotional meaning of the pictures did not impact stop-signal trials and no-stop signal trials.

b. Physiological Response

Visual LPP to pictures

As hypothesized, there was a significant increase in the Late Positive Potential (LPP) component to negative pictures compared to neutral pictures. This finding supports results from previous studies that show the amplitude of LPP being significantly larger when viewing negative pictures compared to neutral pictures (Dunning & Hajcak, 2009). This ERP component is believed to reflect attention to emotional stimuli, specifically stimuli that depict motivational or evolutionary relevance (Dunning & Hajcak, 2009).

Attention to Subsequent Stimuli: Target

There was a significant increase in the Late Processing Negativity (LPN) to the subsequent visual stimulus (target) when negative pictures were presented compared to neutral pictures on no-stop signal trials. This LPN component is thought to reflect attention to a stimulus. So, following a negative picture where there is an increase in attention to that picture, there is also an increase to the subsequent stimulus (target).

Attention to Subsequent Stimuli: Stop Signal

Contrary to what was hypothesized, there was no decrease in the P300 component to the stop signal. This could be a result of the timing of the task being too long, so any physiological differences might have occurred earlier. Also, another explanation may be that the increase in ERP components to picture and target masked any effect the stop signal might have produced.

c. Present Findings in Context of Previous Research

Both behavioral and physiological studies have found that emotional stimuli capture attention resources, but it is less clear how subsequent stimuli are being processed. Some studies show that emotional stimuli are capable of priming subsequent stimuli while others show that processing of subsequent stimuli are diminished (Tartar et al., 2012). Consistent with the view that subsequent stimuli are primed, it was found that following the presentation of highly arousing negative pictures, an ERP component that reflects attention (late processing negativity) to the subsequent visual stimuli (target) increased. This effect of emotional priming was not seen in the auditory ERP to the auditory stop signal.

Thus, the results show that highly arousing negative stimuli prime a physiological measure of attention to a subsequent visual target. However, this emotional priming effect does not influence (through either enhancing or diminishing) behavior to an auditory stop signal (or auditory ERP's to the stop signal).

d. Limitations

There are several limitations in this study. First, only females took part in this study, so results cannot be generalized to males. Second, a total of seventeen participants were tested; however, due to problems with the electroencephalographic apparatus, the EEG of only seven participants was analyzed while the behavioral data of all fourteen participants were analyzed. Third, in a previous study (Verbruggen & De Houwer, 2007); a longer practice session was done before the experimental session to make sure participants responded appropriately. However, in this study only a fifteen minute practice session was given and this could have contributed to participants responding slowly. Finally, the response time was longer (1600ms) than response time in previous studies (500ms), so participants were not responding as quickly as possible.

e. Future Directions

A potential avenue for future direction is to decrease the response time and stop signal delays on trials. Previous studies used time ranges that are shorter, and this may increase reaction times. Also, a longer practice session should be done so as to make sure participants can effectively carry out the task (respond fast and reduce blinking when picture and target is presented).

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APPENDIX

Figure 1: Stop Signal Trial

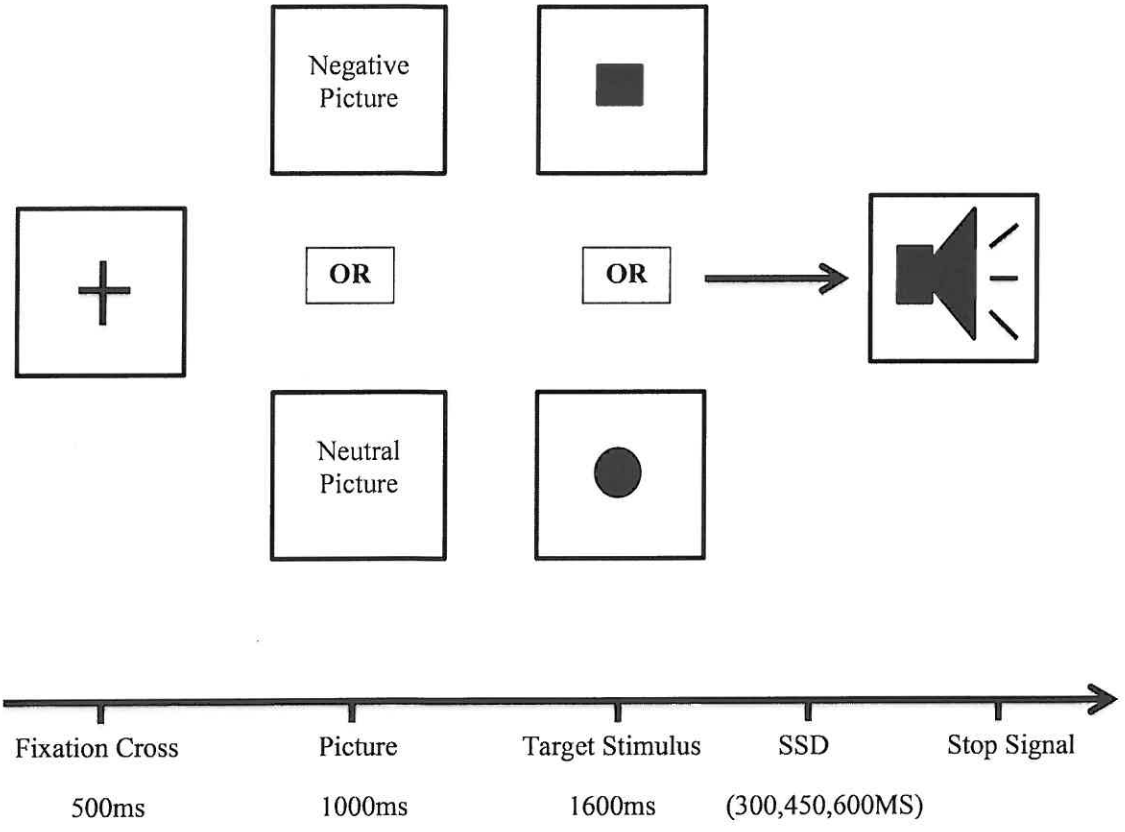


Figure 2: No-Stop Signal Trail

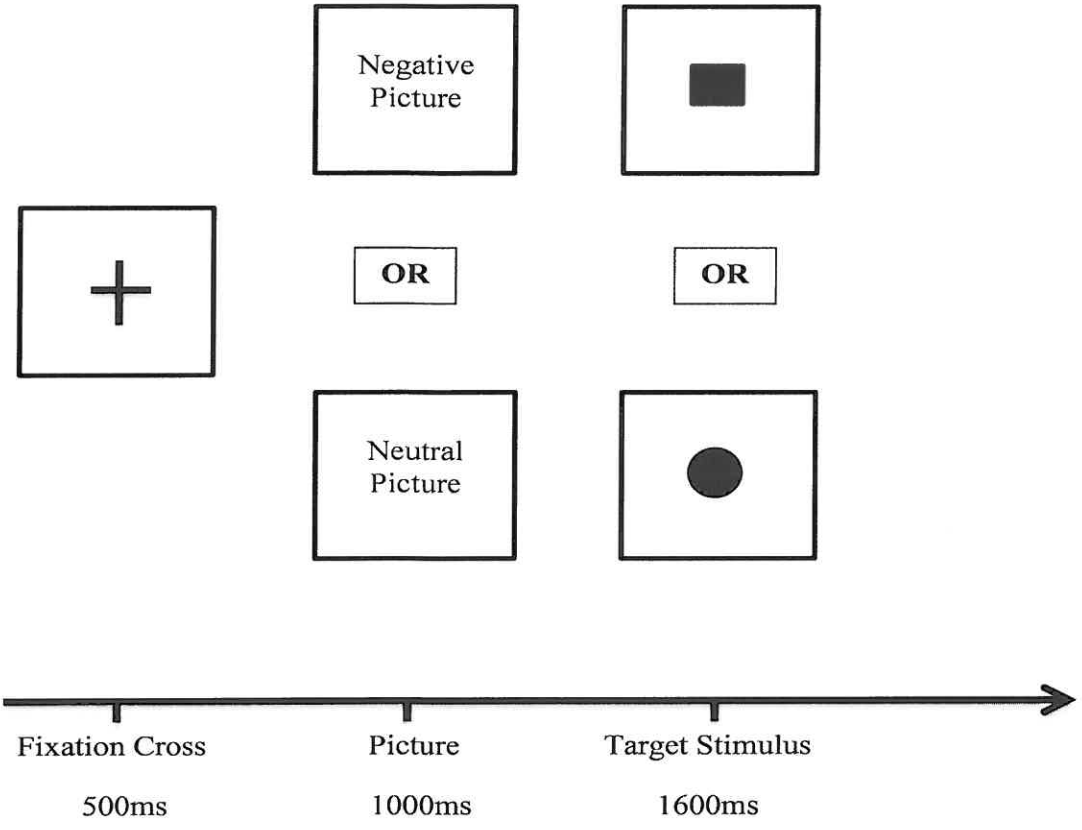


Figure 3: Graphic Representation of Reaction Time to Emotion Type

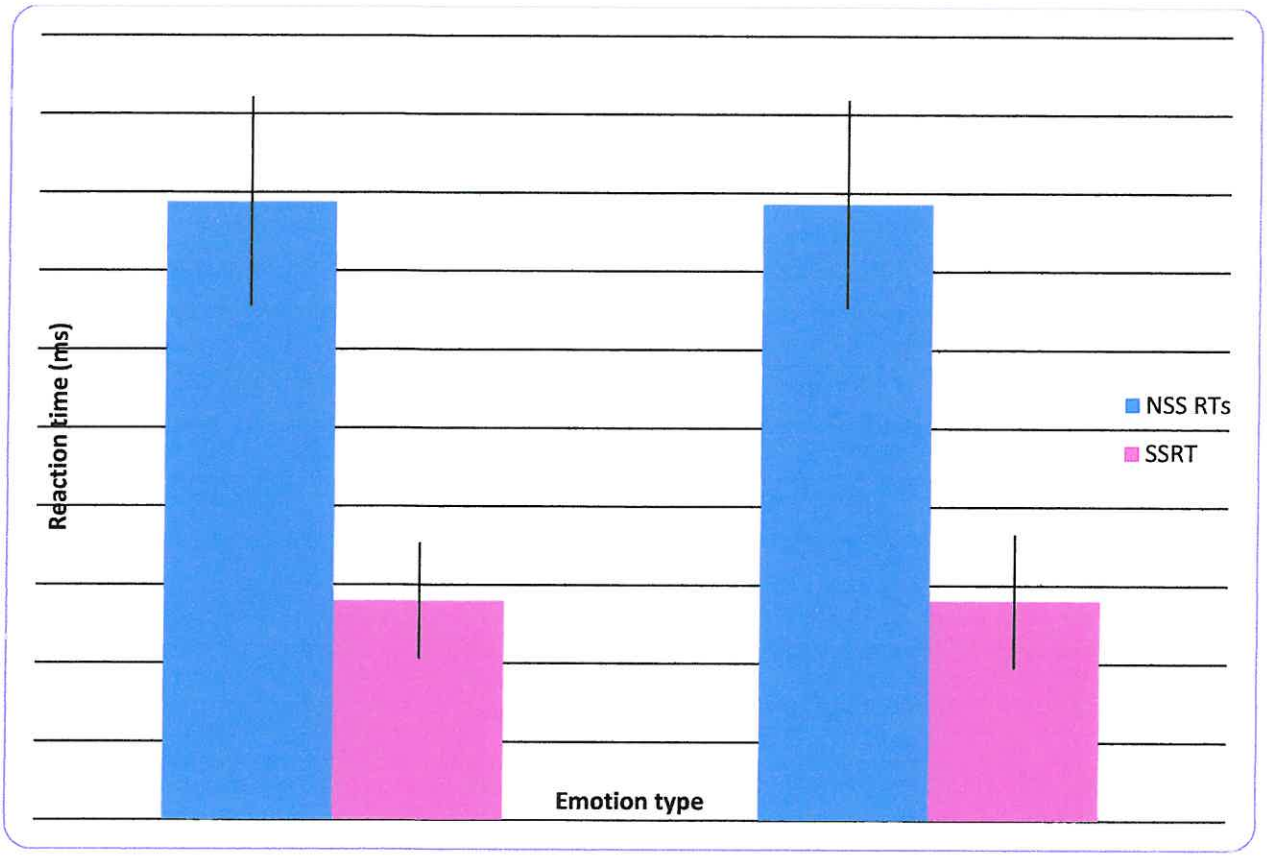


Figure 4: Graphic Representation of the Inhibition Function

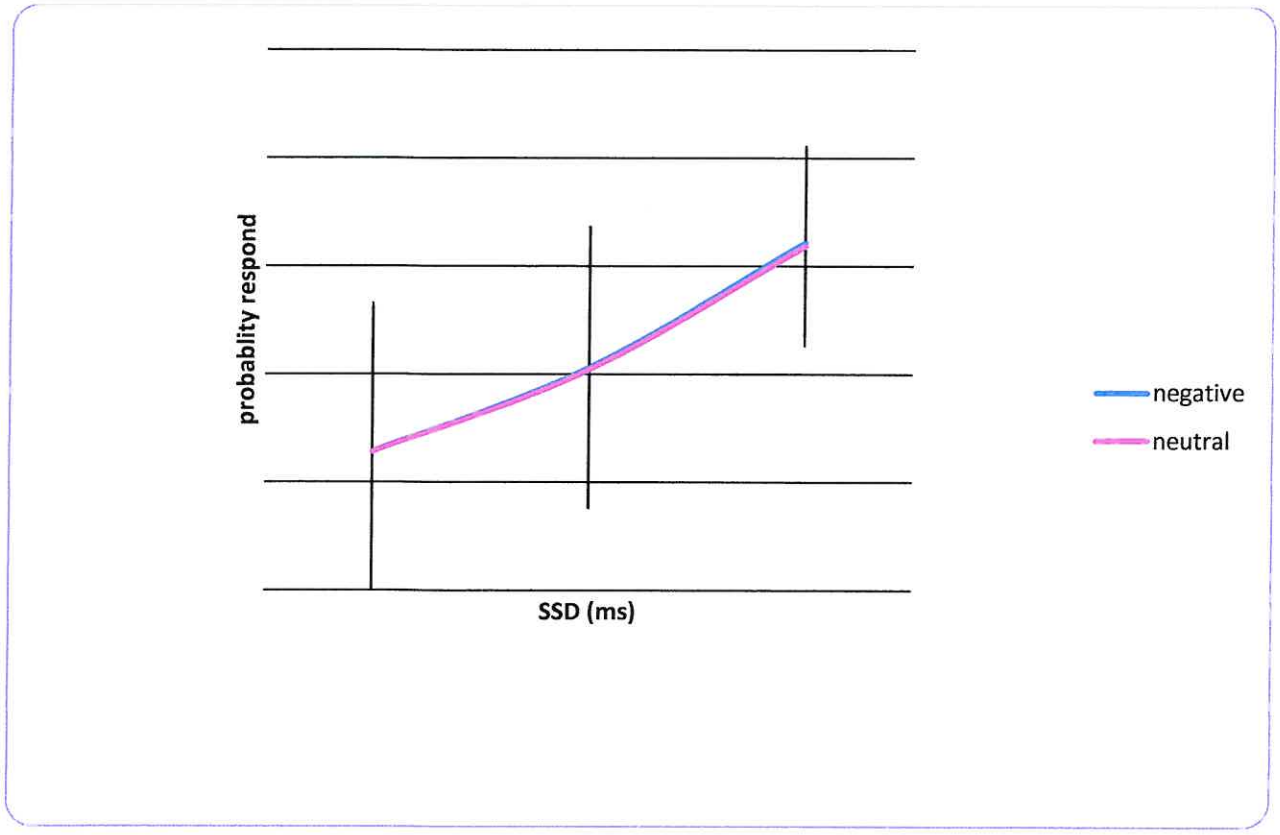
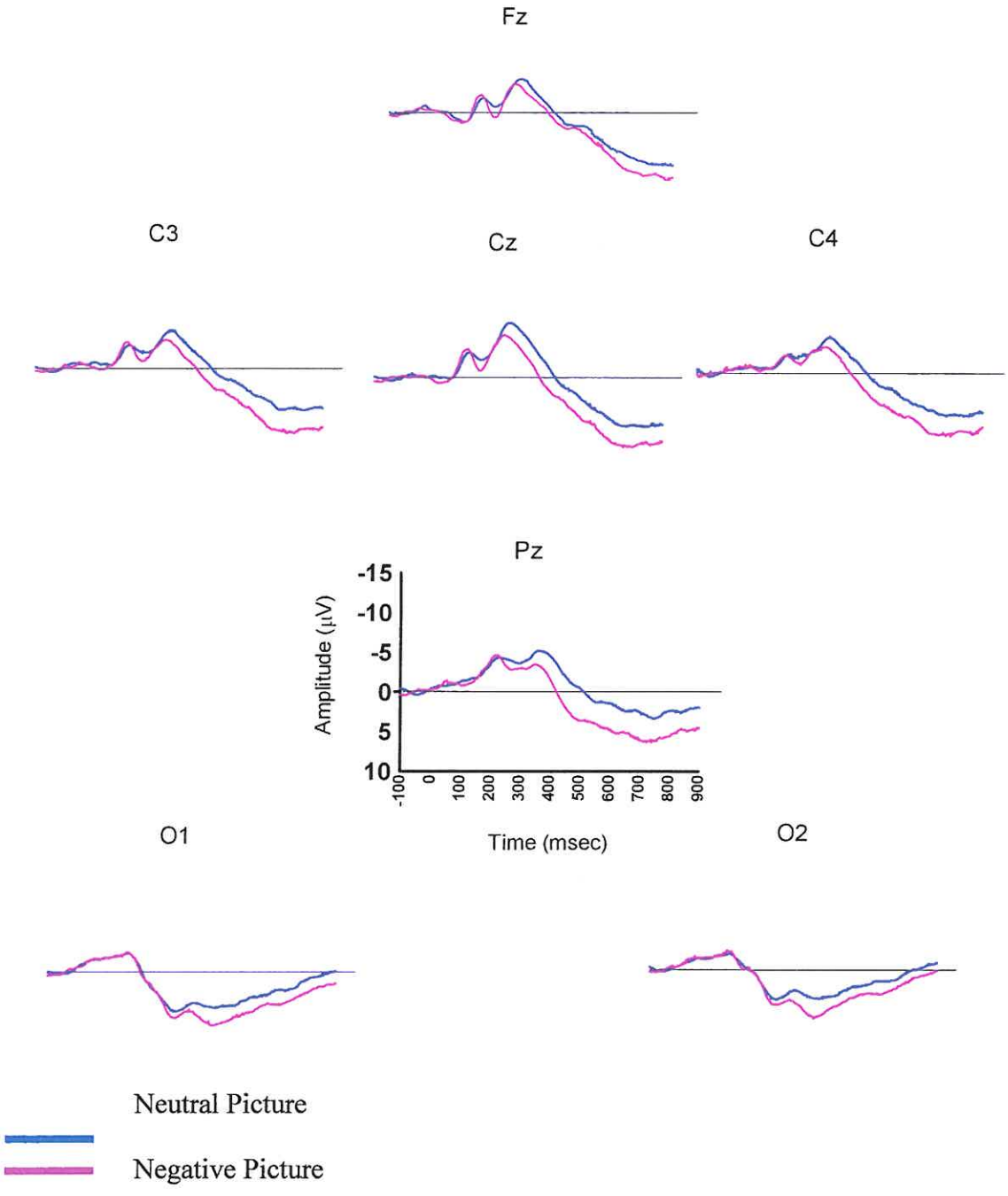


Figure 5: ERPs Aligned to Picture Onset



Appendix 6: ERPs Aligned to Target Onset

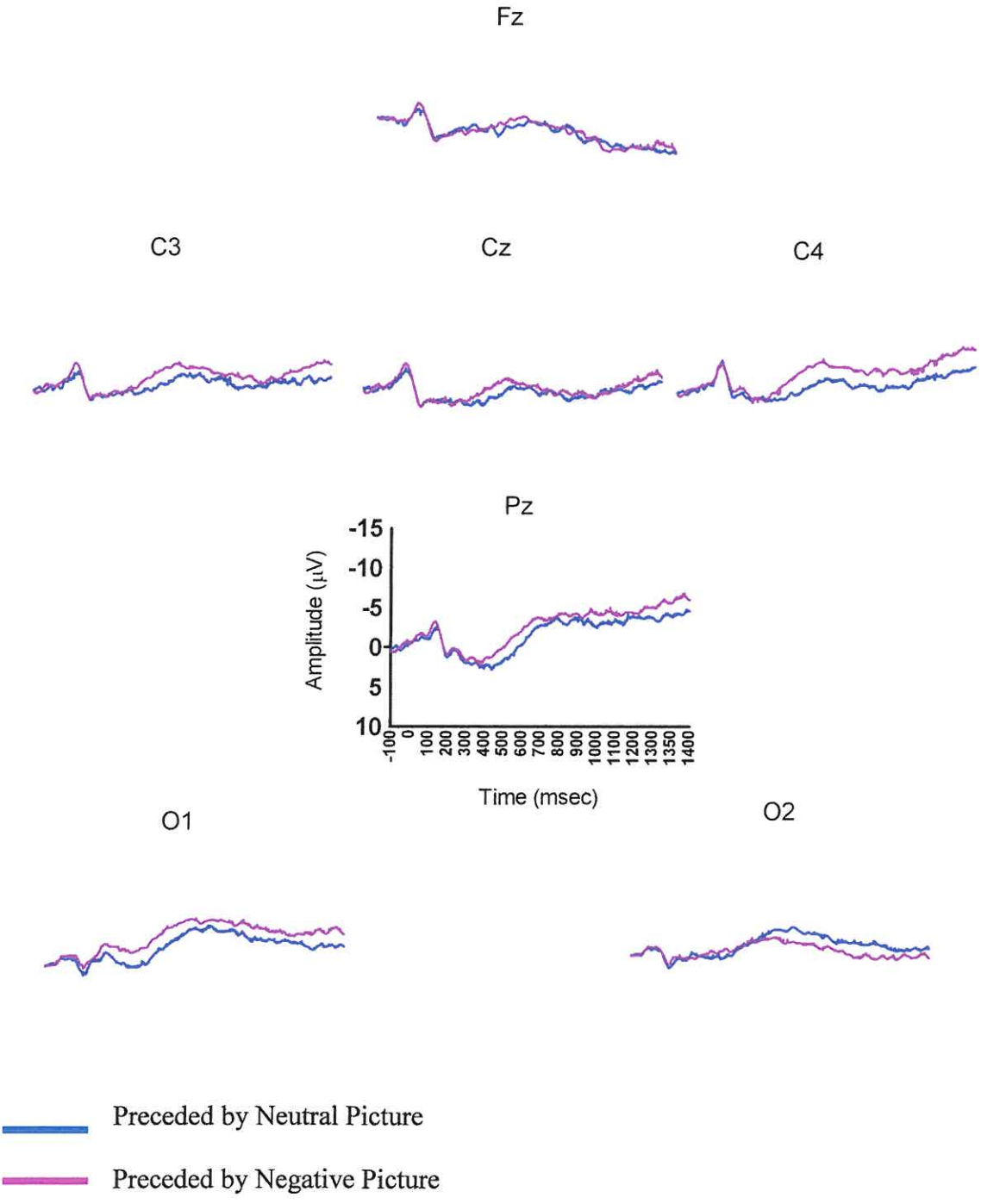


Figure 7: ERPs Aligned to Stop Signal Onset

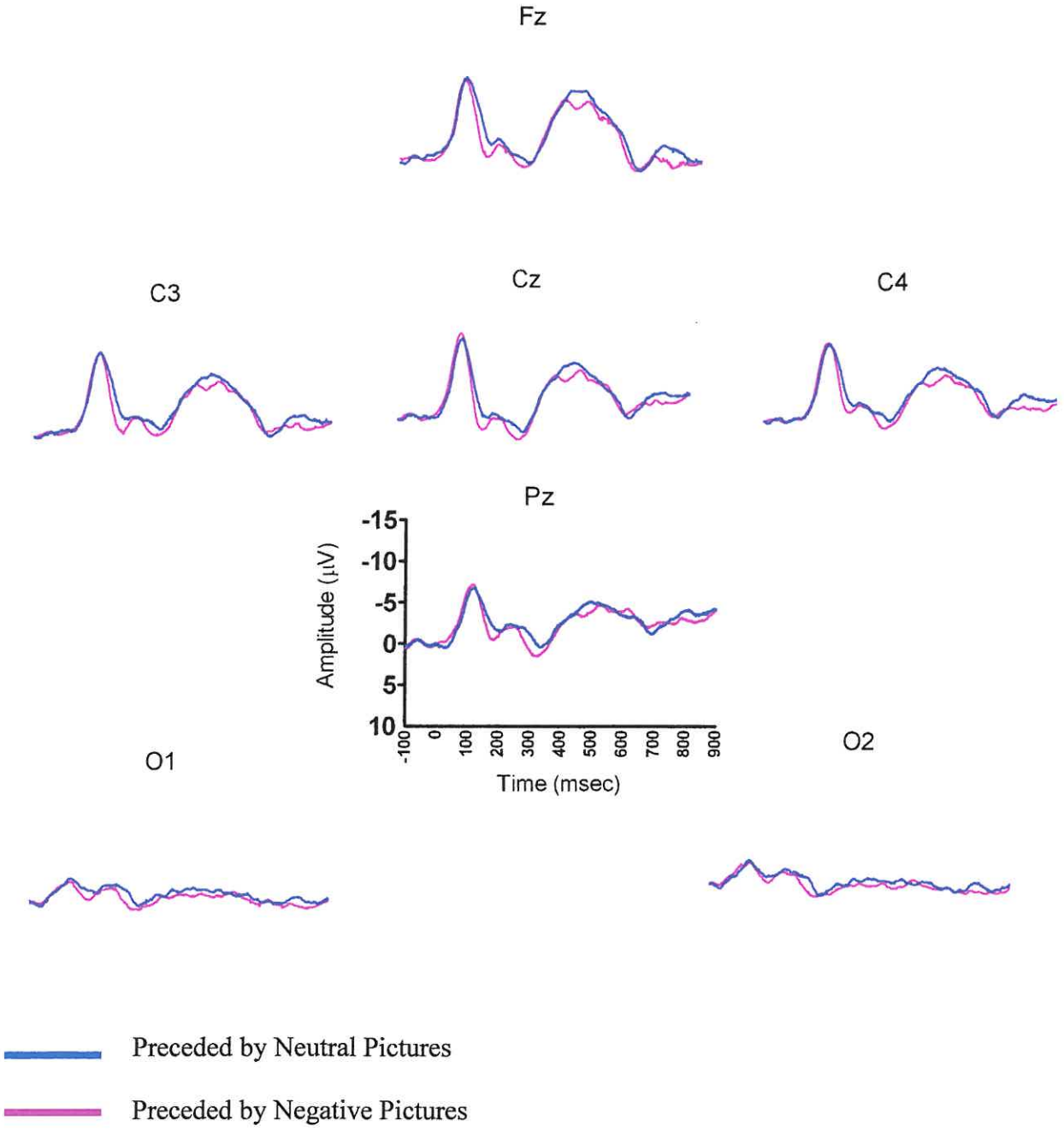


Figure 8: Consent Form

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Institutional Review Board
Approval Date: JUN 0 9 2011
Continuing Review Date: JAN 2 4 2012

Adult/General Informed Consent form for Participation in

The Influence of Emotional Stimuli on Response Inhibition Study

Funding Source: Farquhar Divisional Honors Program.

IRB approval # 01101109Exp.

Principal investigator:
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Institutional Review Board
Nova Southeastern University
Office of Grants and Contracts
(954) 262-5369/Toll Free: 866-499-0790
IRB@nsu.nova.edu

What is the study about?
You are invited to participate in a research study. The purpose of this present study is to examine the influence emotionally negative stimuli (highly arousing negative pictures) compared to neutral stimuli have on response inhibition using the stop signal paradigm.

Why are you asking me?
We are inviting you to participate because you are a female student at NSU over the age of 18. There will be between 50 participants in this research study.

What will I be doing if I agree to be in the study?
You are being asked to participate in a study on the influence of emotional stimuli on response inhibition. Approximately 50 people will be asked to participate in the entire study. Today, I will administer a demographic questionnaire to collect basic information about you, and after you will perform the stop signal task. The stop signal task will last approximately two hours and thirty minutes. Your EEG will be recorded as you carry out the task.

Initials: _____ **Date:** _____

Farquhar College of Arts and Sciences
Division of Social and Behavioral Science
3301 College Avenue, 236 Parker Building • Fort Lauderdale, Florida 33314-7796
(954) 262-7949 • Fax: (954) 262-3760

There will be two types of trials in the stop signal task called "stop signal trials" and "no-stop signal trials". You will respond by pressing a button depending on the shape of the object presented (e.g. press one when you see a square and two when you see a circle); however when a tone is presented (stop signal), you have to withhold your response.

The purpose of the electroencephalograph (EEG) testing is to meas ure the activity of your brain. In order to do this, we will need to clean small areas of your scalp, two areas on your face (below and next to your left eye), your earlobes, and your forehead with a 'gritty' liquid cleaner. We will place a cap on your head with EEG electrodes (small metal disks which monitor electrical activity) inside that will rest on your scalp. The electrodes will have a jelly-like paste on them to keep them in place. The electrode paste will completely wash out when you wash your face and shampoo your hair at home. The electrodes will be attached to a computer so that we can see your brain electricity. Every effort will be made to be sure that this process is not uncomfortable for you.

During the test, you will be asked to view neutral pictures (like a pencil) and unpleasant pictures (like the scene from a car crash) to see how your responses (responding and not responding) are influenced by the presentation of emotional and non-emotional images. There is no discomfort associated with EEG recording. There is a moderate chance, however, that you may experience discomfort while viewing the unpleasant images. If these are very uncomfortable to you and you do not wish to view them please tell the experimenter and you can stop the experiment.

What are the dangers to me?
All studies are considered to have some risk, however, an overall minimal risk (no greater than what one experiences in everyday life) is expected from participation in this study. There is a small risk that the cleaning of the skin may some irritation of the skin. However, utilizing the standard accepted technique of EEG electrode placement will reduce this risk to a minimum. If injury does occur, NSU has no plans to offer medical treatment which occur as a result of your participation in this study. There is a moderate likelihood that the unpleasant images you see on the computer screen will cause a brief period of discomfort.

If you have any questions about the research, your research rights, or have a research-related injury, please contact Dr. Jaime Tartar. You may also contact the IRB at the numbers indicated above with questions as to your research rights.

Are there any benefits to me for taking part in this research study?
There are no benefits to you for participating.

Is there any audio or video recording?
This research project will not include video or audio recording.

Initials: _____ **Date:** _____

Will I get paid for being in the study? Will it cost me anything?
You will receive a $40.00 Wal-Mart gift card as compensation for your time and effort after completion of the study.

How will you keep my information private?
The data collected in this study will not be associated with your name- only your participant number will appear on all forms and computer records. The signed consent form will have your printed name, signed name and participant number on it, and will be kept in a locked filing cabinet in the psychology research laboratory for three years after completion of the study. All information obtained in this study is strictly confidential unless disclosure is required by law. The IRB and regulatory agencies may review research records. Data collected from you will only be used for the present study.

What if I do not want to participate or I want to leave the study?
You have the right to leave this study at any time or refuse to participate. If you do decide to leave or you decide not to participate, you will not experience any penalty or loss of services you have a right to receive. If you choose to withdraw, any information collected about you **before** the date you leave the study will be kept in the research records for 36 months from the conclusion of the study and may be used as a part of the research.

Other Considerations:

This will be a two session study with participation in the second session dependent on your ability to complete screening appropriately. If the researchers learn anything which might change your mind about being involved, you will be told of this information.

*****This section purposefully left blank*****

Initials: _____ **Date:** _____

If there are any other questions or concerns with the research please contact:

Sarah Yassin, Email: ysarah@nova.edu

OR

Dr. Jaime Tartar, Nova Southeastern University, Division of Social and Behavioral Sciences, 3301 College Avenue, Ft. Lauderdale, FL 33314. Phone: 954-262-8192, Email: tartar@nova.edu

OR

Dr. Leanne Boucher, Nova Southeastern University, Division of Social and Behavioral Sciences, 3301 College Avenue, Ft. Lauderdale, FL 33314. Phone: 954-262-8464, Email: leanne.boucher@nova.edu

Voluntary Consent by Participant:
By signing below, you indicate that

- this study has been explained to you
- you have read this document or it has been read to you
- your questions about this research study have been answered
- you have been told that you may ask the researchers any study related questions in the future or contact them in the event of a research-related injury
- you have been told that you may ask Institutional Review Board (IRB) personnel questions about your study rights
- you are entitled to a copy of this form after you have read and signed it
- you voluntarily agree to participate in the study entitled, *"The Influence of Emotional Stimuli on Response Inhibition Study"*

Participant's Signature: _____ Date: _____

Participant's Name: _____ Date: _____

Signature of Person Obtaining Consent: _____

Date: _____

Initials: _____ **Date:** _____

Figure 9: Flier

Research Participation Opportunity

This study is on the influence of emotional stimuli on response inhibition. It involves the recording of electroencephalographic (EEG) activities from the scalp as participants respond to a target stimulus.

Requirements: Must be a female undergraduate NSU student at least 18 years of age.

Location: Nova Southeastern University

Parker Bldg Room 235

Times: By appointment

Duration of Session: Approximately two hours and thirty minutes.

Compensation: $40. Wal-Mart gift card.

For more information, or to participate, please contact:

Sarah Yassin at ysarah@nova.edu

In the email please provide the following information for easier scheduling and confirmation:

1. Name
2. Preferred e-mail address
3. Preferred appointment time

NOVA SOUTHEASTERN UNIVERSITY
Institutional Review Board
Approval Date: JUN 09 2011
Continuing Review Date: JAN 24 2012

response inhibition
Contact Info:
Sarah Yassin: ysarah@nova.edu

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