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Blink Modulation During Positive and Negative Picture Stimuli

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Abstract

In this study, emotional response to negative and positive visual stimuli is examined using blink modulation as a behaviorally based dependent variable. The researcher exposed 57 participants to an array of predetermined emotionally valiant and arousing pictures, and their responses were measured by establishing the number of blinks during presentation of stimuli. Results revealed a significant difference in positive low arousal stimuli compared to negative low arousal stimuli. Implications of this research include both a demonstration of visual stimuli activating measurable different responses and blink modulation as a rigorous behavioral measure to investigate responses to emotionally charged stimuli.

Keywords: Blink modulation, emotional responding, positive, negative, valence, arousal, picture stimuli

Dedication

I would like to dedicate this thesis to my parents and two older sisters. They have supported me over the last several years to help me get to this point; and have through blood, sweat and tears been there for me at every turn! I specifically want to thank my parents for their support and assistance in editing and revising my papers and providing advise and mentoring when I needed it most!

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Introduction

Emotions

Emotions are a part of our lives in numerous aspects throughout the day. Some individuals express the emotions they feel while others are less inclined to be expressive. What most people do not realize is though we think we are not expressing our emotions or how we feel, our body is expressing what and how we feel. This expression can be anything from body language (crossing arms and positioning our feet or body in certain directions), to changes in our facial expressions, or to even the rate at which we blink. Emotional expression has been studied since before the 1800s, as early Modern researchers began to wonder where emotions come from and how are they expressed.

Unfortunately, Darwin did not define the term; and as of 2000, the field of emotion had failed to provide a consensual definition (Wilson, 2006; Hess & Thibault, 2009; Gendron, 2010). According to Izard (1992), neuroscientists and ethologists assume emotions are specific neuropsychological phenomena, which are shaped by natural selection. Natural selection, in this framework, organizes/motivates physiological, cognitive, and action patterns facilitates an array of responses to environmental demands and opportunities. Though emotion has not been granted a proper, official definition, many authors and scientists have tried to define emotion in the best way to fit their model.

Author John Reeve (2005), in his book *Understanding Motivation and Emotion,* defines emotions as multidimensional, existing as "subjective, biological, purposive, and social phenomena." He also defines emotions as biological reactions/responses preparing the human body to adapt to any situation one may face. Reeve additionally identifies the six (6) emotions that have been determined by psychologists: fear, anger, disgust, sadness, threat/harm, and joy. These six emotions have been at the crux of researchers' endeavors in compiling their own definitions of emotion. For example, Cabanac (2002) defined emotion as a mental event that showed high intensity and included high pleasure or displeasure content. Another example is Ness and Ellsworth (2009), who define emotion as specific operation modes shaped by natural selection.

Ness and Ellsworth discuss how though theorists agree valence as a quality necessary for emotions; there is still disagreement on how many emotions exist. Emotions have blatant physiological change as well as facial change, but emotion regulation has a variety of interpretations and therefore the answer to the question as to how many emotions exists still eludes the scientists (see also Calkins, 1994). A study conducted by Graham (2009) concluded there was no one all encompassing answer to what emotion is, nor will there likely ever be. Emotion can be perceived in a variety of ways, but though there has been tremendous success in the study of emotion, Graham states there is a risk potential on a biological model-based push to define emotion, which could overpower conceptualizations that underscore the social influences on the definition.

There are numerous branches within the field of emotion, and each branch is focused on a certain area to help try to ensure the study of emotion is fully covered and eventually understood. Unfortunately, it seems impossible to fully define emotion with an all-encompassing definition. This notion is supported by Karnaze (2013), as he describes convenient in specific circumstances, stating "scientists build constructs for particular purposes with respect to particular contexts; constructs are not meant to be all-encompassing or to cross into different knowledge domains."

A brief history

The word emotion dates back to the 17th century from the French term émotion, "meaning a physical disturbance" (Dixon, 2012; also see Baldwin, 1894; Thorley, 2013). Though its use was increased during the 17th and 18th centuries, it was not assigned the category name for mental states methodically studied until the middle of the 19th century. During the 18th century, the word emotion was used to define the physical stimulations accompanying mental feelings. Scottish philosopher-physicians Charles Bell and Thomas Brown were the main contributors in the 19th century to emotion becoming a full-fledged theoretical term. It was also during the transition from the 18th to the 19th century that emotions were considered external by researcher Cogan (Dixon, 2012). Notions of emotion began to transform from the bodily domain to the mental domain, and increasingly were defined as noncognitive feelings instead of thought forms.

When Darwin conducted his studies on the evolution of species in the 1800s, he included research regarding the emotions of man and animals to help enhance his evolutionary studies (Hess & Thibault 2009). Darwin (1872), in his book *The Expression of the Emotions in Man and Animals*, discusses his research tying evolution to emotional expression. He explains how eye muscles, specifically those surrounding the eyes, contract as a measure of protection during infancy (see also Mattson, Cohn, Mahoor, Gangi & Messinger, 2013). During infancy, this protection measure is usually accompanied with loud screaming for hunger or pain, but as humans advance, and habits of screaming are repressed, the eye muscles will continue to contract during any slight distress detected. This evolution of expression aids in supporting the theory that emotions are internally naturalistic. As the human matures and develops, emotions evolve and adjust to the living environment of the human. However, the question remains if such emotional expressions are voluntary or not.

William James, according to Mandler (1990), theorized that emotion was perceptual/cognitive in the perception of a stimuli, and would then cause our feelings to change, and that occurrence was defined as emotion (this idea was later added to and became known as the James-Lange theory). The theory focuses on the bodily changes causing the emotion [e.g. run away as the basis for disliking to be eaten] (James, 1994; see also, Cannon 1927; Cannon 1931). Specifically, there are internal motivations that bring about emotions, but those motivations are due to voluntary actions (Mandler, 1990; Cannon, 1987; Dixon, 2012; Baldwin, 1894; Gable Reis & Elliot, 2000). Other theorists, including Cannon-Bard and Schachter -Singer, published their own theories of emotion (Dror, 2014; Dror 2017).

The Cannon-Bard Thalamic theory of emotion (Cannon, 1927), helped shift emotional studies to focus on central brain mechanisms; and did not give much thought to the differences in James-Lange theory (Lang, 1994). Specifically, Cannon's theory stated emotional instinctive changes are part of the body's general organization for action (more commonly known as the flight or fight theory). The theory hypothesizes a sympathetic division of the Autonomic Nervous System (ANS) with adrenalin as the basis for the physiological reaction of emotions (Kling, 1933). When a human encounters something our body feels threatened by, it responds physiologically with fight (interact with the threat) or flight (remove the body from the threat). Cannon's theory gives credible evidence to support emotion as an encompassing portion of internal, naturalistic, unconscious and voluntary input. In order for the fight or flight theory to be significant, there must be proof that shows the human body is capable of determining if a situation is threatening and how to respond.

Duffy (1934) discusses the complications with distinguishing what are emotions; pulse, change in muscles/respiration, galvanometric phenomena and other measures have failed to properly and successfully determine when a condition is emotional or non-emotional. Though these complications have caused setbacks, Duffy agrees with Cannon on the ANS controlling emotional responses. The ANS is considered the designated control center for emotions, specifically in the thalamus, but if measures cannot be guaranteed to distinguish, what are emotions then it is hard to determine if the thalamus and ANS are solely responsible for emotions.

Emotion studies have greatly increased the depth and perception of emotion. Expressions of emotions itself are now proven as "elaborate cognitive processing tasks," where integrated data from multiple brain sources occur in outside awareness (Lang, 1994). A consensus that has been developed over the past centuries is that though many theories and research have answered so many questions within the field of emotion, it is still unclear what is considered emotion.

Current Study: Blink Modulation

Blinking is a part of the human nature; it is something we unconsciously do every minute of the day. The amount of blinking is different during each of these minutes, and the change is usually due to the world we are encountering around us. Encounters such as something positive, like seeing a loved one, to something negative, like seeing an animal injured. Physiological measures of blinking could potentially benefit the field of emotion if researchers are able to validate the measurement and correctly identify when and why we blink at different rates to different stimuli.

Blink modulation is the amount of blinks by a person during a designated amount of time (Mallen, Lipp & Libera 2008; Lipp, Cox, & Siddle, 2001; Lang, Bradley, & Cuthbert, 1990; Feng, Courtney, Mather, Dawson, & Davison, 2011; Dichter, Benning, Holtzclas & Bodfish, 2010; Bradley, Cuthbert, & Lang, 1991). By measuring the amount of blinking, one can determine the emotional response occurring. Involuntary blinking has been used in studies to detect mental states associated with lapses of attention, fatigue, and stress. Another factor that can be determined by measuring blink modulation include one's attitude toward an environmental cue; blinking changes with one's attitude, such as during a political speech or looking at a report on a racial crime (Fiske, Gilbert, & Lindzey, 2010). Blink modulation has been used in numerous studies associated with mental states as well as studies checking for drowsiness and observing mental workloads of pilots and drivers (Jiang, Tien, Huang, Zheng, & Atkins, 2013).

Interval blinking has been acknowledged and determined to be a mechanism produced by the body as a protective measure (Darwin, 1872). If one is observing an unpleasant highly arousing stimulation, the body will respond with increased blink modality in preparation for the potential of another highly unpleasant stimulus. The thing to note, though, is this protective mechanism is only effective for a small timeframe. Anything passed 2000 ms would be ineffective and unable to probe for attentional or emotional processing (Amir, Weber, Beard, Bomyea, & Taylor, 2013).

According to research, an individual will blink at a higher rate when viewing something that is highly negative or arousing (Karla, Ruusuvirta, & Wikgren, 2014; Feng et al. 2011; Garner, Clarke, Graystone & Baldwin, 2011). [Feng et al. (2011) notes older adults are the opposite and blink more during positive stimuli compared to negative.] Specifically, these high rates occur when stimulation has in relation to categories of erotic, mutilation or threat at varying arousal levels (Kling, 1933). When one is viewing specific stimuli, it is not just the blink rate increased, but also the pattern of blinking that has been observed as being specific to certain stimuli. Blink inhibition and potentiation are specific to certain aspects and are greatly detailed in identifying the viewed stimuli. Startle inhibition was observed during the viewing of low to moderate arousal of pleasant and unpleasant pictures, while startle potentiation was observed during the viewing of unpleasant highly arousing pictures (Bradford, Starr, Shackman, & Curtin, 2015).

An examination of eye-blink responses has found negative (specifically fear-evoking) stimuli to process faster and automatic in comparison to neutral or positive stimuli. This finding substantiates Hess, Sabourin, and Kleck (2007) who propose, "When an individual is exposed to an unpleasant stimulus, the relevant subcortical, aversive system circuitry is activated, leading to the augmentation of defensive reflexes such as the eye-blink reflex." Studies reviewed involving positive and negative picture stimuli research have included a startle acoustic probe, which accompanied certain stimuli (Bradley et al. 2015; Dichter et al. 2010; Feng et al. 2011; Hess et al. 2007; Lang et al. 1990). With this research they found the acoustic probe caused an increased startle response to negative stimuli verse positive and neutral stimuli. Specifically, they would apply the acoustic probes before or during negative pictures. This brings to question whether the participants were actually responding to the negative stimuli or the startling acoustic probe being played. Such question leads us to the current study looking at whether participants blink more during positive or negative picture stimuli without any additional variables such as a startle probe.

The study of an individual's blink modulation when viewing emotional picture stimuli has been used to determine the effectiveness of measuring emotional responding via blinking by reviewing the amount of blinking conducted. This concept has been studied for many years using multiple methods such as eye-tracking, electromyography (EMG) as well as recording and tallying the number blinks conducted by participants (Jiang et al. 2013). Research methods have advanced over the years from time consuming blink tallying to utilizing electrooculography (EOG), EMG, electroencephalography (EEG), and custom instruments such as infrared light beams, magnetic coils and optoelectronic motion detectors. Unfortunately, measures such as EEG, EOG, and EMG as well as eye tracker equipment have shortcomings of missing data or blended data from recordings of events such as large head movements and recording delays (Jiang et al. 2013). When trying to properly correct for these mechanical errors, other errors can occur such as true blinks not being counted or false blinks being counted by mistake due to a lag in the recording. A time-consuming, yet more reliable way to ensure proper blink totals are counted is by manually counting the blinks accurately from a video-camera feed. This allows for little error in miscounting true or false blinks, as the researcher is able to physically see the blink occur to count accurately. This tallying measure is the method for collecting the dependent variable of our current study.

This study will analyze participant's emotional responses to picture stimuli selected from the International Affective Picture System (IAPS, Lang, Bradley & Cuthbert, 2008). The researcher via the valence and arousal measures provided by the IAPS selected 40 IAPS picture stimuli. Five blocks of valence/arousal stimuli were created based on their ratings, divided between low, mid and high arousal, and separated by positive and negative valence.

Method

Participants

Fifty-eight (49 females, 9 males) students from the University of Central Oklahoma psychology department participated in a 10-minute study. The participants' data was conducted to control for possible errors such as technical issues, participant errors and/or outlier data. The participants' signed up via a sign-up sheet in the capstone psychology course and had normal (or corrected-to-normal) vision and all participants were over the age of 18 years old. Additional demographic information such as age and ethnicity were not collected, as it was not applicable to the current study being conducted.

Materials

A recommendation from a professor for selecting the stimuli was utilized. The IAPS database received included Microsoft Excel files of ratings on each stimulus (Lang, et al. 2008). These rating files specifically included ratings of valence, arousal and dominance, with means of each valence, arousal and dominance. Each collection of ratings is based on ratings conducted by males, conducted by females and overall ratings of male and female combined. To select the stimuli that would be used for the current study, the researcher first created Excel files based on mean ratings of stimuli for valence ratings one through three (negative), four through six (neutral), and seven through nine (positive). The pictures were then divided into new Excel files by arousal levels: one through three (low), four through six (mid), and seven though nine (high). This allows the researcher to properly rate the stimuli as negatively low arousing to positively high arousing. By distinguishing these differences, the researcher will properly be able to identify if there is a significant difference between the participants emotional responding to stimuli via blink modulation. Ratings by females/males were not used, as the current study is not looking at separate gender data for comparisons.

Design

Each participant arrived for their study in Education building lab room 309, signed a consent form and then were directed to a computer. A Dell Intel Premium with a Pentium ® Dual core processor with four gigabytes of memory with keyboard and mouse were utilized in the study. Each computer ran Microsoft Office PowerPoint, which showed a slide show of the stimuli to the participants. An Ion Air-Pro video-camera recorder was set on top of the computer monitor in the center to capture the participant's face from beginning to end; another video-camera recorder was set up at a 90-degree angle to the left or right of the participant's shoulder, facing the computer screen at a 45-degree angle, and recorded the computer screen from beginning to end of PowerPoint (see Appendix A for a picture of the set-up). Once seated at the computer the researcher recorded the participant's ID on a sheet numbered in concordance with the video recording number. The researcher then instructed the student on how to complete the study and answered any questions the participant had.

Stimuli. Each participant viewed a total of 40 picture stimuli from the IAPS via a PowerPoint slideshow with an automatic time set at six (6) seconds per stimuli slide. The slideshow consists of overall instruction slides (Appendix C), which the participant was able to navigate through at their own pace. After participants read all instructions, they began the first trial. There was four trials, 10 stimuli each, with a slide order (figure 1) of fixation slide (500 ms), stimuli slide (6000 ms), mask screen slide (1000 ms). Each participant viewed a total of five (5) picture stimuli for the following levels of stimuli: negative valence + low arousal, negative valence + mid arousal, negative valence + high arousal; neutral valence +low arousal, neutral valence + mid arousal; positive valence + low arousal, positive valence + mid arousal, positive valence + high arousal (See Appendix H for samples). It is important to note there was no neutral valence + high arousal stimuli. At the conclusion of the fourth and final trial, instruction slides were presented thanking the participant for their time and to inform the researcher they were done. The researcher made sure to ask the participant if there were any questions, problems or concerns. Once any issues were addressed, the researcher thanked the participant for their time and led them out of the lab.

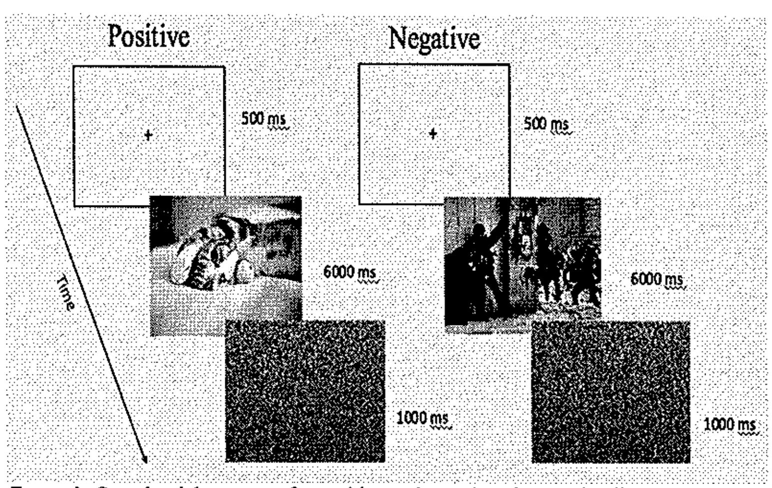

Figure 1. Sample trial sequence for positive and negative picture stimuli.

Results

G* power analysis was conducted before participation to determine the appropriate sample size; analysis has an effect size of 0.30 and sufficient power of 0.80 showing an acceptable sample size of 77. Due to time constraints only 62 participants were recorded; but due to video quality issues only 59 participants' data was adequate for analysis. A 2 x 3 within-within repeated measures Analysis of Variance (ANOVA) was conducted on 58 participants. There was no main effect of valence, $F(1, 56) = .927; p = .340$); and no main effect of arousal, $F(2, 112) = 1.597, p = .207$; mean of positive = -2.28, mean of negative = -2.35. There was no significant 2-way interaction of valence x arousal, $F(2, 112) = 1.538; p = .219$. There was a statistically significant difference of more blinks for positive low arousal verse negative low arousal (see Figure 3). Due to there not being neutral high arousal pictures, the researcher had a 3 x 3 missing block design and choose to completely eliminate the neutral valence group of pictures and no analysis was conducted on neutral low arousal or neutral mid arousal stimuli data.

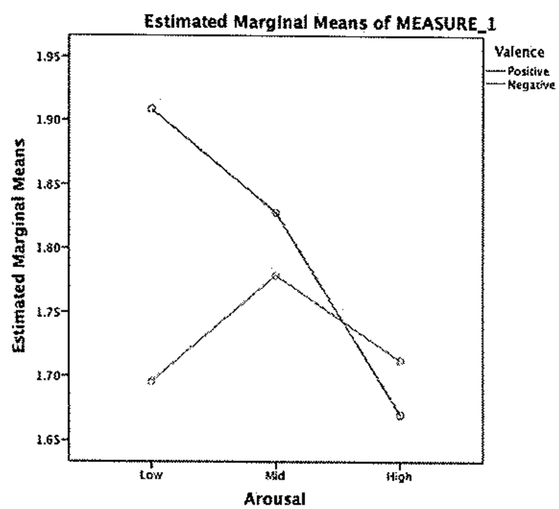

Figure 2. Line graph of estimated margin means between Arousal and Valence.

After completing the experiment, the participant pool individually provided a valence and arousal score for each of the 40 pictures and were allowed to do so at their own pace for no allotted time. They were provided a score sheet (Appendix F) which instructed them to rate each picture for valence and arousal; valence was defined as 'measured on a scale from one (1) to nine (9) with 1 being highly negative and 9 being highly positive'; arousal was defined as 'measured on a scale from one (1) to nine (9) with 1 being non-stimulating (physiologically) and 9 being highly-stimulating (physiologically). They were specifically instructed arousal was not meant as sexual or other wise, but to be rated based on if the picture physiologically made their body react (did their heart rate increase, did they feel nervous or anxious, did they gasp or vocally react in any way, etc.). Once these scores were collected from all participants, the researcher averaged the scores provided for each picture and compared the subject's pool ratings to the ratings provided by the IAPS.

Picture ratings differently scored for both valence and arousal by the current subject pool in comparison to the IAPS pool (Appendix B). There was a total of 13 valence ratings that were between one (1) and four (4) scores lower than IAPS ratings, and a total of two valence ratings that were between one (1) and three (3) scores high than IAPS ratings. There were 11 arousal ratings that were between one (1) and three (3) scores lower than IAPS ratings, and seven arousal ratings that were between .5 and two (2) scores higher than IAPS ratings. Specifically, picture 6 (IAPS 2370), 7 (IAPS 2590), 14 (IAPS 4220), 15 (IAPS 4290), 33 (IAPS 8185), 35 (IAPS 9331), and 36 (IAPS 9045).

General Discussion

The current study found more blinks were elicited during low positive picture stimuli compared to low negative stimuli; with no other significant findings. A two-way interaction was not observed, and a missing block design was discovered. This disallowed for the researcher to conduct any comparisons within or between the neutral blocks as neutral high arousal had no available stimuli. Current findings suggest the images chosen were not sensitive enough to determine differences, as the ratings of the stimuli completed by the participant pool showed that neutral stimuli were not a proper baseline for comparisons (see Appendix B). These findings do not support previous studies, which found blinks to be elicited more during negative compared to positive picture stimuli.

Noticeably absent from this research is the data showing an emotional response from blink modulation when viewing picture stimuli without a priming effect such as a startle probe. After concluding this study, it seems the acoustic probe in previous research could have been a confounding variable causing an unnatural response by the participants to the negative stimuli. The current research supports the theory that during negative events we are less likely to blink, and are more relaxed and more likely to blink during positive events.

To review, Darwin used his studies on emotional expressions to validate his theory of evolution, but unknowingly and greatly increased the future studies of emotion as a starting point for many theories. Researchers such as William James discussed the physical basis of emotion as the emotions we feel being a direct result of the actions we take; so "the reason we dislike to be eaten by a bear is because we run away" (Mandler, 1990). This theory by James was produced and researched based on information James learned from Darwin's work. Information produced by Reeve (2005) in his work "Understanding Motivation and Emotion" discusses how positive and negative emotions reflect the involvements of our motivations states whether that state includes satisfaction or neglect and frustration.

Authors, Reeve (2005, p. 296) and Nesse & Ellsworth (2009), have discussed in their works the distinction between positive and negative emotions; specifically, that positive is focused around the satisfaction of one's motivational states while negative is focused on the frustration of one's motivational states. They also explain that positive emotions echo successful adaptation of circumstances and negative emotions echo the unsuccessful adaptation of circumstances. Something Reeve (2005) discusses is even though we have emotions, and they range from positive to negative in valence, depending on the arousal context of the stimuli, we may not always be consciously aware of the motivation behind our behavior (p.66). When one feels threatened they will usually feel anxious, vulnerable, stressed or in danger (p.235). Fear and anger are emotions that have been discovered to arise from subcortical neural command circuits, but other emotions are not well explained by these circuits; instead, other emotions have been found to more likely come about from "personal experience, social modeling, and cultural contexts" (p. 300). When fear or anger or even the other emotions arise, they are usually during a highly engaging event and the human will show high levels of "attention, effort, persistence, verbal participation, and positive emotion" (p. 125).

Future implications available from this study include a two-part study of an acoustic probe in one group and no probe in the second group to analyze blink modulation and determine if the findings are different and why. Due to the current study's finding not equating to previous studies, it continues to raise the question of if the acoustic probe in causing multi-level stimuli response of blinking and the participants are responding to the probe more than the pictures. An additional implication once this question is answered, is combining blink modulation responses with post-auricular reflex measures (Gable & Harmon-Jones, 2009; Bernat, Pactrick, Benning & Tellegen, 2006).

Having the potential to combine blink modulation with post-auricular reflex measures for analyzing a sounder measure of physiological emotional responding would be a major improvement to the clinical population as well as the psychological and science populations. It is an important and advancing step that could change the way science and psychological assess individuals. By combining blink modulation with post-auricular reflex measures, one would be able to determine the emotional responding of an individual who is not able to verbally communicate or is potentially trying to malinger a response. If we are able to combine these measures, the ability to determine if someone who is mute, traumatically brain-damaged, or hesitant in responding emotionally we could better determine what they know. Someone who has had traumatic brain damage from an accident may not have the option to express motion, but the subtle reflexes (post-auricular and blink modulation) that may go unnoticed by the average human could be measured to express his/her emotions. If the doctors or psychologists were able to show the individual a series of photographs depicting certain people and events, then they would be able to narrow down or determine how much the person remembers, whom they remember, and their emotions towards those they remember.

Self-reporting by participants in Peterman, Bekele, Bian, Sarkar & Park (2015) suggests "social images were more arousing than non-social images," underscoring "the importance of social context in emotional experience." Future research should examine these effects in relation to more broad areas of positive stimuli (i.e. babies, animals, and food). Benning, Patrick, and Lang (2004), suggest the post-auricular reflex is being activated by the same acoustic probe used in eyeblink reflex studies, and therefore could produced a guide to appetitive system stimulation. If this index is produced, a valuable tool for studying these stimulations and investigating insufficiencies in affirmative affect related with psychopathology.

Specifically, results from Gantiva, Diaz, Ospina, Gutierrez, and Romo-Gonzalez (2014) suggests that using a startle probe (i.e. acoustic) while viewing negative picture stimuli produces a potentiated startle response, but inhibits the response while participants view high positive picture stimuli (see also Reagh & Knight, 2013; Lipp, Cox & Siddle, 2001;. As these authors state, though these responses are some of the most studied psychophysiological measures, it will be important to integrate added measures (i.e. heart rate and postauricular reflex) in future studies. Specifically, the aspect of blink modulation in measuring emotion not only is valid using pictures but has been shown to be valid with words as well (Silvert, Delplanque, Bouwalerh, Verpport, & Sequeira, 2004; see also: Van Den Hout, De Jong, & Kindt, 2000). The determined six emotions, that were mentioned earlier, were the primary target of the picture stimuli as to enhance getting the most intense response from the participants as possible. But, more research should be done by incorporating not just pictures, but words as well for stimuli. This could give more insight into responses to positive and negative stimuli as well as help generalize the results and findings to more areas of interest.

Being able to measure emotional responding by other means, other than directly asking someone, can be beneficial for multiple reasons including, someone who is mute or someone who does not have the ability to communicate their emotions well. Also someone who has been in a coma, cannot speak clearly at the time and it is questioned what and how much they remember before their incident. Blink modulation is important to psychological research for many reasons including the potential ability to pair measuring of blinking with other items such as psychological, forensic assessments as well as pairing the measure with postauricular reflex measures for a more solid measure of emotional responding to stimuli.

The final conclusion drawn from this research, thesis project is this: there still lacks a precise, all-encompassing, accurate definition of emotions and their subtypes. Research in the field of emotion is of the up-most importance, and can be frustrating on this lack of defining, but if it is accepted that no such accurate definition will ever be sought, a liberating end to a quest could be resolved. If we are able to accept this flaw in the field of emotional research, hopefully attention can be turned to focusing on the structures of emotions as well as their functioning and mechanisms for regulating the when and how of intensity of emotional expression.

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Appendix A

Picture of set-up

Appendix B

Table of Rating Comparisons

*Those highlighted in yellow are valence ratings that were different between pools.

*Those highlighted in Green are Arousal ratings that were different between pools.

Picture #	BM Valence	IAPS Valence
1	7.392	7.97
2	7.214	7.62
3	5.285	5.78
4	7.107	7.32
5	6.357	7.11
6	3.107	7.14
7	4.285	3.26
8	1.678	1.59
9	1.5	1.79
10	1.642	1.46
11	1.964	2.3
12	1.714	1.82
13	2.48	2.35
14	5.038	8.02
15	4.857	7.61
16	6.25	7.15
17	5.785	7.16
18	5.428	7.31
19	5.821	7.33
20	4.25	4.23
21	2.714	2.37
22	1.928	2.21
23	4.642	5
24	4.571	5.21
25	4.821	4.98
26	4.642	4.69
27	4.857	5.22
28	4.571	4.43
29	3.857	3.79
30	4.75	5.16
31	5.142	7.33
32	4.214	4.63
33	6.285	7.57
34	5.857	7.03
35	5.821	7.21
36	5.428	2.87
37	3.571	3.75
38	3.285	3.9
39	2.607	3.6
40	1.714	1.62

Picture #	BM Arousal	IAPS Arousal
1	4.142	3.94
2	4.5	5.12
3	3.821	4.3
4	4.928	4.37
5	4.142	4.08
6	4.142	2.9
7	4.892	3.93
8	6.821	7.34
9	7.035	7.12
10	6.821	7.21
11	6.535	5.06
12	7.214	5.75
13	3.285	6.91
14	4.115	7.17
15	4.928	7.2
16	3.821	4.67
17	3.25	3.79
18	3.214	3.26
19	2.84	3.57
20	4.178	6.29
21	5.214	7.35
22	6.571	6.2
23	1.678	2.42
24	1.571	4.17
25	1.571	2.66
26	1.5	2.69
27	2.035	2.95
28	1.642	2.55
29	2.857	3.69
30	4.178	4.02
31	5.285	7.35
32	4.071	4.14
33	5.607	7.27
34	5.464	5.41
35	4	7.31
36	4.892	3.85
37	4.464	3.89
38	4.607	3.91
39	5.571	5.57
40	6.107	7.15

Appendix C

Instruction Slides

WELCOME

THANK YOU FOR PARTICIPATING

THERE WILL BE FOUR DIFFERENT TRIALS

BEFORE EACH TRIAL THERE WILL BE INSTRUCTIONS,

PLEASE FULLY READ ALL INSTRUCTIONS & PRESS SPACE WHEN INSTRUCTED TO DO SO

PLEASE PRESS THE SPACEBAR TO CONTINUE

ON THE NEXT SLIDE YOU WILL HEAR A SOUND

THIS IS FOR RECORDING PURPOSES ONLY

THE SOUND WILL BE PLAYED ONCE ON THE NEXT SLIDE AND AGAIN AT THE END OF THE EXPERIMENT

PLEASE PREPARE TO HEAR THE SOUND ONCE YOU PRESS THE SPACEBAR

PRESS THE SPACEBAR TO CONTINUE

TRIAL 1

FOR THIS TRIAL THERE WILL BE ONE BLANK SCREEN, A PICTURE, THEN A MASK SCREEN

THIS ORDER WILL BE REPEATED MULTIPEL TIMES

PLEASE MAKE SURE TO LOOK AT EACH PICTURE FOR THE FULL LENGTH OF VIEW

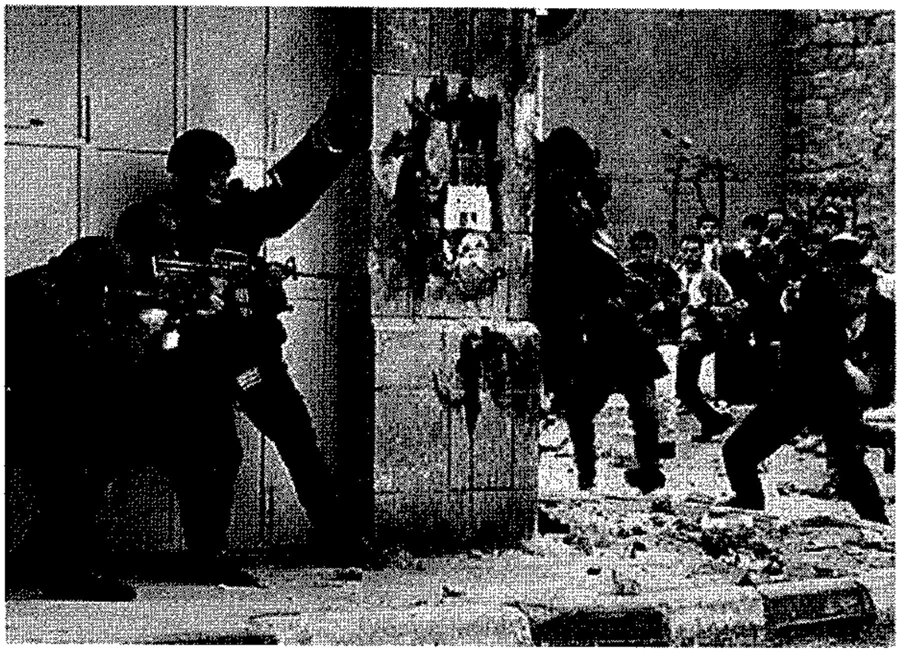
NOTE: ONCE YOU PRESS THE SPACEBAR AFTER THIS SLIDE, THE SLIDES WILL PLAY AUTOMATICALLY

DO NOT PRESS ANY KEYS UNTIL INSTRUCTED TO DO SO

PLEASE PRESS THE SPACE BAR TO CONTINUE

Appendix D

Stimuli examples



Top- Negative stimuli example

Bottom- Positive stimuli example

Appendix F

Participant Scoring Document

Participant Rating Document Blink Modulation During Positive and Negative Picture Stimuli

Participant Rating of Pictures: Valence and Arousal

For the pictures presented during the experiment, please rate each picture for valence and arousal.

Valence is measured on a scale from one (1) to nine (9) with 1 being highly negative and 9 being highly positive.

Negative	Neutral	Positive
1 2 3	4 5 6	7 8 9

Arousal is measured on a scale from one (1) to nine (9) with 1 being non-stimulating (physiologically) and 9 being highly-stimulating (physiologically).

Low	Mid	High
1 2 3	4 5 6	7 8 9

*Please provide one number between one and nine for the valence column and one number between one and nine for the arousal column.

Picture	Valence	Arousal
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

Picture	Valence	Arousal
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		
31		
32		
33		
34		
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36		
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40		

Appendix G

IRB approved informed consent form (2 pages)

UNIVERSITY OF Central Oklahoma

UCO IRB Number 17073
For Office Use Only

Appendix C
UNIVERSITY OF CENTRAL OKLAHOMA
INFORMED CONSENT FORM

Research Project Title: *Blink Modulation During Positive and Negative Picture Stimuli*
Researcher (s): PI: Sadie Jarrett; Co-PI: Dr. Gabriel Rupp; RAs: Blake Nesmith & Kelsey Bishop

A. **Purpose of this research:** This study investigates the blink modulation to study the intensity of one's emotional response to negative, positive and neutral stimuli via blink frequency
B. **Procedures/treatments involved:** Participants will be asked to perform a one session task viewing positive, negative, and neutral stimuli while video recording of the participant's blink frequency is recorded.
C. **Expected length of participation:** 30 minutes
D. **Potential benefits:** Participants are aiding in a study that will enhance general knowledge and benefit the psychological community. Participants will also earn course credit (if applicable).
E. **Potential risks or discomforts:** There are no expected risks associated with participation beyond similarities found in everyday exposure. Participants are allowed to stop at anytime if needed.
F. **Medical/mental health contact information (if required):** N/A
G. **Contact information for researchers:** You may contact the principal investigator, Sadie Jarrett, (970)-630-0057, if you have questions.
H. **Contact information for UCO IRB:** For questions regarding your rights and protection as a participant, contact the UCO Institutional Review Board at 405-974-5497 or irb@uco.edu. Address: NUC 341, Box 132, Edmond, OK 73034.
I. **Explanation of confidentiality and privacy:** Participants' names will not be attached to any data, nor will individuals or their responses be identifiable by researchers. Names will only be used in the SONA system for proper credit. All data obtained will be locked in a cabinet in EDU 309 and remain in confidence.
J. **Assurance of voluntary participation:** Your participation in this experiment is completely voluntary. You may choose to end this experiment at any time without penalty.

AFFIRMATION BY RESEARCH SUBJECT:

I hereby voluntarily agree to participate in the above listed research project and further understand the above listed explanations and descriptions of the research project. I also understand that there is no penalty for refusal to participate, and that I am free to withdraw my consent and participation in this project at any time without penalty.

-I acknowledge that I am at least 18 years old.
-I have read and fully understand this Informed Consent Form.
-I sign it freely and voluntarily.
-I acknowledge that a copy of this Informed Consent Form has been given to me to keep.

Research Subject's Name: ____________________

Signature: ____________________ **Date:** __________

***Please turn over to the other side and review consent information for video recording**

APPROVED
MAR 30 2017
UCO IRB

APPROVAL
MAR 29 2018
EXPIRES

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UNIVERSITY OF Central Oklahoma

UCO IRB Number 17073
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UNIVERSITY OF CENTRAL OKLAHOMA
INFORMED CONSENT FORM—VIDEO RECORDING

Research Project Title: *Blink Modulation During Positive and Negative Picture Stimuli*
Researcher (s): PI: Sadie Jarrett; Co-PI: Dr. Gabriel Rupp; RAs: Blake Nesmith & Kelsey Bishop

Consent to Video Recording: I hereby voluntarily agree to consent to video recording be taken of myself (specifically the eye region of the face) and acknowledge I may be identified via the recording. I understand this is necessary for proper completion of the study by the researcher and all measures will be taken to conceal video recordings.

A. **Purpose of this research:** This study investigates the blink modulation to study the intensity of one's emotional response to negative, positive and neutral stimuli via blink frequency.

B. **Procedures/treatments involved:** Participants will be asked to perform a one session task viewing positive, negative, and neutral stimuli while video recording of the participant's blink frequency is recorded.

C. **Potential benefits:** Participants are aiding in a study that will enhance general knowledge and benefit the psychological community. Participants will also earn course credit (if applicable).

D. **Potential risks or discomforts:** There are no expected risks associated with participation beyond similarities found in everyday exposure. Participants are allowed to stop at any time if needed.

E. **Storage of recordings:** All recordings will be properly stored on a 2TB Seagate Backup Plus Portable Drive in a locked, secure cabinet within the Education Building room 309.

F. **Disposal of recordings:** After the required time limit of storing recordings, 5 years, all participant recordings will be deleted and swiped from the hard drive.

G. **Contact information for researchers:** You may contact the principal investigator, Sadie Jarrett, (970)-630-0057, if you have questions.

H. **Contact information for UCO IRB:** For questions regarding your rights and protection as a participant, contact the UCO Institutional Review Board at 405-974-5497 or irb@uco.edu. Address: NUC 341, Box 132, Edmond, OK 73034.

I. **Explanation of confidentiality and privacy:** Participants' names will not be attached to any data, nor will individuals or their responses be identifiable by researchers. Names will only be used in the SONA system for proper credit. All data obtained will be locked in a cabinet in EDU 309 and remain in confidence.

J. **Assurance of voluntary participation:** Your participation in this experiment is voluntary. You may choose to end this experiment at any time without penalty.

Research Subject's Name: ____________________

Signature: ____________________ **Date:** __________

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MAR 29 2018
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