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Expressions of Threat: Micro Expressions in Response to Facial Expressions Facial Threat

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Expressions of Threat: Micro Expressions in response to Facial Expressions of Imminent Aggression.

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Dedication

In dedication to the countless hours, phone calls and unwavering support from my mother, without her none of this would have been possible. From a young age she taught me the importance of persistence, stubbornness and the amazing ability to always carry on.

I want to thank my committee members for their time, support and expertise, all of you have provided me with the ability to develop my skills as a researcher. Especially, Dr. Rupp, for without him this would have been just a fleeting research idea to be added to the notebooks. He has spent more time than one can count being a sounding board, a dedicated faculty member, a mentor and above all else an excellent example of a human being. Thank you all for everything.

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Abstract

The ability to determine what is a potential threat in our environment is even more important in the current world with terrorist attacks, mass shooters, unprovoked violence, serial offenders, and overall civil unrest. Humans have developed an evolutionary threat management system that allows for the prevention of harm. The threat management system is a biological, social and cognitive defense mechanism that allows for self-protection via the ability to detect a potential threat from the environment, whether that threat be a person, disease or animal (Neuberg et al., 2011). Facial expressions of imminent aggression, of premeditated aggression, disgust, and loss of control of aggression all elicit a threat response. This response is predicted to be a facial reaction in the form of a micro expression according to the guidelines of Facial Action Coding System (Ekman et. al., 2002). Participants were shown a series of pictures that fall under the four classifications of immanent aggression: premeditated, disgust, loss of control and other none threatening emotions. In order to correctly establish threat, participants received a cold pressor test in order to heighten the threat management system (Neuberg et al., 2011; Bublatzky & Schupp, 2011). By inducing mild pain with a cold-pressor test, the threat management system was activated, and micro expressions of threat detection, micro expressions of fear were not shown to correspond to given threatening images. Findings were not statistically significant, however there was an interaction between the conditions to missed threat detection. The ability to detect potential threats via facial expressions could aid in the prevention of terrorist attacks, and other violent crimes.

Introduction

Emotions determine our quality of life, rather it be through social interaction with friends and family, in the workplace, television and other media and even our safety. Emotions influence our decisions, our behavior and our interpretation of others' emotions (Ekman, 2007). Emotions are displayed in two primary ways: nonverbal and verbal. "It is written all over your face", is a clichéd expression for nonverbal expression of emotion. Nonverbal expressions signal to others your emotional state, such as anger, fear or aggression, without a need to understand the same spoken language. Nonverbal emotional expressions are not just in the form of facial expressions but also in body language. Facial expressions of emotions, unlike body language, are cross-culturally universal (Darwin, 1872; Ekman, Friesen, O'Sullican, Chan, Tarlatzis, Heider &Tzavaras, 1987; Hager, Ekman & Friesen, 1971; 1975; 2009).

There are four types of facial expressions: Macro, Micro, False and Masked (Ekman & Rosenberg, 2005) Macro expressions are deliberately shown expressions that match with the voice tone and word choice; they normally last between a half a second to four seconds (Ekman & Rosenberg, 2005). Micro expressions, on the other hand, are very short-lived expressions lasting between one-fifth and one-twenty-fifth of a second (Ekman & Rosenberg, 2005). Micro expressions are flashes of the concealed, either suppressed or repressed, emotion, and are formed from withholding one's self from the expression of the emotion (Ekman & Rosenberg, 2005). False expressions of emotions are deliberate expressions in order to demonstrate a given emotion (Ekman & Rosenberg, 2005). Masked expressions are used to hide a macro expression (Ekman & Rosenberg, 2005). The facial expressions of emotion that are universal are anger, happiness, contempt, fear, surprise, sadness, and disgust (Ekman & Friesen, 1975).

Not all facial expressions of emotions are recognized at the same rate; for example, facial expressions of anger are identified in a crowd before any other emotion. Facial expressions of anger can be an indicator for potential violent acts. One theory as to why humans can detect facial expressions of anger at a faster rate than other expressions is the evolutionary drive for survival (Öhman et. al., 2001). Humans have developed an evolutionary threat management system that allows for the detection of potential harm from our environment (Neuberg, Kenrick & Schaller, 2011). Threat management system is a biological, social and cognitive defense mechanism that allows for self-protection via the ability to detect a potential threat from the environment, whether that threat is a person, disease or animal (Neuberg et. al., 2011). Physical aggression is often proceeded by anger, which is the easiest identified facial expression (Öhman, Lundqvist, & Esteves, 2001; Ekman & Friesen, 1975; Zebowitz , Kikuchi, & Fellous, 2010). The perception of an angry facial expression could imply an impending threat to ones' physical safety (Neuberg et. Al., 2011). These expressions of anger are a specific version of facial expressions of anger: premeditated and two versions of loss of control (Matsumoto & Hwang, 2014). These expressions of imminent aggression are cross culturally identified, whether one has had personal experience with assault and violence, such as a victim or a police officer, or that have not had any prior exposure to violence. Facial threat expressions, that allow for the identification of what is a potential threat is even more important in the current world with terrorist attacks, mass shooters, unprovoked violence, serial offenders, , and overall civil unrest. The ability to determine what is and is not a threat in our environment is necessary to survive. With the current level of possible violence from terrorist attacks, suicide bombers, mass shooters, unprovoked violence, serial offenders, and violent riots, the ability to identify not only these

facial threats but identify the facial response can aid in prevention of violent acts being carried out.

A centuries old argument: Universality of Facial Expressions

Since Darwin's work, few scientists that have studied emotional expression have used such a wide variety of data such as animals, adults, children, different cultures, the mentally ill and the blind (Ekman, 2014). Emotions are complex; Darwin argued that emotions are innate, and they serve a purpose in communication and especially in survival (Darwin, 1872). Charles Darwin was one of the first to recognize the nonverbal expression of emotions on faces based on muscle structure (Ekman, 2009). All humans, regardless of race or culture, should express emotions through facial expressions and body in a similar, consistent pattern (Darwin, 1872, Barrett, Lewis & Haviland-Jones, 2010). The expression and comprehension of emotional expressions are even more complex, specifically, with nonverbal expressions. Nonverbal expression of emotions has been an outlier subject to study, with a long history of arguments and debates over facial expressions of emotions universality, and if some are, is there really these given universal emotions that are expressed on our face cross culturally. This debate began with Charles Darwin's *The Expression of the Emotions in Man and Animals* (1872).

Are facial expressions of emotions the same for all people? Are there rules for determining what is inherited and what is instinctive? Are these expressions more based on cultural habit? These and more questions that Darwin could answer through his observational studies; included in his findings were three principles of expression. Darwin, through his observations, concluded that in both animals and man, facial expressions communicate how one (man or animal) feels (Ekman, 2014). Darwin determined three principles for expression of emotions: The principle of serviceable associated habits; the principle of antithesis; and the principle of actions. The last is

due to the constitution of the nervous system, and are independent of the first of the Will and independent, to a certain extent, of Habit (Darwin, 1872).

1. The Principle of Serviceable Associated Habits: “Certain complex actions are of direct or indirect service under certain states of the mind, in order to relieve or gratify certain sensations, desires and whenever the same state of mind is induced, however, feebly, there is a tendency through the force of habit and association for the same movements to be performed, though they may not then be of the least use.”
2. The Principle of Antithesis: “Certain states of the mind lead to certain habitual actions, which are of service, as under our first principle. When a directly opposite state of mind is induced, there is a strong and involuntary tendency to the performance of movements of a directly opposite nature, though these are of no use; and such movements are in some cases highly expressive:
3. The principle of actions due to the constitution of the nervous system, independently from the first of the Will and independently to a certain extent of Habit or Direct action of the nervous system: “When the sensorium is strongly excited, nerve-force is generated in excess, and is transmitted in certain definite directions, depending on the connection of the nerve-cells, and partly habit.”

The first principle is needed for survival; the second is subsumed under “opposite minds”, meaning fear instead of anger, actions opposite in form will be performed involuntarily. The third principle is that the nervous system acts directly on the body and is involuntary as well (Ekman, 2014). These guiding principles cover the “majority” of involuntarily used by both man and lower animals, “under the influence of various emotions and sensations” (Darwin, 1872). The principles provide a stance for determining the difference between habit expressions, bio-

response; and expressions that are indirect or direct states of the mind. Actions readily become associated with other actions and blend together with sensations, and states of feeling, where they occur and grow together; it is hard to distinguish between all of the influencing factors to form expressions of emotions, to determine what is habit versus what is instinctual (Darwin, 1872).

Expressions of habit, such as when a man scratches his head when perplexed or contemplating, or when a man rejects a concept or idea and will typically shut his eyes as if to dismiss the topic are formed and are not part of the evolutionary determined expressions of emotions but are based on introduction from family and culture or media (Darwin, 1872), whereas there are reflex actions and that are elicited due to excitement in the peripheral nerve. These actions are highly expressive, are involuntary such as response to being started (Darwin, 1872). These reflex actions are seen in both man and "lower animals", with varying intensity levels (Darwin, 1872).

The ability to understand where and how emotional expressions are formed, from the three principles to the expressions in lower animals, provides insight into the universality of facial expressions of emotions. Darwin studied emotions such as "low spirits": anxiety; grief; despair; love; tender feelings; devotion; hatred and anger; contempt; disgust; pride; fear; and horror (Darwin, 1872). While, there are numerous cross cultural empirical studies, it is now well established that there are only six universal emotions of facial expressions (fear, anger, joy, contempt, sadness, happiness and surprise) (Ekman, 1971). That number was not as clear with Darwin's evidence. While majority of Darwin's theories have held up with empirical testing, there was scrutiny from the time of publication onwards for the merit and use of Darwin's findings on expressions of emotions.

There are four primary arguments that have been consistently formed in the years since the publication of Darwin's *Expressions of Emotions* book (Ekman, 2014). These five arguments are primarily based on the changing of the scientific method and acceptance of the times. As the years have passed, science is not conducted in the same manner and older findings become obsolete or questioned as to their applicability to "current" standards. The first argument against Darwin's findings is his tendency to anthropomorphize animal behavior; this error stems from his theory that man evolved from animal. However, as Chevalier-Skolnikoff (Chapter 2, p. 18, 1971) points out, contemporary science objects to characterizing animal behavior as having emotions (Ekman, 2014). The second argument against the accuracy of Darwin's findings is data collection; Darwin used observational data instead of systematic empirical data. Even though, Darwin's findings have been demonstrated to be accurate, the small sample of observations; lack of inter-rater reliability, and lack of control allows for Darwin's work to be easily dismissed as false findings until Ekman's work beginning in the 1960's (Ekman, 2014). Another issue with his observational data is that the data was collected by, others and he did not include all the observations that he obtained (Ekman, 2014). While this issue was minimized by multiple streams of data it would still be an issue with the acceptance of Darwin's work. The third issue with Darwin is his emphasis on innate determinism. That philosophy did not fare well, especially in the psychological community (Ekman, 2014). Watson rejected Darwin's work based on the notion that expression behaviors are not inherited and are solely based on environmental factors (Ekman, 2014). Watson claims that to know why one man differs we must consider what has been learned and not what is inherited (Ekman, 2014). This is a prime example of the current popular science influencing the acceptance of previous findings because it no longer fits the current accepted model, when only to be proven accurate later in history. The

fourth argument is about the use of natural selection and Lamarck's theory, which stated that learned characteristics could be inherited. Darwin (1872) uses observational data of a family to demonstrate that a specific action is inherited without considering the influence of environment on behavior. While Darwin's theory of natural selection has withstood over time, Lamarck's theory has not, which creates an issue due to how much emphases Darwin placed on Lamarck's theory instead of his own (Ekman, 2014). Darwin, however, was able to provide a foundation of evolution of emotional expression through his natural selection theory, specifically with his observations of animals (Ekman, 2014). "Animals who had a genetically based tendency to substitute facial displays (threats) for more dangerous actions (fights) probably had a higher survival ratio, thus passing this propensity on to their descendants", according to Chevalier-Skolnikoff (Ekman, 2014). "The young and the old of widely different races, both with man and animals, express the same state of mind by the same movements." (Darwin, 1872)

Despite the aforementioned criticisms, Darwin has had major contributions that have stood up to decades of empirical testing. Darwin was the first to treat emotions as separate discrete entities or modules, such as anger, fear and disgust (Ekman, 2009). While some of his emotion classifications would not stand up to being universal distinct emotions, they are considered variants of the universal emotions, such as hatred is considered a variant of anger and disgust (Ekman, 2009). Darwin's primary focus on the face and not on vocalization, tears or posture allowed for the separation of other influences on understanding the emotion that is expressed (Ekman, 2009). Research determines that while timing of emotion expression is important, vocalization is not universal nor is body language as they fall under cultural display rules that varies (Ekman, 2009). Another contribution is that emotions are not unique to humans; animals have emotions and display emotions (Ekman, 2009; Darwin, 1872). There are two other major

contributions that Darwin would find that would define facial expressions for decades to come: (1) Facial expressions of emotions are universal, whereas gestures are cultural; (2) Particular movements of the face signal particular emotions, such as raising of the upper lip is one indicator for anger (Ekman, 2009; Darwin, 1872). Ekman's own research over 13 cross cultural studies and decades of research that would empirically demonstrate Darwin's findings (Ekman, 2009).

Facial Expressions of Emotions

As Izard (2010) notes, " Emotion consists of neural circuits (that are at least partially dedicated), response systems and a feeling state/process that motivates and organizes cognition and action" Emotion also provides feedback and information to the person experiencing it and may include "antecedent cognitive appraisals and ongoing cognition including an interpretation of its feeling state, expressions or social-communicative signals" emotions also might provide information for avoidant behavior and be social in nature and provide abilities to relate to one and another (Izard, 2010). Emotions influence social actions, relationships, and empathy for others (Ekman, 2015). There is still no clear and concise definition of what emotions are and how they are expressed and interpreted not only by one's self but by others, with "current research" insinuating there cannot be a "unilateral definition of emotion" (Izard, 2010). While there may not be a distinguished definition that can be applied universally to emotions, research has generated an accepted six universal emotions. These six are: anger, fear, disgust, happiness, sadness and surprise (Ekman, 1994). However, there is a debate on whether there should be a seventh universal emotion; the seventh possible universal emotion is contempt (Matsumoto & Ekman, 2004). While in some tasks Japanese and Europeans do identify contempt more often in certain tasks, native English speakers do not label contempt as contempt expressions (Matsumoto & Ekman, 2004). The six universal emotions are part of families or groups of other emotions;

they are a part of larger groupings of emotional states that fall into these basic categories (Matsumoto & Ekman, 2004). For instance, the sadness family also includes hurt, distress, sorrow, depression, melancholy and disappointment (Matsumoto & Ekman, 2004). The universal emotions were established through 13 cross-cultural studies of facial expressions beginning in the 1960's with the Primary Investigator being Paul Ekman PhD (Ekman, 2014). Facial expressions are elements of a coordinated response involving multiple response systems; they are one part of a complete behavioral response with body language, vocalization, posture gestures and physiological responses (Barrett, Lewis & Haviland-Jones, 2010 Chapter 13). Facial expressions are more complex than being "simple readouts of internal states"; facial expressions coordinate social interactions by providing contextual information for others (Keltner & Kring, 1998). An emotional expression also serves as a social affordance that elicits a specified response (Esteves, Dimberg & Öhman, 1994). For example, with anger, it is possible that the evolutionary reasoning behind anger as an emotional expression is to elicit fear-related responses and the inhibition of "inappropriate action" (Dimberg & Öhman, 1996). Matsumoto (2006) demonstrates that the Japanese tend to label others anger expressions as "scary". Universal facial expressions of emotions follow five basic principles: (1) they occur universally in emotionally arousing situations; (2) are linked with subjective experience; (3) are part of a coherent package of emotional responses; (4) are judged universally and discretely; (5) have important social functions (Barrett et. Al., 2016).

Empirically testing the universality of facial expressions of emotions were performed in isolation from one another. Ekman and Friesen (1971) extended Izard (1971) findings of cross-cultural agreement with their (Ekman and Friesen) study in New Guinea of an isolated tribe. Not only did Ekman and Friesen (1971) have the same emotions identified but were also able to

establish the context and agreement of the context for given emotions, such as expected emotions from the death of a child (Ekman, 1993). Ekman (1972) and Friesen (1972) expanded on their previous findings with how expressions are interpreted (8Ekman & Friesen 1971) to an empirical understanding for how and when expressions are shown; these studies would be the strongest evidence of emotional expressions being universal. Ekman (1972) and Friesen (1972) compared Japanese students with American students facial expressions in a neutral trial and a stressful trial. They found an agreement of .86 in the upper face (brows) and .96 in the lower face was found (Barrett et. Al., 2010; Ekman, 1993; Ekman, 1972; Friesen, 1972). The universality of facial expressions of at least seven emotions has been demonstrated cross-culturally in America, China, Japan, Germany, Canada, and France using both reliable versions of Facial Action Coding System (Ekman, 1978; 2002) (Bonanno & Keltner, 1997;2004; Bonanno et. Al., 2002; Camras et. Al., 1990; Ekman et. Al., 1980; Ekman, et. Al., 1988; Ekman et. Al., 1997; Soto et. A., 2005). There has been consistent demonstration that facial expressions, specifically on the micro expression level, are subjective to experience and cannot be faked and are an accurate representation of the persons current emotional state and intensity ratings (Brattel et. Al., 2016; Rosenberg & Ekman, 1994; Mauss, Levenson, McCarter, Wilhelm & Gross, 2005). This phenomena is specific to emotional expressions, there are some facial movements that are not indicative of emotion (Ekman, 1989), as well as cultural display rules that are culturally specific for the society's members for when and how emotions should be displayed (Ekman & Friesen, 1969; Matsumoto, 1990). Display rules are influenced by the culture, gender and the relationship to the person one is expressing emotions to or around (Safdar et. Al., 2009). For instance, in an individualistic culture emotions are seen as important personal experiences, and the individual has the right to express. The emotions are considered to be inner states, and some cultures may

even encourage exaggerated outward expressions of emotions (Safdar et. Al., 2009). In contrast with collectivistic cultures value groups and see emotions as interactive experiences and reflect social context instead of inner states of emotions; expression of emotion are also grounded in the relationship between the self and the group (Safdar et. Al.,2009; Noon & Lewis,1992; Mesquita, 2001).

Display rules can also determine the intensity and social acceptance of expression of emotions with both powerful (anger) or positive emotions (happiness) (Safdar, Friedlmeier, Matsumoto, Yoo, Kwantes & Kakai, 2009). Individualistic cultures put an emphasis on happiness and positive emotions, to the point that positive emotional situations are sought out (Safdar et. Al., 2009). However, collective cultures do not have this same pressure for positive emotions, so much so that the Chinese have the lowest display of positive emotions when compares to Australia and the United States (Safdar et. Al., 2009). Anger, disgust and contempt, which are powerful emotions also have different acceptance levels based on the type of culture and situation. In individual cultures, anger is seen as functional and expression is tolerated on the notion of self-assertion and protecting of ones' rights and freedoms, so long as the expression still follows socially appropriate methods (Eid & Diener, 2001; Stearns & Stearns, 1986). In collectivistic cultures, expression of anger is not as accepted because it is perceived as a threat to authority and harmony (Miyake & Yamazaki, 1995). It is important to understand display rules for cultures and in-group versus out-group parameters. The closer one feels to his/her in private with in-group the more freely expressions of emotions are, allowing for different display rules than in public (Safer et. Al., 2009). The relationship of the group does not account for all emotions being expressed equally, nor does the type of culture. For instance, contempt, disgust and fear are the least accepted emotional expressions with both in-group and out-group, because

they are disruptive to social relationships (Gottman & Levenson, 1992, 2000; Rozin, Lowery, Imada & Hadt, 1999).In-group versus out group not only dictate rules of display but also how expressions are interpreted. For instance, those of the same group are less likely to determine facial threats as a personal threat than from individuals of other groups (Matsumoto & Hwang, 2011). While display rules influence how and when facial expressions of emotions are displayed, those rules do not influence facial reactions

Understanding how we interpret facial expressions of emotions and respond to them is just as important as understanding what the expression means on a global level. Humans recognize emotion in other via simulating the emotional experience themselves (Goldman & Sripada, 2005). It is through mimicry that the correct emotional response is experienced from the observer (Goldman & Sripada, 2005; Lipps, 1907; Niedenthal, Brauer, Halberstadt , & Innes-Ker, 2001; Oberman, Winkielman & Ramachandran, 2007; Stel & van Knippenberg, 2008). This process is theorized as the *reserve stimulation model*, it is a three-step model (Goldman & Sripada, 2005; Lipps, 1907). The first step is reignition of the emotion, the observer then mimics, subtly, the emotion which generates the second step of facial feedback for the corresponding emotion for the correct response. The third step the observer has classified the emotion that is being experienced by the other person at which point the response is produced at a spontaneous and rapid rate (Dimberg, Thunberg & Elmehed, 2000; Lundqvist & Dimberg, 1995).

Dimberg (1982) found that in response to emotions being expressed, the observer has EMG response patterns that are evoked during the displayed emotion. Dimberg, Thunberg and Elmehed (2000) found that "it is possible to unconsciously evoke a physiological response that is more than an attention-arousal response (e.g., an aversively conditioned skin conductance response to angry faces, as in (Dimberg & Öhman, 1996)". Positive and negative facial

emotional response patterns can be spontaneously evoked without conscious awareness of the eliciting stimuli (Dimberg et. Al., 2000). Humans respond to emotional facial expressions even when the expressions are presented in a masked form (Dimberg et. Al., 2000). This finding supports both Darwin's (1872) and Ekman's (1992) theories that facial expressions of emotions are both biological and independent of cognitive process. In fact, there is a predisposition to react emotionally to facial expressions (Buck, 1994; Dimberg, 1997). Not only do humans react emotionally to facial expressions but special emotional expressions are detected at a faster rate than other. For example, facial expressions of anger (or threat) are detected at a faster rate in crowds than any other emotional expression (Öhman, Lundqvist & Esteves, 2001; Pinkham, Griffin, Baron, Sasson & Gur, 2010; Hansen & Hansen, 1988). Facial threats are a set of gestures that are versions of anger (Ekman & Friesen, 1975), that in some cultures are used as ceremonial masks to represent evil or threatening faces (Aronoff, Barclay & Stevenson, 1988). While facial threats are variants of anger, they serve another purpose; evolutionarily speaking, facial threats serve as an efficient cue for human fear conditioning (Öhman & Dimberg, 1978). Response to facial threats are not dependent on the conscious identification, but response can be observed with masked facial threat expressions (Esteves, Dimberg & Öhman, 1994; Dimber & Ohan, 1996). While angry faces (facial threats) do not "pop out" as originally theorized by Hansen & Hansen (1988) (Ohmen et. Al., 2001). Threatening faces are more quickly and accurately detected than other negative faces such as sadness (Öhman et. al., 2001), which suggests that the threat advantage can be attributed to biological survival, whereas with negative emotions such as sadness, there lacks the same biological drive for survival that threatening faces elicit (Darwin, 1872; Ekman, 1992). The ability to not only detect but also react accordingly to threat has evolved in humans in order to survive and produce the next generation. Evolutionarily

speaking the ability to adapt to the environment and change according to what is needed allows for long-term survival (Darwin, 1872**).** This effect is seen even between younger and older adults, threatening faces are detected at different rates between the age groups, however, the threats are still detected at a faster rate than other faces (Mather & Knight, 2006). Facial threats are identified as variants of anger, with the primary difference between the faces is the motive for the expression.

Anger and aggression

Emotions prime behaviors through unique physiological signatures and mental structures (Matsumoto, Hwang & Frank, 2012). Aggression is defined as " any behavior directed toward another individual that is carried out with the immediate intent to cause harm; the perpetrator must believe that the behavior will harm the target and that the target is motivated to avoid the behavior of the perpetrator" (Bushman & Anderson, 2001;2002; Baron & Richardson, 1994; Berkowitz, 1993; Geen, 2001). There are two key points to the definition of aggression. The first is the intent of the perpetrator: there must be intent to cause harm and or behave in a manner that the target would be expected to avoid. The second is the desire of the target to avoid the given behavior. Aggression is not accidental harm, it is not a byproduct of actions; it is a direct and deliberate act. Anger is defined by a negative phenomenological emotional state that motivates desires for actions against others or oneself to warn, intimidate, control or attack (Kassinove & Tafrate, 2006). Anger, as an illustrative example, is an emotion that is often difficult to control due to the intense physiological reactions involved in the fight-or-flight response which is triggered to protect oneself against the instigating situation (Lazarus, 1991). Aggression does not always require anger; in the same regard anger does not always escalate to aggression (Averill, 1983). The instances where aggression and violence is present without anger

includes professional killing; while this is a violent act, it lacks the hostile aggression as a typical violent act would have due to the context of the violence (Averill, 1983). The intent or motive behind the aggressive act determine the type of aggression.

There are two primary types of aggression: premeditated and loss of control or impulse aggression loss of control/ impulse aggression is elicited in response to a perceived threat or provocation response that is distinguished by a loss of behavioral control (Berkowitz,1993; Barratt, 1991; Stanford et. Al., 2003). Loss of control is also defined as uncontrolled, emotionally charged aggressive act that results from minimal provocation (Lake & Stanford, 2011). In contrast, premeditated aggression is cold, calculated, involves planning, and is typically a behavior that is useful to obtain some subsidiary goal. In short, it is not from a spontaneous nor agitated state (Berkowitz, 1993; Stanford et. Al., 2003). Premeditated aggression is the less common than loss of control aggression and is motivated by an external goal, it is chosen behavior in a way that loss of control is not. (Walsh, Swogger & Kosson, 2009; Woodworth & Porter, 2002; Bandura, 1973; 1983)Loss of control, in contrast, is theorized to be a hostile reaction to frustration (Berkowitz,1993). For instance, loss of control aggression with have anger as a primary emotion whereas premeditated would be less likely to have anger and more along the lines of what an assassin would express based on the presence of anger or not. Expressions of anger are part of the six universal emotions (Ekman, 1972); expressions are aggression are variants of anger, specifically premeditated and loss of control when expressed are identified as a threat (facial threat) (Matsumoto & Hwang, 2014)

Facial threat is typically conveyed by a set of gestures suggesting an emotional expression of anger: pronounced frowning brows, intensely staring eyes, and a shut mouth with lowered corners (Ekman & Friesen, 1976). Anger has multiple expressions, for instance the

traditional angry facial expression involves furrowing of the brow and a "snarl" on their lips, lips are tightened and teeth are displayed; it is theorized that teeth are displayed because these actions form part of what is considered an attack response (Matsumoto et. Al., 2012). Disgust is suggested to be another version of facial threat; however, more research is needed to determine if disgust is considered a threat (Matsumoto Hwang, 2014).

Darwin (1872) defined disgust as an expression to something that is "revolting, primarily in relation to the sense of taste"; Angyal (1941) theorized that disgust is revulsion at the prospect of oral incorporation of an offensive containment, bodily fluid, or food. Disgust has also been theorized to be the response to a social norm violation in addition al avoidance of disease from outgroups (Motsumoto & Hwang, 2014; Faulkner et. al., 2004; Navarrete and Fessler, 2006), and for immoral individuals (Schnall, Haidt, Clore & Jordan, 2008). If a social norm is violated in such a manner that disgust is elicited, such as with a female displaying inappropriate levels of skin in a prominent Islamic country (Motsomoto & Hwang,2014; Bandura, 1990; 2004).

Matsumoto & Hwang (2014) theorize (and others- find others) that a variant of disgust would be the primary micro expression that a non-suicide bomber terrorist would express in response to their religious/social norms being violated. Terrorist actions in targeting civilians violate civilized behavior and in turn violate the unsaid moral code of civilization (Silke, 2003, 2008; Horgan, 2005). These violations of this moral code not only create an even deeper divide and "otherness" (Boccato et. al., 2008) but also prompt emotional reactions, such as disgust. For one that has grown up in a war zone, that feels as if it is not a war but a terrorist attack by other nations as mentioned in *Milestones* by Syyaid Qutb, it is a moral difference between the Western culture and the Islamic culture that creates this "disgust" response. While disgust is not sufficient as the sole cause, it is in addition to other extenuating factors such as seeking of revenge and

variations of anger (Silke, 2010). The differences in disgust and anger are easily seen in both facial expressions when compared side-by-side and the context that elicited the emotion, disgust can be confused with anger and vice versa. Ekman and Friesen (1971) discovered a confusion in identifying anger and disgust facial expressions, preschool aged children have also demonstrated this phenomenon (Widen & Russel, 2003). They note that at each expression was not similar enough to confuse the expressions. Disgust is categorized using Emotional Facial Action Coding (EMFACS) as Action Units: 9+15+16 (Figure 1); whereas anger uses: 4+5+7+23 (Figure 2) (EMFACS,). While disgust is theorized to be a potential facial threat, however, there have been three expressions of threat identified: premeditated, and two variations of loss of control (Matsumoto & Hwang, 2014).

Facial threat expressions are variants of anger. Premeditated aggression involves AU's 4+5+6+7+9+10+17+ any combination of 22, 23, 24 or 28 (Figure 3); which translates to the eyebrows are lowered, upper eye lids are raise to where the sclera is slightly visible, cheeks are raised creating crows feet at the corners of the eyes, the bridge of the nose is wrinkles and the upper lip is raised, the chin boss is raised, the lips can either be funneled, tightened, pressed or in a lip suck position. Loss of control has two primary facial expressions type one is AU 4+5+6+7+ (9 or 10 or both)+ a combination of 22,23,24,28 +25+26 (Figure 4); which is eyebrows are lowered, upper eye lids are raise to where the sclera is slightly visible, cheeks are raised creating crows feet at the corners of the eyes, the bridge of the nose is wrinkles and the upper lip is raised to some degree depending on the presence of just AU 9 's or AU 9 and 10, the lips can either be funneled, tightened, pressed or in a lip suck position, as well as the lips are parted and the jaw dropped. Type two loss of control is the same as type one however instead of lips parting and jaw dropping the low lip corners are depressed and the jaw is clenched; the AU's

are: 4+5+(6)+7+(+20 with or without 10+16+ (22, 23,24,28)+31(Figure 5). Disgust is characterized by AU: 4+5+6+9+17 (Figure1) the eyebrows are lowered and drawn together, the upper eyelid is raised, the lower eye lid is tightened, cheeks are raised and nose bridge is wrinkled causing the upper lip to raise slightly. These action units are comprised of the muscle movements identified by Matsumoto and Hwang (2014), each facial muscle movement lends itself to a specific AU (Ekman et. al., 2002) (Appendix B for AU chart). Humans naturally pay more attention to angry faces in the crowd (Öhman et. al, 2001) and the facial expressions can hold attention and be viewed as an imminent threat (Koster et. al., 2004).

Threat Management System

To survive and reproduce are the main evolutionary goals of humans (LoBue, 2010; Neuberg et. al., 2012), in order to do so humans have developed an evolutionary threat management system that allows for the detection of potential harm from our environment (Neuberg et. al., 2012). The threat management system is a self-protection evolutionary precautionary system that has evolved to protect the person from potential environmental threats such as violent actions or infection (Neuberg et. al., 2011). There are social cues, facial expressions and body language, that appear when there is a potential for aggression, specifically, physical aggression is often foreshadowed by expressions of anger (Ekman & Friesen, 1975; Zebrowitz, Kikuchi, &Fellous, 2010; Schaller & Neuberg, 2012). Avoidance of a threat is termed as a prejudice, which elicits either fear or disgust; for example, prejudice against African American men response is typically fear, whereas with a gay man the response (when a prejudice is present) is physical disgust (Cottrell & Neuberg, 2005). The ability to determine what is a potential threat is even more important in the current world with terrorist attacks, mass shooters, unprovoked violence, serial offenders, , and overall civil unrest. Threat management system is a biological,

social and cognitive defense mechanism that allows for self-protection via the ability to detect a potential threat from the environment, whether that threat is a person, disease or animal (Neuberg et. al., 2012).

Humans have evolutionary set behaviors that improve the likelihood for both survival and reproduction, these behaviors are more easily obtained in a social setting such as gathering resources of food (Neuberg et. al., 2012). While reaching these goals is improved with a group it also introduces a set of potential threats; others possess the ability to do harm rather that be physical harm or a contagious disease (Neuberg et. al., 2012). When humans enter into a social in-group with others, there is a level of vulnerability with such close proximity of others (Neuberg et. al., 2012). Because of these potential costs to reproductive fitness, evolutionary features were developed to dispose humans to live a life in close proximity of others but also cognitive and behavioral mechanisms to attune individuals to potential threats from others and ways in which to response to threats (Neuberg et. al., 2012). Humans have adaptive system that respond in ways for relevant features to the environment, such as physical with vision and olfactory cues that distinguish between edible and poisonous fruit (Neuberg, 2012) There are also evolved sensory, emotional, cognitive and behavioral mechanisms that respond to the social environment, with some of these abilities attuned to categories of other individuals such as potential mates and offspring (Kenrick,Sundie, Nicastle & Stone, 2001; Lieberman. Tooby & Cosmides, 2007) and others that are attuned to potential threats both from in-group and out-groups (Neuberg et. al., 2012). The system of mechanisms that detects potential threats is classified as the self-protection and disease avoidance system. Each subcategory system is categorized by a coordinated set of mechanisms based on the type of threat that is to be detected,

for example the disease avoidance mechanism is attuned to such things as skin rashes where the self-protection system is attuned to angry faces (Neuberg et. al., 2012).

In 2016, an estimated 1.2 million violent crimes were committed and reported, this is a 3.4 % raise in violent crime from 2015 (Crime in the United States, 2017). Homicide rates in similar hunter-gatherer populations are equal to industrial populations (Chagnon, 1988). Humans have a long history of violent acts, with threats in ones in-group being as serious as from other groups with in-group conflict appearing to be common in ancestral populations of humans (Hass, 1990; Schaller & Neuberg, 2008). The threat of potential harm stands the test of time in human history and appears to be a recurrent feature of the evolutionary landscape (Neuberg et. al., 2012). Because of this the evolution of the self-protection mechanisms server two primary purposes: (1) to detect features in others that potentially imply the possibility of harm and (2) respond to the perception of threat with the activation of affective and cognitive systems such as fight or flight (Neuberg et. al., 2012). Specifically, the ability to detect angry faces, which are facial threats, and other markers of physical aggression such as nonverbal postures (Ekman & Friesen, 1976; Zebrowitz, Kikuchi & Fellous, 2010; Neuberg et. al., 2012). Therefore, the perception of a facial threat implies the potential threat to personal safety (Neuberg et. al., 2012), because of this human are quick to detect and identify both consciously and unconsciously perceived facial threats in the environment (Becker, Kenrick, Neuberg, Blackwell & Smith, 2007; Fox, Lester, Russo, Bowles, Pichler, & Dutton, 2000; Schupp, Öhman, Junghofer, Weike, Stockburger, & Hamm, 2004). While these facial threats are identified as cross culturally (Matsumoto & Hwang, 2014), the threat implication of a facial threat is greater when the expression is displayed on an individual that has more of an inclination and ability to do harm (Neuberg et. al., 2012). For instance, men are more likely to be able to carry out the perceived threat and to have been

perpetrators of a violent act than women (Daly & Wilson, 1994). This could also be contributed by the bias of detecting anger more often in faces of men than women (Neuberg et. al., 2012). Other factors such as race and the members of the group influence detection of threat.

Traditional outgroups are especially likely to be viewed as a threat over ingroup members lacking the association and relationship. One theory is that it is easier to acquire and maintain a fearful response to members of an ecologically meaningful outgroup than members of an ingroup (Neuberg et. al., 2012). This has been found to be consistent with non-African American individuals in the United States are slower to unlearn this fear response to the faces of African American strangers (Olsson, Ebert, Banaji & Phelps, 2005), this effect is specific to males (Navarrete, Olsson, Ho, Mendes, Thomsen, & Sidanius, 2009). Ackerman et. al. (2006) found that while previous research (Anthony, Copper & Mullen, 1992; Chance and Goldstein, 1996) found that Caucasian individuals were more accurate at identifying familiar Caucasian faces than African American faces it is the exact opposite with facial expressions of anger/threat; Caucasians recognize angry/ threat African-American male faces at a better rate than angry Caucasian male faces.

Emotions are a core feature of the threat management system, specifically, threats to physical safety elicit negative emotions and it is not just a wide range of negative emotions but specifically threats to physical safety elicit the negative emotional response of fear (Neuberg et. al., 2012). Elicited emotions act as an alarm system rather it be fear or disgust, it allows for a quick response to the perceptual cues of a presence of a threat that reorients attention toward the potential threat (Shaller & Neuberg, 2012). The response of fear to a potential perceived threat activates the fight-or flight response in order to protect the individual and remove itself from harm (Öhman & Mineka, 2001).

Fear

Fear is an inevitable part of human existence: fear is a functional emotion with a deep evolutionary origin (Barrett et. Al., 2016, chapter 2 Öhman). Survival of the species has always been a primary goal, along with reproduction (Barrett et. Al., 2016); fear occurs in response to a threat in the environment, whether that threat is a person or another hazard (Neuberg et. Al., 2011). Humans are more likely to fear events and circumstances that provided threats to the survival of our ancestors (Barrett et. Al., 2016), such as snakes, spiders and those that are not in our in-group (Öhman & Mineka, 2003; Flykt & Caldara, 2006; Neuberg et. al., 2011; Schaller & Neuberg, 2012). However, modern threats such as handguns, motorcycles and knives are a learned threat and do not have the same evolutionary bases as predators, snakes, and spiders (Neuberg et. al., 2012; Öhman & Mineka, 2003). Facial threat is an efficient evolutionary cue for human fear conditioning (e.g.,Öhman & Dimberg, 1978) Facial expressions are one category of cues that are useful when determining another's intentions; it is theorized that part of the reason humans have evolved brain systems specifically for facial perception is due to survival (Kanwisher, McDermott & Chun, 1997; Ekman & Friesen, 1976). Fear perception does incorporate rapid processing that is pre-attentive and is context based (Anderson & Phelps, 2001). Unconscious processing of a threat allows for survival; by recognition of a threat a defense response is elicited (Öhman, 1993). Defense responses are useless unless they are properly elicited, it is much less costly to have a false positive than it is to have a false negative (Öhman, 1993). If a threat is not identified (false negative) then survival of the intended prey is in question. Because of this phenomena, threat stimuli must be able to be detected no matter the current environmental factors and must be detected in the perceptual field independently of the

directed attention (Öhman, 1993). Fear is a universal emotion (Ekman & Friesen, 1976); and facial expressions are elicited in response to an emotion (Dimberg, 1982).

What does our face say to the predator? Do we give ourselves away by recognizing them for what they truly are? How we communicate is an essential aspects for daily living; the ability to understand how individual selves and others are communicating both verbally and non-verbally allows for social interactions, empathy of others, development of relationships and bonds society together as well as safety for ourselves. The ability to determine what is a potential threat is even more important in the current world with terrorist attacks, mass shooters, unprovoked violence, serial offenders, , and overall civil unrest. Threat management system is a biological, social and cognitive defense mechanism that allows for self-protection via the ability to detect a potential threat from the environment, whether that threat is a person, disease or animal (Neuberg et. al., 2012). If the threat management system detects an expression of imminent aggression, specifically premeditated aggression, disgust or loss of control, as a potential threat to the self then a threat response expression will be elicited in the form of micro expressions. If a threat is consciously identified then the selection of threat will be accurate in accordance to the displayed micro expressions.

Methods

Participants

A total of 55 University of Central Oklahoma undergraduate students, between the ages of 18 and 45 years old, two participants were eliminated due to no threat detection. Each participant was given one SONA credit for completion of the study; any extra credit provided in the courses attended by the participant was solely up to the professor. The participants for this study were

undergraduate students currently enrolled in the courses of General Psychology, Social Psychology, Writing for Psychology and Sensation Perception and Action courses from the University of Central Oklahoma. The participants were no younger than 18 years old and could speak and read English. The participants all had normal vision or used corrected lenses in the form of glasses or contacts.

Materials

The experiment was conducted in the University of Central Oklahoma Cognitive Lab in room 309. All rooms used in collection of data maintained the same model of computer, Microsoft Office PowerPoint , as well as maintaining a constant comfortable temperature and using a mixture of overhead artificial florescent lighting as well as natural lighting. The computers used Dell Intel Pentium Processor, using a windows' based system; the desktop computers were complete with mouse, keyboard and monitor. The 60 slides (Appendix B) were divided into 3 sections, with 20 slides each section. The stimuli were a collection of google images and IAPS (Lang et. al., 2008) images. Ozarka Trails ice chest was filled with two gallons of water and 20lbs of ice with two Tiger pump 120 GPH submersible water pump to circulate the water, and a submerged AODE digital LCD thermometer to maintain consistent water temperature for the cold pressor task was also used. A Cannon PowerShot ELPH 360HS and a tripod were used for video recording of facial expressions.

Procedure

Participants were given a welcoming script that included following all IRB ethical guidelines pertaining to the informed consent and the video release form. Each researcher would follow a general script for instructions **(**Appendix C) to maintain a consistent procedure for

greeting all participants and verifying their identity according to SONA. Each participant received a copy of the informed consent and video consent (Appendix D) and signed acknowledging that they had read and understood the informed consent. All signatures were kept confidential from all other participants. Prior to entering the experiment room the participants were asked to turn off any and all electronic devices for the duration of the experiment. The participant was then shown to the assigned room and asked to place their belongings out of the immediate area of the computer and to have a seat. Once the participant took their seat approximately 24 inches from the monitor of the Dell desktop computer, at which point the researcher will begin the PowerPoint and participants number will be recorded on the threat survey. The threat survey is a document that has the participants select if the image is a threat or a non-threat (Appendix E). The participant's number was based on the room and the chronological order. The experimenter then instructed the participant to read all instructions carefully and ask the participant if there were any questions. Participants were divided between two groups through random assignment: control and cold pressor group. Participants that were part of the cold pressor group had their hand; elbow, forearm or foot submerged into the cold water for up to 15 seconds 3 times; each time was after completing 20 images. Participants in the control group begin the visual task of identifying the images a s threat or a none-threat. Both groups fill out the threat survey (APPENDIX E) selecting if the image shown is a threat or a nonthreat facial expression.

All instructions on the PowerPoint informed the participant to work as "quickly and accurately as possible". The participant was informed by the researcher to notify the researcher when the experiment was completed at which point the researcher retrieved the threat survey and save the facial recording under the participants' number, the experimenter then thanked the

participant for participating while walking them to the proper exit, once again asking if there were any questions or concerns. Facial expression response to stimuli was recorded and rated with the Facial Action Coding System following the Emotional FACS instructions.

Results

A two-way 2x2 mixed factor ANOVA was conducted to compare the effect of facial threats on the identification of potential threat. Analysis of variances did not show a main effect of facial threat detection of potential threat, (false alarm) F (1, 3118) = .304, p - .582; (non threat) F (1, 3118) = .517, p= .473; (threat) F (1, 3118) = .375, p = .375; however, there was a difference between conditions on missing potential facial threat (missed) F (1, 3118) = 3.727, p = .054. (Figure 11) While not statistically significant there is a demonstration of a difference between the conditions for missing a potential threat. Each facial threat shows a difference between the groups for detection (Figure 7-10); the ice condition demonstrated less missed threats and a higher detection rate of potential threats.

There were no definitiive micro expressions of fear present in the participants' recordings, however there were two participants that had a number of markers for fear: participant 18 AU: 2+4+12+ 20; participant 23: 1+2+4+5. Participants 18 and 23 were both 18 year old cacasuian females. Participant 28 showed markers for anger AU: 4+5+7+10, participant 28 was an 18 year old caucasian male. Due to the lack of facial expressions a Chi Squared analysis was unable to be conducted.

Discussion

The ability of the threat management system to be activated to detect facial threat is evolutionarily inherent to the continuation of the species and individual survival (Neuberg et. al.,

2011;2012; Darwin, 1872). The recognition of a facial threat is a key component to detection of potential threat, Matsumoto & Hwang (2014) demonstrated the cross-cultural identification of facial threat using the same gendered and race faces. Similar results were demonstrated in the experiment; however, it was demonstrated using different races, ages and genders. The threat management system, when activated for a potential threat should elicit a fear response (Neuberg et. al., 2014), but for a fear response to be elicited there must be a potential risk this is the same potential issue for micro expressions to not be present; if there is not an actual risk such as activating the self-protection aspect of the threat management system then the facial and emotional response of fear will not be demonstrated (Neuberg, et. al., 2011; 2012; Ekman et. al., 2002). While the null hypothesis failed to reject, it was demonstrated that facial response in the lab setting with facial threats does not appear. Micro expressions are only displayed when the person has a true emotional response to the stimuli at that specific time (Ekman, 2009). The lack of eliciting micro expressions could be based on the actual lab environment, the stimuli of still images could not be enough of a personal risk to display the intended emotion of fear. While the stimuli is able to be recognized as a threat, it could not provide enough of a personal risk (i.e. a real threat) to display fear (Blanchard, Griebel, Pobbe & Blanchard, 2011).

Threat detection (risk assessment) is determined by a distinct set of activates involved in the detection and assessment of the threatening stimuli (Blanchard et. al., 2011). Such aspects as location to the threat, ability to escape (flight), ability to defend against the threat (fight) and freezing in response to the threat; if the threat is no longer present then behavior returns to normal (Blanchard et. al., 2011). If the threat does not reach to the levels of not only identifying the behavior as a threat but also the possibility of potential harm fight, flight or freeze will not be activated; however, Neuberg et. al., (2011) looks at the risk level of a potential threat influences

the response to threatening stimuli. Meaning, when an individual has a weakness or a disadvantage to survival (i.e. pregnant or in pain from an injury) threats are general detected more often than an individual without disadvantages to survival. The analysis found that pain from the cold pressor task was not statistically significant to elicit fear in the form of a micro expression, based on Neuberg et. al., (2011; 2012) fear is the response from the self-protection aspect of the threat management system that should be demonstrated. It has been previously discussed that micro expressions are difficult to elicit when the person has nothing to lose (Ekman et. al., 2002). Further investigation on facial response to threatening stimuli needs to be conducted to determine if the factor of a lab environment (i.e. no personal risk) is a contributing factor to micro expressions of fear not being displayed. Facial threat and the detection of potential threats is a complex process that needs further research.

Disgust was identified with more false alarm rates than with none threat facial expressions in the current study, however, there has yet to be definitive demonstration that disgust would be present with terrorist actions. Moley and Yakeley (2014) link moral outrage as one identifier of the "lone wolf" terrorist, moral outrage has also been linked with disgust based on social norm violations (Silke, 2003, 2008; Horgan, 2005; Qutb, 1981). Moral outrage is one identifier; however, it is not clear when this would be expressed in facial expressions. Moral outrage of another culture, society or changes in the terrorist society violates their identified social norm, while the terroristic act of targeting civilians violates civilized behavior and in turn violate the unsaid moral code of civilization (Silke, 2003, 2008; Horgan, 2005). With the current level of possible violence from terrorist attacks, suicide bombers, mass shooters, unprovoked violence, serial offenders, and violent riots, a better understanding of detection of threat facial expressions, specifically is disgust a facial threat, as well as potential violence expressions could

prevent targeted violence (Fein et. al., 1995 & Mandel, 2008). While there are demonstrations of facial threat being identified cross-culturally, there is still a deep lack of understanding of fundamental questions such as when facial threats are displayed; how soon are they displayed prior to the actual act; is there a display of a version of disgust prior to a terrorist attack; could this version of disgust be identified in the days, weeks or months before the attack takes place.

TSA currently has a behavioral science program (SPOT) based on facial expressions, body language, deception research, speech and language patterns and other behavioral aspects to detect potential aviation threat (United States., Congress., House, 2011). The SPOT program began in 2003 that is comprised of detecting behaviors of stress and anxiety based on patterns of deception, however, it does not, yet, take into consideration facial threats. However, there is a distinction between regular criminal behavior and terrorist behavior (Ekman in testimony of United States., Congress., House, 2011). The potential for additional behavioral measures such as facial threat and macro expressions of disgust could be an additional layer of potential protection and identification of potential terrorists. Matsumoto and Hwang (2014) theorized that terrorist display a version of disgust prior to a terroristic act, whereas the identification of a potential threat is lacking the training of looking for facial expressions of disgust as a potential additional marker to a threat. The introduction of facial threats in addition to current behavioral measure sand potential future findings on disgust would allow for the ability to look for other potential threats than those that are displaying stress and anxiety traits.

Limitations

It is important to note that while the foundational research (Neuberg et. al., 2011;2012; Schaller & Neuberg, 2012; Ekman, 2009; Ekman & Friesein, 1976) would indicate when an individual identifies a threat to their selves it would trigger the threat management system which

would elicit fear in the form of a micro expression; this is reliant on actual personal risk and emotions. There are several limitations that are created through a lab setting, sample using general psychology students, the data collected as far as a laughter present at the stagnate images and eliciting emotion response without a personal risk element.

The primary issue with this study is the lack of micro expressions present, participants primarily responded with a neutral face or laughter, this could indicate more so to the concept that there was no real chance with the images and that the threat management system potentially was not activated, adjustments to the experimental design to increase threat such as darkening the room, using video stimuli or virtual reality to stimulate a personal risk. A more robust population outside of the traditional general psychology undergraduate population is always a concern with findings or lack of findings. The limitations that are presented can be solved through a series of studies to determine, how to elicit fear, if different stimuli would activate the threat management system, would a larger population sample demonstrate a larger effect and the ability to determine if disgust or a variation of disgust is a facial threat based on moral objection and aggression. The present study did not examine different variations of disgust, instead the universal facial expression of disgust was used as there has not been research conducted of disgust demonstrating to be a threat outside of speculation. With further research exploring the limitations of the current study a broader understanding of the literature and various topics can be explored to provide more answers.

A series of studies to determine how to increase personal risk to elicit micro expressions while maintaining ethical standards and personal safety should be conducted. Beginning with a study that involves body language and facial threat with a confederate being threatened to receive a mild electric shock or the participant. A participant and 2 confederates would be in the

room, the first confederate would be the potential victim of mild shock while the second confederate would be the shocker. The participant would have a series of questions asked of them while the shocker would be acting in aggressive manner with body language and facial threats to the point of threatening to shock to the participant if the information is not given. Threats are recognized as potential threats even if it is direct towards others. A pilot study should be conducted to determine if the threat alone would be enough of a personal risk in a laboratory setting.

Appendix A

Facial Action Coding (FACS)

Facial Action Coding System (FACS) is a measurement of facial expression based on the anatomical structure of the facial muscles movement, by using facial muscle structure to production action units (AU) observed by the researcher (Ekman, 2015 & Kohler et. al., 2004; Cohn, Ambadar & Ekman, 2007; Donato et. al., 2010; Bartlett et. al., 1996). While facial features are typically not asymmetrical, the muscle structure is, excluding those with injury or birth defects; there are universal facial expressions (Cohn, Ambadar & Ekman, 2007; Ekman & Rosenberg, 2005; Ekman et. al., 1987). FACS uses the detection of micro expressions and the specific movement of the muscles in the face to code AU. Action Unit's are the observable behavior of facial expression, specifically micro expressions; AU's are comprised of "nine action units in the upper face and 18 in the lower face" (Ekman et. al., 2002). In addition there are "14 different head positions and movements, nine eye positions and movements, five miscellaneous AU's, nine action descriptors, nine gross behaviors and five visibility codes" (Cohn, Ambadar & Ekman, 2007). Each AU is a combination of a numerical code from each facial section, as well as head position/movement and eye position/movement (Cohn, Ambadar & Ekman, 2007). Action units use multiple numbers that corresponds to a facial movement. For example, micro expressions translate into AU's for the emotion of "sad" involve a raised inner brow, brow is lower, eye lids are tight, lips are stretched and chin is raised (Ekman et. al., 2002).

Appendix B









Appendix C

Script and Procedure

Meet participant in the hall outside the lab.

"Hi are you __(Participant Name)__? Welcome to the study!
My name is __(State Name).__ Please take a moment to turn off your phone."

Bring participant into the lab.

"Please follow me to room ____state the name of the room____ and have a seat before the computer.

Instruct participant to move their personal belongings away from their immediate area.

Once the participant is properly arranged, give them the informed consent form and allow them a few moments to read it, after they sign the informed consent give them the recording consent form and have them sign it as well. After they have signed the informed consent form, give them a none-signed informed consent form and video recording form for them to keep.

"Thank you for agreeing to participate in this research experiment. During the experiment we require your complete, undistracted attention. So we ask that you follow instructions carefully. This experiment will begin with brief instructions. On the paper provided select threat or none threat for each image presented. There will be two times when the screen instructs you to pause the experiment before continuing. Do you have any questions before we begin the experiment?"

Cold pressor group:
Instruct the participant to use the hand sanitizer to clean their hand then when they are ready instruct them to place their hand and forearm (or selected body part) into the ice water and they may remove it at any time. **DO NOT LET THEM GO OVER 15 SECONDS!!!!!!!!**

Control group: Have the participant wait 1 minute between each section.

At the end of the experiment thank them for participating, answer any questions, and prepare for the next participant.

MAKE SURE THEY SIGN THE INFORMED CONSENT FORM AND THE INFORMED CONSENT ACKNOWLEDGMENT DOCUMENT!

Appendix D

UNIVERSITY OF Central Oklahoma

UCO IRB Number 17034
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UNIVERSITY OF CENTRAL OKLAHOMA
INFORMED CONSENT FORM

This is a template including all of the necessary elements of an Informed Consent Form. It is not necessary to use this form. In some cases, you may need another format, i.e. an online survey, a participant letter, etc. See Informed Consent Guidelines on our website for more information.

Research Project Title: Expressions of Threat: Micro-Expressions in Response to Imminent Aggression Facial Expressions

Researcher (s): Stephanie Lieber, Gabriel Rupp Ph.D

I. **Purpose of this research:** : The purpose of this research is to gain a better understanding of the micro expressions that are present at the point of detection of a threatening face.

II. **Procedures/treatments involved:** You will be in one of two groups, one group with a cold pressor test that involves submersion of the hand or elbow into ice water for one minute or the group without the cold pressor test. At any point during the cold presosr test you can remove your hand or elbow if you do not wish to continue for any reason. All participants will be shown images. You will be asked to select the image as threat or nonthreat via the keyboard.

III. **Expected length of participation:** The experiment will take up to 60 minutes to complete.

IV. **Potential benefits:** There is no direct benefit.

V. **Potential risks or discomforts:** The study involves potential threatening images of facial expressions and discomfort from the cold pressor test. The threatening images are variations of angry faces. Because of the nature of these faces it can cause a feeling of uneasiness. The faces are experienced in everyday life, however, there is a chance for extenuating circumstances of being triggering due to previous experiences or trauma specifically for those with PTSD. If at any point during the experiment you as a participant feel uncomfortable or wish to end the experiment, the experiment can and will be terminated at any point without repercussions. Limitations for participation are on SONA as part of the requirements to participate, covering mental health as well as physical health concerns.

VI. **Medical/mental health contact information (if required):** Center for Counseling & Well-Being 100 N. University Drive Box 174 Edmond, OK 73034 Phone: (405) 974.2215 Fax: (405) 974.3829

VII. **Contact information for researchers:** Stephanie Lieber can be contacted at slieber@uco.edu Gabriel Rupp PhD can be contacted at grupp@uco.edu

VIII. **Contact information for UCO IRB:** NUC 341, BOX 132 405-974-5497 or 405-974-5479 email: irb@uco.edu

IX. **Explanation of confidentiality and privacy:** : We will take the following steps to keep information about you confidential, and to protect it from unauthorized disclosure, tampering, or damage: Stephanie Lieber, Gabriel Rupp PhD will be the only ones to

Appendix D

ii. UCO IRB Number 17034

iii. For Office Use Only

have access to any identifying materials. The recordings of your response to the images will not be provided to any other agency or used in publication. At no point will any identifying marks will be used in any paper. Dr. Gabriel Rupp and Dr. Mark Hamlin will be notified if a student participates in the experiment in order for them to reviece their extra credit. The only instructor that will have access to the recording is Dr. Rupp in the experiment. Extra credit will be provided for those that participate, however extra credit will also be provided for the same amount for a 2-page report over a classic experiment in psychology. If for any reason, you do not finish the experiment, you will have the option to complete the alternative extra credit for the points and it will be up to the Professor to determine if partial or full credit will be given for attempting the experiment.

X. Storage, disposal and security of recordings: Digital files containing human subjects research data will be stored in password protected files on Dr. Gabriel Rupp's office computer. Recordings will be kept until the end of data analysis (12/31/2017). At which point Dr. Rupp will delete and scrub the files off his hard drive. All consent forms will be kept in a locked cabinet that Dr. Rupp will have access to in his office once the 6 years are completed all paper documents will be properly shredded and disposed of.

XI. **Assurance of voluntary participation:** Participation in this study is voluntary. You have the right not to participate at all or to leave the study at any time. Deciding not to participate or choosing to leave the study will not result in any penalty or loss of benefits to which you are entitled.

XII. **AFFIRMATION BY RESEARCH SUBJECT**

I hereby voluntarily agree to participate in the above listed research project. I acknowledge that I meet the requirements of being a healthy individual free of any heart conditions 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: _____

Appendix D

Consent & Recording Release Form

Title of Study: Expressions of Threat: Micro-Expressions in Response to Facial Expressions of Imminent Aggression

Principle Investigator: Stephanie Lieber

Co-Principle Investigator: Dr. Gabriel Rupp

I understand and consent to the use and release of the recording by the University of Central Oklahoma. I understand that the information and recording is for research purposes only and will not be released. Once the study has concluded the recordings will be kept until 12/31/2017. Recording will be kept in a password protected file on Dr. Rupp's hard drive. Once the project has concluded the recordings will be deleted and scrubbed from Dr. Rupp's hard drive.

I understand that participation in this study is voluntary and I agree to immediately raise any concerns or areas of discomfort during the session with the researcher.

Please Sign below to indicate that you have read and you understand the information on this form and that any questions you might have about the session have been answered.

Date_____

Please print your name: _____

Please sign your name for video release: _____

Please sign your name for consent for video recording: _____

Appendix E

Participant #_____ 1

For this experiment a threat is defined by a Facial expression that indicates the potential of bodily harm; imminent assault or aggression.

Please indicated if the image is a threat or a none threat by selecting the correct box:

1. Threat ☐ None ☐
2. Threat ☐ None ☐
3. Threat ☐ None ☐
4. Threat ☐ None ☐
5. Threat ☐ None ☐
6. Threat ☐ None ☐
7. Threat ☐ None ☐
8. Threat ☐ None ☐
9. Threat ☐ None ☐
10. Threat ☐ None ☐
11. Threat ☐ None ☐
12. Threat ☐ None ☐
13. Threat ☐ None ☐
14. Threat ☐ None ☐
15. Threat ☐ None ☐
16. Threat ☐ None ☐
17. Threat ☐ None ☐
18. Threat ☐ None ☐
19. Threat ☐ None ☐
20. Threat ☐ None ☐

Participant #_____ 2

Please indicated if the image is a threat or a none threat by selecting the correct box:

21. Threat ☐ None ☐
22. Threat ☐ None ☐
23. Threat ☐ None ☐
24. Threat ☐ None ☐
25. Threat ☐ None ☐
26. Threat ☐ None ☐
27. Threat ☐ None ☐
28. Threat ☐ None ☐
29. Threat ☐ None ☐
30. Threat ☐ None ☐
31. Threat ☐ None ☐
32. Threat ☐ None ☐
33. Threat ☐ None ☐
34. Threat ☐ None ☐
35. Threat ☐ None ☐
36. Threat ☐ None ☐
37. Threat ☐ None ☐
38. Threat ☐ None ☐
39. Threat ☐ None ☐
40. Threat ☐ None ☐

Participant #_____ 3

Please indicated if the image is a threat or a none threat by selecting the correct box:

41. Threat ☐ None ☐
42. Threat ☐ None ☐
43. Threat ☐ None ☐
44. Threat ☐ None ☐
45. Threat ☐ None ☐
46. Threat ☐ None ☐
47. Threat ☐ None ☐
48. Threat ☐ None ☐
49. Threat ☐ None ☐
50. Threat ☐ None ☐
51. Threat ☐ None ☐
52. Threat ☐ None ☐
53. Threat ☐ None ☐
54. Threat ☐ None ☐
55. Threat ☐ None ☐
56. Threat ☐ None ☐
57. Threat ☐ None ☐
58. Threat ☐ None ☐
59. Threat ☐ None ☐
60. Threat ☐ None ☐

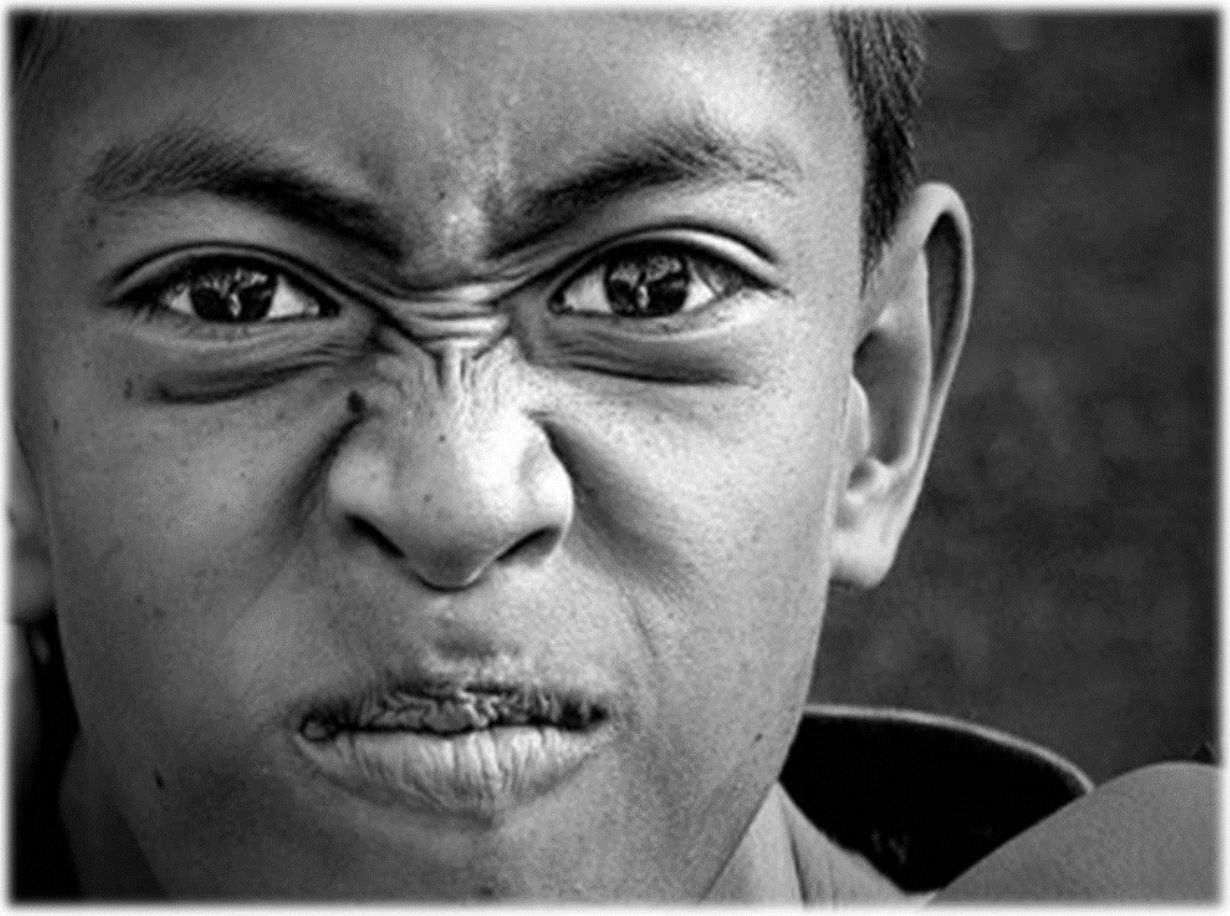
Figure 1

Disgust

(Disgust, 2017)

Figure 2

Anger



(Parvez, 2015)

Figure 3

Premeditated Aggression

(Premeditated, 2017)

Figure 4

Loss of Control 1

(LC1, 2017)

Figure 5

Loss of Control 2

(Ali, 2017)

Figure 6

Fear

(Fear,2017)

Figure 7

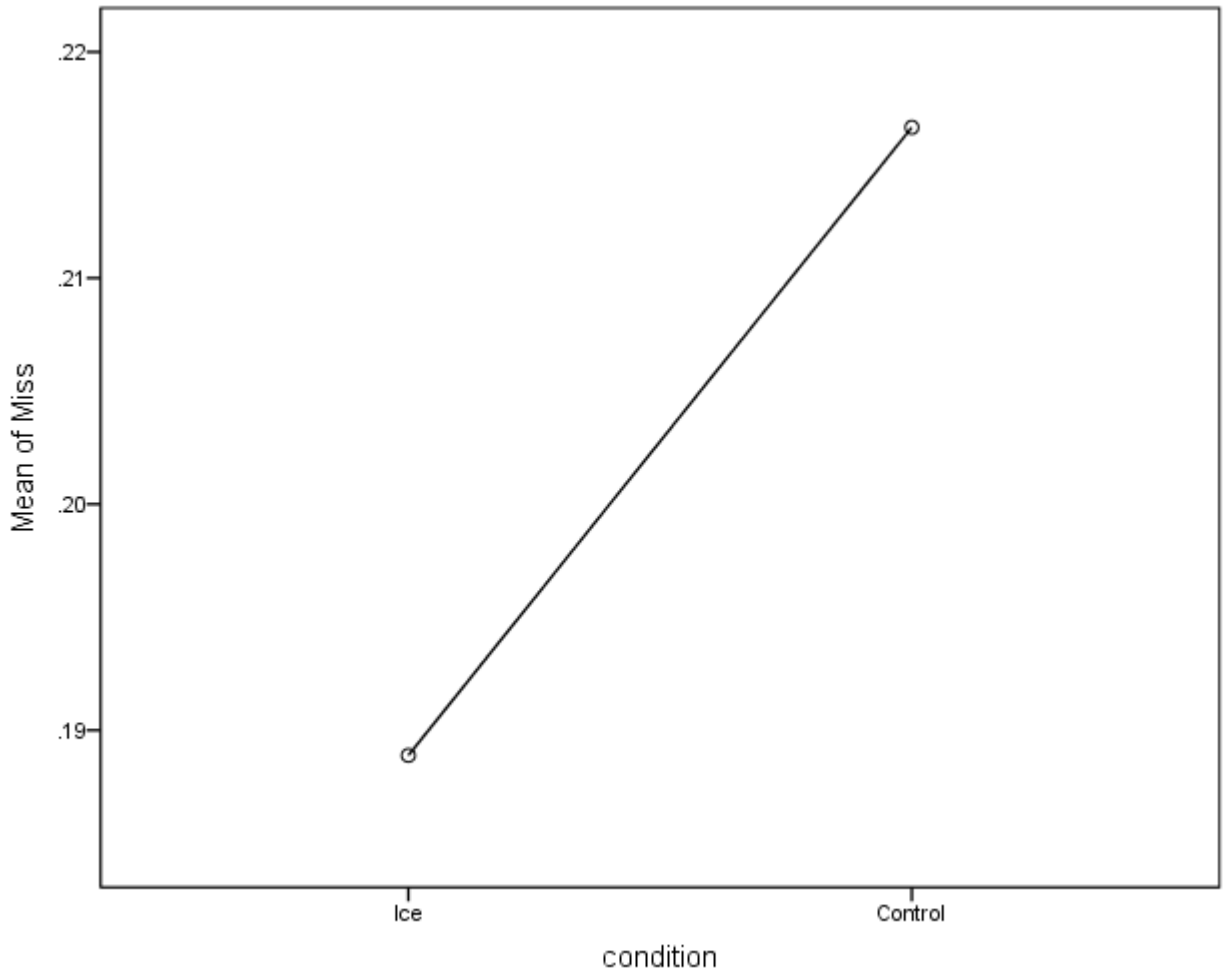


Figure 8

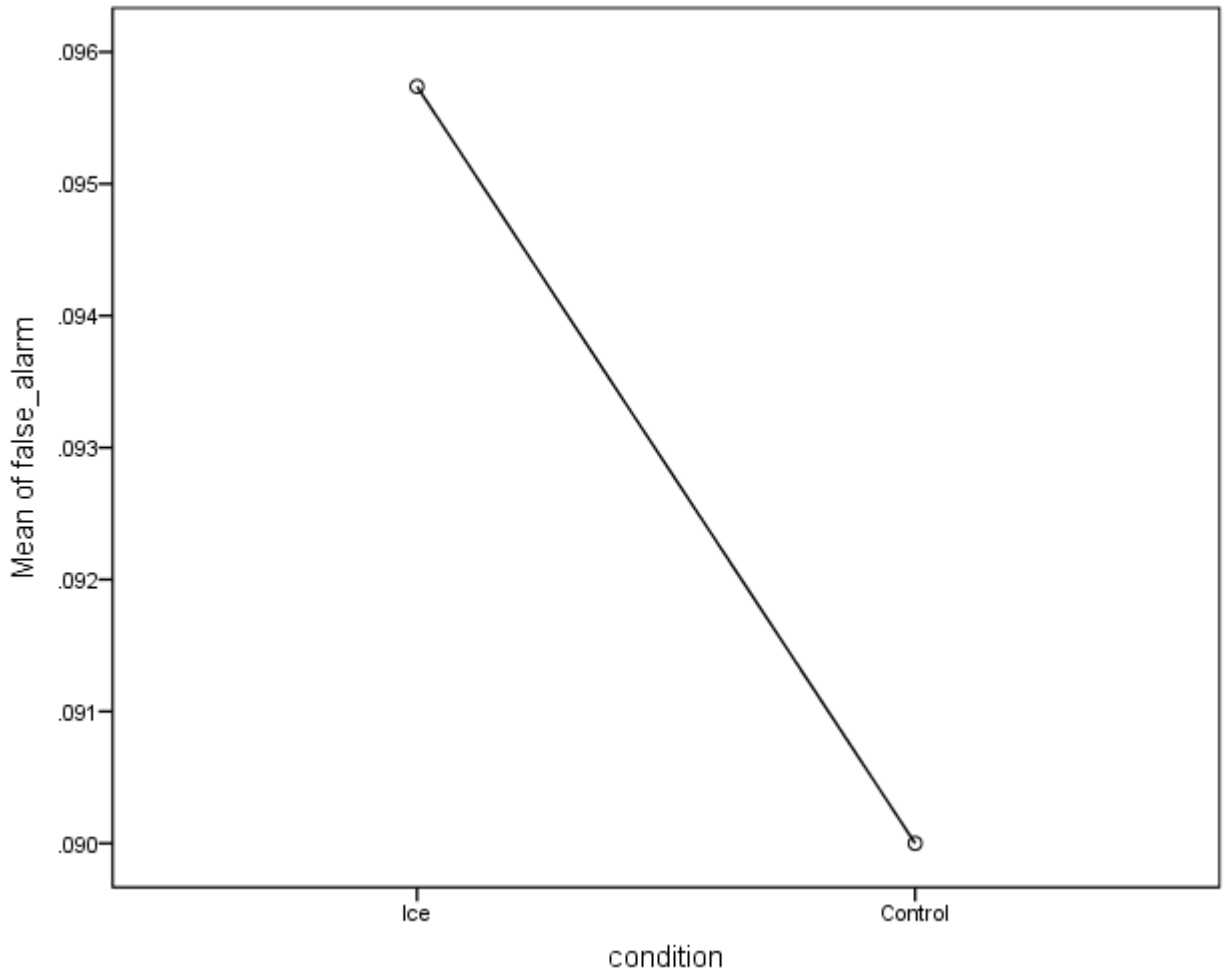

.096
.095
.094
.093
.092
.091
.090
Mean of false_alarm
Ice
Control
condition

Figure 9

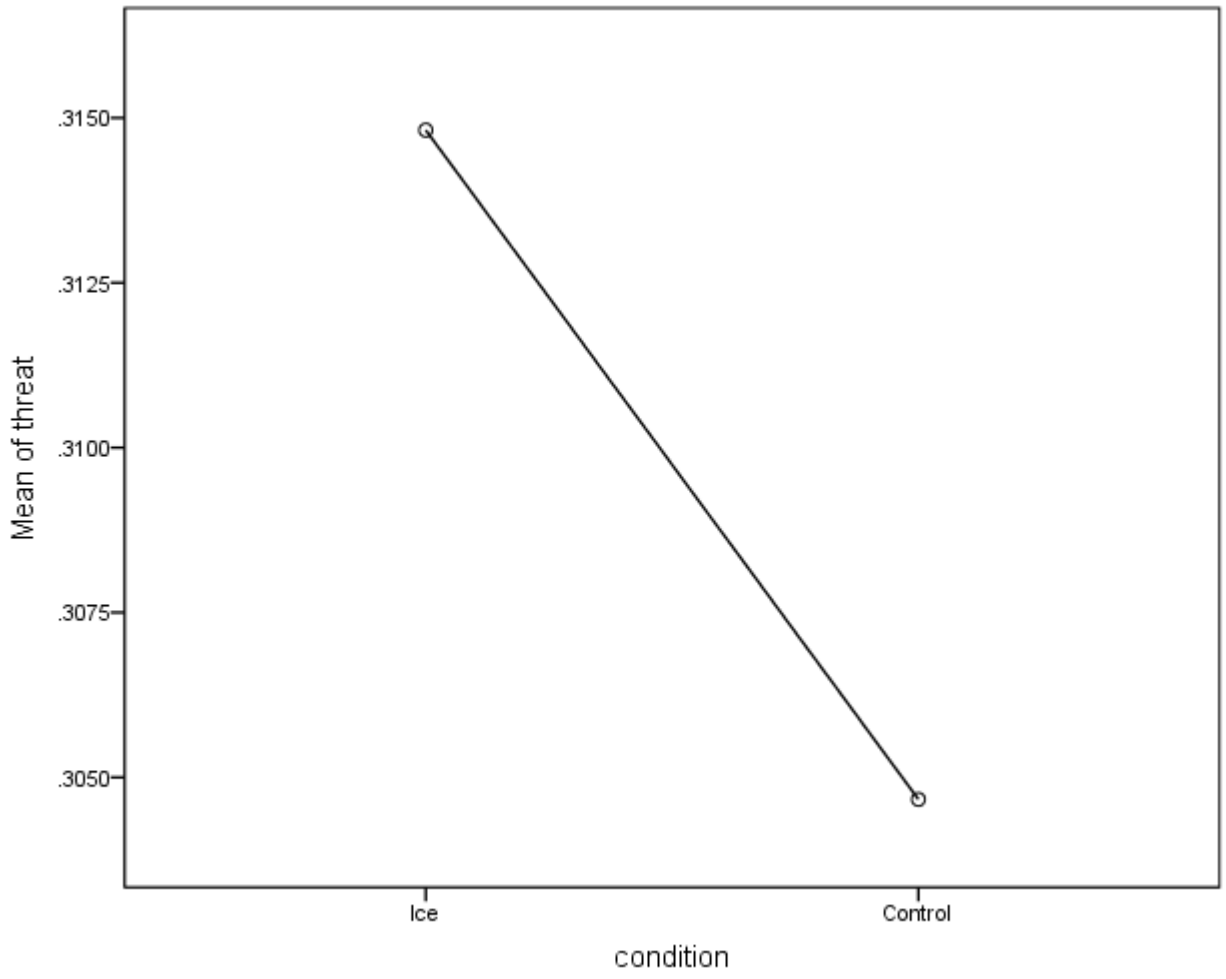

.3150
.3125
.3100
.3075
.3050
Mean of threat
Ice
Control
condition

Figure 10

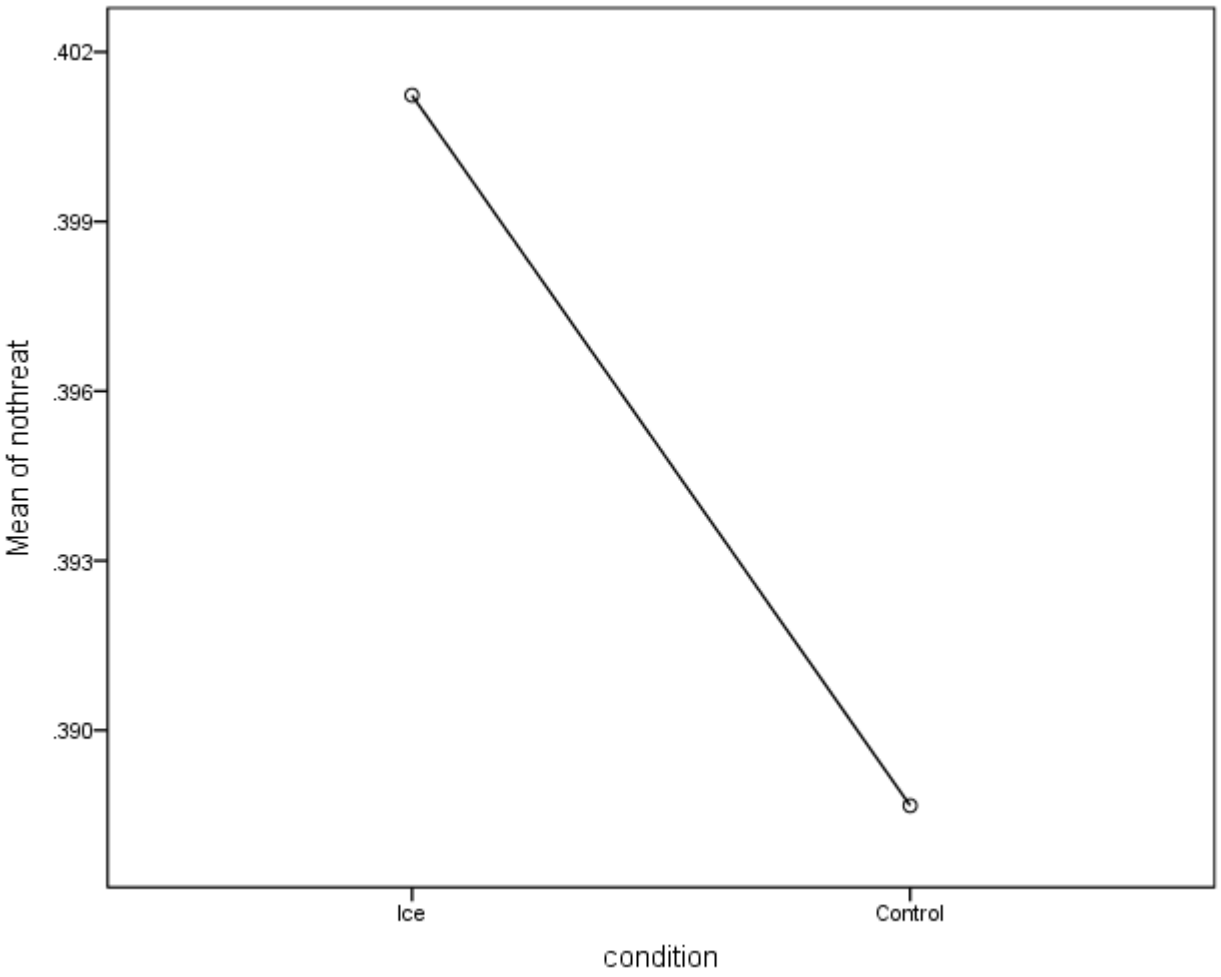
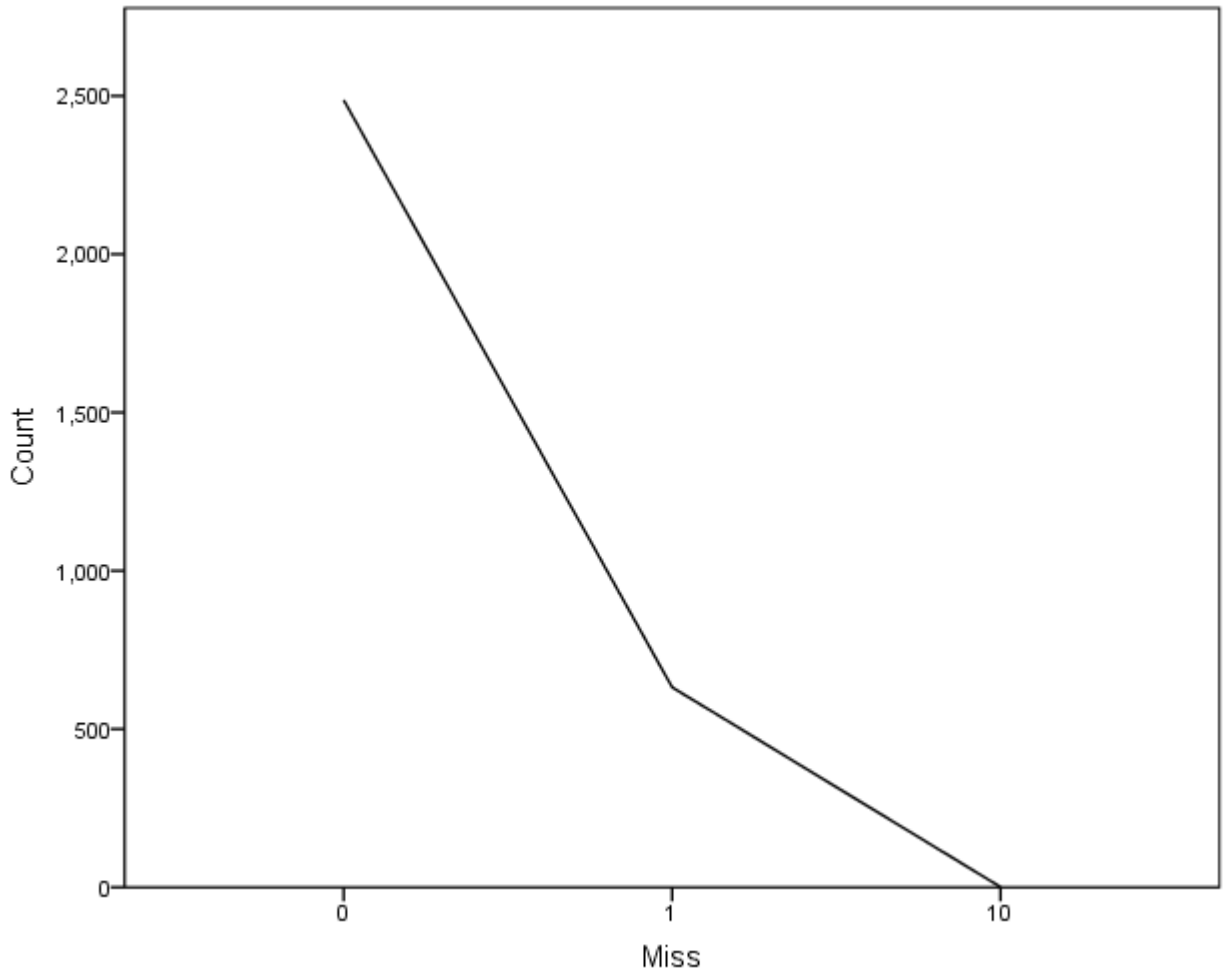


Figure 11



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