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Survive or Thrive: Focusing on the Forest (Global) or the Trees (Local) Impacts Meaning Making

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by

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"The greatest revolution of our generation is the discovery that human beings, by changing the inner attitudes of their minds, can change the outer aspect of their lives."

-William James

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ABBREVIATIONS

IAPS	International Affective Picture System (IAPS)
$GLOMO_{sys}$	Global and Local Processing Model
HR	Heart Rate
SCL	Skin Conductance Level
NCT	Novel Categorization Theory
CLT	Construal Level Theory

ABSTRACT OF THE DISSERTATION

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Dr. Paul Haerich, Chairperson

Focusing on the forest versus the trees illustrates a fundamental difference in how people see the world and make meaning, termed global and local attention. How we shift between them may impact whether we experience happiness or anxiety. We explored how different emotions serve as triggers for shifting between global and local attention using film clips and measuring responses to computerized attention tasks. We found that negative film clips localized attention, while positive films globalized attention, concluding that emotions can impact whether we attend to the forest or the trees.

However, different induction strategies and various studies have led to discrepant findings in supporting whether affect alone impacts the activation of global and local systems of attention. A potential alternative explanation comes from a more recent theory, $GLOMO_{sys}$, which asserts that perceived novelty and familiarity of a stimulus are essential for signaling global vs. local precedence over emotional state (Forster & Dannenberg, 2010). The current study provided support for an integrated model, considering both variables of novelty and affect on global versus local processing that we termed *The Survive or Thrive Hypothesis*. As predicted we found that novel and threatening film clips led to a global level of processing; however, after one repetition

(familiarity) there was a shift toward a local level of processing. Thereby, upon repetition and familiarity with the threatening stimulus, there was a shift to a more detail-oriented processing approach (F [3, 37] = 3.35, $p < .05$, $\eta^2 = .21$). This trend demonstrated an interaction between cognitive appraisals of novelty, and specific affect states, in influencing global versus local systems of attention. Physiological measures of heart rate (HR) and skin conductance level (SCL) provided objective measures of emotional experiencing. Trends indicated that threatening film clips were associated with increased HR and SCL when compared to neutral and positive films clips. Further, HR and SCL were most elevated upon initial viewings (novelty) of the film clips. Physiological responding was impacted by both the emotional state as well as cognitive appraisals about the emotional stimulus. Our *Survive or Thrive Hypothesis* is based upon the integration of multiple theories, and would benefit from continued empirical replication. Future studies should explore different ways to induce novelty and familiarity, and possibly induce a broader spectrum of emotional valence categories. Continued exploration of the cognitive constructs of global versus local information processing can have implications for understanding how cognitive rigidity could be implicated in a range of mental disorders. Understanding the triggers and bounds for these different levels of information processing could be manipulated for clinical treatment purposes of a range of mental disorders.

CHAPTER ONE

INTRODUCTION

"There is nothing either good or bad, but thinking makes it so." –

William Shakespeare

From Perception to Conception: The Drive to Make Meaning

Making meaning is the driving force for how humans experience the world. There are multiple ways an individual can perceive the same event or stimulus and make meaning from it. A subtle shift in an individuals' style of processing information can significantly alter their experience of the world, their perceptions, feelings, judgments, and behaviors. Studies have demonstrated that there are two main ways that individuals make sense of the world, either attending to the whole forest (global processing), or focusing on the trees (local processing). It is even common for people to speak of how negative feelings can produce "tunnel vision," or how those in love or generally optimistic tend the see the world through "rose-colored glasses (La Vie En Rose)." These common sayings have been around for centuries, and recent empirical research continues to validate some of them. Understanding global versus local levels of processing can have important implications in many areas of psychology, such as differences in perception (Hunsinger, Isbell, & Clore, 2010), mood (Gasper & Clore, 2002), creativity (Friedman, Fishbach, Forster, & Werth, 2003), face recognition (Facrae & Lewis, 2002), autism (Wang, Mottron, Peng, Berthiaume, & Dawson, 2009), and obsessive-compulsive disorder (Yovel, Revelle, & Mineka, 2005). For instance, biases in attention have been linked to chronic emotional states and mental health disorders, such

as depression (Donaldson, Lam, & Mathews, 2007), anxiety (Mogg & Bradley, 2005), and posttraumatic stress disorder (Bryant & Harvey, 2009). Negative emotional states and traits have been linked to local, narrowed attentional scope (Derryberry & Tucker, 1994), decreased attentional flexibility, as well as biases toward attending closely to threatening stimuli at the expense of important information unrelated to the perceived threat (MacLeod & Mathews, 1988).

This hyper-focus on survival, though well intentioned, can wreak havoc upon the psyche, nervous system, and overall wellbeing. Notably, an overly piecemeal and detail-oriented bias toward experiencing the world can hamper the processing of meaning making, and extracting the "big picture" underlying an array of details. This can lead to problems on basic tasks like summarizing or understanding the themes of a novel because the details of the story are not seen in their greater context. On a more global scale, an ability to integrate experiences can lead to poor psychological coping when negative or unpredictable events occur in life. On the other hand, an over focus on higher-level global stimuli can be distressing in that important details are ignored or over-looked. Flexibility between global and local levels of analyses are essential for gaining the most accurate picture of the environment, but rigidity on either end can bring about particular biases that reduce success overall. In contrast to mental illness and anxiety being associated with a local level of processing, positive emotional states and traits have been linked to a broader visual scope, increased attentional flexibility, and an enhanced ability to disengage from more distressing stimuli (Isaacowitz, 2005).

Recent studies have even demonstrated the potential bidirectional relationship between attention tendencies and higher order processing, such as cognition and

emotional experiencing. Macleod et al., 2008 demonstrated this bidirectional relationship when he experimentally trained individuals diagnosed with mood disorders to attend to global level stimuli in a cognitive task for eight weeks. This intervention was found to lead to reductions in mood disorder symptom severity when compared to a neutral control condition (Macleod, 2008).

The notion of sensory perception impacting higher-order processing has led to the growing interest in the study of global and local processing. Perception has been shown to impact higher-level conceptions and cognition in various studies (Barsalou, 1999; Masson, 1995; Derryberry & Tucker, 1994). For instance, merely priming an individual to view a situation with a global lens can change levels of creativity, perceptions of distance, and emotional regulation (Friedman, Fishbach, Forster, 2009). The mechanisms driving the shifts in perceptual attending may be linked to the very mechanisms driving conceptual attention, such as the activation of selective attention within semantic networks (Posner, 1987). Processing styles, like global and local processing, have been described as content-free ways of perceiving the world, and are best represented in procedural memory, which usually occurs below the levels of conscious awareness (Tulving & Schacter, 1990).

Emotional Regulation and Cognitive Appraisal

Understanding global and local attention processes can be essential for understanding how emotions are regulated, and can have implications for teaching individuals more effective regulation strategies. Emotional regulation has been defined as the process by which individuals can influence their own emotional experiences using

cognitive and behavioral techniques. The strategies used can have implications for short-term emotional responding, as well as long-term mental and physical health (see Shiota & Levenson, 2012). However, this capacity to regulate and change an experience seems to require effortful cognitive functions, associated neurologically with prefrontal cortical activation, which can act to suppress or change an automatic appraisal of a situation or stimulus to generate alternative appraisals (Ochsner et al., 2004). Animal and human studies have provided added insight into these processes, showing that inhibitory projections running from the prefrontal cortex going to the amygdala are active during instructed reappraisal tasks (Quick, Likhtik, Pelletier, and Pare, 2003). The amygdala is also projects to the hypothalamus and brainstem areas, which are responsible for regulating autonomic and hormonal responses that have been strongly implicated in emotional experiencing (Cacioppo, Bernston, Larsen, Pohlmann, and Ito, 2000; James, 1884).

Many studies have demonstrated how voluntary reappraisals of automatic thoughts and emotions can modulate emotional intensity, changing emotions qualitatively. However, not all emotion regulation strategies are made equal. Most simply, there are two overarching methods most often used in humans to regulate emotional experiencing: positive reappraisal and distancing/suppression (Shiota et al., 2009). Positive reappraisal has been associated with higher positive affect, lower negative affect, greater life satisfaction, lower depression, and greater overall wellbeing (Gross & John, 2003). In contrast, distancing and disengaging from the emotional implications of target issues can have short-term benefits to reduce distress. It allows for a shift in focus toward aspects and interpretations with no actual threats or benefits

(Shiota et al., 2009). Both these reappraisal strategies require the ability to globalize and distance from the situation at hand; however, reappraisal seems to be more voluntary and solution-focused for long-term gain, while distancing or suppression of an emotional experience brings about short-term shifts in emotional experiencing and likely globalizes attention to the point that the focus is minimized in the service of distracting from distress.

Gross et al. (2008) demonstrated how emotional expression when watching disgusting film-clips was reduced for participants in a study instructed to apply cognitive reappraisal and suppression. However, suppression did not reduce reports of negative affect and led to increases in sympathetic nervous system responding, while cognitive reappraisals lowered both. These unintended effects of suppression have been associated with the increased effort necessary to shut off already activated and automatic emotion expressive behaviors. Overall, both strategies can be healthy when applied appropriately; however, chronic use of distancing and suppression has been associated with negative health outcomes and mental illness (Gross et al., 1998).

Models of Global versus Local Processing

Recently, Forster and Dannenberg (2010) proposed a comprehensive model of global and local processing ($GLOMO_{sys}$), focused on how these different types of information processing can impact perceptual and conceptual levels of processing. Most notably, $GLOMO_{sys}$ makes the assumption that perceptual level processing is related to and directly impacts conceptual level processing, and vice versa (Kuhnen & Hannover, 2010). It is a systems account of how cognitive mechanisms are elicited by global/local processing styles and how these systems are triggered. According to this model, when

the global system is activated, people tend to perceive overarching gestalts, integrate new information into existing knowledge structures to make meaning, and activate broader categories within memory. When the local system is activated, people tend to perceive details, and activate more narrow information categories focused on excluding information and discerning incoming stimuli (Forster et al., 2008). Furthermore, global and local levels of processing are understood as occurring outside of awareness and impacting procedural (content-free) learning across sensory modalities. For instance, when individuals were primed visually to use global level processing, they performed better on a face recognition task when compared to those primed more locally (Macrae and Lewis, 2002). $GLOMO_{sys}$ also takes into account how factors other than affect impact processing style biases, such as appraisals about the novelty or familiarity of the situation.

Impact of Novelty on Global and Local Processing

The impact of novelty on psychological processes has been explored in various studies. Investigators have questioned whether individuals have a tendency toward being interested in new information, or are afraid of it (Silvia, 2005). Both situations have been observed experimentally, such that novelty has been shown to bring about both approach and avoidance behaviors. Novelty has been defined in the cognitive and emotion literature as unexpectedness, obscurity, complexity, uncertainty, newness, and ambiguity (see Berlyne, 1960). For the purposes of the current study, we define novelty as simply lack of experience and lack of familiarity. Familiar events or stimuli tend to be perceived

as less frightening than novel ones (Bornstein, 1989). In contrast, novel stimuli can also be unrelated to potential harm or danger, and elicit curiosity and exploration.

The current study is based upon the $GLOMO_{sys}$ model for global and local processing, in that we view appraisals of novelty and familiarity as being among the initial moderators of whether global or local processing will become activated. In addition, we incorporate components of Novelty Categorization Theory (NCT; Forster, Marguc, & Gillebaart, 2010), and Construal Level Theory (CLT; Liberman, Trope, & Stephen, 2007). Our proposal is an integration of these models, and we espouse a more continuum-based understanding of global and local processing rather than seeing them as two dichotomous systems, as proposed by $GLOMO_{sys}$. According to this dichotomous conceptualization, global and local processing are distinctive systems that cannot be activated simultaneously (i.e., you cannot see the forest and the trees). On a continuum, global and local processing can be activated to greater or lesser extent, based on the situations and triggers (i.e. you can see the trees, and be aware of the forest). However, there can be predispositions or learned preferences for one system or another. The current models in the literature are discussed below in order to lay the groundwork for our current integrated model.

NCT discusses how people are generally motivated to understand novel events, and proposed that when situations are "new," people automatically process their surroundings globally. However, if the novel situation is perceived as threatening, local processing will take over to help people focus on coping with the danger or particular threat. Experiments have supported these assertions, such that when situations are framed as potentially dangerous, processing is localized, while mildly negative and

positive novel events actually enhance global processing (Forster, Liberman, & Shapira, 2009). Therefore, NCT asserts that global and local processing is driven by the need to learn and the need to survive (Kagan, 1972).

Psychological Distancing as Global Processing

CLT proposes that global and local processing is driven by the construal of psychological distance and closeness, and related to the abstractness or concreteness of stimuli or events (Liberman et al., 2007). With that, CLT holds that people represent distant events as more abstract and at a higher level of construal, thereby leading to a broadening of attentional scope. Therefore, increased perceptions of psychological distance are related to global levels of processing, with psychological closeness or concreteness associated with local level processing. Experimentally, Liberman and Forster (2009) primed a global or local processing style in participants and showed that participants estimated greater temporal distance, psychological and social, when primed with global processing. CLT demonstrates how global processing can activate "distant" remote thoughts and semantic categories for exploration. Psychological distance can also be activated to cope with certain situations or emotions by removing focus from a current stressor. At an extreme, it can be comparable to psychological dissociation, and more mildly with distractibility or inattention. Altogether, globalizing or distancing can also play a role in emotional regulation. Psychological distance can also be compared to novelty, in that it is a more abstract and unknown experience that is ideal for more global levels of processing. However, CLT does not account for the well-established impact of affect on processing styles.

Survive or Thrive Hypothesis

When events are perceived as novel yet threatening, individuals localize their perceptual scope and search for coping mechanisms for the threat. When a novel event is framed as threatening, local rather than global processing has been shown to activate (Forster et al., 2009). Therefore, the two underlying factors for the activation of global and local processing may be survival or exploration of novelty, which occur on a continuum. When a particular threshold for danger or familiarity is perceived, there can be a switch in the prominence of a particular attention focus. This integration of attentional biases, cognition, emotion, and meaning making provides a deeper understanding for how individuals fall on different parts of the continuum for being driven by the fear to survive, or the drive to thrive and make meaning. Both provide a frame for experiencing across a vast array of contexts; impacting what is attended to, and hence, what emotions are triggered. To be focused on survival, is to be attentive to the details in the category of danger and threat. To be focused on creating meaning and thriving, is to be attentive to the integration of information in multiple categories simultaneously (Bartlett, 1932).

The current study integrates these facets to experimentally explore the *Survive or Thrive* hypothesis of global and local processing. Our study will also experimentally explore the potential causes for inconsistency in the emotion and attention processing literature, discussing how all emotion induction laboratory strategies may not be made equal. The importance of inducing specific valence and arousal states reliably is essential for inter-study consistency and comparability. Therefore, consistent with the integration of previous research, we predict that only non-threatening novel stimuli will induce

global processing, since negative arousal will likely localize processing due to threat of the novel situations. The effects of novelty are believed to supersede valence and affect states in general. We expect that once a threatening novel stimulus becomes familiar, there will be a switch to a global level of processing. Rigidity in this system of checking for danger can be observed in mental disorders such as anxiety, in that this checking for danger seems to continue, and global processing cannot activate to introduce contradictory information to activate exploration rather than threat scanning.

CHAPTER TWO

LITERATURE REVIEW

Seeing the Forest or the Trees

On a perceptual level, global processing involves perceiving an item's overall configuration, while local processing breaks the item down into its component parts. However, there have been multiple definitions and explanations of global and local processing, as well as confusion concerning the level of processing being referred to in different studies. Fishbach, Freidman, Forster, and Werth (2003) hypothesized the attentional mechanisms employed for broadening or narrowing visual perceptions are correlated with those employed for attending differentially to higher order conceptual thinking (see Freidman et al., 2003). Therefore, broadening and narrowing attention occurs through similar mechanisms, by impacting perceptual content and/or internal conceptual content. Furthermore, broadening or narrowing visual perception of the external world can lead to a broadening or narrowing, respectively, of the internal conceptual world, such as working memory. For instance, visual perception can be manipulated to attend broadly or narrowly on an external stimulus. When presented with a semantic construct such as "bird" or "automobile," a person's ability to make creative associations about these constructs will be more extensive if the initial perceptual focus of attention was broad as opposed to narrow (Friedman et al., 2003).

The Navon Task and Global Bias

Overall, global and local processing are largely unconscious styles of attending to the environment as a whole gestalt or as component parts. Navon (1977) proposed the earliest hypothesis concerning global and local processing, and showed that global

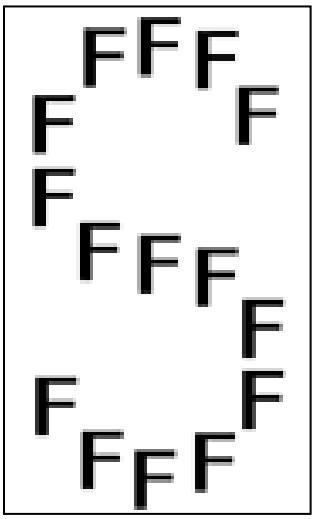

Figure 1. Sample Navon task figure.

processing tends to take precedence over local. This was demonstrated using what are now known as "Navon figures." These figures consist of large letters made up of smaller letters (e.g. a large S made up of small Fs). The Navon task usually requires the identification of either a larger letter, which requires global processing, or a smaller letter, which requires local processing, depending on the target provided. Navon (1977) presented participants with large letters that were made of small letters and asked them if a target level was present. He found that overall response times were faster when the target matched the global letters than when it matched the local letters. This became

termed the "global dominance effect." However, future studies went on to demonstrate how several factors can minimize or reverse global superiority (Tan, Jones, & Watson, 2009). For instance, many studies have shown that emotional state can shift global superiority, namely if the state is fearful or threatening.

Differences have been identified between cultures and groups of people in terms of how strongly global and local levels of processing bias occur. In East Asia, a greater global processing bias was shown when compared to Western and African participants (Caparos et al., 2012). A local attention bias has been observed in populations with Autism Spectrum Disorder (Happe & Frith, 2006), schizophrenia (Landgraf et al., 2011), and obsessive-compulsive disorder (Yovel, Revelle, & Mineka, 2005). Global level processing as an overarching default for humans is likely an adaptive survival trait, since it is specialized for more rapid evaluations of large areas of the visual field. Global processing is also better for perceiving lower resolution visual information, which is important for detecting predators during human evolution (Navon, 1977).

Global and local processing systems are triggered by different variables, behaviors, and may even be triggered by and associated with different brain regions (Forster & Dannenberg, 2010). Certain external or internal stimuli may more readily activate a global or local level of processing. Oscillations are said to occur where one can zoom-in or out; strongly and mildly, making for global or local level perception, respectively. Therefore, both systems may always present, but one more strongly or weakly activated at any given time than the other (Forster et al., 2010). Research has also indicated that global and local systems are associated with specific brain hemisphere processes, with the right hemisphere associated with global level processing and the left

hemisphere with local level processing. This ability to switch flexibly between these systems of processing is adaptive. The alternative would be cognitive rigidity, when the processing strategy used does not suit shifts in the environment. For instance, in autism spectrum disorder, individuals have trouble with global level processing, manifested as difficulties with understanding social cues and the tendency to develop highly detail oriented and specific interests (Happe & Frith, 2006).

Affect and Processing Style

Most of the literature to date has focused on how affect, mood, valence, and arousal impact attention, and vice-versa. However, findings have been inconsistent across studies. Easterbrook (1959) suggested that anxiety states and negative emotionality narrow attentional focus by reducing peripheral visual information processing toward threatening stimuli. Researchers have established that positive emotional states promote more abstract and global processing while negative emotional states promote more concrete and local processing. *The Broaden-and-Build hypothesis* of emotion (Fredrickson, 1998) suggested that positive emotions like joy, love, or contentment can temporarily broaden an individual's thought-action repertoire and promote a more global range of attention and interest in the environment, by encouraging creativity and exploration. Additionally, studies also show that those with a tendency to use one system over the other show associations with certain emotional states or regulation strategies. This can include worry and rumination on a specific concern, or a goal-oriented focus on solving a particular problem.

Emotions have also been shown to influence perception at differing stages of visual processing (Bocanegra & Zeelenberg, 2009). They can include many facets of perception, from color and brightness to attentional selection of which object to attend to (Anderson, 2005). The neurophysiological data, particularly from functional magnetic resonance imaging (fMRI) studies, have shown that emotion itself can boost activity in the visual cortex of the brain (Lang et al., 1998). As mentioned previously, the amygdala has projections to all levels of the ventral visual stream. Therefore, emotions like fear automatically activate the amygdala, which in turn modulates the processes of the visual cortex. (Vuilleumier, 2005; Amaral, Behniea, & Kelly, 2003). There is evidence for emotion and visual processing being linked, such that emotions influence how we attend to specific types of stimuli. However, findings have been mixed with regard to how specific emotions moderate or trigger global or local processing and whether there is an interaction with another variable involved in more readily bringing about a specific level of processing. In the current study, we assert that this additional variable is novelty.

Biased Attention, Cognitive Rigidity, and Mental Disorder

To further demonstrate the effect of emotion induction on perception, a study conducted by Matthews and Harley (1996) used the emotional Stroop task, with emotionally provocative words as well as neutral words to assess for color naming delays. The findings revealed that anxious individuals were slower to name the colors of words that were negative and threatening, suggesting that they were less able to ignore the negative information in order to complete the task. This demonstrates a conceptual localization, where the attentional bias at a semantic/cognitive level interfered with the

task at the more initial visual processing level. This bias for a more local level of processing, in anxious and depressed individuals, is also indicative of cognitive rigidity. This rigidity can be understood as a difficulty switching between different modes of processing to best suit the task at hand, leading to dysfunction in multiple areas of processing (Mathews & Harley, 1996).

Additionally, when the anxiety provoking words were masked, they were still processed on a pre-awareness level, causing the same interference effect. This distinction between global and local processing styles has been implicated as a potential player in the maintenance of certain mental disorders, such as anxiety, which is characterized by hypervigilant states, incessant worry, and irrational fears. The feeling state of anxiety has been shown to have a localizing effect on information processing ability by biasing attention toward threat (Macleod, 2002) and creating a bias for localized information processing (Macleod, 2002). With certain mental disorders, such as anxiety, it appears that this system may lose some flexibility, and get stuck in a particular processing mode (Isbell, 2010). In other words, localized processing may become more easily activated across many situations compared to global processing when there is a pervasive mental disorder present, rather than only in situations for which it is most adaptive and helpful. Whether the mental disorder causes the bias in processing style or vice versa is not conclusive.

Many studies have shown that training individuals with diagnosed mood disorders to attend globally can lead to reductions in symptom severity and increase cognitive flexibility overall (Macleod, 2008). These connections were explored by the *Broaden and Build* experiments, which demonstrated how positive emotions broaden perspective

and increase thought-action repertoires, which in turn led to increased levels of creativity; while negative emotions narrow perspective and bring about a conceptual focus in order to deal with dangers, problem solve, or other specific circumstances (Fredrickson, 1998; 2001). For example, Wadlinger and Isaacowitz (2006) used eye-tracking technology to demonstrate the *Broaden and Build hypothesis*, showing the effect of emotion on visual perceptual scope. Participants in positive moods had increased attention toward peripheral images (if the images were not negative) when shown emotionally neutral visual scenes when compared to participants in neutral moods. This theory accounts for both the changes on a perceptual level and conceptual level of processing, demonstrating that specific emotions can bring about conceptual shifts in attention which are mirrored on the perceptual processing levels, impacting visual attention.

Novelty versus Familiarity: Cognitive and Social Processing

Affect can also influence processing style, not based upon affect alone, but by changing how novel and familiar events are appraised (challenging vs. threatening), which leads to potentially decreased confidence and other negative behaviors if appraised as threatening (Brinol & Petty, 2009). Anxiety may act by changing the perception of a novel event to a threatening frame, leading to increased attention to the details of potential threat and localized processing (Easterbrook, 1959). Overall, individuals with anxiety disorders tend to generalize fears, and have specific tendencies to question and perceive the unknown as threatening. For example, anxious individuals often tend to ruminate about the future, because it is unknown. Anxiety generalizes as a fear of the unknown, and can make it difficult to thrive in different situations because one's focus is shifted heavily to local level concerns around survival. Studies examining novelty and

emotion have found that anxiety-related, but not sadness-related emotions, tended to shift novel global processing to more local processing (Forster, Liberman, and Shapiro, 2009). This finding is indicative of potential specific signal characteristics possessed by discrete emotional states, that we explored in the current study using film clips and IAPS images to induce discrete emotional states.

The links between affect and information processing have led to investigations exploring what moderates global and local processing, as well as the effects of each system. As mentioned previously, Forster and Dannenberg proposed this as the global and local processing model ($GLOMO_{sys}$) in 2010, suggesting two psychological processing systems: a global system for processing novel events, and a local system for processing familiar events. This overarching model took from many different areas of research, such as neuroscience, social psychology, anthropology, and so forth, leading to an identification of multiple variables that can activate either global or local processing. For example, positive emotions and creativity were associated with global processing while negative emotions and anxiety were associated with local processing. Other variables explored included psychological distance, coping, feelings of love versus lust, and even different colors associated with one system more than the other. Forster and Dannenberg (2010) proposed that the constructs of perceived novelty and familiarity of stimulus are essential to the activation of global or local processing, and encompass all other influencing variables. They define novelty as a lack of past experience, which creates a sense of psychological distance, predictive of globalizing to assist in taking in a new experience and exploring. If a novel stimulus is exposed repeatedly, than local processing will gradually take precedence because the novel stimulus is eventually

perceived as familiar (Forster, 2009). However, if the novelty is perceived as threatening or brings about a sense of uncertainty and inconsistency with what was expected, the processing has been shown to take local precedence, which demonstrates that novelty alone cannot dictate processing style even though it is one of the important pieces. Therefore, while a more positive mood facilitates exploration and the pursuit of higher and more abstract goals, negative moods inhibit these tendencies to focus on proximal needs. Schwartz and Clore (1983) asserted that mood provides essential information about the environment, with a positive mood suggesting safety, freeing the individual to explore and reach their full potential. This leads to globalized and more top-down processing overall. Though mood has been linked to global and local processing, many studies have found opposing effects on information processing when the same emotional valence was induced (Gable & Harmon-Jones, 2008).

The specific processes and stimuli that can most prominently activate these systems differentially have included affect. On the other hand, emotion does not seem to be the mechanism that primarily leads to specific shifts in processing level activated, contrary to previous studies. Rather, the appraisal of novelty about specific experiences or situations may be moderating whether global or local systems are activated (Forster et al., 2010). Experimentally, novelty has been enacted via exposure experiments, such that certain stimuli are repeated to create a state of familiarity. Forster (2009) used an exposure paradigm to induce novelty and showed that with multiple exposures (increased familiarity), local processing increased.

Overall, more empirical evidence is necessary to support whether there is a threshold of familiarity that needs to be reached in order for local system processing to

activate. Furthermore, NCT states that people first appraise the novelty of an event and construe whether an experience is new to them or old, and then start processing it either locally or globally. Once a more global understanding is attained, people shift to a more local level. Researchers have also demonstrated why novelty appraisals are important for activating specific processing systems, such as self-defense, survival, and epistemic motivation (Kagan, 1972).

Researchers have explained these effects with two different assumptions about how affect influences processing styles. First, affect can change the appraisal of novel and familiar event (challenge vs. threat), and it can also decrease a person's level of confidence to excel at a novel task (Brinol & Petty, 2009). Overall, global processing was found to be the default option for processing novel events, so that people in good moods tend to maintain a global bias in novel circumstances while those in a bad mood may change from the default style. However, findings have been mixed in that it may be that only threatening feelings, rather than just negative valence, trigger the shift to local processing for novel stimuli. For example, anxiety can change the perception of novel events from challenging to threatening, which leads to increased attention to local, detail-oriented processing in order to look for any indications of danger (Easterbrook, 1959). This demonstrates that valence alone is not the overarching factor for determining shifts in global versus local levels of processing, rather, the appraisal of a neutral event can impact the processing style and the emotion experiences as a result. Researchers also predict a possible switch to global level processing as a response to negative mood and feedback. Studies have demonstrated this switch occurring in response to sadness, but results have been inconsistent regarding anxiety and its signaling power to switch

processing styles when a stimulus becomes familiar. More research is needed to test the specific signal functions of discrete emotions, which is part of the current experimental design: using film clips to induce discrete emotion states.

Creativity

Higher order links to global and local processing have also been demonstrated by many studies linking *global processing and creativity*. The creative process has been defined as the activation of remote associations, increased conceptual scope, and cognitive flexibility (Friedman, Fishbach, Forster, & Werth, 2009). Friedman et al. (2009) conducted a study where participants were primed to either attend to a global or local perceptual level using the Navon task. Following the perceptual priming, participants were asked to find creative titles for a cartoon or unusual uses for a brick. They found that, following global primes, participants came up with more creative responses such as, "grind up the brick and use it as makeup," after a global prime and less creative responses such as, "build a wall," after a local prime (Forster & Friedman, 2010). It has been asserted that training a global focus can activate more remote concepts and enhance creativity, demonstrating a potential parallel link between perceptual processing of information and higher order conceptual level processing. Furthermore, global processing also leads to more inclusion and assimilation of information, while local processing leads to more exclusion and is focused on finding contrast and difference (Forster et al., 2008). However, local processing has also been found to be essential to the creative process, in such that a local focus can be essential when deciding and focusing upon one of the creative solutions that were previously broadly generated in the

global brainstorm-like phase of creativity (Forster & Friedman, 2010). Therefore, the essential piece to successful creativity seems to also be a greater flexibility in switching between local and global levels of processing.

Social Processing

Researchers continue to demonstrate how global and local processing are essential procedural and content-free ways of perceiving the world that impact *how* specific content is processed rather than the semantics of *what* it is. For instance, Macrae and Lewis (2002) demonstrated how *face recognition* can be improved after a global processing task, but impeded if preceded by a local processing task. Specifically, participants were primed to global or local levels of processing on the Navon task, followed by videos of a bank robbery. Those who were primed for the global level stimuli more accurately identified the robber, compared to those primed for the local level stimuli. Furthermore, these findings indicate that more global holistic processing styles benefit facial encoding abilities (Macrae & Lewis, 2002; see also Michel, Rossion, Han, Chung, & Caldera, 2006).

As mentioned previously, biases in global and local processing styles have been implicated in a variety of different mental disorders, one of which is autism spectrum disorder (ASD). It has been widely suggested that ASD is characterized by abnormal shifts between global and local levels of processing, such that there seems to be a bias toward local level processing (Koldewyn, Jiang, Weigelt, & Kanwisher, 2013). It has been hypothesized that children diagnosed with ASD show a local processing bias, which may be related to their difficulties processing whole faces and processing emotional and

social cues (Wang, Mottron, Peng, Berthiaume, & Dawson, 2009). However, experiments have demonstrated that this local bias may be an attentional preference instead of an actual deficiency, which has significant clinical implications for remediation. This was shown during tasks where ASD children performed the same as typically developing children when they were instructed to attend globally on one block of the task, and locally on the other. So, processing styles can be primed and trained, even in individuals who were predisposed to be biased toward a certain level of processing, due to unknown factors (Koldewyn et al., 2013). These findings demonstrate the potential bidirectional relationship between perceptual processing and higher order emotions and cognition.

Emotion Induction

Previous studies have demonstrated the impact of specific emotions on attentional scope (Bocanegra & Zeelenberg, 2011; Huntsinger, Clore, & Bar-Anan, 2010; Macleod et al, 2002; Tan, Jones, & Watson, 2009). Different emotion induction strategies have been employed by studies to demonstrate how emotion impacts attention in a controlled setting.

Films and Images

In the current study, we employed emotional images and film clips as the two methods of emotional induction in the laboratory because they have been used in many previous studies and have been normed by hundreds of participants on their emotional valence and arousal. We used still images from the International Affective Picture System (IAPS) to induce positive and negative emotional states, as well as for the neutral

control condition (Center for the Study of Emotion and Attention [CSEA-NIMH], 1999). The IAPS provides normative ratings of emotion (arousal, valence and dominance) for a set of color photographs that evoke a set of normative emotional reactions.

We also used film clips. Fredrickson and Branigan (2005) used film clips to induce specific positive, negative, and neutral emotional states. They found that, following the amusing film-clips, participants identified more global Navon task targets then when negative or neutral video clips were shown (Fredrickson and Branigan, 2005). The use of video clips has gained momentum in recent years due to their dynamic nature and ecological validity, putting the viewer into an artificial model of reality where strong emotions can be elicited (see Schaefer, Nils, Sanchez, & Philippot, 2010). Multiple studies have demonstrated the strong impact of film clips on inducing positive and negative mood states, and reliable sets of film-clip stimuli for the elicitation of discrete emotional states have been developed. Most recently, Schaefer and colleagues (2010) developed a set of film-clip stimuli that are validated in their ability to produce specific emotions. These stimuli will be employed in the current study.

In summary, many techniques have been developed to induce emotions, such as emotional images (Lang et al, 1995; Schaefer et al. 2009), music or sounds (Bradley and Lang 2000), facial expressions (Ekman and Friesen 1979), autobiographical memory induction (Brewer et al. 1980), social interactions (Harmon-Jones et al 2007), and films (Gross and Levenson 1995; Hagemann et al. 1999; Philippot 1993; Schaefer et al. 2010). Films have been shown to have multiple advantages for lab emotion induction. First, they are dynamic and combine visual and auditory components to increase ecological validity. Second, they can be standardized for better replication. Third, films can induce

discrete emotions rather than focusing broadly on general negative or positive states. Though many studies have tested films' ability to induce discrete emotion states, it has largely been tested using self-reported instruments.

Objective Measures of Emotion: Physiological Responding

The autonomic nervous system (ANS) is responsible for modulating peripheral and automatic physiological functions. It is split into the sympathetic and parasympathetic branches, associated with activation and relaxation, respectively. The ANS is general and encompasses various functions related to homeostasis, emotion, attention, and so forth (Berntson & Cacioppo, 2000). Some of the most common indices of ANS activation include electrodermal, measured using skin conductance levels (SCL). There is also cardiovascular (blood circulation), measured most commonly as heart rate (HR), blood pressure (BP), and heart rate variability (HRV). However, all of these measures differ in whether or not they primarily reflect sympathetic, parasympathetic, or both nervous systems' activation. Broadly, SCL is know to represent sympathetic NS activation, while HR can be a combination of both, and HRV is more closely related to parasympathetic activation (Cacioppo et al., 2000). Overall, there have been inconsistent findings relating to autonomic specificity of response (Cacioppo et al., 2000).

This has led to more the popular view of ANS responding encompassed in broader dimensions such as arousal and valence (Malmo, 1959). Multiple studies have demonstrated that increased arousal is strongly associated with increased levels of SCL, with effects largely independent of specific stimuli valence and emotion induction technique. However, some studies have shown high arousal leading to increased SCL,

while HR decreased (Bradley & Lang, 2000). There is some support for specificity in discrete emotional responding, such that anger and fear lead to different patterns of cardiovascular and respiratory change. Fear-inducing, and sadness-inducing film clips also lead to different patterns of physiological responding. This differentiation was accomplished when multiple ANS measures were considered together (Kreibig, Wilhelm, Roth, and Gross, 2007). However, ANS measures and responses are complex and encompass many levels of processing and behavior, and hence are unlikely to serve as a direct measure of emotional experiencing.

Current Study

In the current study, to measure the physiological responses to the discrete emotions induced using film-clips we measured heart rate (HR) and skin conductance level (SCL) to capture moment-to-moment affective experiencing during film clip viewings. These measures provide a broad index of physiological activity and have been most frequently used in similar studies related to emotional and cognitive processing (Gross, 1998; Gross and Levenson, 1997). SCL is a more pure measure of sympathetic nervous system activation, while heart rate is influenced by more complex patterns involving both sympathetic and parasympathetic nervous system activity (Cohen et al., 2000).

Based upon previously studied models of emotional processing, Gross (2002) asserted that expressive emotional suppression would be associated with activation of the sympathetic nervous system, while cognitive reappraisal would not impact physiological responding. Specifically, it has been demonstrated that using suppressive strategies for coping with emotion reduce behavioral expressions of emotion without actually reducing

negative affect, and serve to increase physiological responding. Previous studies measuring physiological variables and emotional induction have also shown that fear leads to the greatest increase in both heart rate and skin conductance, although findings relating to heart rate changes have been inconsistent across studies. Gross (1998) found that changes in heart rate were unrelated to emotion regulation, likely due to the complexity of influence on heart rate variability. Furthermore, neutral emotions were found to be associated with the lowest changes in heart rate and skin conductance, as theoretically expected (Fernandez, Pascual, Soler, Elices, Portella, Fernandez-Abascal, 2012). Subjective ratings will also be taken using Self-Assessment Manikans (SAM; Bradley and Lang 1994) in order to assess for subjective experiencing of emotion, and whether it matches with physiological changes.

Summary of Aims

Understanding how global and local processing are differentially activated and maintained can have implications for understanding emotional and mental processing. This area of study gained in popularity in the last decades due to the increasing interest in determining the neurobiological processes underlying healthy versus pathological emotion-related states (see Fernandez et al., 2012). Studies have determined that there are three main components of emotional responding: behavioral, physiological, and cognitive. Understanding global versus local responding can be an effective way to study this cognitive aspect of emotional responding, as well as cognitive mechanisms that determine which system is activated when (Forster et al., 2012). Most studies have used only self-report measures to understand emotional responding, which leads to a dismissal

of the three aforementioned components that call for more objective measurement. Furthermore, researchers have indicated the need to study all three of these components simultaneously so as to understand the convergence between them using more objective measurement tools. Many studies that have explored the convergence of these components have reported discrepant results (Cacioppo et al., 2000; Mauss and Robinson 2009), possibly due to differential effects of emotional induction strategies used. The aim of the current study is to compare two primary methods of experimental emotion induction, as well as to objectively and subjectively measure whether images and films rated and validated to produce particular types of affect reliably produce the intended discrete emotional experiences.

The current study has three main parts. First, we aim to integrate different models of global and local processing into our proposed *Survive or Thrive* model of global and local processing, by demonstrating how novelty appraisals of certain emotional stimuli impact global versus local activation. Second, we aim to measure subjective and objective emotional responding to increase reliability about how different levels of processing are activated, and compare novel versus familiar, as well as specifically valenced emotion states. Third, we aim to replicate findings from our previous pilot experiment, where IAPS images and film clips induced different processing biases while evoking the same emotional state, demonstrating possible discrepancies between and within emotion induction strategies.

In the pilot study (Experiment 1) for the current experiment, we found the expected trends following fearful, amusing, and neutral emotional images, in that there was a pattern of fearful images localizing attention while positive and neutral globalized

attention. Following fearful, amusing, and neutral film clips, the trends were reversed, with neutral and amusing film clips localizing attention, and fearful film clips globalizing. Although significance was not reached in these comparisons, we will attempt to replicate these findings and explain how the neutral film clips, in particular, localized processing. Currently, we introduced object-neutral film clips in addition to the previous actor-neutral film clips to compare negative and positive inductions. The goal of adding this additional neutral condition was to determine the reliability of those actor-neutral clips for future use in research, since previous findings demonstrated that cognitive reactions to those clips indicated a more negative appraisal. Therefore, the object-neutral film clips may serve as a more reliable source of neutral comparison.

In summary, we will explore how global and local processing impact automatic cognitive appraisals of novelty and familiarity. To induce familiarity of stimuli, the film clips will each be presented twice. The aim was to determine whether the appraisals of novelty or familiarity acted as moderators for how affect is experienced, and in turn lead to different levels of global and local processing. Most previous studies exploring global and local processing have employed affect as the main moderator, but findings have been plagued with inconsistent findings. We propose these inconsistencies are due to novelty and familiarity appraisals leading to cognitive shifts in attention initially, followed by specific emotions of threat, or anxiety, signaling that a novel situation may be a survival threat. With this, the *Survive or Thrive* hypothesis integrates novelty and affect as important aspects of how global and local processing systems are differentially activated.

Hypotheses

1. Novelty versus Affect: *Survive and Thrive Hypothesis*. Demonstrate how novelty appraisals and affect moderate the activation of global versus local visual processing systems of attention after emotional induction using film clips, considering reaction times and accuracy of responding.
    a. We predict that cognitive appraisals of novelty versus familiarity will lead to significantly different patterns of responding, in that novel stimuli will globalize attention, while familiar stimuli will localize attention. If local processing is activated for novel stimuli, we predict it will switch to global processing upon familiarity with the stimulus and vice versa.
    b. We predict that there will be an interaction between novelty/familiarity appraisals and valence, such that negative novel film clips will localize attention, while familiar negative clips will globalize.
    c. Local level responding will lead to more accurate responding when compared to global level responding.
2. Subjective and Objective Emotional Response (IAPS vs. Film Clips): Determine whether or not the intended emotions were being induced by film clips and IAPS images using SAM ratings and peripheral measures of HR and SCL. Explore whether the expected trends of physiological response follow the different film valence categories as well as the impact of novelty versus familiarity of the clip. Furthermore, determine how these two laboratory emotion induction techniques

compare in emotional experiences with the domains of subjective experience, physiological response, and cognitive response.

   a. Film-clips will lead to greater levels of self-reported arousal and valence ratings compared to IAPS images, due to greater ecological validity.
   b. For film-clips, novel clips will lead to greater increases in both heart rate and skin conductance across valence categories than familiar film clips.
   c. Negative film clips will lead to the greatest increase in both heart rate and skin conductance. Neutral emotion induction will lead to the lowest change in heart rate and skin conductance. The same trends are expected for IAPS images.
   d. We predict that the object-neutral clips will be significantly different from actor-neutral, positive, and negative film clips, while actor-neutral clips will not differ from positive and negative films. In this way, we predict that the object-neutral clips will serve as a more reliable neutral comparison than the actor-neutral clips that were validated and normed as neutral in previous studies.

3. Replication of Experiment 1: We will incorporate the current findings with the previous data to determine if the same findings are supported.
   a. We predict that our previous findings will be replicated for response time, in that IAPS and film clips lead to significantly different patterns of responding, such that negative IAPS images will localize attention, while negative film clips will globalize attention. Furthermore, positive/neutral

IAPS images will globalize attention, while positive/neutral film clips will localize attention.

b. We predict that our previous findings will be replicated for accuracy, such that IAPS will lead to more accurate responding then film clips.

c. Global level responding will be less accurate than local level responding.

Table 1. Visual representation of film-clip hypotheses.

Predictions:	**Negative**	**Actor-Neutral**	**Object-Neutral**	**Positive**
Novel	**Localize**	**Localize**	**Globalize**	**Globalize**
Familiar	**Globalize**	**Globalize**	**Localize**	**Localize**

CHAPTER THREE

METHOD

Participants

Power analyses indicated that we need a sample size of 44 participants to have an 80% chance of detecting a significant effect. A total of 40 students were recruited via the SONA system, and were rewarded extra credit points toward select courses in return for participating in this study. Previous data collection for pilot study, experiment 1, consisted of 35 participants. In addition, participants were provided with $5 Starbucks gift cards for participation. Participants who reported current or past history of any type of anxiety disorder or major depression were excluded from the analyzed data, since current clinical levels of anxiety may confound the results of the study (although they will be allowed to participate and receive extra credit). Two participants were removed from final analyses due to lower than chance responding.

Measures

The primary dependent measures were speed and accuracy on the Navon Task. Mean reaction times for each cell in the design will be calculated based on accurate responses after discarding those responses that were produced too quickly (< 250ms) to be valid, or that were delayed to the point that it was unclear what additional cognitive processing was accomplished before the response (> 2000 ms).

Emotional State. Video film clips and still images from the International Affective Picture System (IAPS) were used to induce positive and negative emotional states as well as for the neutral control condition. Gross and Levinson (1995) evaluated

250 films and of those selected two that were rated most consistently as evoking each of the seven specific emotion types addressed: amusement, anger, contentment, disgust, fear, sadness, and surprise. About 400 people watched and rated the film clips, indicating the amount of each emotion they felt. For example, one of the film clips selected as being the most effective at evoking sadness was taken from *The Champ* (Lovell & Zeffirelli, 1975). It is a 2-minute scene during which a boy's father dies after being beaten severely in the ring.

Table 2. Film clips selected for the current experiment, with the scene descriptions.

Film Clip Valence	**2-minute Film Clip Scenes**
Negative	"Misery" (Hobbling)
Negative	"It" (Clown)
Positive	"When Harry Met Sally" (Orgasm faking)
Positive	"There's Something About Mary" (Dog fight)
Actor-Neutral	Unknown French Film (Girl in a carriage)
Actor-Neutral	Unknown French Film (Man organizing desk)
Object-Neutral	Lava lamp
Object-Neutral	Blue flag waving

The IAPS images will be used to evoke emotion in the second phase of the experiment (Center for the Study of Emotion and Attention [CSEA-NIMH], 1999). The IAPS provides normative ratings of emotion (arousal and valence) for a set of color photographs that evoke a set of normative emotional reactions. The valence and arousal

rating scales will be included in the current study for participants to rate how they felt after viewing each image, as well as after viewing each film clip.

The use of video clips has gained momentum in recent years due to their dynamic nature and ecological validity, putting the viewer into an artificial model of reality where strong emotions can be elicited. (see Schaefer, Nils, Sanchez, & Philippot, 2010). Multiple studies have demonstrated the strong impact of *film clips* on inducing positive and negative mood states and have developed reliable sets of film-clip stimuli for the elicitation of discrete emotional states. Most recently, Schaefer and colleagues (2010) developed a set of film-clip stimuli were validated in their ability to produce specific emotions. These stimuli will be employed in the current study.

Global/Local Processing. The Navon task will be used to assess global and local visual attention. The Navon task has been used in multiple studies assessing for global/local attention, and is one of the only reliable and validated measures for measuring this construct in the literature (Billington, Baron-Cohen, & Bor, 2008; Christesen & Lynn, 2002; Fredrickson and Branigan, 2005). Using the Navon task will facilitate comparisons of our findings with those of previous studies.

Physiological Measures. (1) Heart rate (HR) was measured using a finger photoplethysmometer placed on the middle finder of the nondominant hand. This is similar to the "pulse-ox" device ubiquitous in medical settings. HR was converted to beats-per-minute and averaged within 0.5 s bins across the trial interval and averaged within cells of the experimental design. HR was calculated with max HR scores, corresponding to the shortest inter-beat-interval registered during the watching of the films. (2) Skin conductance level (SCL) was measured using two electrodes taped to the

distal phalanges of the first and third fingers of the same nondominant hand as the pulse meter, which measures SCL in microSiemens with a frequency of four times per second. Baseline levels were established as mean score. SCL variations were calculated with respect to max SCL scores during the film clips, since emotional responding could appear at different moments for each film, and can also occur suddenly or progressively depending upon the film. Skin conductance was analyzed to the First Interval Response, the largest response with an onset 1 to 4 seconds after the presentation of the critical stimulus. SCL and HR were measured continuously during the presentation of film clips.

Self-Report Measures. Self Assessment Manikans (SAM; Bradley and Lang 1994) were used. The SAM evaluates three different dimensions, but we only used two: (a) Affective valence ranging from smiley, happy figure (max score, 9) to a frowning, unhappy figure (min score, 1); and (b) Arousal or activation, ranging from excited, wide-eyed figure (max score, 9) to a relaxed, sleepy figure (min score, 1). Participants rated how they felt after viewing each image, a well as after each film clip.

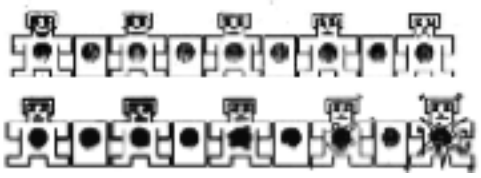

Figure 2. Self-Assessment Manikins. Top – Valence, pleasant to unpleasant. Bottom – Arousal, low to high.

Emotion Regulation Questionnaire (ERQ; Gross & John, 2003). This scale comprises a four-item suppression scale (alpha = .73), and a six-item reappraisal scale (alpha = .79). The ERQ uses a seven-point scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Items included statements like "I keep my emotions to myself," "I control my

emotions by not expressing them," and "When I want to feel less negative, I change what I am thinking about."

Beck Depression Inventory (BDI) and Beck Anxiety Inventory (BAI). These scales assess the presence and severity of affective, cognitive, motivational, vegetative, and psychomotor components of depression and anxiety (Beck et al., 1979). Items include statements like "I feel sad" and "I feel discouraged about my future." They are ranked on a scale of severity from 0 to 3. Retest reliabilities have been from good to very good, ranging from .48 for psychiatric patients after three weeks, and .74 for undergrad students after three months (Beck, Steer, & Gabrin, 1988). The BDI also has demonstrated good concurrent validity with other measures of depression and there is evidence that it discriminates psychiatric from non (Beck et al., 1988).

Recall and thoughts during film clips. At the end of the experiment, participants were asked to recall each film they saw and provide a brief title or description, followed by their thoughts and feelings about the clip. Specifically, they were asked, "Please describe what you were thinking and feeling during each film clip." These open-ended responses were then transcribed and coded. Specifically, we created a coding system in which statements were coded as positive, negative and neutral, and depending on the clip, these ratings were further coded as consistent or inconsistent with the intended valence of the film clip.

Procedure

All participants provided informed consent before the start of the experiment. Then the Beck Depression and Anxiety inventories were administered. After all the baseline measures were collected, a brief but clear explanation was provided about the

experimental procedures, and participants were told that the goal of the study was to assess the impact of emotional states on attention.

First, the experimenter provided instructions and described all that would take place during the experiment. The participants were seated in a comfortable chair at a distance of about five feet from the 19-inch screen in an electrically isolated laboratory room with attenuated light and sound. They were instructed to move as little as possible during the experiment, so as to reduce noise signals for the physiological tools.

Prior to the experiment, all participants were instructed that images and film clips with differing emotional content would be presented on the computer screen. They were instructed to keep their eyes on the screen and to view all the films and images for their entire presentation time. They were also instructed about the Navon tasks that would follow each image and film presentation.

Next, the physiological measures were connected to the participant for heart rate (HR) and skin conductance (SCL). SCL and HR were measured continuously during the presentation of film clips. The SCL was fitted with two electrodes for finger surfaces, which measures SCL in microSiemens, with a frequency of four times per second. Baseline levels were established as mean score.

The task then began with one-minute of baseline measuring, with participants asked to breathe normally and look at the "X" on the screen. This was followed by a practice phase for the Navon task. Participants were shown non-emotional images, followed by the Navon task and provided feedback by the experimenter on their responding. During this training phase, all participants learned how to respond to the Navon task by using the keyboard arrow keys using their dominant hand. The keys were

demarcated on the keyboard, with a green sticker on the right arrow for "Target Present," and a red stick on the left arrow key for "Target Not Present." The training phase consisted of three Navon trials. This was to help ensure all participants understood the Navon task before starting the actual experiment.

Phase I

Eight film clips were randomly presented first, two times each. The film clips ranged from one to two minutes in length, with two films for each emotion category: amusing, fearful, and neutral (actor-neutral and object-neutral). For IAPS images, there were 45 images selected, with 15 per valence category ranging from low to high arousal. Additionally, the film clips were selected to have an equal number of high and low arousal level rated stimuli per emotion category in order to account for arousal level. After each film clip, the Navon task was administered. First, a target figure was flashed on the screen, followed by 12 Navon figures, one at a time, to which the participants responded with a yes or no to indicate the presence or absence of the target stimuli shown previously. The IAPS images were presented after the video portion in a counterbalanced order across participants. Following IAPS images, only four Navon figures were presented. For each Navon, there was a target figure. For example, if the target figure was "H," and the Navon figure following was an "H" made up of small "Ls," a "yes" response would signal global level detection of the figure, while a "no" or error response would suggest a local level response. Each Navon figure was flashed on the screen for 500ms, with participants having 2500 ms to select a response before the computer proceeded to the next Navon figure. There was one target figure prompt for each film,

followed by 12 Navon figures. In each set of Navon figures, four had targets present on a global dimension, four on a local dimension, and four figures without the target letter (i.e., If target was "A," these figures would be a Navon "T" made up of "B"s). The Navon figures were randomized for each participant.

Phase II

After all the stimuli were presented and the Navon task portion of the experiment was completed, physiological equipment was removed and the rating portion of the experiment ensued. All the film clips and IAPS images were shown again in random order for the participants to rate each on valence and arousal using. The physiological equipment was removed for this portion of the task. Specifically, participants were asked to report how they felt upon viewing the stimuli the first time during Phase 1 of the experiment. The ratings were measured using the SAM.

Participants were also asked to recall the film clips they were shown and provide a brief description of their content and how they felt upon viewing them. This also provided an opportunity to explore the qualitative feelings the participant experienced aside from the two dimensions provided by the rating scale.

Analysis

Separate repeated measures ANOVAs were computed for each dependent variable (Reaction time, accuracy, HR, SCL). A (2 x 2 x 4) Repeated Measures ANOVA was conducted for the first objective, assessing for the effects of appraisal (novel and familiar), valence (positive, negative, actor-neutral, and object-neutral), attentional scope (global or local) on reaction times (msec) and accuracy of responding. A-priori

hypotheses testing was conducted using paired sample *t*-tests. For response frequency, the proportion of trials a participant endorsed at a local level of processing was calculated and used as a dependent measure. Participants who performed at chance level or below (.50 accuracy) on the Navon task were removed from the analysis. Participants who scored in the clinical range on the BDI and BAI were removed from final analyses as well; however, none met criteria for removal. Further, we explored how different neutral film clips led to different cognitive response styles. For this, we compared neutrally rated film clips, which were scenes selected from movies, as well as our own neutral clips that consisted only of objects (i.e., lava lamp and a waving flag). We conducted paired-sample t-tests to compare the two types of neutral film clips. Post-hoc comparisons from ANOVAs were used to determine whether the object-neutral or actor-neutral clips led to significant differences when compared to the other valence categories, as would be expected for a reliable neutral comparison condition.

For the second objective, SCL and HR were assessed with separate 2 x 4 Repeated Measures ANOVAs with Appraisal (Novel and Familiar) and Valence (Negative, Positive, Actor-Neutral, and Object-Neutral). Descriptive statistics were run to determine average ratings on SAM, comparing film clips and IAPS images.

The third objective was to replicate previous findings from Experiment 1. For this, the same analysis was conducted, which was a 2 x 2 x 3 Repeated Measures ANOVA was conducted assessing the effect of Medium (Film clips vs. IAPS images), Level (Global vs. Local), and Valence (Negative, Positive, Neutral) on reaction times and accuracy of responding. A-priori hypotheses testing was conducted using paired sample

t-tests. For response frequency, the proportion of trials a participant endorses a local level of processing will be calculated and used as a dependent measure.

Due to the multiple *t*-tests, the Bonferroni correction was applied and indicated that $p < .0025$ was needed for statistical significance to be reached. Some of the comparisons reached that level, with some trending in the expected directions. Furthermore, we reported the effect sizes (partial eta-squared) to assess the relationship between the variables for the a priori analyses.

The Greenhouse-Geisser correction was applied to degrees of freedom in all cases in which the assumption of sphericity was not met. When the ANOVAs had significant effects due to the factors and their interactions, post-hoc comparisons of the mean values were done using paired multiple comparisons (adjusted to Bonferroni, $p < .0025$). The level for statistical significance was set at $p < .05$, and all analyses were performed using IBM SPSS 22.0 (IBM).

CHAPTER FOUR

RESULTS

Objective 1: Novelty vs. Affect

A repeated measures ANOVA was conducted with appraisal (novel and familiar), level (global and local), and valence (negative, actor-neutral, object-neutral, and positive). There was a significant interaction between appraisal, level, and valence (F [3, 35] = 3.35, $p < .05$, $\eta^2 = .21$), such that positive familiar films localized processing while negative globalized, and negative familiar film clips led to globalized processing while negative novel film clips localized processing. Novel films also showed more significant differences in global and local levels of processing within valence categories. Specifically, negative and object-neutral films shifted from globalized processing when novel, to localized processing when familiar. There was also a significant two-way interaction between appraisal and valence (F [3, 35] = 4.9, $p < .01$, $\eta^2 = .29$), such that familiar films led to faster response times for negative and positive film clips when compared to novel (Figures 1 and 2). There was also a significant main effect for Appraisal (F [1, 37] = 18.4, $p < .01$, $\eta^2 = .32$) and Level (Global versus Local processing) (F [1, 37] = 9.4, $p < .01$, $\eta^2 = .19$; see Table 1 and Figures 1, 2, and 3).

Novel films showed overall global processing preference across valence categories, except for slight local bias for negative clips, which did not reach significance. Only novel object-neutral (MD = 39, SE = 10.7; t[37] = 3.65, $p < .01$) showed a significant global bias in responding, with actor-neutral approaching significance (t[37] = 2.2, MD = 35, SE = 16, $p < .05$. In contrast, familiar films showed significant global bias in responding for negative (t[37] = 1.89, MD = 24, SE = 13, $p <$

.05) and positive familiar films (t[37]= 5.2, MD = 70, SE = 14, p = .00) (see Table 2 and 3).

Table 3. ANOVA Table of response time (N = 38).

Independent Variable	*df*	Mean Square	*F*	η^2
Appraisal	1	242201	18.48**	.32
View	1	80919	9.37**	.19
Valence	3	13014	1.43	.23
Appraisal x View	1	128.48	.04	.001
Appraisal x Valence	3	30666	4.5**	.10
View x Valence	3	13398	2.02	.05
Appraisal x View x Valence	3	10990	1.83*	.05

*p < .05. **p < .01.

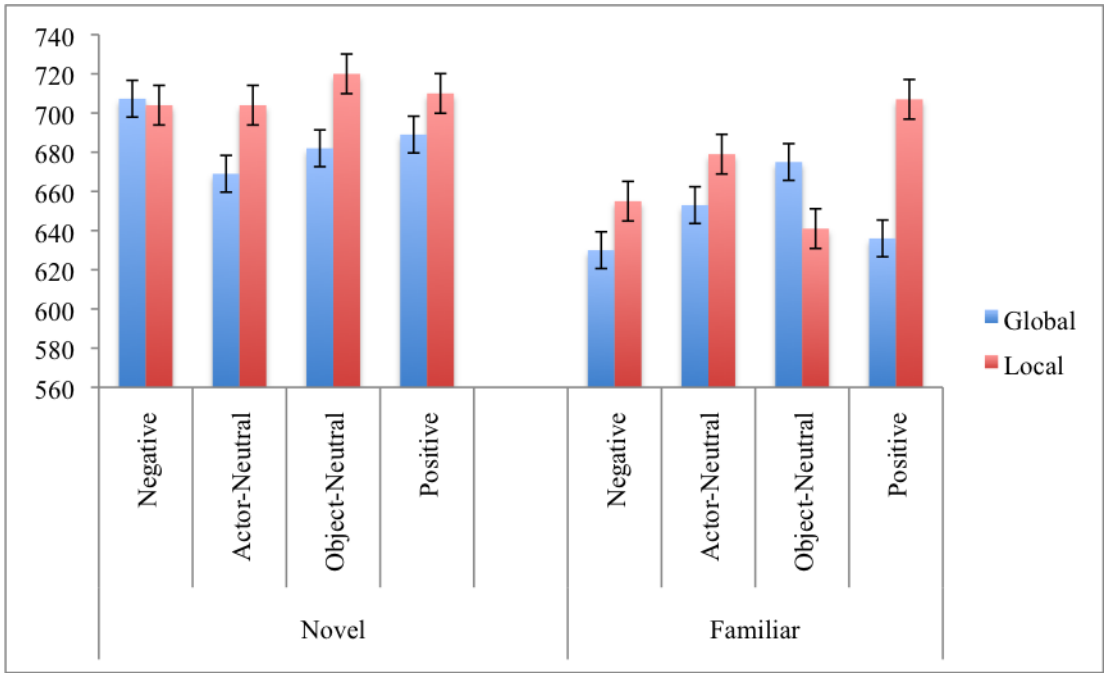

Figure 3. Reaction times on Navon task for film clips that were seen first (Novel) versus for a second time (Familiar).

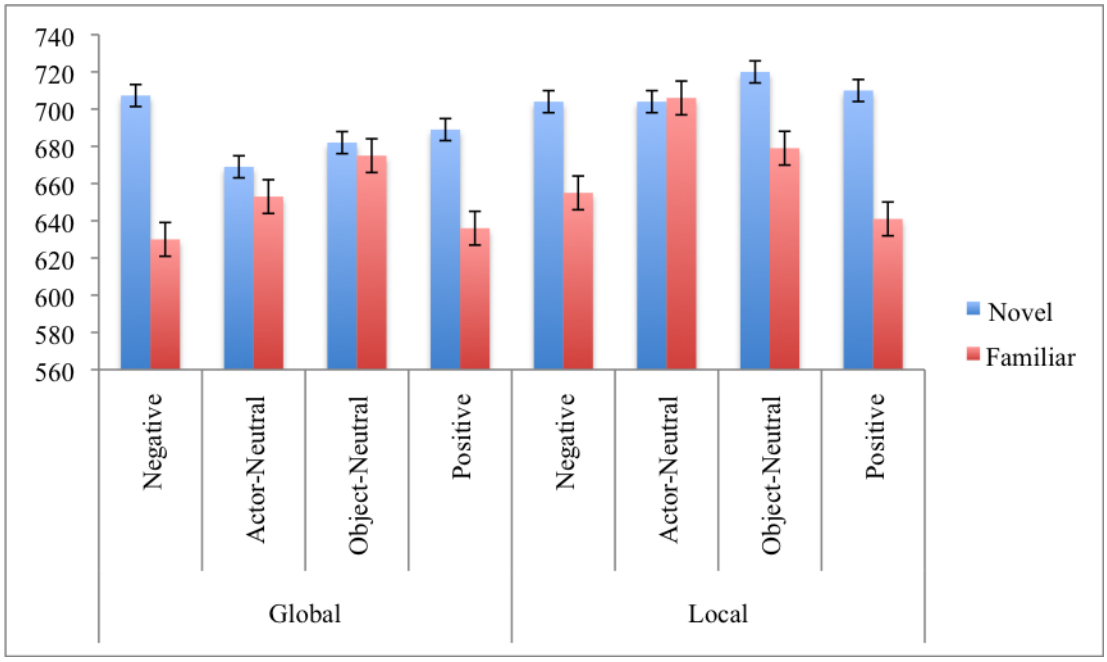

Figure 4. Comparing novel and familiar appraisal based upon balance and global and local processing.

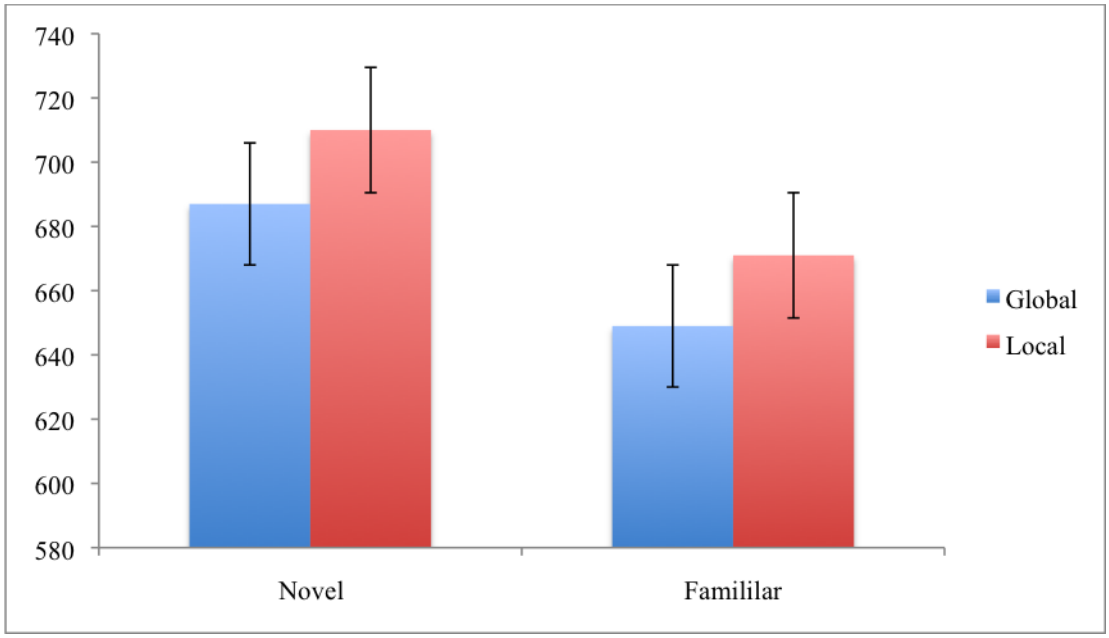

Figure 5. Comparison between local and global levels of processing based upon novel or familiar appraisal of film clips.

Table 4. Pairwise comparisons between novel and familiar appraisal by valence, with global and local processing kept constant within comparisons (N = 38).

Variable	*M*	*SD*	*df*	*t*	*p*	*d*
Novel Negative Global **	**707**	**163**				
Familiar Negative Global	**630**	**156**	**39**	**3.17**	**.003**	**.54**
Novel Negative Local **	**705**	**161**				
Familiar Negative Local	**655**	**141**	**39**	**3.1**	**.004**	**.32**
Novel Positive Global *	**689**	**162**				
Familiar Positive Global	**636**	**120**	**39**	**2.73**	**.01**	**.36**
Novel Positive Local	710	157				
Familiar Positive Local	706	162	39	1.63	.11	.12
Novel Actor-Neutral Global	670	146				
Familiar Actor-Neutral Global	654	156	39	.91	.37	.04
Novel Actor-Neutral Local	704	132				
Familiar Actor-Neutral Local	679	144	39	1.75	.08	.19
Novel Object-Neutral Global	681	148				
Familiar Object-Neutral Global	675	173	39	.36	.72	.04
Novel Object-Neutral Local ***	**737**	**142**				
Familiar Object-Neutral Local	**642**	**128**	**39**	**4.4**	**.00**	**.57**

*$p < .05$. **$p < .01$. ***$p < .0025$*

Table 5. Paired sample comparisons between global and local level processing, with valence and appraisal held constant.

Variable	*M*	*SD*	*df*	*t*	*p*
Novel:					
Global Negative	707	163			
Local Negative	704	161	39	.104	.92
Global Positive	688	162			
Local Positive	711	158	39	1.3	.19
Global Actor-Neutral*	669	147			
Local Actor-Neutral	705	133	39	2.20	.03
Global Object-Neutral***	682	155			
Local Object-Neutral	721	142	39	3.65	.001
Familiar:					
Global Negative	630	157			
Local Negative	655	141	39	1.89	.07
Global Positive ***	636	119			
Local Positive	716	162	39	5.16	.000
Global Actor-Neutral	654	156			
Local Actor-Neutral	679	145	39	1.66	.11
Global Object-Neutral	675	173			
Local Object-Neutral	641	134	39	1.81	.07

*$p < .05$. **$p < .01$. ***$p < .0025$*

For accuracy, a 2 x 2 x 3 repeated measures ANOVA was conducted. We found a significant interaction between Medium, Level, and Valence (F [1, 45] = 4.3, p <.05, η^2 =.17), such that IAPS images had lower rates of accuracy compared to film clips,

specifically to global level responding following positive stimuli. There was also a significant main effect for Valence (F [1, 45] = 3.78, p <.05, η^2 =.13), such that positive stimuli led to the least accurate responding, specifically for global level responding, with negative and neutral leading to the most accurate responding, specifically for local level stimuli (see Figure 4).

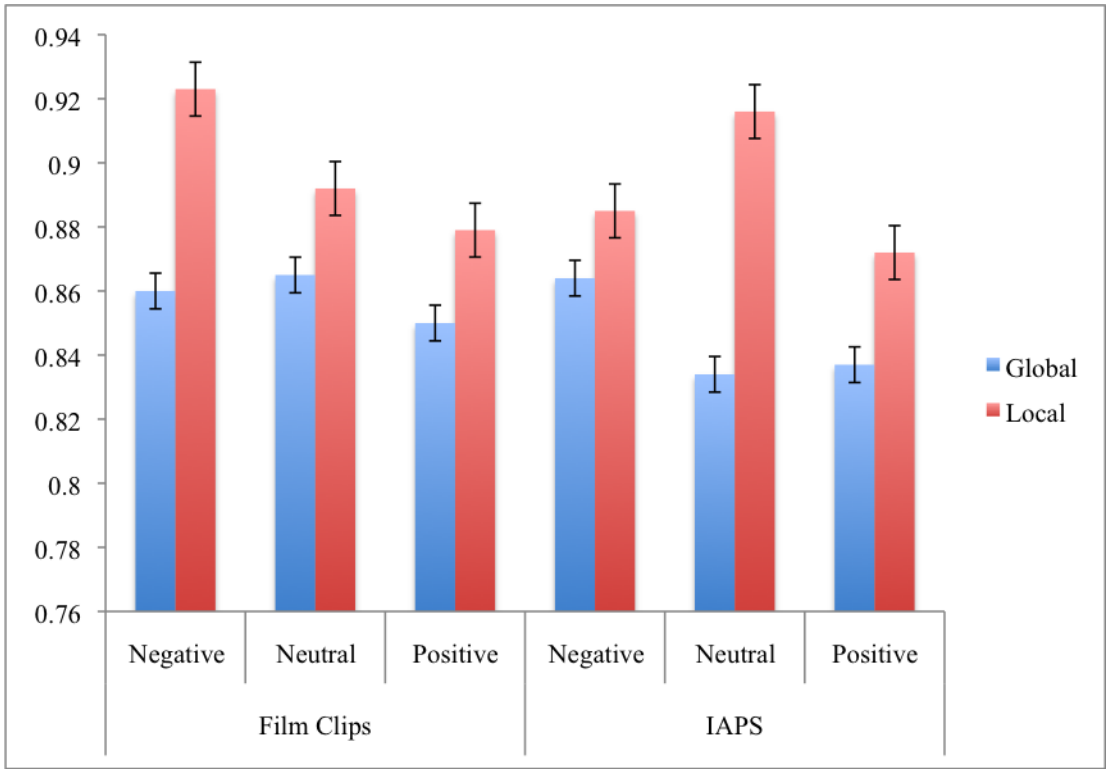

Figure 6. Accuracy of response to Navon task, overall trends demonstrated lower accuracy following IAPS images and global level responding to positive stimuli.

Objective 2: Do Neutral Film Clips Feel Neutral?

There were differences approaching significance that demonstrated how valence categories differed from the two neutral conditions on global and local processing. Findings demonstrated significant differences and those trending toward significance

only in the familiar film clips and only in comparison to object-neutral film clips. We found that global negative (t[37]=18.1, MD=45, SE= 13, p = .002) and local positive familiar films (t[37] = 4.5, MD = 65, SE = 15, p < .0025) significantly differed from object-neutral familiar clips, but not from actor-neutral familiar clips. Furthermore, familiar local object-neutral and actor-neutral films trended toward being significantly different, as was familiar global positive from object-neutral (see Table 3 & 4).

Table 6. Significant and trending differences between negative, positive, and neutral film-clips on global and local responding (N = 38).

Variable	*M*	*SD*	*df*	*t*	*p*	*d*
Familiar Global Negative *	630	157				
Familiar Global Object-Neutral	675	173	39	3.39	.002	.27
Familiar Global Positive	636	119				
Familiar Global Object-Neutral	675	173	39	2.32	.02	.24
Familiar Local Positive*	707	161				
Familiar Local Object-Neutral	641	135	39	4.48	.00	.42
Familiar Local Actor-Neutral	679	144				
Familiar Local Object-Neutral	641	134	39	2.32	.02	.27

*p < .05. **p < .01.

Objective 3: Subjective and Objective Emotional Response

The self-report ratings for valence and arousal provided after the participants viewed the IAPS images and film clips were consistent with predictions and norms. All participants rated the appropriate images and film clips as the intended valence and arousal level, with film clips being rated more strongly on all levels (Figures 5 and 6).

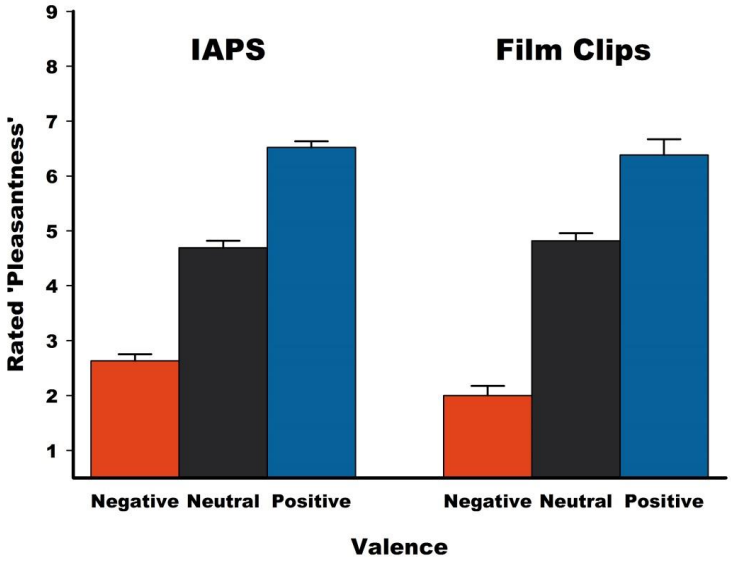

Figure 7. SAM valence ratings for IAPS images and film clips.

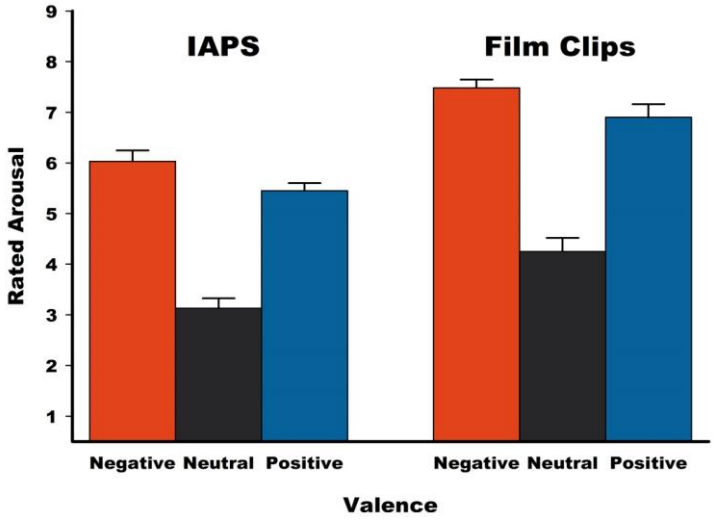

Figure 8. SAM arousal ratings for IAPS images and film clips.

All participants had a two-minute baseline measure (HR = 74.35, *SE* = 33; SCL = 4.52, *SE* = 1.2). A 2 x 4 repeated measures ANOVA with appraisal (novelty and familiarity) and Valence (negative, actor-neutral, object-neutral, positive) showed a trend

toward significance in HR (beats per minute) changes based on valence and appraisal (F[3,35] = 2.1, η^2= .21, p = .12). We conducted multiple pairwise post hoc comparisons, which revealed trends indicating that negative/horror film clips (M = 100.2, SE = 42.3) and positive/amusing film clips (M = 103.2, SE = 36.5) led to increased heart rate compared to actor-neutral (M = 85.6, SE = 28.9) and object-neutral (M = 81.1, SE = 27). Overall, novel film clips led to greater changes in HR (M = 92.5, SE = 36.4) than familiar film clips (M = 79.45, SE = 32.3). No differences reached significance. The same trend was evident for the familiar clips, but there was less physiological responding overall (see Figures 7, 8, and 9). The ANOVAs showed a trend toward significance in SCL between the film clip categories (F [3,35] = 2.4, η^2 = .25, p = .17). The multiple pairwise post hoc comparisons showed that negative/horror films (M = 6.5, SE = 1.3) and positive/amusing (M= 7.2, SE = 2.8) trended toward increased SCL compared to actor-neutral (M = 5.3, SE = 1.4) and object-neutral (M = 5, SE = 1.2). Overall, novel film clips (M = 6.1, SE = 2.3) led to greater changes in SCL than familiar film clips (M = 4.92, SE = 2.2) (see Figures 7, 8, and 9).

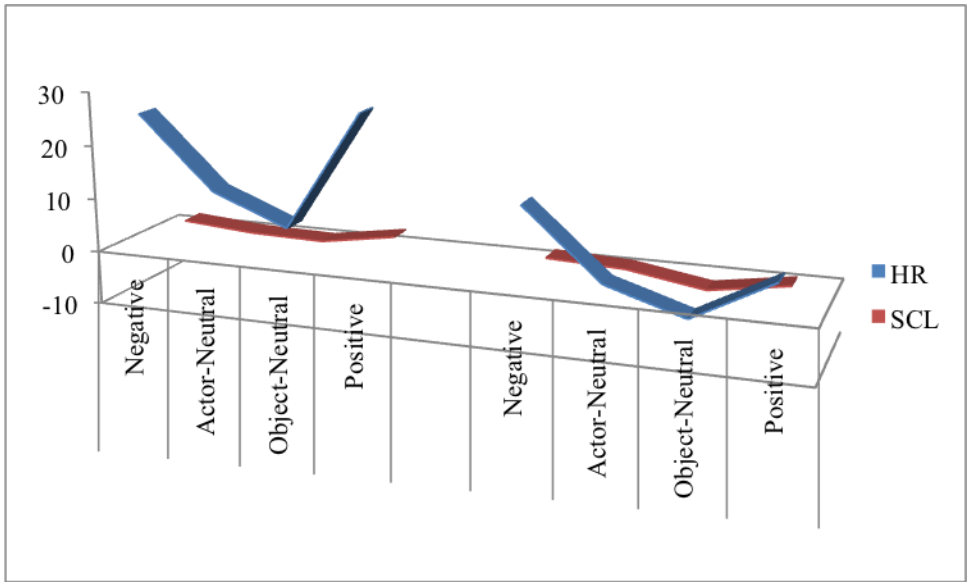

Figure 9: Average changes in HR and SCL from baseline measures, by valence film-clip categories.

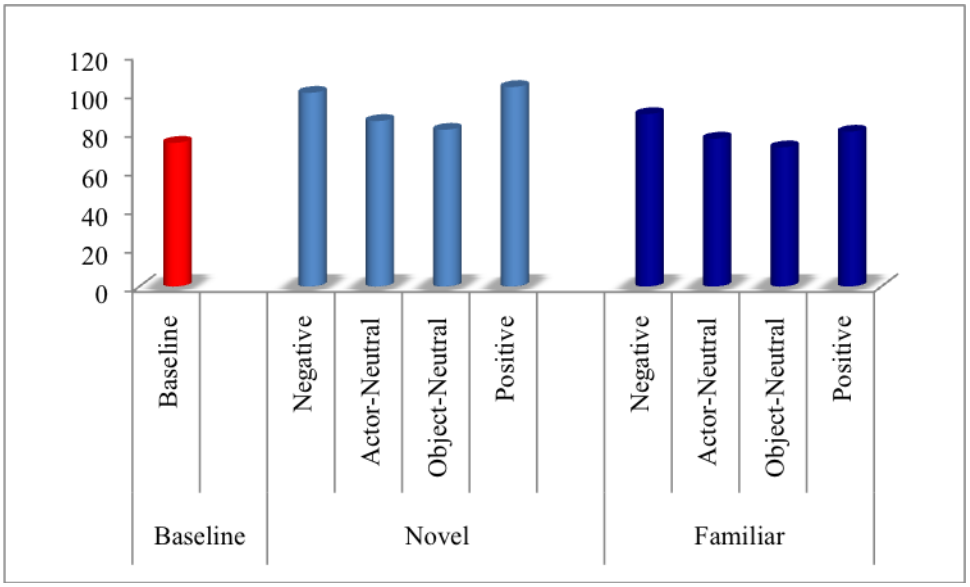

Figure 10. Average HR (beats-per-minute) for film clips.

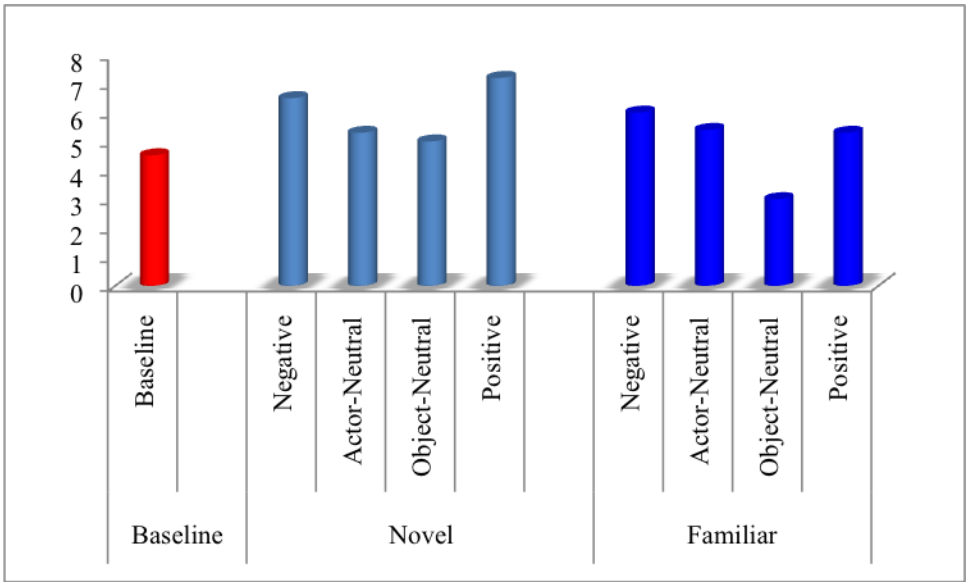

Figure 11. Average SCL for film clips.

Objective 4: Replication of Experiment 1

Data from the previous study, which we will refer to as Experiment 1, were analyzed using repeated-measures ANOVA with medium (IAPS and film clips), level (global and local), and valence (negative, neutral, and positive) as IVs. There was a three-way interaction that was trending toward significance among medium, level, and valence (F [2, 28] = 2.24, $p > .05$, $\eta^2 = .072$) for reaction times (Table 6). Inspection of Figure 10 suggested that reaction times between level and valence were reversed for *film clips* and *IAPS images*, such that negative *IAPS images* led to faster responding for local stimuli, while negative *films* led to faster responding for global stimuli (see Table 6 and Figure 10).

The current study repeated the same analyses and revealed a similar pattern, with reaction times between level and valence still reversed for *film clips* and *IAPS images*, such that negative *IAPS images* led to faster responding for local stimuli, while negative

films led to faster responding for global stimuli (see Figure 10). In the current analyses, there was only a significant interaction between medium and valence (F[2,48]= 2.47, p < .05, η^2 = .09), such that IAPS did not show significant differences in response pattern based upon valence, while film clips showed significantly faster responding following positive and neutral films for global stimuli as compared to local, and a shift from global to local processing for negative films (see Figure 11). In the previous experiment, neutral clips also showed a trend for localized processing. The current analyses used object-neutral in conjunction with actor-neutral film clips from the Experiment 1, and found the expected globalizing effects in the current study using the object-neutral film clips rather than the localizing effects seen with the actor-neutral clips in Experiment 1.

Table 7. ANOVA Table of response time to global and local stimuli following negative, positive, and neutral film-clips and images. Data from previous experiment (N = 30).

Independent Variable	*df*	Mean Square	*F*	η^2
Medium	1	280142.87	13.72**	.32
Level	1	1185.84	.17	.01
Valence	2	2003.64	.23	.02
Medium X Valence	2	18373.55	2.08	.14
Medium X Level	2	3850.22	.82	.03
Valence X Level	2	3855.14	.14	.01
Medium X Level X Valence	2	6784.96	2.24	.12

*p < .05. **p < .01.

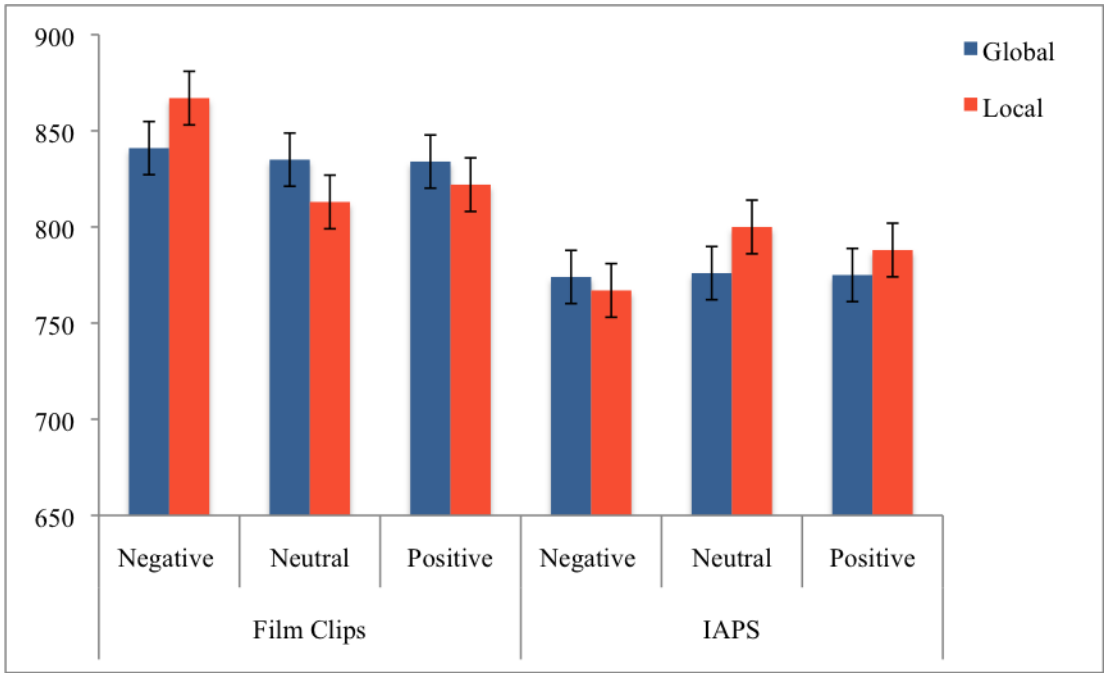

Figure 12. Experiment 1: Reaction times on Navon task for IAPS images and film clips (*N=30*).

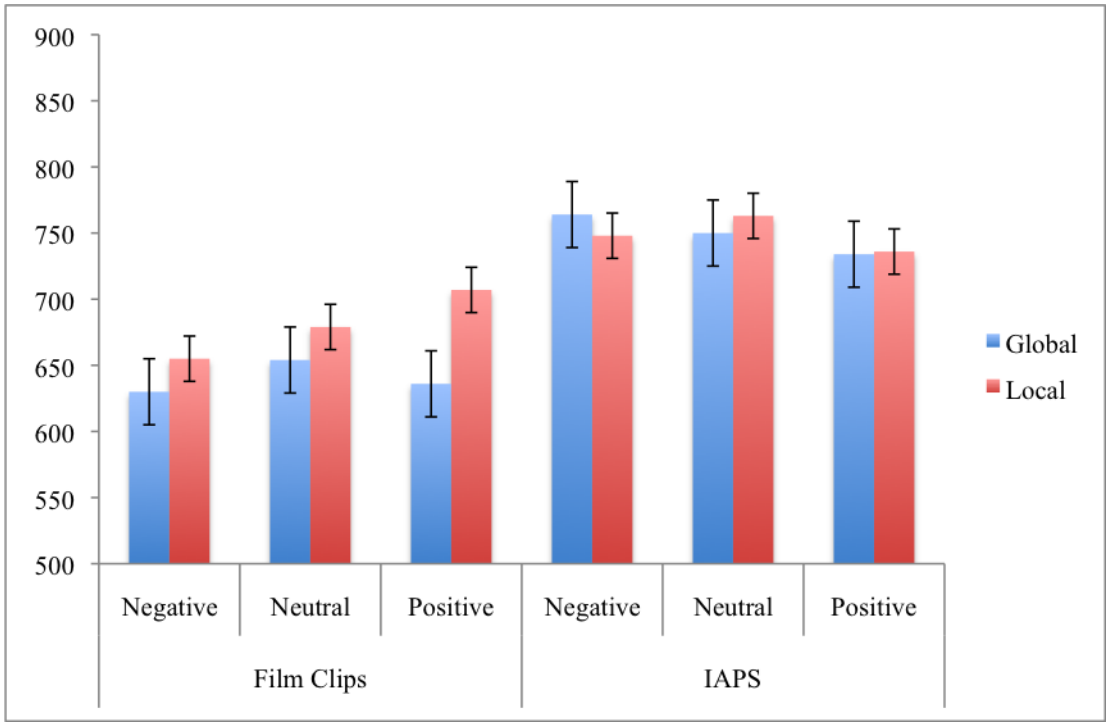

Figure 13. Current Experiment Combination: Comparison between familiar film clips and IAPS images including all recent data (*N = 70*).

Summary of Findings

Table 8. Non-shaded represent supported hypotheses for film-clips.

Predictions:	**Negative**	**Actor-Neutral**	**Object-Neutral**	**Positive**
Novel	**Localize**	**Localize**	**Globalize**	**Globalize**
Familiar	**Globalize**	**Globalize**	**Localize**	**Localize**

Novelty versus Affect

- *Cognitive appraisals of novelty versus familiarity will lead to significantly different patterns of responding, in that novel stimuli will globalize attention, while familiar will localize. Familiar films will lead to more local attention for positive and neutral clips. Furthermore, for negative films we predict localizing at novelty but globalizing once familiar. This switching between levels of processing would support NCT and Survive or Thrive, discussed previously* (Partially Supported).

Familiar films led to faster responding for local stimuli compared to novel films. Familiar films also led to faster responding across valence and level categories. More specifically, we found support for novel negative local processing switching to global precedence when familiar. We also found support for novel object-neutral film clips leading to global level processing, and switching to local level processing when familiar. Positive and actor-neutral were globalized when novel, and remained so when familiar (See Figure 1, and Tables 1, 2, & 7).

- *Negative novel film clips will localize attention, while familiar negative clips will globalize* (Partially supported).

Overall, no significant differences were found within the negative valence category for global over local responding alone. Following negative film clips, there was a trend for increased global processing. However, there was a pattern for more local level responding following negative versus following object-neutral film clips (see Table 3 and Table 4).

- *Local level responding will be more accurate when compared to global level responding, and that responding will be more accurate following film presentations overall when compared to IAPS images* (Supported) (see Figure 4).

Do Neutral Film Clips Feel Neutral?

- *Object-neutral film clips will be significantly different from actor-neutral, positive, and negative film clips, while actor-neutral clips will not differ from positive and negative films. In this way, we predict that the object-neutral will serve as a more reliable neutral comparison* (Supported).

Results showed that negative, positive, and actor-neutral film clips differed significantly on global and local processing when compared to the object-neutral film clips. This provides evidence for the notion that the actor-neutral clips that show ambiguous and low plot parts of unknown foreign films did not serve as a valid neutral comparison condition because they may have elicited negative affect, leading to more localized attention (see Table 3 & 4).

Subjective and Objective Emotional Response

- *Film clips will lead to greater levels of self-reported arousal and valence ratings compared to IAPS images* (Supported) (see Figures 5 and 6).
- *Novel film clips will lead to greater increases in both heart rate and skin conductance across valence categories when compared to familiar film clips* (Supported) (see Figures 7, 8 and 9).
- *Negative film clips will lead to the greatest increase in both heart rate and skin conductance. Neutral emotion induction will lead to the lowest change in heart rate and skin conductance* (Partially supported).

Negative and amusing film clips had the greatest changes, followed by actor-neutral, then object-neutral, at the lowest. However, negative and amusing showed an average decrease in heart rate, with an increase in SCL (see Figures 7, 8, and 9).

Replication of Experiment 1

- *Previous Experiment 1 findings will be replicated for response time, in that IAPS and film clips will lead to significantly different patterns of responding, such that negative IAPS images will localize attention and positive/neutral IAPS will globalize, while negative film clips will globalize attention, while positive/neutral film clips will localize attention when novel* (Partially Supported).

Trends supported IAPS pattern of responding; however, film clips did not show the same pattern of responding and did not replicate previous findings.

- *We predict that previous findings for accuracy will be replicated, such that IAPS will lead to faster and more accurate responding than film clips* (Not supported).

Current findings showed decreased accuracy following IAPS image presentation and slower response rates. The most accurate responding followed local level processing when followed by negative film clips. Most inaccurate responding followed neutral and positive global IAPS images (see Figure 4).

- *Global processing will be associated with less accurate responding when compared to local* (Supported) (see Figure 4).

CHAPTER FIVE

DISCUSSION

The fundamental distinction between how we perceive the world has been broken down into either attending to an event or stimulus as a whole, or breaking it down and focusing on its component parts and details. These differences in style of attending can have implications for affective experiencing as well as conceptual understanding. As predicted, we found support for the hypothesis, *Survive or Thrive*, such that automatic appraisals of novelty and specific affect impacted global and local processing in the expected directions. We also showed that shifts occurred most likely based upon a switch from appraising the stimuli from novel to familiar, and from threatening to safe. In this study, following threatening films, attention was initially localized when novel, but switched to global once the stimuli were no longer perceived as threatening. Also, the novel object-neutral film clips led to global level processing as predicted, but only when novel. Upon repeated viewing, termed familiarity, there was a shift to local level processing. This shift to local processing for these neutral stimuli, which were validated as neutral based upon subjective and objective measures, cannot be explained as a shift in affect. Rather, it was understood as a switch in novel or familiar cognitive appraisal that lead to the "tipping point" from global to local processing. In other words, once the gestalt of the stimuli were understood, the details became the focus. Because the object-neutral clip initially elicited a more global processing need, it was low in complexity so it is logical to assume that no more exploring and integration was needed; therefore, a more local and detailed view was taken to more deeply engage in the experimental task.

Specific cognitive processes seemed to be set in motion when people expect to encounter a novel stimulus compared to one that is old or familiar. Multiple studies have suggested that this expectation and experience of novelty engages global processing, while the expectation of familiarity allows for more detail-oriented local processing. The switch from global can occur when the greater gestalt has already been internalized, and deeper local processing can take over if necessary. However, specific affect states interact with novelty as the switch between global and local processing occurs.

Aside from the expected threatening film clips inducing a state of anxiety and threat and local level processing, amusing clips led to unexpected response patterns. Ratings about the amusing films on the qualitative measure; specifically, the clip from "When Harry met Sally," was normed as strongly positive in valence and arousal, but was associated with negative experiencing in our sample. Most prominently, participants described attempting to suppress their emotional expression, reported feelings of shame associated with the content of the video, and some indication of shame for feelings of arousal. The sexual nature of this film clip introduced this variability may have led to these inconsistent findings. Cognitively, there was little significant difference in global versus local processing when the positive films were presented initially (novel); however, there was a significant increase in global level processing upon familiarity. This shift to global processing may be explained participants globalizing in order to create psychological distance from a stimuli they already were aware brought about a state of arousal that was undesirable for them in the context of the testing room. Thus, they were prepared to cope by suppressing emotional expression upon the second viewing, and thus employed psychological distancing (a type of globalized processing). As would be

predicted, this psychological distancing likely reduced their focus on the task, which contributed to lower accuracy of responding on the task. We do not see this finding as inconsistent with the *Survive or Thrive* hypothesis; rather, we see it as an expansion that includes different types of perceived threat beyond just physical danger and survival. In this case, that threat was conceptualized as the social danger perceived with the experience of shame.

A limited number of studies have shown that shame serves as a primary register to an individual that a threat to the social self has occurred, damaging one's most inner sense of identity and humanity (Lewis et al., 1987). This seems to be felt as a painful self-consciousness, anxiety about negative judgment, unwanted exposure, inferiority, failure, and defeat. Shame has been shown to possess both internal and external orientations. Both have defensive postural responses including slumping, gaze aversion, turning away of the face, and dissociation or psychological distancing and suppression of emotional expression. Researchers have also asserted that shame and fear may share a family relatedness as defensive emotions, anchored in the "fight or flight" response. The perception of physical threat and social threat have similar consequences physiologically and behaviorally. The results from the current study support this, in that the trends of HR and SCL change were similar for the threatening and positive film clips.

Our proposed integration of previously explored models of $GLOMO_{sys}$ and NCT were supported overall when integrated into our model of *Survive or Thrive*. Specifically, our findings indicated that threatening emotions set the stage for the initial exploratory and integrative approach to novelty and into a more focused and primal need for survival. In order to survive, more local processing is fitting, in that discernment and

judgment take center stage as the focus of attention becomes avoidance of danger. This detail-oriented and focused state of processing information likely evolved for the purposes of important problem solving. However, exploration and embarking upon unknown territory is equally essential to the bigger picture of success in life, adaptation, and survival.

Novelty versus Affect

Our primary aim for this study was to attempt to identify how novelty and familiarity appraisals or emotional valence moderate global and local system activations. We predicted that novel stimuli would induce more global attention while familiar stimuli would induce more local attention. The present study found trends supporting our proposed *Survive or Thrive hypothesis*, as well as falling within the scope of $GLOMO_{sys,}$ NCT, and the Broaden-and-Build hypothesis, such that appraisal and affect interacted to activate global or local systems of processing. We found support for our predictions about the interaction between novelty and affect, such that threatening novel film clips trended toward localized processing while nonthreatening novel film clips trended toward globalized processing.

According to NCT, people first appraise an event as new or old, then process it either globally or locally. Once a broad and global understanding has been attained of a particular stimulus or situation, people switch to a more detail and goal oriented stance of local level processing. However, the threshold for when a stimuli or situation is no longer perceived as novel, and has crossed into being appraised as familiar is not well understood. Novelty and familiarity have been experimentally manipulated using simple strategies, such as gradual exposures. Forester (2009) showed that with multiple

exposures of stimuli (i.e., familiarity) there was a gradual shift toward more local level responding to Navon stimuli and reduced creative generations.

Future research is needed to continue to identify and understand this "tipping point" between novel and familiar appraisals. In terms of our findings, it may be that for the negative film clips, participants were aware of the emotional implications of engaging in the films, and may have disengaged, or created psychological distance from the films in an effort to cope, hence leading to the globalized processing. In general, it may be appropriate to assume that after the novel negative film was watched with anxious apprehension the first time, the anticipation was no longer present upon repetition where the participant not only knows the outcome of the film, but is more aware of the experimental task at large. Forster et al. (2010) conducted studies in which merely framing a task as new and novel for participants led to more global levels of responding, compared to when framed as common and familiar. In terms of the object-neutral film clips becoming localized once familiar, we believe the same explanation stands, in that the film situation was so benign, that the need for exploratory global processing was exhausted, leading to a significant shift to local system processing.

Overall, results supported our predictions of novel film clips globalizing attention and familiar film clips localizing attention. The interaction between affect and novelty was also supported, such that threatening novel film clips trended toward activating the local system, with a shift to the global system when the film clip was repeated (familiar).

Both the negative and neutral film clips had the most accurate responding to local level stimuli, particularly when familiar. Additionally, we found that novel positive and neutral film clips led to more activation of the global processing system. Upon familiar

viewings of the film clips, both global and local processing was speeded across valence categories, with the aforementioned shifts for the negative and object-neutral films. Positive films only increased in global level processing when familiar, with no change in local level response rates. These accuracy rates may be indicative of the qualitative differences that exist between global and local levels of processing, in that more local processing is associated with more focus and task proficiency. For novel and familiar appraisals, it is fitting that familiar stimuli led to both more accurate and faster responding due to practice effects. However, the significant differences point to changes in processing systems that allowed for the more focused processing to improve task performance once the "tipping point" was reached and the participant felt familiar enough with the stimuli to transfer more focus to the task, rather than managing the novelty and emotionality of the stimulus.

This provides additional evidence for CLT, NCT and $GLOMO_{sys}$ in that the apparent threshold to switch from global to local processing was interrupted by perceived threat. It appears that one of the mechanisms for maintaining global processing once a stimulus is no longer novel, is psychological distancing or suppression; manifested as increased global level processing (CLT).

Subjective and Objective Emotional Response (IAPS and Film Clips)

Qualitatively, people described negative emotion states in response to the positive film clips; the overarching valence reported through SAM was still in the positive valence range on average (see Figure 7). This leads us to question whether participants

tend to respond to the SAM ratings with retrospective and social desirability bias. It may be that participants respond to the SAM based upon what they believe was intended by the experiment, or providing the "right answer." It can easily be assumed that the amusing clips were meant to be positive, which possibly lead participants to respond when prompted in they believed to be the most valid way. However, this may not be completely representative of their experience at the time of viewing.

To help us tease these issues apart, objective physiological measures were included in this study. As predicted, we found changes in HR and SCL for both negative and positive film clips when compared to both neutral conditions. HR showed trends of increase from baseline following negative/fearful films clips and an increase in SCL for negative and amusing film clips when compared to physiological changes following the neutral film clips. The actor-neutral film clips had greater shifts in HR and SCL than the object-neutral film clips. Though none of these differences reached significance, the trends were in the expected directions based upon previous research. Furthermore, when the film clips were familiar there were overall reductions in physiological response levels compared to novel. Negative film clips led to deceleration in HR and SCL; however, even though amusing film clips also led to a deceleration in HR, the SCL remained elevated. Trends of reduction in physiological response followed for both neutral conditions.

The pattern of deceleration in HR with the increased SCL for negative and positive stimuli during the familiar trial may be indicative of the orienting reflex, which has been shown to be facilitative for effectively processing the external environment. Therefore, studies have suggested that increased SCL and decreased HR represent

increased sensory intake and attentional processing, and more sustained attention to the motivationally relevant stimulus.

Furthermore, positive/amusing film clips led to the greatest increase in SCR, which was not expected. In this study, it is likely that due to the "amusing" nature of the film clips chosen, as well as the sexual subject matter, arousal may have been increased more than a non-sexual or amusing film clip. Based upon responding to the open ended questions provided at the end of the experiment, a large proportion of participants in the current study provided inconsistent descriptions of the amusing film clips, particularly "When Harry Met Sally" (The orgasm scene). Specifically, participants described feelings of shame, embarrassment, and described attempts to suppress their discomfort or laughter. These attempts to suppress seemed to be driven not only by the content of the film clip, but also the experience of watching the film clip alone in the experiment room. Some participants described feeling worried about their own level of arousal during the clip, not wanting the physiological reactivity measures to reveal their level of arousal to the experimenters. Actual excerpts from the qualitative responses from participants can be reviewed on Table 14.

These apparent attempts at suppression to regulate their emotional experiencing during the experiment could have contributed to the elevated SCL, which stayed elevated even after repetition in the familiar trial only for the amusing film clip category. It appeared that many of the participants were using expressive suppression of emotion during this film clip. Gross et al. (2002) referred to emotion regulation as the process by which humans influence their emotional experiences in terms of how they are experienced, when, and how they are expressed. Studies have explored different types of

emotional regulation strategies, one of which has been termed suppression and related to increased sympathetic nervous system responding. Gross et al. (1998) showed that emotional expression was reduced when participants were asked to watch disgusting films when they were instructed to suppress their emotional response. Suppression was shown to impair memory and increase sympathetic activation. These unintended effects of suppression are assumed to be manifestations of the effort that is necessary to shut down already activated expressive behaviors. In the current study, it seems that many of the participants attempted to suppress their expressive emotional response during the experiment, and likely contributed to the elevated SCL observed for amusing film clips. However, because significant differences were not found between valence categories, it may be indicative of novelty and overall arousal accounting for more of the changes in responding.

The current findings are also indicative of possible discrepancies in retrospective self-report in capturing accurate, in-the-moment experiencing of emotional state. This may also have implications for how discrepancies and inconsistencies occur in the literature. Emotion induction strategies must reliably measure the discrete emotion states we claim to be measuring in order to draw appropriate conclusions about emotional processing. This will require more studies in the future aimed at studying the three major components of emotional processing (behavior, physiological, and cognitive) simultaneously, in order to find more valid measures for emotion laboratory induction. In addition, contrasting with some previous studies examining emotional responding to emotion inducing films, we looked at emotional reactivity changes while participants performed a cognitive attention task, the Navon task. This procedural fact may have

impacted physiological responding, and contributed to the trend of physiological responding observed in the current study.

Replication of Experiment 1

Our main initial hypothesis for the pilot study (Experiment 1) was that fear, like anxiety, would lead to more localized perceptual attention and that positive emotions such as amusement would lead to more globalized perceptual attention, and would be distinguishable from neutral emotional induction. Findings showed a significant difference on global and local processing between film clips and IAPS images. While participants responded as predicted following IAPS images of amusing, fearful and neutral emotionality, the opposite was observed following film clips, such that neutral film clips led to an activation in localized processing and fearful films led to an activation of globalized processing.

The negative IAPS images consisted of pointed guns and scenes of violence, which may have led to a more automatic fear response that localized perception when compared to a more anxious response following negative films. These findings were in line with both the Broaden-and-Build and $GLOMO_{sys}$ theories, which asserted that anxiety and fear localized processing in order to respond to threat (see Figure 4). However, the opposing findings following film clips did not fit our predictions that negative films would lead to more localized processing compared to IAPS images. Furthermore, actor-neutral film clips also localized processing rather than globalizing.

Unlike the negative films, the neutral were take from French films that none of the participants were familiar with. According to retrospective self-report, many of the participants reported feeling as if there was something negative looming, which may have

created a sense of suspense and hypervigilance, which activated localized processing. This may provide a more appropriate depiction and model for how anxious individuals feel and experience the world, projecting negative outcomes and possibilities into an unknown future. The unknown is interpreted as negative and threatening, as was the case for participants watching the neutral film clips. However, another possibility was that the neutral clips may have been perceived by participants as incomplete gestalts, leaving them searching for the resolution and completion. This may have been the case because unlike the negative and amusing clips, the neutral were not complete scenes and lacked a definitive start, climax, or ending. These findings have implications for whether or not emotion is the full story when it comes to how the global and local processing systems are activated. It seems that there are many variables at play, including the experience of novelty and familiarity. Future studies should focus on showing whether extreme cases of novelty are experienced as threatening or whether valence and novelty are independent form one another.

The positive/amusing film clips also localized processing, as opposed to globalize processing as was predicted and the case with amusing IAPS images. This difference may be accounted for by the difficulty in matching IAPS images and the film clips on levels of amusement. For the film clips, participants were often observed to be laughing out loud, which was not the case with the positive IAPS images. The positive film clips, like the negative, were also familiar to the majority of participants, which would be expected to globalize as well. However, it is possible that humor and amusement activate global/local processing differently than a simple positive emotion like joy or peace. The amusing clips could have led participants to over-focus on the punch line of the jokes,

hence become locally focused. Furthermore, performance following the positive/amusing film clips for global stimuli was the least accurate. Therefore, it seems that all positive emotions may not be created equally, with amusement possibly functioning as a discrete category of its own.

With the discrepancies in Experiment 1, we explained that the findings were most likely due to novelty effects, which lead to the design of our current experiment. In terms of replicating the previous results from Experiment 1, we currently conducted the same analyses and revealed a similar pattern, in that reaction times between level and valence still reversed for *film clips* and *IAPS images*, such that negative *IAPS images* led to faster responding for local stimuli, while negative *films* led to faster responding for global stimuli (see Figure 4). However, in the current analyses, there was only a significant interaction between medium and valence, such that IAPS did not show significant differences in response pattern based upon valence, while film clips showed significantly faster responding following positive and neutral films for global stimuli as compared to local, and a shift from global to local processing for negative films (see Figure 5). In the previous experiment, neutral clips also showed a trend for localized processing. The current analyses used object-neutral in conjunction with actor-neutral film clips from Experiment 1, and found the expected globalizing effects in the current study using the object-neutral film clips rather than the localizing effects seen with the actor-neutral clips in Experiment 1. Therefore, overall, the replication continues to support the Broaden-and-Build Hypothesis, in that negative stimuli tend to localize attention, with neutral and positive stimuli tending to globalize attention. However, the replication demonstrated the

reverse effect for negative films leading to global level processing, providing support for novelty affects discussed in $GLOMO_{sys}$.

In terms of the IAPS images and use of film clips as emotion induction techniques, the results of the current study did not show any significant differences between IAPS and images in overall responding. In summary, the pattern of response was replicated for IAPS images; however, for the films, the same pattern was not replicated. Again, the lack of replication can be explained with the addition of object-neutral films, as well as the repeated exposure of the films to induce familiarity.

According to the rating scales provided at the end of the IAPS image and film clip presentation, participants rated the IAPS and film clips similarly on valence and arousal measures, with film clips being rated as slightly stronger on both levels. However, the difference detected on the level of global or local processing activation indicates that the in-the-moment experience of certain emotions may occur outside of conscious awareness and not be consistent with self-report descriptions. This finding has implications for how findings are interpreted in the emotion literature, and whether parallels can easily be made between different emotion induction techniques. Specifically, the neutral stimuli in the film-clips induced negative rather than neutral mood states. Furthermore, the film clips led to more inaccurate responding to the Navon task, as compared to the IAPS images. This again indicates potentially different processing that takes place when participants are exposed to these two types of stimuli, said to be measuring the same emotional phenomena. Specifically, IAPS images and film-clips, led to differential activation of the global and local systems apart from any valence or arousal brought about by either content. Further evidence for these differences was apparent in the

participants' slower and less accurate responding to the Navon task following film-clips as compared to the IAPS images, regardless of the valence of the stimuli.

Global and local processing may function on a continuum rather than as two dichotomous systems. Therefore, certain external and internal stimuli may more readily activate a global or local level of processing to a greater or lesser extent. According to the findings in this study as well as previous work, it seems that both global and local processing systems are always present, but one may be more strongly or weakly activated at any given time. However, a switch must occur for one system to be active over the other, as is described by $GLOMO_{sys}$. The system most strongly activated at any given time, impacts the emotional experience of the individual, and vice versa.

There is likely a bidirectional flow, which has implications for potential treatment strategies aimed at training people to activate one system more readily than another. For instance, in people with anxiety disorders, research has shown there is a bias toward threatening information and more localized levels of processing. Training anxious individuals to activate the global processing system may serve to change their emotional experience and alleviate anxiety. However, future studies are needed to more systematically identify this bidirectional flow between levels of attending and emotional experience.

Limitations

Although many trends supporting the current hypotheses and previous theories were found, there were multiple limitations. First, many of the differences observed in this study did not reach significance, likely due to small sample size. Second, the Navon task itself may have a ceiling effect, not allowing enough differentiation in global versus

local responding. Third, physiological measurement tools had significant levels of noise, which likely impacted the integrity of the data. Also, heart rate and skin conductance response provide indirect measures for brain activation. More precise and direct measurement instruments, such as Electroencephalogram (EEG), may be helpful in the future to replicate the current findings with more power. Lastly, the emotion induction techniques, though validated by research showed some discrepancies in producing reliable emotional experiencing states. Furthermore, it will be important to analyze samples with different age groups and cultural backgrounds, as well as clinical presentations (mental illness diagnosis vs. control).

Statistically, the study was significantly limited by a small sample size, which reduced statistical power of the analysis. For this, we reported effect sizes to meaningfully examine non-significant findings and to obtain information about which findings may be important to pursue in future studies. The small sample coupled with the number of analyses conducted, raises the possibility that the significant findings that emerged could be the result of chance and any null findings could be the results of Type II error. Studies with larger sample size needed before firm conclusions can be drawn.

Future Directions and Implications

Future studies are needed to more systematically investigate how global and local processing systems are activated. For instance, are there truly two distinct systems accounting for global and local processing, or do they function as a continuum? Currently, $GLOMO_{sys}$ conceptualizes global and local processing as polar opposites and a dichotomy. Thereby, one system cannot be active when another is on. In other words, Forster and Dannenberg (2008) assert that you cannot view the forest and the trees at the

same time. However, different researchers have asserted that viewing global and local processing as on a continuum rather than as dichotomous systems is more valid (Smith & Ledgerwood, 2010). They state that though processing can be more global or local, relatively, there are variations in how broad or detailed processing becomes. They compare global and local processing on a continuum to a camera lens, able to zoom in and out at more than just two settings, but rather in a continuous fashion. Therefore, more empirical research is necessary to tease apart whether there are two distinct processing systems, or one continuum. This issue is essential in the field of psychology, because of growing tendencies to put things in categories for simplicity when they may not be warranted or accurate. An example of this comes from the clinical realm of the Diagnostic manual. The most current Diagnostic and Statistical Manual of Mental Disorders (5th ed., DSM-5; American Psychiatric Association, 2013) has already demonstrated a movement away from simple categories to a more dimensional approach to mental illness, due to findings that have shown significant overlap among diagnostic categories, suggesting that mental illnesses may occur on a continuum rather than fitting into clean categories. With that, it is still viable that there are two separate processing systems, but there is a call to understand what those are and how distinctly they function.

We ask the question in this current study about what the tipping point between stimuli being perceived as novel versus familiar is. Similarly, it could be asked what the tipping point is for switching between global and local levels of processing. There has been little empirical demonstration of these switches; however, understanding these boundaries and thresholds could provide powerful information about how the systems work, and how they can be manipulated for therapeutic and treatment purposes.

Therefore, future studies should focus on teasing apart the effects of novelty and familiarity on global and local processing. These two systems have been shown to become activated by a variety of different psychological and environmental factors. Mapping out these triggers will guide researchers to more clearly manipulate these systems and possibly apply global and local processing activations for treatment purposes.

Finally, our *Survive or Thrive Hypothesis for* global and local processing, is based upon the integration of multiple theories, and would benefit from continued empirical replication. Future studies should explore different ways to induce novelty and familiarity, and possibly induce a broader spectrum of emotional valence categories. Our current study was limited to only exploring amusement, threat, and neutral emotion states. Clinical populations and comparing to control groups will be an important next step in the global and local processing literature, such that biases in processing can be tested, which can have implications for mental health treatment, and even diagnosis.

In summary, the main objective of this research study was to integrate a wide array of findings from a diverse pool of researchers, spanning the space between social psychology and neuroscience. We explored how different processing styles, or ways of paying attention, are activated and how they influence experiencing. Understanding these differences is essential for distinguishing between healthy versus pathological emotion-related states, which can be essential for mental health treatment. Through our integration of the literature and different current theories, we uncovered the potential for bidirectional relationships between the levels of perceiving and conceptual level understanding, such that literally changing the way people look at the world could impact

their emotional wellbeing. Furthermore, we found support for emotion impacting global versus local levels of processing, and vice versa, we also found support for another powerful moderator: novelty.

We observed that the cognitive appraisal of novelty could be a driving force for global processing, with threat as the driving force for more local level processing. At the most basic level, humans have a need for expansion and exploration; but also the need for basic survival. But how do these signals to survive or explore interact? For instance, studies have shown that individuals with anxiety disorders tend to interpret most ambiguous stimuli as threatening and view anything distant or novel as potentially dangerous. Anxious individuals also show a bias toward local levels of processing toward threat. However, in most healthy individuals who are able to thrive, novelty is experienced with curiosity and exploration, leading to more global levels of processing with an eventual shift to more local processing to enact more detail oriented understanding and analysis. So, local processing is not necessarily bad or only present for the anxious. It is highly adaptive when used flexibly and appropriately.

Concluding Remarks

We broadly explored the influence of multiple factors on processing styles, and added to the literature with regard to the impact of novelty and familiarity. We showed that the drive to survive or to thrive through exploring new contexts overtakes processing activation. When people were presented with nonthreatening novel stimuli, they used a more global level of processing, as opposed to when presented with either familiar or threatening novel stimuli, which lead to local level processing. Through research and empirical testing, we assert that the effects of novelty and threat are essential for

understanding human learning, creativity, decision-making, and perceptions. This is likely due to both threat and novelty striking two of the most basic and primal human needs, that of survival and expansion. Threat signals survival and protection, while novelty signals expansion and exploration. Both are essential for existence, and yet paradoxically at odds with one another.

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