

**Effect of Subjective or Objective Mood Induction over Change  
Detection using Positive and Negative affect**



*Project submitted for partial fulfillment of the degree of*

MASTER OF ARTS  
IN  
PSYCHOLOGY

SUBMITTED BY:  
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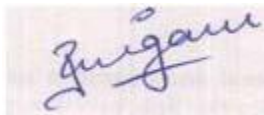
## CERTIFICATE

This is to certify that the thesis entitled ‘The Effect of Subjective and Objective mood induction using Positive and Negative affect over Change Detection’ submitted by Gurman Kaur Gurm (Regd. No. 862102005) for the partial fulfillment of the degree of Master of Arts in Psychology, submitted in Thapar School of Liberal Arts and Sciences, Thapar Institute of Engineering & Technology, Patiala is a bonafide work completed under the oversight of Dr. Richa Nigam, Assistant Professor, Thapar School of Liberal Arts and Sciences, Thapar Institute of Engineering & Technology, Patiala and that no piece of this venture has been submitted for the honor of any other degree.



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# DECLARATION

I hereby declare that the work being presented in the thesis entitled, “Effect of Subjective or Objective Mood Induction over Change Detection using Positive and Negative affect” in the partial fulfillment of the degree of Master of Arts in Psychology, Thapar School of Liberal Arts and Sciences, Thapar Institute of Engineering & Technology, Patiala, is an original record of my own research work carried out under the guidance and supervision of Dr. Richa Nigam, Assistant Professor, Thapar School of Liberal Arts and Sciences, Thapar Institute of Engineering & Technology, Patiala. The content in the dissertation has not been submitted to any other university or institute for the award of any other degree.

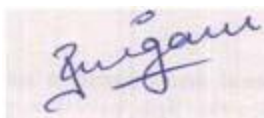
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## ABSTRACT

Visual faculty dominates as our primary mode of interaction with the world around us. Yet there are severe limits to what we can consciously experience in our everyday lives. Failure to detect changes in the environment may result in change blindness, a phenomenon of visual perception that occurs when we potentially miss out on the visual changes that have occurred around us. Previous literature has attempted to examine the phenomena of change detection in the context of driving, gaming, active sports and so on. However, the potential influence of other factors such as the emotional state of the individual witnessing the change is explored less. Moreover, the difference in change detection as a consequence of subjective versus objective mood induction has not been explored at all. The current study therefore investigated the effect of mood states (positive or negative) on people's ability to detect changes (incidental and attentional). Comparisons across participants were made based on their performance on a standard motion picture change detection task, after a positive or negative mood induction using either a subjective or objective mood induction method. The results found that positive mood enhances change detection in comparison to negative mood and change detection was not facilitated by subjective mood induction, participants in the objective mood induction group detected more changes on average.

**Keywords: Change Detection, Mood Induction, Affective state, Attentional Change Detection, Incidental Change Detection**

## CONTENTS

Certificate	2
Declaration	3
Acknowledgement	4
Abstract	5
List of Tables	8
List of Figures	9
CHAPTER 1 INTRODUCTION	10
1.1 Change Detection	10
1.2 Change Detection and Attention	11
1.3 Attentional vs Incidental Change Detection	12
1.4 Factors Affecting Change Detection	13
1.5 Mood Induction	13
CHAPTER 2 REVIEW OF LITERATURE	18
CHAPTER 3 RESEARCH GAP, MOTIVATION FOR THE STUDY, OBJECTIVES AND HYPOTHESES	23
3.1 Motivation for the present study	23
3.2 Research Gap	23

3.3 Objectives	24
3.4 Hypotheses	24
CHAPTER 4 METHODOLOGY	25
4.1 Participants	25
4.2 Design	25
4.3 Measures	25
4.4 Procedure	27
CHAPTER 5 RESULTS	29
CHAPTER 6 DISCUSSION	40
CHAPTER 7 CONCLUSION	44
REFERENCES	46
APPENDIX A	54
APPENDIX B	55
APPENDIX C	56
APPENDIX D	57

## LIST OF TABLES

<b>Table Number</b>	<b>Description</b>	<b>Page Number</b>
1	Descriptive Statistics for Positive Mood Induction	29
2	Descriptive Statistics for Negative Mood Induction	30
3	Repeated Measures ANOVA Within Subjects Contrasts	32
4	Repeated Measures ANOVA Between subjects effects	33
5	Independent t-tests for Change Detection	34
6	Independent t-tests for PANAS Scores	36

## LIST OF FIGURES

<b>Figure Number</b>	<b>Description</b>	<b>Page Number</b>
1	Average changes detected for subjective and objective groups in the Incidental viewing for positive mood induction	37
2	Average changes detected for subjective and objective groups in the Attentional viewing for positive mood induction	38
3	Average changes detected for subjective and objective groups in the Incidental viewing for negative mood induction	38
4	Average changes detected for subjective and objective groups in the Attentional viewing for negative mood induction	39

# CHAPTER 1: INTRODUCTION

## 1.1 Change Detection

The ability to detect changes in one's visual environment is fundamental for their survival. This process of detecting changes around us is stated as change detection. The process of change detection is crucial in a wide range of areas such as disaster monitoring, aviation, sports and gaming and so on. Observable instances of our incapacity to recognize changes have been revealed through research on the visual integration of information across eye movements. For instance, changes that happen within a quick flash on a computer monitor are frequently missed by observers (e.g., Pashler, 1988; Rensink, O'Regan, & Clark, 1999), a cut from one view to another in a motion picture (Levin & Simons, 1997), an eye movement (Grimes, 1996; Henderson & Hollingworth, 1999; McConkie & Currie, 1996), a blink (O'Regan, Deubel, Clark, & Rensink, 2000), or even a real-world disruption (Simons & Levin, 1998). Such a phenomenon is termed as Change blindness which happens as a consequence of failure in change detection, that is, when a stimulus changes without the observer noticing it (Attwood et al. 2018). It is suggested as the failure of an observer to visually perceive changes that, once noticed, are simple to see. Now change blindness can occur even if the changes are significant, frequent, and the observer is aware that they will happen (Rensink 2009). Change blindness may occur due to reasons such as an observer not representing the accurate information about the changing object, if they don't compare an accurate representation across views, or if they only represent the pre or post-change object (Varakin 2007). The unexpected character of this phenomena results from a discrepancy between the belief that our visual impressions are extremely detailed and virtually complete, and the visual system's actual capacity to represent and contrast scenes in real time. Change detection and change blindness thus

are opposite concepts and testable phenomena which can be utilized to learn more about the nature of visual representations in diverse situations (Simons and Rensink, 2005). A significant number of studies that have been conducted thus far have used altered images or clips of real-world scenes that are shown on computers to cause change blindness. Change blindness has also been shown to occur in more naturalistic scenarios. (Simons and Levin, 1998). In a study, more than half of participants were blind to the changes in colour or font of an object or a printed word as a result of which, when missed changes are later brought up, people are frequently astonished at how they could possibly have been overlooked (Varakin et al., 2007).

## **1.2 Change Detection and Attention**

While various interconnected perceptual and representational systems can be used to account for change blindness (Levin & Simons, 1997), several researchers stress the significance of attentional processes in change detection (Simons, 2000). According to prior research, focused attention is necessary for the conscious perception of changes without which viewers won't be aware of even significant changes (Rensink, 2009). Further, Rensink et al., (1997) suggested that changes that take place at the center of visual attention are promptly recognized because such detections and producing more accurate representations of things of high visual interest, both require focused attention. Thus, failure to detect changes serves as a demonstration of how people's attentional ability is frequently constrained to focal details and how our internal representations of visual events are much more sparse and under-representative than we intuitively believe (Simons, 2000). As a consequence of this, in reality, people struggle to pay attention to and retain what they see because the visual world is so dense and packed with information. Instead, they selectively

prioritize the most crucial details of a visual picture and concentrate their attention on them, missing and ignoring less important information, despite there being a change significantly between visual scenes (Levin & Simons, 1997).

### **1.3 Attentional vs Incidental Change Detection**

There are two modes of change detection: a) Incidental which pertains to observer not being aware of a potential change in the environment a priori until overtly asked to do so and b) Attentional which pertains to a priori awareness of the notion that changes might take place in what we are encountering (visual stimulus in this case). In intentional and attentional tasks observers are told to expect some kind of change. They are assumed to devote all of their resources to detecting the change, providing a method for determining perceptual capacities. A visual transient due to a sudden visual change is generally considered to draw our attention to a location of interest (Kanai 2004). In incidental tasks no such mention of a possible change is made until the task is completed. The activation of perceptual mechanisms is thought to be more representative of their use in daily life. The degree of blindness found under these conditions is higher than under attentional conditions, indicating that in many real-life tasks, relatively little is attended to - or at least remembered (Rensink 2009). Additionally, attentional change-detection tasks might not only increase the chances of detecting changes overall (Levin and Simons 1997; Varakin and Levin 2006), but they may affect the specific kinds of failure that underlie change detection when it does occur.

### **1.4 Factors Affecting Change Detection**

The 'biasing' of attentional resources, known as selective visual attention, involved in change detection, is influenced by a variety of factors and is reliant on both top-down and bottom-up processing. Top-down processing is distinguished by goal-directed behavior, such as the allocation of attention to items that match target-defining features and the suppression of distractors (Schneider & Shiffrin, 1977; Bayliss & Driver, 1993). Bottom-up processing, on the other hand, is the automatic capture of attention by salient information in the environment, regardless of task demand (e.g., Itti and Koch, 2000). It should be noted, however, that the top-down and bottom-up perspectives cannot adequately explain all attentional processing (Awh et al., 2012).

Traditionally, research in the field of visual attention has concentrated on universal influences such as task demand (Henderson et al., 1999), stimulus properties (Treisman and Gelade, 1980), and visual biases (Tatler, 2007). It has been observed that a wide range of psychological processes, such as attention, memory, and decision-making, can be significantly impacted by mood (Forgas, 1995; Isen & Daubman, 1984; Rusting & DeHart, 2000).

## **1.5 Mood Induction**

Mood induction is a technique used in psychological research to manipulate an individual's affective state in a controlled manner. The purpose is to temporarily alter someone's mood so that its impact may subsequently be examined on different psychological processes (Gerrards-Hesse, Spies, & Hesse, 1994). Researchers have begun to understand how crucial a role mood may play in influencing human behavior and cognition.

Mood induction may be positive or negative. Positive emotions broaden thought-action repertoires and build enduring resources, enhancing cognitive abilities and overall well-being, according to Fredrickson's broaden-and-build theory (1998). Experiencing positive emotions over time will have a cumulative effect that will give a person resources they can draw upon in the future. The affective-priming model suggests that exposure to positive stimuli can activate positive affective states and improve mood, although the effects may be short-lived (Bower, 1981). Engaging in rewarding activities associated with positive affective states can also induce positive mood, according to the self-perception theory (Bem, 1972), suggesting that individuals infer their affective states by observing their own behavior and the context in which it occurs.

On the other hand, negative mood induction can interfere with cognitive function, impairing attention, memory, and problem-solving (Sarason, Pierce & Sarason., 1996). It can also perpetuate negative affect through rumination (Brosschot, Gerin, & Thayer, 2006) and activate negative cognitive schemas and biases that underlie depression (Beck, 1967).

Both kinds of mood induction have different effects on visual attention. Studies have shown that individuals in a positive mood exhibit broadened attention and increased cognitive flexibility (Isen and Daubman 1984). In contrast, negative mood induction tends to narrow visual attention, directing it towards negative or threatening stimuli (Mogg & Bradley, 2000)

Various methods of mood induction have been developed over the years, including music, film clips, guided imagery, and recall of past experiences, among others (Gerrards-Hesse, Spies, & Hesse, 1994). One such method, recall of past experiences, has also been used as a method of mood induction. Participants are asked to recall specific events from their past that evoke a particular emotional response, which can then be used to induce that emotion in the participant

(Gerrards-Hesse et al., 1994). Such a method is used in subjective mood induction. Subjective methods of mood induction rely on self-report measures, where participants are instructed to imagine or recall specific events or situations that elicit certain emotional states. These methods can be used to induce positive emotions, such as happiness, contentment, or relaxation, and can be tailored to fit individual preferences or experiences (e.g., using music or guided imagery). They can also be used to induce negative emotions such as sadness, stress or anger in similar ways.

Another popular method is viewing images which involves exposure to various images that can cause certain emotional reactions, ranging from positive emotions like excitement and happiness to negative emotions like fear and sadness. One commonly used set of stimuli is the International Affective Picture System (IAPS), which includes images that have been rated for valence (positive or negative) and arousal (intensity of emotional response). IAPS images have been widely employed in research on emotion and mood induction (Mikels, Fredrickson, Larkin, Lindberg, Maglio, & Reuter-Lorenz, 2005). According to earlier research (Lang, Greenwald, Bradley, & Hamm, 1993), individuals can successfully experience mood states like sadness, fear, and happiness when exposed to IAPS images. Such methods are frequently used in objective mood induction tasks. Objective methods of mood induction, on the other hand, use external stimuli, such as images, videos, or sounds, to induce mood states in participants. These stimuli are often standardized and pre-selected to elicit specific emotions, and can also be used to induce both positive and negative emotions. Other modes of induction included in objective mood induction methods are watching emotional movie clips, listening to emotionally charged music, or completing stress-inducing tasks.

Subjective and objective mood induction techniques can have differential effects on visual attention. Subjective mood induction can result in attentional biases, as people selectively focus their attention on information that relates to their induced mood (Gotlib and Joormann, 2010). Subjective mood induction can also influence cognitive processing, including focused attention. Research by Rowe et al. (2007) demonstrated that individuals induced into positive moods showed broader and more flexible attention compared to those induced into negative moods. Objective mood induction can prime individuals' emotional states, which may then cause changes in visual attention. A study by Schupp et al. (2003), for instance, discovered that viewing images with a favorable emotional response improved attentional processing. Objective mood induction can also create emotional contexts that influence visual attention (Gasper and Clore, 2002). It is crucial to explore such differential effects in the field of change detection since in many real-world circumstances, such as security surveillance, transportation, and healthcare, change detection is essential. Understanding the impact of subjective and objective mood inductions on change detection can have practical implications. Individual variations in change detection skills depending on the type of mood induction can also be identified by examining such differential impacts. This information might be useful for creating customized experiences or personalized interventions that take into account the individual variances in mood responsiveness to improve change detection.

Both subjective and objective methods of mood induction have their advantages and disadvantages. Subjective methods allow for greater personalization and may be more ecologically valid, as they simulate real-world experiences. However, they are also more prone to demand characteristics and social desirability bias. Objective methods are more standardized and can be

used across participants and settings, but may not capture the full complexity of individual emotional experiences. Therefore, researchers often use a combination of both methods to induce and measure mood states in their studies.

## CHAPTER 2: REVIEW OF LITERATURE

Change detection is a critical cognitive process that plays a significant role in our daily lives. It is essential for maintaining environmental awareness and ensuring safety in areas such as transportation where drivers need to detect changes in road conditions, traffic signals, and the behavior of other vehicles to respond appropriately and avoid accidents. Change detection is also pivotal in visual search tasks, such as surveillance or airport security screening and allows individuals to identify changes in complex scenes or detect anomalies. When individuals are engaged in complex tasks or under high cognitive load, their ability to detect changes may be compromised. This has implications for domains such as aviation, where pilots need to monitor instrument displays for critical changes. Failure in change detection is known as change blindness. One of the seminal studies on change blindness was conducted by Simons and Chabris (1999) to show that when people's attention isn't focused on the changing element in a visual image, they frequently fail to notice substantial changes. As a gorilla moved across the screen, participants in this study viewed a video of two people passing a ball back and forth. Change blindness was demonstrated when participants were asked to count the number of ball passes and frequently missed the gorilla. Simons and Levin (1998) suggested that when a change involves a person that observers are engaging with, they might still be extremely vulnerable to change blindness (that is the failure to detect changes). The studies have further found that the ability to pay attention is essential for change detection. In a study conducted by Rensink, O'Regan, and Clark (1997) it was found that individuals who actively searched for changes in a scene as opposed to passively monitoring it were more likely to notice those changes. Focused attention is employed by selecting a limited part of the visual field in which visual stimuli receive priority for further processing and awareness, while the processing of stimuli falling outside the attentional focus (i.e., at an

unattended location) is suppressed (Hillyard et al., 1998; Ungerleider, 2000). In their study of the role of attention in visual memory, Hollingworth and Henderson (2002) discovered that participants were better able to recall things that they had actively attended to throughout a scene than objects that they had not. Participants who actively sought out changes in a visual scene outperformed those who passively observed the scene on change detection tests, emphasizing the need of focused attention in change detection. Active search involves deploying an attentional spotlight to scrutinize different regions of a visual scene systematically. This focused attention can allow for efficient comparison between the current and previous states, enhancing change detection. It also involves actively guiding attention toward potential change locations, increasing the likelihood of detecting changes which helps individuals allocate their attentional resources to relevant areas, facilitating change detection (Wolfe, 2021).

In addition to the direct link between attention to change detection, moods are also found to have variable effects on attention and thereby influence change detection. Qiao et al. (2013) conducted a study on patients with major depressive disorder (MDD) and found that pre-attentive information processing that happens before conscious awareness and aids people to identify and detect changes in the environment efficiently, is impaired in Major Depressive Disorder (MDD). It has been observed in a change detection task, participants in a positive mood condition outperformed those in the negative mood condition (Rondeel and colleagues, 2007). Several potential mechanisms have been proposed to explain the effect of mood induction on attention tasks, including changes in cognitive control and emotional processing (Joormann & Siemer, 2011). Research involving global-local processing tasks show that positive moods induce a global processing style, while negative moods promote a local processing style. This, it is argued, reveals a narrowing of attention in negative moods and a broadening of attention in positive moods (e.g., Derryberry and Tucker,

1994; Basso et al., 1996). A global-local visual processing task was also used in a study by Fredrickson and Branigan (2005), who discovered that positive mood resulted in larger global biases than neutral mood. A more passive processing style for people in a positive mood was also discovered by Olivers and Nieuwenhuis (2005) who suggested that performance of participants improves if they are distracted during their task. Positive mood induction can also enhance selective attention, making it easier to focus on a single task or stimulus. Gasper & Clore (2002) found that individuals induced with negative mood were less likely to categorize figures based on their global features than individuals induced with positive mood. Positive mood induction can also improve sustained attention, allowing individuals to stay focused on a task for longer periods of time (Fredrickson, 2001; Rowe et al., 2007). Positive mood induction has also been shown to increase the efficiency of attentional processing, leading to faster reaction times and improved accuracy. Positive mood induction can improve perceptual processing, making it easier to detect subtle changes in the environment.

Contrary to positive mood, multiple factors can influence attention when a negative mood is induced. The narrowing of attentional focus is one of the most noticeable effects of negative mood induction on attention. According to Easterbrook's (1959) theory, negative emotions cause attentional focus to become narrowed and towards the emotion's source. This means that when people are exposed to negative emotions, only negative stimuli become the focus of their attention. As a result, this reduction in attentional focus may result in the processing of only a small amount of information, which may have an impact on cognitive tasks (Ellis and Ashbrook, 1998).

The inhibition of cognitive flexibility is another way that negative mood induction affects attention (Murphy & Michael 2007). Inducing negative emotions can result in cognitive rigidity, which can make people concentrate on one task or piece of information while impeding their ability to shift

their attention to another. As a result of this restriction of cognitive flexibility, cognitive function may deteriorate and processing speed and memory retrieval may become slower. Additionally, attentional bias towards negative stimuli can be impacted by negative mood induction. According to research, inducing a negative mood can make people pay more attention to negative stimuli like bad words or bad pictures (Gotlib and Joormann, 2010). Individuals may concentrate more on negative information as a result of this increased attentional bias towards negative stimuli, which can result in more ruminating and pessimistic thinking. It has also been seen that self-focused rumination maintains or increases negative mood, whereas distraction decreases negative mood (Nolen-Hoeksema & Morrow, 1993).

Only a few research studies have focused on studying the impact of mood induction specifically on change detection tasks (Llamas & Koole, 2003; Werner & Thies, 2000). Additionally, a small study conducted by Rondeel and colleagues (2007) investigated the influence of positive versus negative mood on change blindness. They induced moods using video fragments and found that participants in the positive mood condition performed better than the participants in the negative mood condition in a change detection task. Recent research studies involving mood induction have shown that both subjective and objective methods can effectively induce positive and negative moods. For example, Gasper and Clore (2002) conducted a study in which they successfully induced positive, negative and neutral moods subjectively. On the other hand, Joormann and colleagues (2007) used an objective method of negative mood induction by having participants watch a sad film. The authors found that this method also led to an increase in negative affect and reduced cognitive flexibility. Bless and colleagues (1996) conducted a study in which they used both subjective (by providing a vivid report of a happy or sad life event) and objective (watching brief video clips) methods to induce positive and negative moods to study their reliance on general

knowledge structures. Rusting and Nolen-Hoeksema (1998) also used both subjective and objective methods to induce negative moods in participants successfully to examine their effects on memory retrieval. Overall, these studies suggest that both subjective and objective methods of mood induction can effectively induce positive and negative moods.

Given the previous studies conducted so far, the specific type of mood induction has variable influences on cognition . As people focus their attention only on information that is related to their induced mood, subjective mood induction might lead to attentional biases (Gotlib & Joormann, 2010) and impact cognitive processing (Rowe et al. 2007). Individuals' emotional states can be primed by objective mood induction, which may subsequently result in adjustments to visual attention (Schupp et al. 2004) and produce emotional contexts that affect visual attention (Gasper and Clore, 2002). The same needs to be explored in the context of change detection.

## **CHAPTER 3: RESEARCH GAP, MOTIVATION FOR THE STUDY, OBJECTIVES AND HYPOTHESES**

### **3.1 Motivation for the Present Study**

Previous studies have never compared the two methods of mood induction directly in the context of change detection for both positive and negative affect. The present study focuses on the effects of subjectively and objectively induced positive and negative mood on change detection. The effects of mood on change detection are largely unstudied, specifically the effects of subjective mood induction on change detection have not been studied at all. Since in any given setting mood exerts an influence on an entire array of important psychological characteristics, we explored the effects of different moods on change detection. Specifically, since mood affects the way we perceive outcomes and subsequent experiences we have, the effect of mood on attentional processes is crucial to our understanding of the process of change detection. The current study specifically aimed to highlight the differential role that subjective versus objective mood induction have on change detection across positive and negative affects.

### **3.2 Research Gap**

The existing literature suggests that change detection has not been explored directly under the two contexts of subjective versus objective mood induction for positive and negative valence. Additionally limited research has showcased comparison between incidental and attentional coding in change detection.

### **3.3 Objectives**

Following are the three main objectives of the current study:

1. To study the difference between subjectively and objectively induced positive mood on change detection
2. To study the difference between subjectively and objectively induced negative mood on change detection
3. To study the difference between incidental and attentional change detection

### **3.4 Hypothesis**

H1 : Variability in change detection will be observed as a function of Mood Induction Type

## **CHAPTER 4: METHODOLOGY**

### **4.1 Participants**

One Hundred and Sixty students (80 Females; Mean age= 21) volunteered for the study. All the participants were matched for the basic level of education (at least up to undergraduate level). Informed consent was obtained in a written format from all the participants for their participation in the study. The study was carried out in accordance with the guidelines of the Ethics Committee, Thapar University.

### **4.2 Design**

Mixed Design was adopted for the current research with Mood induction Type (Subjective or Objective) and Valence (Positive or Negative) as between subject factors being and Viewing (Incidental and Attentional) as within subject factors. The Mode of Mood Induction and Valence were independent variables, and the number of changes detected was the dependent variable.

### **4.3 Measures**

#### *Mood Induction Tasks*

Subjective Mood Induction for positive affect: Google forms were used to request participants to recall and mention their fondest childhood memory in detail.

Subjective Mood Induction for negative affect: Negative: Google forms were used to request participants to recall and mention their most stressful memory in detail.

Objective Mood Induction for positive and negative affect: 100 IAPS images (Lang, Bradley & Cuthbert, 1997) were rated by 30 raters on the basis of valence (mean) and arousal (mean) on a scale of 1-9. Out of these 20 images that were rated to be high in arousal (10 of Positive Valence & 10 of Negative Valence) were used to induce the respective positive and negative mood in participants.

*PANAS (Positive and Negative Affect Schedule; Watson et al. 1998)*

Participants filled the PANAS questionnaire about their current mood/affective state following the mood induction task. It is made up of 20 items, each item is a word that describes positive or negative mood states. Participants indicated how much they currently relate to each mood descriptor on a scale of 1 to 5 (1 = Very slightly or not at all, 2 = a little, 3 = Moderately, 4 = Quite a bit and 5 = Extremely). The items yield separate scores for Positive Affect and Negative Affect.

*Change Detection Task*

The change detection task involved viewing a motion clip taken from Levin & Simon's (1977) Change Blindness study. It depicts a conversation between two characters and lasts 36 seconds. It initially showed a side view of both actors and then moves to close up shots of each actor in turn as they speak. Every time the camera angle changed, there was at least one continuity error, making a total of nine intentional errors in the clip e.g. in one shot an actor is wearing a scarf which disappears in the next shot, the color of the plates switch from red to white and so on.

#### 4.4 Procedure

After obtaining informed consent, participants were briefed about the experiment. In particular, they were made to go through the google slides which was used to present the experiment. They were asked to proceed based on the written instructions in each slide. The experimental design was similar to Wang (2022) where the entire task was presented in a presentation format with following details:

The participants in the experiment were divided randomly into groups undergoing either positive or negative affect of mood induction and further subdivided into groups taking subjective or objective mood induction. Therefore, there were four groups based on the type and valence of mood induction (Positive Subjective, Positive Objective, Negative Subjective & Negative Objective). Participants belonging to subjective mood induction group were asked to recall and write a fond memory from their childhood for positive mood induction, or their most stressful memory for negative mood induction. Participants belonging to objective mood induction group were made to view 10 positive or negative images based on the group which the participant belonged to. The rest of the process was same for all the participants. Following their respective mood inductions, they were requested to complete the PANAS scale (Watson et al. 1998) so as to indicate their current mood/affective state. The participants were then informed of a short video (Levin & Simon 1977) that they would be shown next and were instructed to watch it carefully. Following this first viewing of the clip, participants were instructed to respond to two questions: (1) “Did you notice any unusual differences in the video just shown from one shot to the next where objects, body positions, or clothing suddenly changed?” They were required to respond to the question in either a ‘Yes’ or a ‘No’ and (2) “If you responded ‘Yes’ to the above question,

please describe any changes you noticed,”. Here they freely reported the changes they detected (similar to Levin & Simons, 1997, p. 502). These responses were recorded as ‘Incidental Change Detection’. This was followed by the participants being explicitly informed that in the video they just watched, unusual changes occurred every time the camera angle changed. They were told to watch the video once again and this time were also asked to make mental note of as many changes as they could detect. Them being explicitly informed of the probable changes after the first viewing would give them cues regarding the sort of changes that would occur in the second viewing. After the second viewing, the participants were asked to describe any change that they had noticed in the video they watched again in a written format. The number of correct changes detected were noted down. These responses were recorded as ‘Attentional Change Detection’.

## CHAPTER 5: RESULTS

Statistical Package for Social Sciences (SPSS) 23 was used to compute descriptive and inferential statistics for the data collected.

### 5.1 Descriptive Statistics

Descriptive statistics were computed for PANAS scores (Positive and Negative Affect Scores), Incidental changes detected and Attentional Changes Detected for both the groups (Subjective Mood Induction and Objective Mood Induction)

**Table 1: Descriptive Statistics for Positive Mood Induction**

	Groups	Mean	Std. Deviation	N
Positive Affect Score	Subjective	32.00	7.411	40
	Objective	33.50	6.710	40
Negative Affect Score	Subjective	18.55	6.890	40
	Objective	15.85	4.458	40
Incidental Changes Detected	Subjective	0.750	0.266	40
	Objective	0.750	0.349	40
Attentional Changes Detected	Subjective	0.900	0.671	40
	Objective	1.375	1.030	40

Table 1 depicts descriptive statistics computed for PANAS scores, incidental changes detected and attentional changes detected for positive mood induction. The mean positive affect score for subjective and objective groups for positive mood induction was 32.0 (SD 7.41) and 33.5 (SD 6.71) respectively. The mean negative affect score for subjective and objective groups for positive mood induction was 18.55 (SD 6.86) and 15.85 (SD 4.45) respectively. The mean changes detected in the incidental viewing for subjective and objective groups for positive mood induction was 0.750 (SD 0.266) and 0.750 (SD 0.349) respectively. The mean changes detected in the attentional viewing for subjective and objective groups for positive mood induction was 0.900 (SD 0.671) and 1.375 (SD 1.030).

**Table 2: Descriptive Statistics for Negative Mood Induction**

	<b>Groups</b>	<b>Mean</b>	<b>Std. Deviation</b>	<b>N</b>
Positive Affect Score	Subjective	28.100	8.834	40
	Objective	21.450	7.376	40
Negative Affect Score	Subjective	23.875	7.002	40
	Objective	23.300	5.464	40
Incidental Changes Detected	Subjective	0.125	0.404	40
	Objective	0.300	0.648	40
Attentional Changes Detected	Subjective	0.950	1.060	40
	Objective	1.150	0.863	40

Table 2 depicts descriptive statistics computed for PANAS scores, incidental changes detected and attentional changes detected for negative mood induction. The mean positive affect score for subjective and objective groups for negative mood induction was 28.10 (SD 8.83) and 21.45 (SD 7.37) respectively. The mean negative affect score for subjective and objective groups for negative mood induction was 23.87 (SD 7.002) and 23.30 (SD 5.464) respectively. The mean changes detected in the incidental viewing for subjective and objective groups for negative mood induction was 0.125 (SD 0.404) and 0.300 (SD 0.648) respectively. The mean changes detected in the attentional viewing for subjective and objective groups for negative mood induction was 0.950 (SD 1.060) and 1.150 (SD 0.863).

## 5.2 Inferential Statistics

- 1) **ANOVA:** A three way repeated measures ANOVA was conducted with 2 Mood Induction type (Subjective, Objective) x 2 Valence (Positive, Negative) x 2 Change Detection Type (Incidental, Attentional)

**Table 3: Within Subjects Contrasts**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Paramet er	Observe d Power
Valence	.050	1	.050	.093	.761	.001	.093	.060
Valence * Groups	.050	1	.050	.093	.761	.001	.093	.060
Error(Val ence)	41.900	78	.537					
CD	72.200	1	72.200	149.976	.000	.658	149.976	1.000
CD * Groups	1.250	1	1.250	2.597	.111	.032	2.597	.356
Error(CD )	37.550	78	.481					

Valence *	1.013	1	1.013	1.796	.184	.023	1.796	.263
CD								
Valence *	1.012	1	1.012	1.796	.184	.023	1.796	.263
CD *								
Groups								
Error(Valence*CD)	43.975	78	.564					

**Table 4 : Between-Subjects Effects**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power <sup>a</sup>
Intercept	122.512	1	122.512	245.813	.000	.759	245.813	1.000
Groups	3.612	1	3.612	7.248	.009	.085	7.248	.758
Error	38.875	78	.498					

The tables 3 and 4 show a three way repeated measures ANOVA conducted with 2 (Mood Induction: Subjective, Objective) x 2 (Valence: Positive, Negative) x 2 (Change Detection Type:

Incidental, Attentional). The main effect of mood induction type was significant,  $F(78) = 7.24$ ,  $p = .009$ ,  $\eta_p^2 = .085$ . The main effect of Change detection was significant,  $F(78) = 149.976$ ,  $p < .001$ ,  $\eta_p^2 = .658$ . The main effect of Valence was not significant,  $F(78) = .093$ ,  $p = .761$ ,  $\eta_p^2 = .001$ .

The two way interaction between Valence and Groups was not significant,  $F(78) = .093$ ,  $p = .761$ ,  $\eta_p^2 = .060$ .

The two way interaction between Change Detection and Groups was not significant,  $F(78) = 2.597$ ,  $p = .111$ ,  $\eta_p^2 = .032$ .

The two way interaction between Valence and Change detection was not significant,  $F(78) = 1.796$ ,  $p = .184$ ,  $\eta_p^2 = .023$ .

The three way interaction between Valence, Change Detection and Groups was not significant,  $F(78) = 1.796$ ,  $p = .184$ ,  $\eta_p^2 = .023$ .

**INDEPENDENT T-TEST:** An Independent T-test was conducted to evaluate the difference of Change detection between groups (Subjective Mood Induction, Objective Mood Induction)

**Table 5: Independent T-test between groups (Subjective Mood Induction, Objective Mood Induction)**

t	df	Significance (2-tailed)

Incidental	Change	Equal variance assumed	.000	78	1.00
Detection (Positive)		Equal variance is not assumed	.000	78.885	1.00
Attentional	Change	Equal variance assumed	-2.443	78	.017
Detection (Positive)		Equal variance is not assumed	-2.443	67.096	.017
Incidental	Change	Equal variance assumed	-1.448	78	.152
Detection (Negative)		Equal variance is not assumed	-1.448	65.340	.152
Attentional	Change	Equal variance assumed	-.925	78	.358
Detection (Negative)		Equal variance is not assumed	-.925	74.921	.358

Table 5 shows the analysis of the number of changes detected using independent t-tests. Attentional Change Detection between Subjective Mood Induction (0.900) and Objective Mood Induction (1.375) with Positive Mood was found to be significant,  $t(78) = -2.443$ ,  $p = 0.017$ .

Attentional Change Detection between Subjective Mood Induction (0.950) and Objective Mood Induction (1.150) with Negative Mood Induction for was found to be comparable,  $t(78) = -.925$ ,  $p = .358$ .

Incidental Change detection between Subjective Mood Induction (0.750) and Objective Mood Induction (0.750) with Positive Mood Induction was found to be comparable,  $t(78) = 0.00$ ,  $p = 1.00$ .

Incidental Change Detection between Subjective Mood Induction (0.125) and Objective Mood Induction (0.300) with Negative Mood Induction for was found to be comparable,  $t(78) = -1.448$ ,  $p = .152$ .

**Table 6: Independent T-test for PANAS Scores between groups (Subjective Mood Induction, Objective Mood Induction)**

		t	df	Sig
Positive Affect for Positive Mood Induction	Equal variances assumed	-.949	78	.346
	Equal variances not assumed	-.949	77.243	.346
Negative Affect for Positive Mood Induction	Equal variances assumed	2.081	78	.041
	Equal variances not assumed	2.081	66.780	.041
Positive Affect for Negative Mood Induction	Equal variances assumed	3.654	78	.000
	Equal variances not assumed	3.654	75.593	.000
	Equal variances assumed	.409	78	.683

Negative Affect for Negative Mood Induction	Equal variances not assumed	.409	73.647	.683
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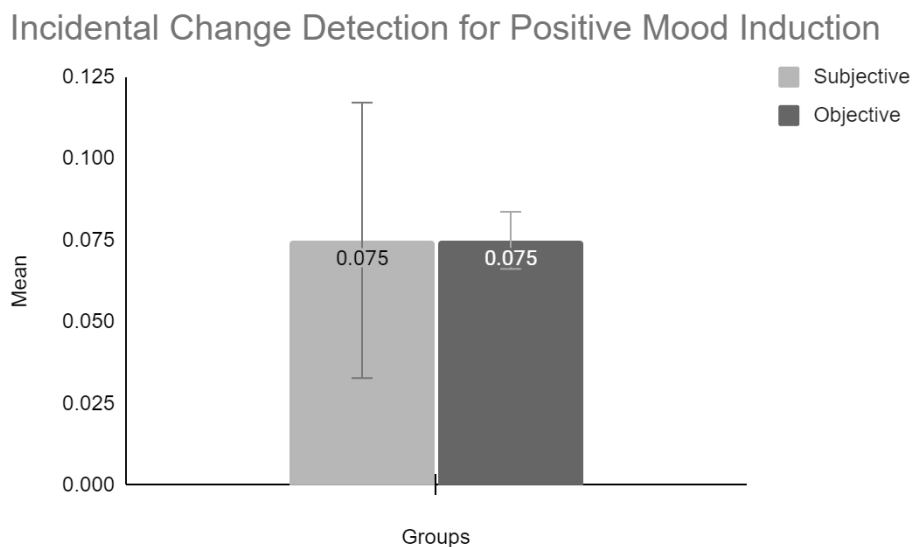
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Positive Affect scores for Positive Mood Induction were comparable between subjective and objective mood induction,  $t(78) = -.949, p = .346$ .

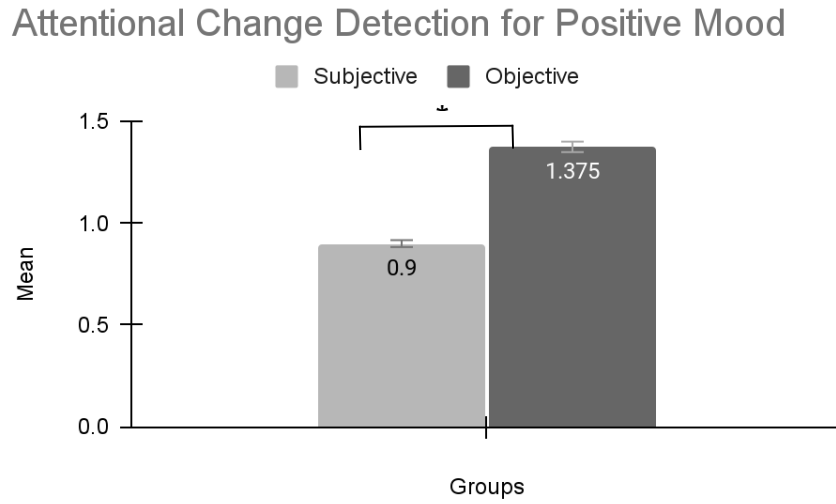
Negative Affect scores for Negative Mood Induction were comparable between subjective and objective mood induction,  $t(78) = .409, p = .683$ .

Significant differences were found between subjective and objective mood induction for Negative Affect scores for Positive Mood Induction,  $t(78) = .2081, p = .041$ , and for Positive Affect scores for Negative Mood Induction,  $t(78) = 3.654, p < .001$ .

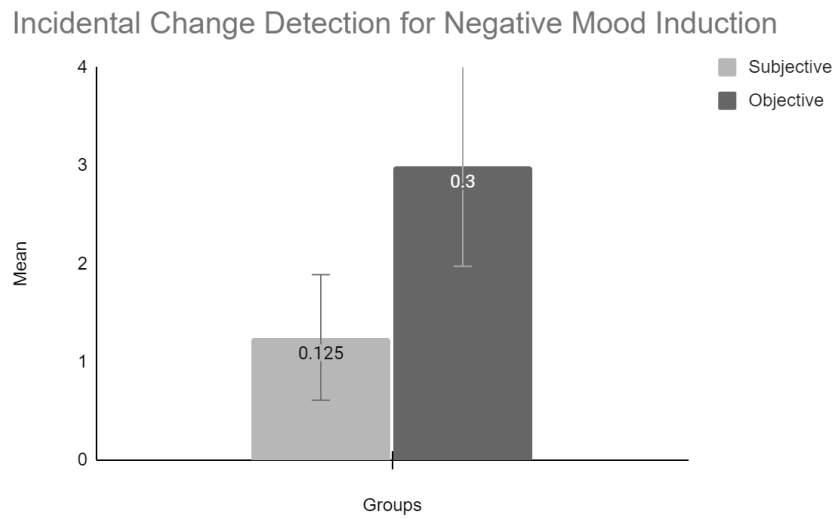
**Figure 1: Graphically comparing Incidental Change Detection for Positive Mood Induction**



**Figure 2: Graphically comparing Attentional Change Detection for Positive Mood Induction**

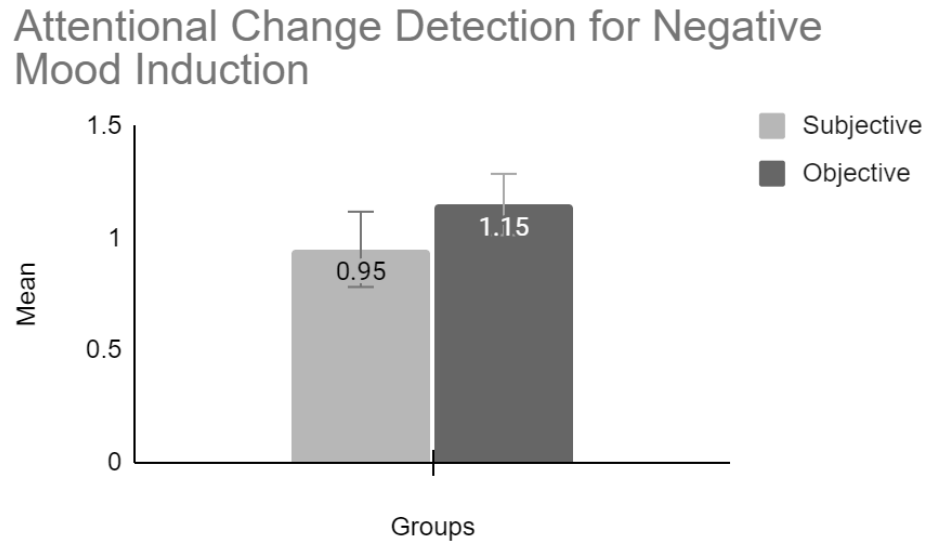


**Figure 3: Graphically comparing Incidental Change Detection for Negative Mood Induction**



**Figure 4: Graphically comparing Attentional Change Detection for Negative Mood**

**Induction**



## CHAPTER 6 DISCUSSION

The present study aimed to compare the effect of subjective and objective mood induction for positive and negative affect valence on change detection. It was hypothesized that variability in change detection will be observed as a function of mode/type of mood induction. The results obtained in the current research are the first attempt to showcase larger attentional change detection for objective as compared to subjective mood induction (for positive affect only). This was also true overall across both positive and negative valence, that is, on average participants in the objective groups detected more changes as compared to participants in the subjective group. In particular, the subjective mood induction showed comparable performance among participants across both positive and negative moods. This may indicate rather enduring effects of subjective mood induction over cognitive processes. Similar suggestions are made by Gable and Harmon-Jones (2010), who in their study found that the use of subjective mood induction techniques, specifically, the subjective induction of positive moods, led to an increase in attentional breadth that persisted even after the mood induction task.

An additional finding of the current study focuses on attended objects that found to be processed more thoroughly with larger number of changes detected in attentional phase as compared to incidental phase. This is supported by previous research that state that through effortful encoding people can form longer, richer representations and be able to notice changes when they intentionally search for continuity errors (Levin & Simon 1997). Hence we may conclude that attention is necessary for change detection. In contrast to this, no significant difference was found in the incidental changes detected even though the subjects were instructed to pay attention to the video. Thus, simply focusing attention on an object might not automatically lead to accurate change detection. Although it has been demonstrated previously that attention is necessary for the detection of changes and that changes to central objects will be detected more readily (Rensink et al., 1997). Studies further show that even when we attend to an object, we may not form a rich representation that can be preserved from one view to the next unless the object's properties are intentionally coded. Thus, attending to an object is necessary, but not sufficient, for change detection, an idea also supported by existing research (Levin & Simon 1977).

Comparable Positive Affect scores for positive mood induction, and Negative Affect scores for negative mood induction, between subjective and objective participants indicates that the mood induction led to similar magnitude of moods induced for both the groups. The observed effects supports the current results in terms of no influence of mood magnitude upon observed significant differences between subjective and objective type of mood induction. Objective methods may induce a more general and diffuse emotional state (Westermann, Spies, Stahl, and Hesse, 1996) , while subjective methods (such as recalling a memory) may induce a more specific and context-dependent emotional state (Erber & Erber 1994) affecting attentional processing and change detection in different ways. This means that objective mood induction methods might be more likely to produce a stronger and more consistent emotional response in participants, as they are less dependent on the individual's own subjective interpretation and so may lead to a more intense and pervasive emotional state, which in turn may facilitate attentional processing and change detection. As opposed to this, subjective mood induction methods are more dependent on individual differences in cognitive and emotional processes, and may produce more variable and less intense emotional states resulting in reduced attentional processing and change detection. Westermann et al. (1996) found objective measures to be more potent procedure for the induction of both positive and negative moods. Additionally, even though the two mood induction techniques are comparable at PANAS, the biological relevance of the subjective mood induced technique has detrimental effects on attention as shown in the current task, even for positive mood, compared to objective mood induction. Neuroimaging studies have provided evidence for the biological relevance of stimuli in influencing attentional processes and modulating brain activity. The neurological correlates of attentional processing were examined in a study conducted by Kastner and Ungerleider in 2000. They discovered that paying attention to particular visual stimuli

increased neural activity in the visual cortex, especially in areas connected to processing the attended stimuli demonstrating that stimuli that capture attention can modulate neural activity in a selective manner. Hence subjective mood induction does not facilitate change detection.

Comparing the average number of changes detected, negatively induced individuals reported fewer changes than positively induced individuals. This finding is in accordance with the majority of literature supporting the notion that a negative mood reduces the amount of attentional commitment to the task in hand and may do so by enhancing the focus on task irrelevant personal concerns (Smallwood et al., 2009). This research might also explain why no significant difference was found in the incidental as well as attentional changes detected between the members with negative mood induction across both subjective and objective mood induction groups.

Overall the attentional changes get better at detection under only objective mood induction condition in comparison to subjective under the influence of only positive mood induction implying the significance of not only emotional state but mode of mood induction equally influencing the process of change detection. This imply that objective positive mood induction have subtle changes in the baseline emotional state which may have a substantial impact on decisions in comparison to objective negative mood induction or in comparison to subjective mood induction of positive or negative valence in general.

## CHAPTER 7: CONCLUSION

The current study compared the effects of subjectively and objectively induced positive and negative mood on change detection and found that objective mood induction is facilitatory for attentional change detection as compared to subjective change detection. The subjective mood induction is not facilitatory for change detection likely due to the enduring effect it has on cognition. Subjective mood induction could be more salient because of its inherent emotional quality. The findings are also in line with the idea that positive mood is facilitatory for change detection and other attentional tasks as compared to negative mood.

The difference was found in attentional viewing as compared to incidental viewing suggesting that merely attention is not enough for change detection; intentional coding is required to make representations of a stimulus.

However the study wasn't without its limitations, the effect size of the sample was not strong enough to detect changes between groups. Additionally, although the current study attempts to extend to real-life generalizability of change detection paradigm, the motion picture stimuli are still much less rich in visual information than in real world settings. Also the clip used currently was from a foreign experiment, there might be chances of an effect of cultural barrier. The current study was also limited due to potential order effects that might have existed. Because the intentional encoding trial was always completed during the second viewing of the motion picture clip, it is possible that participants detected more changes in the intentional encoding condition, simply because they had seen the clip once already.

Also, because mood induction effects may be short-lived, positive mood effects may have worn out towards the end of the experiment. The respondents were all young adults, and research has shown that older adults may feel a larger link between emotions and physiological and cognitive states than younger adults due to motivational relevance and life events. Therefore, when analyzing within-individual relationships between emotion systems, age is a crucial individual difference factor to take into account. (Lohani and Isaacowitz, 2018)

Future research is needed to clarify the impact of mood induction procedures on different types of attentional tasks and their underlying mechanisms, as well as to explore individual differences in response to emotional memory recall.

## References

1. Attwood, J. E., Kennard, C., Harris, J., Humphreys, G., & Antoniadis, C. A. (2018). A Comparison of Change Blindness in Real-World and On-Screen Viewing of Museum Artefacts. *Frontiers in psychology, 9*, 151.
2. Awh, E., Belopolsky, A. V., & Theeuwes, J. (2012). Top-down versus bottom-up attentional control: a failed theoretical dichotomy. *Trends In Cognitive Sciences, 16(8)*, 437–443.
3. Basso, M. R., Schefft, B. K., Ris, M. D., & Dember, W. N. (1996). Mood and global-local visual processing. *Journal of the International Neuropsychological Society, 2(3)*, 249–255.
4. Baylis, G. C., & Driver, J. (1993). Visual attention and objects: Evidence for hierarchical coding of location. *Journal of Experimental Psychology: Human Perception and Performance, 19(3)*, 451–470.
5. Beck, A. T. (1967). Depression: Clinical, experimental, and theoretical aspects. *J R Coll Gen Pract, 18(87)*, 249.
6. Bem, D. J. (1972). Self-Perception Theory. *Advances in Experimental Social Psychology, 6*, 1–62.
7. Bless, H., Schwartz, N., & Wieland, R. (1996). Mood and the impact of category membership and individuating information. *European Journal of Social Psychology 26(6)*, 935–959.
8. Booth, J. E., Schinka, J. A., Brown, L. M., Mortimer, J. A., & Borenstein, A. R. (2006). Five-Factor Personality Dimensions, Mood States, and Cognitive Performance in Older Adults. *Journal of Clinical and Experimental Neuropsychology, 28(5)*, 676–683.
9. Bower, G. H. (1981). Mood and memory. *American Psychologist, 36(2)*, 129–148.

10. Brosschot, J. F., Gerin, W., & Thayer, J. F. (2006). The perseverative cognition hypothesis: a review of worry, prolonged stress-related physiological activation, and health. *Journal of Psychosomatic Research, 60*(2), 113–124.
11. Derryberry, D., & Tucker, D. M. (1994). Motivating the focus of attention. *The heart's eye: Emotional influences in perception and attention*, 167–196.
12. Easterbrook, J. A. (1959). The effect of emotion on cue utilization and the organization of behavior. *Psychological Review, 66*(3), 183–201.
13. Eldar, E., Rutledge, R. B., Dolan, R. J., & Niv, Y. (2016). Mood as Representation of Momentum. *Trends in Cognitive Sciences, 20*(1), 15–24.
14. Ellis, H. C., Ashbrook, P. W. (1998). Resource allocation model of the effects of depressed mood states on memory. *Affect, cognition and social behaviour*, 25–43.
15. Erber, R., & Erber, M. W. (1994). Beyond mood and social judgment: Mood incongruent recall and mood regulation. *European Journal of Social Psychology, 24*(1), 79–88.
16. Forgas, J. P. (1995). Mood and judgment: The affect infusion model (AIM). *Psychological Bulletin, 117*(1), 39–66.
17. Fredrickson, B. L. (1998). What Good Are Positive Emotions? *Review of General Psychology, 2*(3), 300–319.
18. Fredrickson, B. L. (2001). The role of positive emotions in positive psychology: The broaden-and-build theory of positive emotions. *American Psychologist, 56*(3), 218–226.
19. Fredrickson, B. L., & Branigan, C. (2005). Positive emotions broaden the scope of attention and thought-action repertoires. *Cognition and Emotion, 19*(3), 313–332.
20. Gable, P. A., & Harmon-Jones, E. (2008). Approach-Motivated Positive Affect Reduces Breadth of Attention. *Psychological Science, 19*(5), 476–482.

21. Gasper, K., & Clore, G. L. (2002). Attending to the Big Picture: Mood and Global Versus Local Processing of Visual Information. *Psychological Science, 13*(1), 34–40.
22. Gerrards-Hesse, A., Spies, K., & Hesse, F. W. (1994). Experimental inductions of emotional states and their effectiveness: A review. *British Journal of Psychology, 85*(1), 55–78.
23. Gotlib, I. H., & Joormann, J. (2010). Cognition and depression: current status and future directions. *Annual review of clinical psychology, 6*, 285–312.
24. Grimes, J. (1996). On the failure to detect changes in scenes across saccades. In K. A. Akins (Ed.), *Perception* (pp. 89–110). Oxford University Press.
25. Henderson, J. M., Weeks, P. A., & Hollingworth, A. (1999). The effects of semantic consistency on eye movements during complex scene viewing. *Journal of Experimental Psychology: Human Perception and Performance, 25*(1), 210–228.
26. Hillyard, S. A., Vogel, E. K., & Luck, S. J. (1998). Sensory gain control (amplification) as a mechanism of selective attention: electrophysiological and neuroimaging evidence. *Philosophical Transactions of the Royal Society of London, 353*(1373), 1257–1270.
27. Hollingworth, A., & Henderson, J. M. (2002). Accurate visual memory for previously attended objects in natural scenes. *Journal of Experimental Psychology: Human Perception and Performance, 28*(1), 113–136.
28. Isen, A. M., & Daubman, K. A. (1984). The influence of affect on categorization. *Journal of Personality and Social Psychology, 47*(6), 1206–1217.
29. Itti, L., & Koch, C. (2000). A saliency-based search mechanism for overt and covert shifts of visual attention. *Vision Research, 40*(10–12), 1489–1506.

30. Joormann, J., & Siemer, M. (2011). Affective processing and emotion regulation in dysphoria and depression: Cognitive biases and deficits in cognitive control. *Social and Personality Psychology Compass*, 5(1), 13–28.
31. Joormann, J., Talbot, L., & Gotlib, I. H. (2007). Biased processing of emotional information in girls at risk for depression. *Journal of Abnormal Psychology*, 116(1), 135–143.
32. Kanai, R., & Verstraten, F. A. (2004). Visual transients without feature changes are sufficient for the percept of a change. *Vision research*, 44(19), 2233–2240.
33. Kastner, S., & Ungerleider, L. G. (2000). Mechanisms of visual attention in the human cortex. *Annual review of neuroscience*, 23, 315–341.
34. Lang, P.J., Bradley, M.M., & Cuthbert, B.N. (1997). International Affective Picture System (IAPS): Technical Manual and Affective Ratings. *NIMH Center for the Study of Emotion and Attention*.
35. Lang, P. J., Greenwald, M. K., Bradley, M. M., & Hamm, A. O. (1993). Looking at pictures: Affective, facial, visceral, and behavioral reactions. *Psychophysiology*, 30(3), 261–273.
36. Levin, D & Simons, D. (1997). Failure to Detect Changes to Attended Objects in Motion Pictures. *Psychonomic Bulletin & Review*, 4, 501-506.
37. Llamas, D.O., & Koole, S.L. (2003). Zelfregulatie en visuele waarneming: Effecten van actie oriëntatie en externe motivationele ondersteuning op veranderingsblindheid. *Jaarboek Sociale Psychologie*, 227-235.
38. Lohani, M., Payne, B. R., & Isaacowitz, D. M. (2018). Emotional coherence in early and later adulthood during sadness reactivity and regulation. *Emotion* 18(6), 789–804.

39. McConkie, G. W., & Currie, C. B. (1996). Visual stability across saccades while viewing complex pictures. *Journal of Experimental Psychology: Human Perception and Performance*, 22(3), 563–581.
40. Mikels, J. A., Fredrickson, B. L., Larkin, G. R., Lindberg, C. M., Maglio, S. J., & Reuter-Lorenz, P. A. (2005). Emotional category data on images from the International Affective Picture System. *Behavior research methods*, 37(4), 626–630.
41. Mogg, K., Millar, N., & Bradley, B. P. (2000). Biases in eye movements to threatening facial expressions in generalized anxiety disorder and depressive disorder. *Journal of Abnormal Psychology*, 109(4), 695–704.
42. Murphy, F., Michael, A., & Sahakian, B. (2012). Emotion modulates cognitive flexibility in patients with major depression. *Psychological Medicine*, 42(7), 1373-1382.
43. Nolen-Hoeksema, S., Morrow, J., & Fredrickson, B. L. (1993). Response styles and the duration of episodes of depressed mood. *Journal of Abnormal Psychology*, 102(1), 20–28.
44. O'Regan, J. K., Deubel, H., Clark, J. J., & Rensink, R. A. (2000). Picture changes during blinks: Looking without seeing and seeing without looking. *Visual Cognition*, 7(1-3), 191–211.
45. O'Regan, J. K., Rensink, R. A., & Clark, J. J. (1999). Change-blindness as a result of 'mudsplashes.' *Nature*, 398(6722), 34.
46. Olivers, C. N., & Nieuwenhuis, S. (2006). The beneficial effects of additional task load, positive affect, and instruction on the attentional blink. *Journal of experimental psychology: Human perception and performance*, 32(2), 364–379.
47. Pashler, H. (1988). Familiarity and visual change detection. *Perception & Psychophysics*, 44(4), 369–378.

48. Qiao, Z., Yu, Y., Wang, L., Yang, X., Qiu, X., Zhang, C., Ning, N., Shi, J., Chen, L., Li, Z., Liu, J., Xu, J., Zhao, L., & Yang, Y. (2013). Impaired pre-attentive change detection in major depressive disorder patients revealed by auditory mismatch negativity. *Psychiatry Research: Neuroimaging*, *211(1)*, 78–84.
49. Rensink, R. A. (2009). Change Blindness and Inattentional Blindness. *Encyclopedia of Consciousness*, *1*, 47-59.
50. Rensink, R. A., O'Regan, J. K., & Clark, J. J. (1997). To See or not to See: The Need for Attention to Perceive Changes in Scenes. *Psychological Science*, *8(5)*, 368–373.
51. Rondeel, E. W. M., Holland, R., Kempen, M., & Wijngaards, N. (2007). In the mood for change: the influence of mood on change blindness. *Unpublished manuscript*.
52. Rowe, G., Hirsh, J. B., & Anderson, A. K. (2007). Positive affect increases the breadth of attentional selection. *Proceedings of the National Academy of Sciences of the United States of America*, *104(1)*, 383–388.
53. Rusting, C. L., & DeHart, T. (2000). Retrieving positive memories to regulate negative mood: Consequences for mood-congruent memory. *Journal of Personality and Social Psychology*, *78(4)*, 737–752.
54. Rusting, C. L., & Nolen-Hoeksema, S. (1998). Regulating responses to anger: effects of rumination and distraction on angry mood. *Journal of personality and social psychology*, *74(3)*, 790–803.
55. Sarason, I. G., Pierce, G. R., & Sarason, B. R. (1996). *Cognitive interference: Theories, methods, and findings*.
56. Schneider, W., & Shiffrin, R. M. (1977). Controlled and automatic human information processing: I. Detection, search, and attention. *Psychological Review* *84(1)*, 1–66.

57. Schupp, H. T., Junghöfer, M., Weike, A. I., & Hamm, A. O. (2003). Attention and emotion: an ERP analysis of facilitated emotional stimulus processing. *NeuroReport*, *14*(8), 1107–1110.
58. Simons, D. J., & Chabris, C. F. (1999). Gorillas in Our Midst: Sustained Inattentional Blindness for Dynamic Events. *Perception*, *28*(9), 1059–1074.
59. Simons, D. J., & Levin, D. T. (1998). Failure to detect changes to people during a real-world interaction. *Psychonomic Bulletin & Review* *5*(4), 644–649.
60. Simons, D. J. (2000). Attentional capture and inattentional blindness. *Trends in Cognitive Sciences*, *4*(4), 147–155.
61. Simons, D. J., & Rensink, R. A. (2005). Change blindness: past, present, and future. *Trends in Cognitive Sciences*, *9*(1), 16–20.
62. Smallwood, J., Fitzgerald, A., Miles, L. K., & Phillips, L. H. (2009). Shifting moods, wandering minds: Negative moods lead the mind to wander. *Emotion*, *9*(2), 271–276.
63. Tatler, B. W. (2007). The central fixation bias in scene viewing: Selecting an optimal viewing position independently of motor biases and image feature distributions. *Journal of Vision*, *7*(14).
64. Treisman, A. M., & Gelade, G. (1980). A feature-integration theory of attention. *Cognitive Psychology*, *12*(1), 97–136.
65. Ungerleider, S. K. and L. G. (2000). Mechanisms of Visual Attention in the Human Cortex. *Annual Review of Neuroscience*, *23*(1), 315–341.
66. Varakin, D. A., & Levin, D. T. (2006). Change blindness and visual memory: Visual representations get rich and act poor. *British Journal of Psychology*, *97*(1), 51–77.

67. Varakin, D. A., Levin, D. T., & Collins, K. M. (2007). Comparison and Representation Failures Both Cause Real-World Change Blindness. *Perception, 36*(5), 737–749.
68. Wang, E. (2022). Change Blindness: The Influence of Positive Mood on Change Detection in Visual Scenes. *Inquiries Journal, 14*(06).
69. Watson, D., Clark, L. A., and Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: the PANAS scales. *Journal of Personality and Social Psychology, 54*.
70. Werner, S., & Thies, B. (2000). Is ‘change blindness’ attenuated by domain-specific expertise? An expert-novices comparison of change detection in football images. *Visual Cognition, 7*, 163–174.
71. Westermann, R., Spies, K., Stahl, G., & Hesse, F. W. (1996). Relative effectiveness and validity of mood induction procedures: A meta-analysis. *European Journal of Social Psychology, 26*(4), 557–580.
72. Wolfe, J.M. (2021). Guided Search 6.0: An updated model of visual search. *Psychonomic Bulletin & Review, 28*, 1060–1092.

## APPENDIX A

### Positive and Negative Affect Schedule (PANAS)

The PANAS is a 20-item scale, which codes for a Positive Affect and Negative Affect scale, sampled from The Ohio State University (2020).

#### PANAS Question and Items

Indicate the extent you have felt this way over the past week.		Very slightly or not at all	A little	Moderately	Quite a bit	Extremely
PANAS 1	Interested	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
PANAS 2	Distressed	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
PANAS 3	Excited	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
PANAS 4	Upset	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
PANAS 5	Strong	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
PANAS 6	Guilty	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
PANAS 7	Scared	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
PANAS 8	Hostile	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
PANAS 9	Enthusiastic	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
PANAS 10	Proud	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
PANAS 11	Irritable	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
PANAS 12	Alert	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
PANAS 13	Ashamed	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
PANAS 14	Inspired	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
PANAS 15	Nervous	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
PANAS 16	Determined	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
PANAS 17	Attentive	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
PANAS 18	Jittery	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
PANAS 19	Active	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
PANAS 20	Afraid	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5

## APPENDIX B

### Questionnaire 1

Filled after the first viewing of the video (Incidental Viewing) via a Google Form

Did you notice any unusual differences from one shot to the next where objects, body positions, or clothing suddenly changed?\*

- Yes
- No

If you responded Yes to the above question, please describe any changes you noticed.

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# APPENDIX C

## Questionnaire 2

Filled after the second viewing of the video (Attentional Viewing) via a Google Form

Describe any unusual changes you noticed in the video.

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## APPENDIX D

### Consent Form

In the present experiment you will be given a short task and then be shown a video followed by a couple of questions about the video. The only thing you are required to do is pay attention to the video. The complete experiment will require approximately 10 minutes. All information you provide will remain confidential and not be associated with your name. If, for any reason, during the experiment, you do not feel comfortable, you may leave and your information will be discarded

The results of this experiment may be presented at professional meetings or published in the scientific literature. Your name will not be used in the reporting of the results. Only group data will be used; however, your scores and name will be coded for a possible follow-up study or reanalysis of the data. All personal details will be kept confidential.

If you wish to withdraw from the experiment, you may do so at any time without penalty. Following the experiment, I will discuss the results of the experiment with you if needed.

If you have any questions, please feel free to ask me or the advisor of the research, Dr. Richa Nigam, TSLAS, Thapar Institute of Engineering and Technology, Patiala.

Thank you for participating in the experiment.

I, \_\_\_\_\_, understand  
(First Name) (Last Name)

that my participation in this experiment is voluntary and that I may refuse to participate or withdraw from the experiment at any point of time without penalty.

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature of Participant

\_\_\_\_\_  
Signature of Experimenter