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# Despicable Me: Shame and Guilt on Self-Avoidance Behaviours – An Eye-Tracking Study

Senior Project Submitted to
The Division of Science, Math, and Computing
of Bard College

by

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Abstract

Shame and guilt are often used interchangeably in our daily lives, however, this project aims to differentiate between the two emotions based on people's self-avoidance behaviours. Existing theories propose that while feelings of shame lead to increased self-avoidance behaviours, feelings of guilt do not. Using a modernised version of the mirror paradigm, this project captured participants' gaze behaviours around their own face reflections. In this pre-registered study, the gaze behaviour of 30 participants were collected while emotions (either shame or guilt) were induced. Their state shame and guilt as well as trait shame and guilt were also collected through self-reports. It was hypothesised that participants in the shame condition would exhibit less eye-fixation and saccades toward their face reflection and those in the guilt condition would exhibit more. Results in this project showed that also a strong difference on gaze behaviours was detected between shame an guilt experimental conditions, this effect was reduced after adding other regressors, including trait shame and trait guilt. In later regression models, only a marginal negative effect of shame on gaze behaviours was found whereas feelings of guilt has not found to be correlated with gaze behaviours.

*Keywords:* objective self-awareness, shame, guilt, self-avoidance

Dedication

First and foremost, I need to thank all my participants. I know this experiment must not be the most pleasant one in the world. Without you, this project would not have been possible—especially Zongyou Xiang, who came back and forth for the pilot tests.

Then, I need to thank the project supervisor, Professor Justin Hulbert. I should've said it more often: you are the best advisor and supervisor in the world - and an even better life mentor! Despite numerous obstacles along the way, you made this project a life-worthy experience for me.

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Finally, I'd like to thank my family and my dearest friends. Thank you for being with me all this way.

# Shame and Guilt on Self-Avoidance

Living a moral life is easier said than done. It is not only about setting up an impeccable moral standard but is also about countless individual choices and morally relevant behaviours. As imperfect human beings, it is only an illusion to always adhere our moral behaviours to our moral standards. Most of us have likely done something wrong even when aware it goes against our principles, such as lying, cheating, or drinking before we turn 21. Take lying as an example. Most times our lies seem benign with little consequences, like fabricating a sick leave from one class to make up for assignments from another class or making up fake excuses to get out of an uncomfortable situation. Other times our lies are not so benign. For example, a survey among 30,000 respondents revealed that 60.8% of college students have admitted to cheating in some circumstances and 95% of them reported that they were never caught (Frank, 2019). But does that mean these actions were made without a cost? What are the psychological repercussions of breaching moral standards? - are the main questions for this project to answer. Specifically, the objective of this project was to examine the differential effect of two distinct moral emotions, namely shame and guilt, on people's self-avoidance behaviour.

While shame and guilt are often used interchangeably in daily conversations, psychologists have made several attempts to distinguish the two in theoretical frameworks. However, existing models are largely confined to theories while empirical supporting evidence are still elusive (Tracy & Robins, 2006; Tangney et al., 2007). This project aims to contribute to this research gap by examining whether existing theories, particularly the self-avoidance theory on shame and guilt, can be supported by empirical testing under a controlled laboratory setting with undergraduate participants.

Furthermore, previous studies mainly relied on self-report questionnaires when it comes to measuring shame and guilt. However, this current project aims to explore whether a standardised measurement outside of introspective self-reports - eye-tracker - can also be used to distinguish between shame and guilt. Establishing such measurements could be particularly beneficial for future cross-linguistic studies that examine shame and guilt on non-native English speakers, participants who cannot read or write, or even potentially autistic patients facing challenges in self-reporting emotional experiences.

## Background

Before digging into this present project, I will provide an overview of existing theories and the literature background that are critically relevant to this present project in this section. I'll start with the original objective self-awareness theory which lays the foundation of our self-focused avoidance behaviours, and its contemporary progresses. Then, I'll discuss more specifically on the definition of shame and guilt as moral emotions and self-conscious emotions, and their differences between each other. I will end this section by discussing existing methods that have been used to induce and assess emotions respectively.

### Objective self-awareness theory

The objective self-awareness theory (OSA) theory was first proposed in 1972 (Duval & Wicklund) in parallel with Lewis's theory of self-conscious emotions (Lewis, 1971). The OSA theory evolved from the concept of "objective self-awareness". In this theory, our conscious attention is essentially a dichotomy: either it is directed toward ourselves, or it is directed toward the outside world. When conscious attention is directed toward ourselves, "objective self-awareness" occurs as a state in which we view ourselves as the object. The core idea of this theory is that when we are self-aware, we evaluate ourselves in comparison to our standards. Any discrepancy as the result of this self-evaluation process raises self-evaluative emotions. If the evaluation reveals a negative disparity between our real selves in comparison to our ideal standards, shame or guilt would be elicited. The theory posits that, given the negative nature of this self-evaluation, shame and guilt are inherently aversive affects that we would naturally crave to alleviate. There are two potential approaches to alleviate shame and guilt: either approaching to change the incongruent self (approach) or avoiding the self-focusing stimuli and terminating all self-evaluation at once (avoidance). It means that when individuals are made to experience

objective self-awareness, some may exhibit self-focused avoidance behaviour, whereas some way exhibit a self-focus approach. It was also proposed that those who exhibit avoidance behaviour would consequently exhibit less reparative efforts to restore the consistency between the self and the standard in comparison to those who exhibit approach behaviours.

However, the original OSA theory (1972) did not explicitly answer the question: "Why" do some people exhibit more self-avoidance, whereas others do not? Later, theorists made several attempts to answer this question. The "test-operate-test-exit" (TOTE) system, proposed in 1979, suggests that the OSA theory is essentially a feedback loop where individuals choose their responses to discrepancies between their selves and standards by evaluating the outcome favourability of "approach" versus "avoidance" (Carver et al.). However, this notion of the TOTE system relies on an important premise, that is, people make rational evaluations and decisions about their responses toward discrepancies, and overlooks the role that our emotions, which can be rationally uncontrollable, in shaping our responses in the face of discrepancies. As of 2022, this theoretical gap remains unresolved.

There are a few studies that touched briefly on this matter. For example, using empirical experiments, de Hooge et al. (2018) attempted to examine the relationship between emotions and approach/avoidance behaviours. The study focused on the relationship between induced shame and guilt in people's social choices (social approach and avoidance). Feelings of shame or guilt were induced by asking participants to write down a personal experience of either shame or guilt. Then, participants were asked to self-report their social choices by rating their preferences for doing a task with other people or alone. In contrast to their assumptions and previous theories, results from their experiment suggested that shame is related to a higher preference for social approach than guilt. With that being said, this study focused on the social and interpersonal

consequences of shame and guilt. However, it did not directly examine the effect of shame and guilt on self-focused approach and avoidance, a vital element of the original OSA theory.

In 2022, the first study that empirically examined the role of shame and guilt in the OSA theory was conducted using an adapted version of the classic mirror paradigm (Mogener et al., 2022). The original mirror paradigm has been widely used in both clinical and research settings. It usually involves participants sitting in front of a mirror, and the experimenter/clinician records and codes their behaviours. Indicators of discomfort in front of the mirror, such as turning their backs to the mirror, touching hair, or biting lips, were markers of self-dislike or avoidance (Mor et al., 2002; Winter et al., 2015). Rather than using mirrors, In the Moneger et al (2022) study, objective self-awareness was induced by exposing participants to the reflections of their faces from a reflective black computer screen. During exposure to their facial reflections, participants were asked to imagine themselves in a hypothetical scenario where they failed an exam in front of their friends. Participants then self-reported their state feelings of shame and guilt through a revised version of the classic State Shame and Guilt Scale (SSGS) scale, splitting them into either shame or guilt conditions (Moneger et al., 2022). Using modern eye-tracking technologies, Moneger et al. could measure participants' gaze behaviours toward the reflections of their faces. In line with the original OSA theory, Moneger et al. hypothesised that participants who reported higher shame scores would exhibit fewer fixations into areas of their face reflections (indicating higher self-focused avoidance) than those who reported guilt. Unexpectedly, their hypothesis was not supported, as guilt was correlated with higher self-avoidance, whereas shame was not. This study is relevant because, like the Moneger et al. study, this project also adopted the modernised mirror paradigm and used eye-tracking technology to directly but unobtrusively

assess participants' gaze behaviours in measuring the differential effects of shame and guilt on self-focused avoidance behaviours.

Given the contradicting results found by previous studies, my Senior Project aimed to examine the relationship between emotions, namely shame and guilt, and people's response toward objective self-awareness. Like the Moneger et al. study, my Senior Project also employed the modernised version of the mirror paradigm and eye trackers to measure participants' self-focused attention or avoidance during aroused states of shame and guilt.

**Shame and Guilt as Self-conscious emotions**

All living organisms self-regulate, and humans are no exception. This means that we have a communication system that links the internal and external environment of our bodies so that we make changes to better adapt to the world. For example, we adjust our bodily temperature by sweating when we feel hot. Similarly, we adjust our behaviours when we feel emotions, such as shame or guilt, to better align with our standards and "standard self". Since eliciting such emotions fundamentally relies on our ability to recognise our "standard self" and, more importantly, to have the capacity for self-reflection and self-consciousness, shame and guilt are also called self-conscious emotions. Therefore, by definition, self-conscious emotions stand apart from other basic emotions (e.g. anger, fear, sadness, happiness) due to their critical relationship with self-evaluation (Tangney, 2007; Tracy & Robins, 2004, 2007). Furthermore, shame and guilt necessitate reflecting on one's stable self-representation to assess how current behaviour deviates from such self-representations (Tracy & Robins, 2004). The negativity associated with shame and guilt made them a motivational force, propelling us to self-regulate and strive towards our ideal selves.

Despite its importance in moral, behavioural, and clinical psychology, self-conscious emotions are still under-explored - and this is not unreasonable. Investigating shame and guilt is far more challenging due to their lack of universality and expressiveness. This brings us forth another difference between self-conscious emotions and basic emotions: Unlike basic emotions such as sadness and happiness, self-conscious emotions do not have universally recognisable facial expressions, and more often than not, people would internally digest them without revealing explicit expressions (Tracy & Robins, 2004). Although it was initially assumed that all emotions must have discrete nonverbal expressions due to their communicative nature (Darwin, 1872; Ekman,1992), self-conscious emotions are unique in the way that they are not evolved to express signals or communicate with others; instead, they are emotions developed for internal communication and regulation. In other words, shame and guilt cannot be captured simply by attending to discrete sets of particular facial movements, which, in turn, underlines the importance of this project as it aims to capture shame and guilt using eye-tracking technology and pupilometric data.

In addition to capturing shame and guilt more precisely, developing such an eye-tracking system could also be helpful in developmental and clinical research. As existing theory suggests, self-conscious and basic emotions also differ in their developmental timings. While most basic emotions emerge within the first nine months after birth, self-conscious emotions do not develop until 18-24 months. Shame and guilt, as they require the formation of a stable self-representation and basic understanding of social rules and expectations, can only emerge when a child has developed a relatively elaborated theory of mind, which enables one to understand that one's behaviour will be observed and evaluated by others accordingly (Tracy & Robins, 2004). Therefore, developing a standardised measurement to capture shame and guilt outside of self-

report is essential for us to explore the cut-off point on the age when shame and guilt first emerge and the capacity for shame and guilt in clinically autistic patients.

**Shame and Guilt as Moral emotions**

Numerous theories on human morality and moral behaviours have been proposed for the past 2000 years, starting from Plato's model of moral reasoning in humanity (Thayer, 1969). From classic moral philosophy to relatively contemporary moral psychology, theories converge on emphasising the role that rational reasoning and cost-benefit evaluation play in our moral behaviours. For example, Piaget's research on morality concerns children's moral reasoning development, understanding punishments, and violating moral codes (Piaget,1965). Similarly, Kohlberg's work emphasised stages of development in which children acquire morality and moral reasoning ability (Kohlberg, 1963). However, theorists soon realised that moral reasoning theories are limiting because simply raising the stakes for criminal actions (harsh punishments, death penalty, etc.) cannot eliminate crimes or immoral actions. Along with the emergence of Affect psychology in the early 21st century, psychologists and criminologists shifted their focus to the role that moral emotions play in real-life moral behaviours (Haidt, 2003). As mentioned in the previous section, shame and guilt are two unique self-conscious emotions that provide immediate punishments towards the self following transgressions; therefore, they are also called moral self-conscious emotions due to their self-regulatory role in moral decisions and moral behaviours.

**Shame vs. Guilt**

Thus far, I have explained the definition and characteristics of shame and guilt as moral and self-conscious emotions, however, I have yet to distinguish shame and guilt from each other.

Although they can be used interchangeably in daily conversations, there are a number of meaningful ways to differentiate between the two when it comes to psychological research.

First, the most prevalent theory proposed by Lewis draws the distinction between shame and guilt by their differential focus of the emotional eliciting event. This theory suggest that shame is elicited when the "self" is the focus of a negative evaluation process whereas guilt is elicited when the specific "behaviour" is the focus of a negative evaluation process (Lewis, 1971). This theory of focus on the self versus behaviour was later elaborated into an appraisal-based model of self-conscious emotions. In this model, when one needs to determine the attribution of a transgression, an internal attribution is made when shame is experienced, and an external attribution is made when guilt is experienced. In another word, shame is the emotional experience when one thinks "I am a bad person" while guilt is the emotional experience when one thinks "I did a bad thing" (Tracy & Robins, 2004; 2007). The theory also suggests that the attributions made when experiencing shame and guilt also differ in their stability and controllability. This means that guilt-prone people are more likely to attribute an emotional eliciting event to an unstable, controllable cause whereas shame-prone people are more like to attribute to a stable, uncontrollable cause. For example, when failing an exam, guilt-prone people will attribute it to not making enough effort, which is unstable (because they can make more efforts next time) and controllable (because they can determine and control it). On the contrary, shame-prone people will attribute it to the inability of themselves, which is stable and uncontrollable.

Stemming from this theory, a number of later studies have discussed the implications of shame and guilt in terms of their functioning and adaptiveness. These studies can be generally categorised into five types. Specifically, they investigated the differential effects of shame and

guilt 1) on individual internal self-concept, 2) daily self-regulatory behaviours, 3) common transgressions, 4) criminal or violent behaviours, and 5) physiology. However, in contrast to proposed theoretical models, results from empirical studies are mostly mixed, especially when it comes to self-regulation or transgression on normal populations while studies criminal offenders appeared to be more consistent.

**Shame and Guilt on Self-concept.** Let's start with studies that examined the effect shame and guilt have on our mental welling by shaping our self-concepts. Self-concept, defined as the way we perceive ourselves, encompasses a set of processes like self-efficacy, which refers to individuals' beliefs in their ability to execute actions required to achieve desired outcomes. It is an influential factor of the real-life actions that a person chooses, the amount of effort that a person expends, and the endurance level that a person has in the face of obstacles (Bandura, 1997). Shame and guilt, stemming from self-evaluative processes, are considered pivotal yet distinct factors in shaping one's self-concept. For example, in the Baldwin et al. study, 198 American undergraduate students were asked to fill out two questionnaires: one that measures their trait shame or guilt process (individual differences in the propensity to experience shame or guilt under different situations as the result of one's thinking pattern), another one that measures their self-efficacy. Results found that the trait shame scores were negatively correlated with scores of self-efficacies whereas guilt was not found to be correlated with self-efficacy (Baldwin, 2006). However, this trend was not found when a similar study was conducted on 228 Italian children. Rather, only guilt was to be positively correlated with self-efficacy (Passanisi, 2015). This difference could be attributed to both the age group difference and the different measure used in assessing self-efficacy. Although both studies used self-efficacy as their primary dependent variable, the former (Baldwin, 2006) used the Social Efficacy Scale whereas the latter

(Passanisi, 2015) used the Self-Regulatory Self-Efficacy Scale in assessing self-efficacy. Also, the former used American undergraduate students whereas the latter used Italian children (ages of 12-13).

Self-esteem, defined as a person's belief in their worthiness to be rejoicing, is another component of our self-concepts (Branden, 1994). Like self-efficacy, self-esteem is also intimately related to self-evaluative emotions such as shame and guilt. While self-efficacy focuses on a person's confidence about their ability to succeed in tasks and reach goals ("I can succeed at most endeavour to which I set my mind."), self-esteem is more concerned with one's affective feelings regarding their self-worth and value ("I have a number of good qualities") (Chen et al., 2014). A recent study has summarised all existing studies, prior to 2020, on shame in relation to self-esteem. A total of 18 studies were found and all of them concluded a negative correlation between shame and self-esteem. Surprisingly, no study has directly examined the relationship between guilt and self-esteem. The only study was conducted 25 years ago, contrary to their assumptions, they found that both self-esteem and feelings of guilt transiently increased prior to binge eating episodes, suggesting sudden increase in guilt could potentially predict binge eating behaviours (Sanftner, 1998).

**Shame and Guilt in Self-Regulatory Behaviours.** Beyond their distinct impacts on our internal self-concepts, shame and guilt have also been examined in relation to self-regulatory behaviours. For instance, guilt has been identified as a motivational force for self-control, as participants who reported higher intensity of guilt feelings predicted higher importance assigned to their goals. In a study involving 205 participants, daily reports were collected over seven days regarding desires conflicting with current personal goals (e.g., food, alcohol, coffee, tobacco). Participants indicated the importance of their personal goals and reported whether they acted on

their desires. If enacted, there was a 60% chance they would be asked to assess the level of guilt experienced. Results indicated that guilt serves as an incentive, heightening the perceived importance of relevant goals. However, it was also associated with challenges in subsequent real-life inhibitory control actions (Hofmann & Fisher, 2012). Nonetheless, not all evidence supports this claim. A more recent study focused on the self-regulation of physical activities (PA) and found that guilt resulting from missing a planned PA session is negatively correlated with future PA intentions. Interestingly, this guilt did not prove to be a reliable predictor of future PA activity (Meade, 2020). It is noteworthy that the study by Hofmann and Fisher primarily addressed self-control concerning resisting temptations and unwanted desires, requiring higher cognitive efforts. In contrast, the Meade study centred around regulating the self to engage in an unfavourable activity, which might be less cognitively demanding. Thus, the nature of the cognitive demands associated with the behaviour in question may influence the relationship between guilt and subsequent actions.

**Shame and Guilt in Moral Behaviours.** Apart from pulling us toward desired behaviours, studies have also the effect of shame and guilt in terms of pushing us away from transgressions, such as cheating, lying, gambling etc. As human beings living in a society, we do occasionally lie, cheat, or even steal. Psychologists have been particularly interested in what makes a person more likely to repeatedly conduct such transgressions than others, and whether experiences of shame and guilt from one immoral incident will affect future morally relevant decisions. Previous research has suggested several ways that shame and guilt, differentially, play when it comes to socially undesirable behaviours. For example, academic cheating behaviours have been investigated in relation to trait shame and guilt on 777 American high school students. Participants in this study were asked to self-report their trait shame and guilt scores and their

cheating behaviours were reported by their teachers. Results showed a positive relationship between trait guilt and cheating behaviours while trait shame was not significantly correlated with cheating (Murdock et al., 2008). This similar trend was also detected from a study on Greek undergraduate students. Undergraduate participants were asked to self-report their levels of anticipated shame and guilt during a hypothetical cheating incident along with their reported cheating intention, rating the perceived seriousness of academic cheating, and the acceptability of academic cheating among college peers. Results revealed that guilt has a mediating effect on the positive relationship between college students' psychopathy and cheating intentions (Curtis et al., 2022). Once again, however, we can see that this study relies heavily on participants' self-report, which is not ideal, especially for questions such as cheating intentions and anticipated shame and guilt experiences.

Gambling is another socially undesirable behaviour that has been examined in relation to feelings of guilt. Two experiments were conducted in one study in attempt to show the relationship between shame and guilt on problematic gambling behaviours (Vivas et al., 2022). The first experiment compared problem-gamblers' trait shame and guilt scores on 80 Greek speaking participants from the general Geek population. Results suggest that problem-gamblers exhibit much less level of trait-guilt in comparison to non-gamblers, suggesting a potential projective effect that guilt has against problematic gambling. The second experiment recruited 49 Greek-speaking university students and asked them to describe a traumatic experience that elicited feelings of guilt. They also found a higher intensity of reported guilt in problem-gambler students in comparison to non-gambler students. Alongside with gambling behaviours, this study also examined the relationship between guilt and risky behaviours using an established computer-based task. In this task, participants were asked to play a game where they press the

space bar on the keyboard to inflate (pump) the balloon that appears on the screen. Each pump (pressing the keyboard once) gives them a 5-cent incentive in a virtual bank. They can decide to cash out the incentives by terminating the game at any time. However, if the balloon explodes, they lose all the money in the virtual bank. All participants were asked to perform this task twice - both before and after the guilt induction session. When analysing these risky behaviours along with state guilt/shame scores, results suggested that regardless of the condition (problem-gamblers or non-gamblers), participants' risky behaviours increased after the guilt induction. The authors concluded that, in contrast with existing theories, experiences of guilt increase one's riskiness. However, it is worth considering that shame was not of primary interest in this study thus did not compare the effects between shame and guilt on gambling and risky behaviours.

Furthermore, not only do shame and guilt influential as predictors for transgressions, but they also affect our subsequent behaviours after a transgression is done. Specifically, shame is related to hiding behaviours such as denying, hiding and escaping the situation, whereas guilt is related to reparative behaviours such as confessing, apologising, and amending (Tangney, 2007).

**Shame and Guilt in Recidivism**

While findings regarding shame and guilt on common transgressions are mainly mixed, a relatively consistent trend was found when it comes to violence and criminal offending. For example, trait shame and guilt scores as well as criminal behaviours, including theft, trespassing, vandalism, illicit drug use, and violent assaults were collected by self-report from 224 undergraduate students in one study. Results showed that trait guilt was negatively correlated with criminal offending whereas trait shame was positively correlated with criminal activity (Tibbetts, 2002).

Besides criminal behaviours in undergraduate populations, a similar trend has also been observed in offender populations, including both juvenile and adult offenders. For example, remorse, psychopathy, and trait shame and guilt were collected from 97 adolescent offenders. Results showed that shame was positively correlated with mental health problems, including anger, depression, and lack of remorse while guilt was negatively correlated with them (Spice et al., 2015). Likewise, in another longitudinal study with 1243 young offenders (ages of 14-24), shame was also found to be positively correlated with social withdrawal, anger, and aggression while guilt was associated with more pro-social behaviours. They also found that a positive relationship between shame and recidivism rates and a negative one between guilt and recidivism rates (Hosser et al., 2008). In terms of adult offenders, the same correlation was also observed on 476 jail inmates. Specifically, shame positively predicts recidivism while guilt negative predicts recidivism (Tangney et al., 2014).

**Physiological difference between Shame and Guilt.** In addition to psychological and behavioural difference, studies have also found physiological data supporting the opposite characteristics between shame and guilt. When heathy participants' cortisol levels and cytokines activities were examined following an autobiographical recall of a shame eliciting experience, data revealed greater increase in cortical and pro inflammatory cytokine activity, which is positively related to self-concealment (Dickerson et al., 2004). Moreover, a recent MRI study has revealed unique neural activation characteristics between feelings of shame and guilt. The MRI results in this study showed that while shame was associated with decreased activity in the superior temporal sulcus and pre-central gyrus, guilt was associated with decreased activity in the praecuneus (Bastin et al., 2021).

As discussed in this chapter, findings on shame and guilt are mostly mixed, especially in terms of common minor transgressions and self-regulatory behaviours. However, I'd like to argue that these conflicting results should not all surprising, given the complex nature of shame and guilt, nor should it acts as a disappointment. Rather, this a light that encourages us to re-consider the existing theoretical models in explaining the characteristics of shame and guilt.

**Inducing Emotions**

As we can see from the mentioned studies, psychologists have long endeavoured to study the effect of particular emotions on our behaviours and attempted to effectively manipulate emotions under experimental settings. When it comes to inducing self-conscious emotions, specifically guilt and shame, there are three main ways that have been employed by researchers: 1) vignettes, 2) causing wrongdoing during the experiment, and 3) the autobiographical recall. Each of the three approaches have its strengths and weaknesses, which will be examined in the rest of this section. The present study induced guilt and shame through the third approach by asking participants to recall an autobiographical experience, and the reasons for this choice will also be explained in these sections.

**Hypothetical Vignettes.** Asking participants to imagine themselves in an emotionally laden vignette is a common way to experimentally induce targeted emotions. When using this approach, stimuli of various forms - including but not limited to textual/verbal, images, and video - are designed to stimulate one particular emotion of interest and presented to the participants. Textual vignettes usually describe a hypothetical scenario that requires participants to read and image themselves being in the situation, whereas imagery- or video-based vignettes induce target emotions more directly. Usée et al. (2020) examined the effectiveness of verbal and imagery vignettes in inducing emotions. By using an eye-tracker, they were able to objectively

capture participants' emotional arousal level and compare it to participants' self-reported level of experienced emotional valance and arousal. In contrary to their assumptions, verbal vignettes were found to be equally capable of delivering high levels of emotional arousal as imagery vignettes.

Using vignettes are particularly beneficial because they can be easily and cost-efficiently delivered and in a highly standardised way across participants. However, there remain some challenges with using vignettes. First, previous studies have shown that eye-movements are influenced by verbal vignettes' supra-lexical and textual structure. For example, Frazier and Rayner (1982) suggested that the vignettes' phrase structure will influence participants' eye fixations. Moreover, both textual valance and textual difficulty were also found to influence audience's comprehension of the vignettes and eye-movement patterns (Usée et al., 2020). This means that, although the implementation of textual vignettes can be easily standardised, the construction of the vignettes themselves is challenging in the way that their textual structure and reading difficulty must be matched across conditions in this study.

Constructing reliable vignettes posed challenges in this project, especially without a specialist in linguistics. Moreover, the study's setting in a Liberal Arts College, with a target population comprising undergraduate students from diverse socioeconomic, ethnic, and racial backgrounds, further complicated the use of existing textual vignettes. Many established vignettes are primarily designed and tested among Western Caucasian participants, making them potentially un-relatable and lacking in social relevance for the targeted population in this study. For instance, some established vignettes describe situations involving exam failure or physical aggression towards a female student (Alibwaini & Ünal, 2022; Bhushan et al., 2020). These cases may not resonate with the diverse background of the participants, as not all student from

Bard College views exam grades as a crucial indicator of personal achievement or can envision themselves being physically aggressive to a female counterpart. Therefore, inducing shame and guilt using standardised existing vignettes may not be as effective in this particular study.

Another type of vignettes, imagery vignettes, proves to be more comprehensible and direct in delivering emotional stimuli. However, challenges arise in finding a suitable imagery vignette that can successfully induce shame and guilt without being too disturbing for the participants, especially given that this study lacks a professional counselling service for participants beyond the school counselling centre.

**Causing a Wrongdoing.** Apart from using vignettes, attempts have also been made to induce shame and guilt by causing a wrongdoing in previous studies. For example, Cunningham et al. (1980) induced guilt by giving participants a delicate camera, that was actually broke, to take an important picture of the experimenter. Other studies have induced shame and guilt by asking participants to choose a lottery for a trained confederate. By choosing the wrong lottery number for the confederate, the participant reported feeling guilty. However, such types of guilt induction require confederates who are well-trained to perform the procedure yet blink to the aim of the study, which is challenging for this study.

**Autobiographical Recall**

Last but not least, autobiographical recall has also been widely used in previous studies for emotion induction (Cunningham et al., 1980; de Hooge et al., 2007, 2011, 2012; Ketelaar et al., 2003; Nelissen et al., 2007). This method typically involves participants recalling a personal experience that elicited the target emotion.

This method was chosen for several reasons. Firstly, guilt and shame are relatively common emotions experienced by most individuals, making autobiographical recalls suitable for

eliciting these emotions. Secondly, unlike vignettes, autobiographical recalls enable participants to re-live their personal experiences, which are closely connected to their own lives, preserving validity in the emotional induction process. Moreover, this method, as opposed to causing a wrongdoing during the experiment, avoided the involvement of confederates and maintained minimal interaction between the experimenter and participants and contributed to standardising procedures across all participants.

**Assessing Emotions**

Measurements of shame and guilt can be generally divided into two categories: trait measures and state measures. Emotional traits refer to a person's characteristic patterns of thinking and feeling, which are relatively stable and can be generalised over time across different situations, whereas emotional states refer to the person's emotional feelings under each concrete situations, which are more variable and may fluctuate across different circumstances.

**Trait Shame and Guilt Measures.** Common assessments of trait shame and guilt include the Personal Feelings Questionnaire -2 (QFC-2), the Guilt and Shame Proneness Scale (GASP), and the Test of Self-Conscious Affect (TOSCA-3). QFC-2 is a self-report measure that asks participants to read words such as "remorse" or "feeling ridiculous" and to rate how often they feel this way. Although it is a relatively short and time-efficient test, it has been criticised on its heavy reliance on the subject's ability to comprehend the definition of words that are uncommon in daily life, such as "guilt", "self-conscious" and "euphoria", and to make global statements about themselves without a context (Tangney and Dearing, 2002). GASP is another self-report measure (Cohen et al., 2011). It asks subjects to read and imagine themselves in hypothetical scenarios of transgressions and to indicate their anticipated behaviours. Although it provides context for help participants to make better statements about themselves, the GASP

scale does not suit this current project because some of its hypothetical scenarios are not common transgressions in daily life (e.g., “You have secretly committed a felony”, “You successfully exaggerate your damages in a lawsuit”), which may not be relatable to the targeted participants of this current project - undergraduate students.

The Test of Self-Conscious Affect (TOSCA-3), once again, is also a self-report measure that requires participants to rate their anticipated behaviours under different hypothetical scenarios. It is beneficial to this current project because those scenarios that it provides are all commonly seen in the daily lives of undergraduate students, such as “you wait under the last minute to plan a project and it turns our badly”, “you realise you have stood your friends up”, or “you break something at work and the hide it”. Therefore, this measure of trait shame and guilt was chosen due to its high external validity to the targeted participants in this current project.

**State Shame and Guilt Measures.** Similar to the trait measures, assessments of state shame and guilt are also self-reports measures, including the Experiential Shame Scale (ESS) and the State Shame and Guilt Scale (SSGS) (Rüsch et al., 2007). As the name suggests, the ESS does not differentiate between shame and guilt, leaving SSGS the most widely used measure of state shame and guilt.

**Eye-tracking**

As the name suggest, eye-tracking is a measure that involves measuring the position and movement of human eye using eye-trackers. It was first intended in 1898 (Richardson & Spivey 2004) and was soon gained its popularity in the field of psychology as a measure of people’s conscious or unconscious attention, perception, and more recently, emotions. Unlike most other measurements commonly used in psychology, such as MIR, EEG, eye-trackers are particularly beneficial in measuring emotions due to its excellence temporal resolution and accuracy (Seeber,

2015). The Tobii screen-based eye-tracker used in this study was attached to the monitor screen and records participants' eye movements in a 60Hz, meaning that participants' gaze behaviours were captured 60 times every second. Another advantage of this remote eye-tracker is its non-invasiveness. It captures participants' by illuminating near-infrared light around participants' eye regions and takes high-resolution images through its cameras, meaning that it would not cause any disruptions when participants were thinking about an emotional experience or answering self-report questions about personal experiences, therefore, assuring the ecological validity of this project.

In addition to the Moneger et al study, which was discussed in the previous sections, eye-trackers have also shown to be useful in other studies to measure emotions. For example, a screen-based eye-tracker that was similar to this study was used to detect and differentiate emotions including "neutral", "disgust", "shameful" and "sensory pleasure". Imagery stimulus designed to invoke each of the four emotions were presented to participants when their pupillometric data was collected. Based on changes in pupil diameter, gaze fixations, attention maps, gaze speeds, and distance of gaze jumps, they reached ~90% accuracy in predicting the participants' emotional state, suggesting a relatively robust accuracy in detecting emotional changes (Maskeliunas & Raudonis, 2016). Similarly, in another study, a maximum of 76% accuracy was obtained when eye-trackers were used to detect and differentiate between "fear", "anger", and "surprise" (Lee et al., 2023).

**The Present Study**

The primary objective of this project was to examine whether shame and guilt can be distinguished by people's self-focused avoidance behaviour using modern eye-tracking devices. Thirty-five (four of them were excluded for reasons described below) undergraduate students

from Bard College were recruited in this study. They were randomly assigned to either the SHAME(n=14) or the GUILT (n=17) condition. I attempted to induce shame and guilt experimentally by asking participants to recall an autobiographical experience that elicits either shame or guilt while their gaze behaviours toward their face reflections were obstructively measured by the eye-tracker. In line with the current theory on self-focused avoidance behaviours, two hypotheses were made:

Hypothesis 1: People would exhibit more self-focused avoidance (measured as shifts away from their own reflection observed on a computer screen placed in front of the participants) when they are experiencing shame than guilt.

Hypothesis 2: People's pupils' phasic activity would be higher (indicating higher cognitive load and brain activation brought by rumination and thoughts of withdrawal) when people are experiencing shame than guilt.

# Method

## Ethic Approval

This study was approved by the Institutional Review Board in Bard College (case number 2024OCT30-SHA) (Appendix A).

## Participants

A total of 35 participants were recruited in this study; 5 of them were excluded because their eye-tracking data had exceeded the pre-designated track-loss percentage exclusion criteria, leaving 30 participants entering the reported analysis. Upon power analysis, the sample size in this project failed to provide sufficient power to detect either a large, medium, or small effect size, and will be discussed in detail in Discussion Section.

All participants were undergraduate students from Bard College, a Liberal arts college located in upper-state New York. Participants were recruited by recruitment fliers (Appendix B) posted on the walls around campus and distributed in classes. On the recruitment flier, although the true aim of this study was not fully disclosed, participants were told that this was an eye-tracker study so that participants' eye data would be tracked and recorded. They were also warned that participating in this study involves recalling personal experiences that arouse potentially negative emotions. In addition, the flier also states that there will be a $10 stipend for participating in this 20-minute experiment. The email address of the experimenter - I- was also on the flier so that people who are interested in the study are encouraged to contact me for more information. When I received emails expressing their interest in participating, a list of eligibility criteria was sent to all participants via email (Appendix B). This eligibility criterion stated that eligible participants must: 1) be comfortable recalling emotional and personal experiences, including negative ones; 2) not have a diagnosis of depression, bipolar disorder, or anxiety

disorder; 3) cannot consume alcohol or marijuana 4 hours prior to entering the study; and 4) are current Bard College students age between 18-25 years.

It is worth noting that most participants in this study were expected to be students majoring in psychology, as the fliers were mostly distributed in psychology classrooms.

## Research Design

The aim of this study was to empirically investigate the differential effects of experimentally induced shame and guilt on people's self-avoidance behaviour. This project had a between-subject design. All participants were randomly assigned to one of two conditions: SHAME or GUILT. Although it further limited the sample size in each condition, it was vital not to repeatedly use participants across these two distinct experimental conditions to avoid carry-over effects. Except when participants were instructed to recall a personal experience of either shame or guilt, the rest of the study was identical for all participants.

By experimentally inducing state shame and guilt in a laboratory setting, this study sacrifices some external validity in exchange for a more accurate report of state emotional experiences. As discussed in previous sections, autobiographical recall is the most suitable way to induce the targeted emotions with the benefits of reducing some potential confounders, such as individual differences in interpreting vignettes or the involvement of confederates.

The first dependent variable, self-focused avoidance behaviour, was operationalised as participants' gaze fixation and saccade into their reflections from the reflective black computer screen. The second dependent variable, emotional arousal, was operationalised as any increase in participants' pupil diameter. Both DVs were measured using a Tobii Screen-Based Eye-tracker.

In addition to eye-tracking data, both self-report state shame and guilt and trait shame and guilt data are also collected as manipulation checks for inducing emotions.

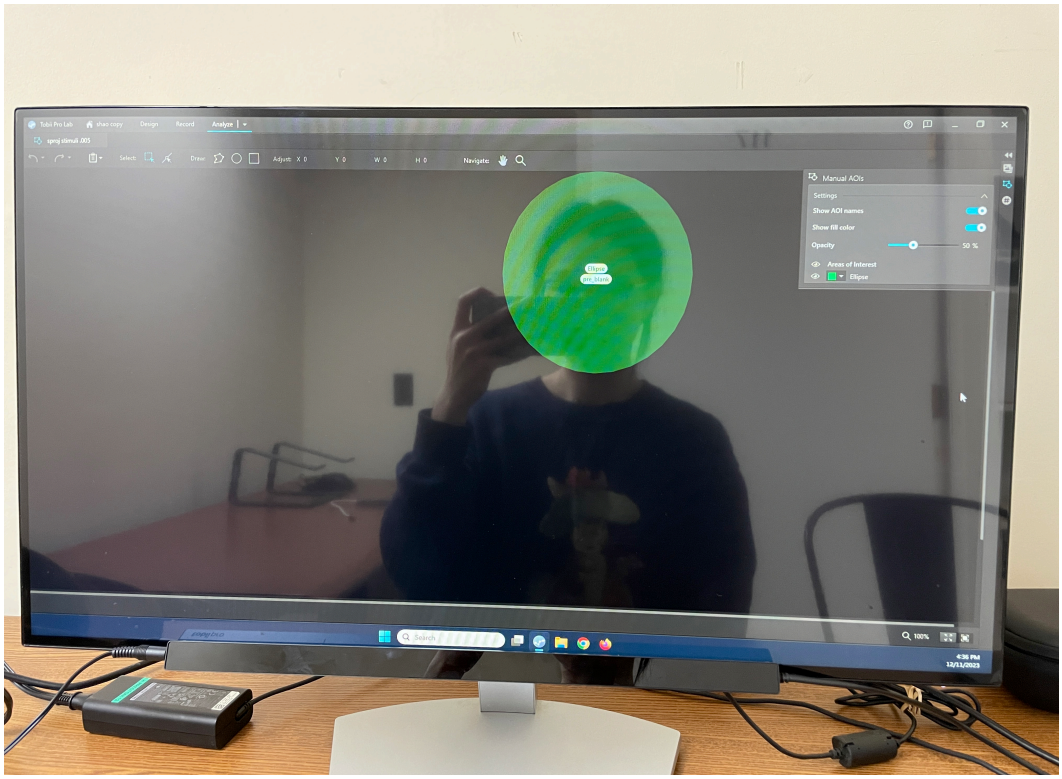
## Measures

### Measuring Self-focused Avoidance

Self-focused avoidance was one of the primary dependent variables in this study. It was operationalised as the dwell time (duration of fixation) and the number of saccades (number of times that participants' gaze moves into or out of the area of interest) the that participants spend on their face reflections from the black monitor screen. This study uses a reflective Dell monitor screen (resolution: 1920 x 1080; refresh rate: 60Hz). Using the screen-based Tobii eye-tracker (Tobii Pro Fusion) attached at the bottom margin of the monitor, gaze behaviour data was collected directly but unobtrusively throughout the eye-tracking phase of the study. Participants were all positioned prior to starting the eye-tracking task. To make sure that their faces were in the area of interest, they all sat in a way that the top of their heads was in line with the top margin of the monitor, and their facial reflections could be seen in the middle of the top half of the reflective monitor screen (Figure 2). This area of interest (AOI) was pre-designated when designing the experiment. When determining the AOI, two different confederates (one male and one female) who knew about the aim of the study but was not involved during data collection phase, were used. They were asked to sit comfortably in front of the eye-tracker with their hands on the keyboard. A circle that covers where their face was reflected from the screen was determined to be the AOI in this study.

**Figure 2:**

Area of Interest




As discussed in the introduction section, this modernised way of measuring self-focused avoidance behaviour has been practised in the Moneger (2022) study, where they also used eye-trackers to capture participants' gaze behaviour under SHAME and GUILT conditions from a reflective computer screen. They also agree that without disclosing any information on this study's interest in face reflections, participants should provide ecological data on avoidance behaviour, especially after they are all accustomed to the exposure of their face reflections in the previous face exposure task, which will be discussed in detail in the Procedure section.

The main time of interest for collecting participants' gaze behaviour was the 2 minutes where they were asked to recall a personal experience that elicited shame or guilt. During these 2-minutes, they were facing a completely blank screen so that their face reflections appeared clearly on the screen. This was the period of time that the eye-tracking data would be critically

examined, in particular, the duration of gaze fixations and number of saccades into their face reflections. Again, these was also the primary data of interest that was used in the Moneger et al (2022) study as an operationalisation of self-focused avoidance behaviour.

**Measuring Emotional Intensity**

In addition to the duration of fixation and number of saccades, pupil diameter was also collected as a measure of the participant's emotional arousal intensity. With the advancements in technologies, different versions of eye-trackers have emerged, including wearable googles, and in the case of this current project, a remote screen-based model. Existing research in the field of Affective Computing has suggest a relatively consistent correspondence between emotional intensity and pupil diameter. As emotional intensity increases, pupil diameter also gets larger as the result of norepinephrine (NE) release from the locus coeruleus (LC) (Oliva & Anikin, 2018).

**State Shame Guilt Scale (SSGS)**

As discussed in the previous section, the State Shame and Guilt Scale (Appendix C) was chosen to assess state emotions in this study because it was designed to differentiate between shame and guilt emotions. This scale consisted of 10 rating scale questions, divided into 2 parts that measures either feelings of state shame (questions 1, 3, 5, 7, 9) or guilt (questions 2, 4, 6, 8, 10). Each question was accompanied by a rating scale. The rating scales were identical across all questions where participants were required to rate from 1(not feeling like this) to 5 (strongly feeling like this) in response to descriptive statements about their feeling at the moment. None of those prompts mentioned the term "shame" or "guilt" therefore avoids participants' exhibiting demanding characteristics such as rating high levels of guilt because they were assigned into the GUILT group.

**Test of Self-Conscious Affect, Version 3 (TOSCA-3s)**

As discussed previously, the Test of Self-Conscious Affect, Version 3 (TOSCA-3s) was chosen to measure trait shame and guilt in this study because 1) it provides participants with situational contexts and 2) the scenarios described in this scale is commonly seen and relatable for undergraduate students (Appendix D). This scale consisted of 10 questions and each question was accompanied with 3 potential behaviours in response to the scenario described. Participants were asked to rate each behaviour (a, b, or c) on the rating scale from 1 (not likely) to 5 (most likely).

**Experiment Room Setup**

This study had a laboratory experimental design and was conducted in the BAP lab room in Bard College. The BAP room was located in the end of the hallway on the first floor of the Preston building in Bard College. It is an "L-shaped" room, consisting of a larger room with a desk and multiple chairs, and a smaller room with a monitor, a remote screen-based eye-tracker attached on the monitor, two chairs, a keyboard, and a laptop. Both rooms have no windows, therefore all light source in the eye-tracker room were controlled for across participants, including 1 overhead LED light, the experiment monitor, and laptop used as moderator during the eye-tracker phase (Appendix G).

The larger room is where the non-eye-tracking phases took place, including extracting consent from participants, illustrating experiment instructions, filling the questionnaire of trait shame and guilt, and the final debrief. The eye-tracker room is where the majority of the experiment took place. It has a heigh-adjustable chair for participants, and I will adjust it for every participant so that their eyes are around 68 -73 cm from the screen and their heads are facing the middle of the screen.

## Procedure

The data collection process was from December 1, 2023, to November 29, 2023. Since it started getting cold in November, to make my participants comfortable during the experiment, I always came to the room 20 minutes earlier and turned on the heater. After extracting the informed consent (Appendix G) from participants, the experiment would officially begin. First, I gave all participants a printed version of the experiment's general instructions, emphasising that it was very important to keep their heads still, not move their bodies abruptly, and not close their eyes or look away during the eye-tracking task. Then, I instructed them to take the height-adjustable chair in the eye-tracker room. I then gave them 2 minutes to make themselves comfortable in the chair while I adjusted their heights so that their faces were within the pre-designated area of interest. I also adjusted their distance from the desk so that their faces were 68-73 cm away from the screen (this distance is measured by the eye-tracker) before the calibration process officially started.

### Eye-tracking phase

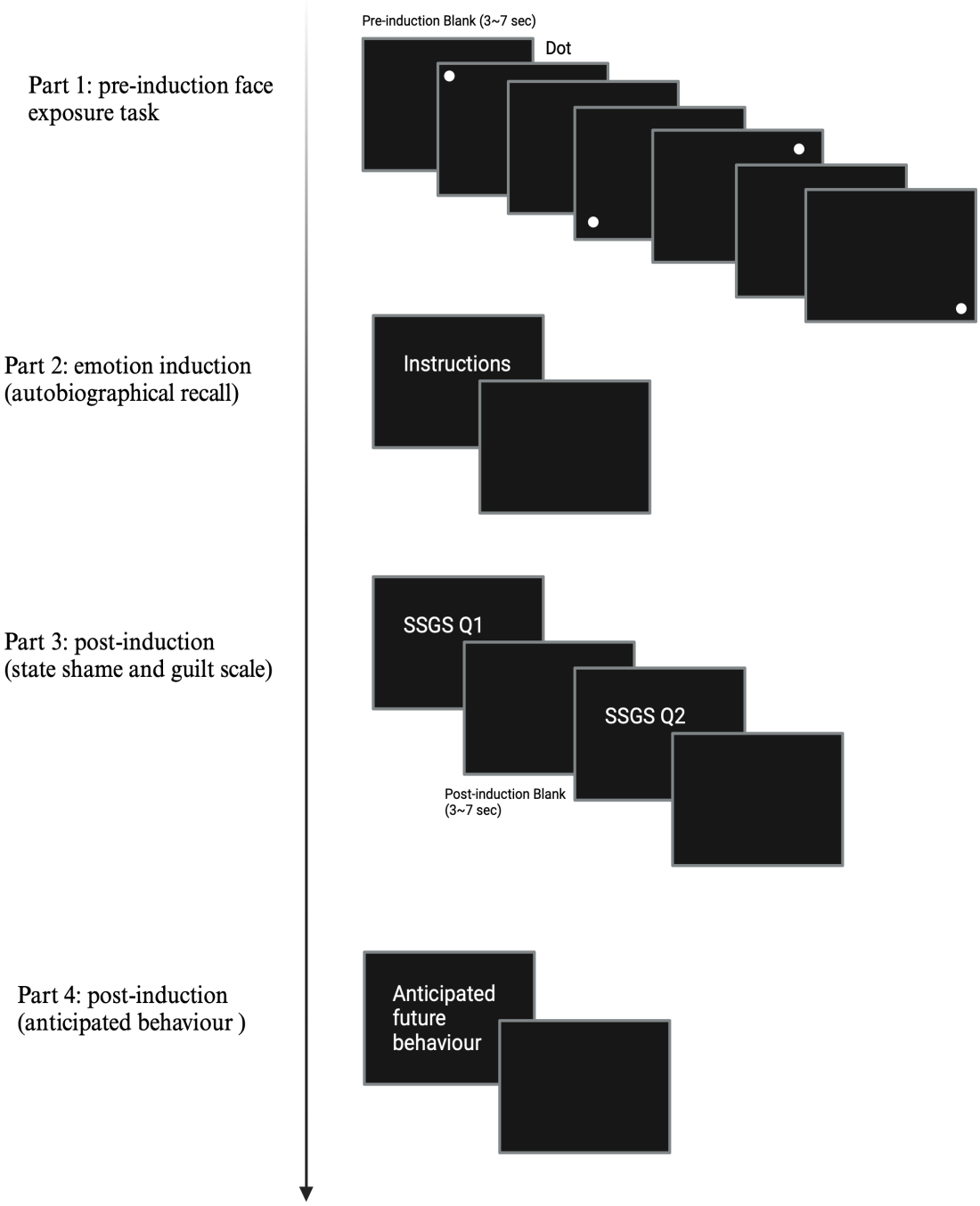
The eye-tracking phase consisted of 4 parts: 1) face exposure task, 2) emotion induction, 3) state shame and guilt scale questions (SSGS), and 4) anticipated future behaviour (Figure 1).

Once I made sure that all participants were comfortable in their seats and located in the pre-designated desirable positions, I let them know that the calibration session had started. The calibration section was a standard version of calibration process, implemented as from Tobbi in its default settings, that took around 30 seconds with a summarised table for calibration results. If data loss was shown to be more than 25%, the participant would proceed to the trial. Each participant had two chances of calibration. If data loss appeared to be more than 25% in both

calibration trials, this participant would be removed. Fortunately, no participant was removed at this stage of the study.

**Figure 1:**

Eye-tracking phase experimental procedure



**Dot-probe Task.** The eye-tracking phase began with a dot-probe task. Participants were required to press “F” on the keyboard if a dot appeared on the left side of the screen and to press “J” on the keyboard if a dot appeared on the right side of the screen. Here, the dots popped up randomly from each of the four corners of the screen, with a black screen that lasted randomly between 3-7 seconds in between dots. Each trial of the dot-probe task consisted of 1 blank screen and one dot screen, and a total of 20 trials were shown to all participants. This task was designed with three purposes: 1) to induce a neutral state of mind, 2) to familiarise participants with their own face reflections from the blank screen, and 3) to accustom participants to move their gazes around to explore the screen. Although a fixation cross would normally be used in between dots in most dot-probe tasks, it was replaced by a blank screen because it is important to make sure that participants are not trained to fixate their gazes in the centre of the screen and that they are covertly exposed to their own facial reflections prior entering the critical time of interest.

**Inducing emotions.** After 20 trials of the dot-probe task, participants were introduced to some basic definitions of guilt and shame through instructions on the screen. The first instruction screen showed them, "As humans, we have all done socially immoral things even when we know that we shouldn’t.” Some examples were also given: “e.g., lying to friends, lying to parents, cheating, stealing” and “Thinking of similar experiences could elicit either **shame** or **guilt**.” This screen would automatically proceed after 7 seconds. They were then given a brief basic definition of both guilt and shame. The instruction appeared: "**Shame** is when you feel like you are inherently bad. **Guilt** is when you realise that you have done something very bad but don’t feel like you are a bad person.”

Then the emotion induction part followed, where participants were randomly divided into two conditions - SHAME or GUILT - by the computer and asked to recall an autobiographical

experience. Those in the SHAME group were asked to "spend 2 minutes and think about one incident when you did something that made you feel **shame**." Whereas those in the guilt group were asked to "spend 2 minutes and think about one incident when you did something that made you feel **guilt**." To minimise the chance that they were confused or forgot the differential definition of shame and guilt, the meaning of either shame or guilt, depending on their condition, was also given to them here once again.

An additional slide, which was not planned initially, was shown before they officially started the 2-minutes autobiographical recall task. It was added because pilot test participants complained about not having enough material to think about during the entire 2-minute section. This slide provided participants additional guidance for the autobiographical recall session by telling them to "*not just think generally about what happened. Instead, relive the situation and think about all the details you can recall. For example, think about the clothes you wore, the weather that day, the person you were with, what the surrounding environment was like, etc.*" They were also asked to press the keyboard when they were to begin to make sure that all participants had a particular targeted incident in mind before starting the 2-minute countdown.

Then, the monitor screen turned black, with their facial reflections seen from the reflective screen, and the computer automatically proceeded to the next slide after 120 seconds.

**State Shame and Guilt**

The next part of this eye-tracking session required participants to self-report their feelings at this moment. Ten questions from the original state shame and guilt scale (SSGS) appears in sequence. One question appears in each slide with a 5-point rating scale below the question. Participants were asked to rate their feelings at this moment by pressing the keyboard.The next part of this eye-tracking session required participants to self-report their feelings. Ten questions

from the original state shame and guilt scale (SSGS) appeared sequentially. One question appeared on each slide with a 5-point rating scale below the question. Participants were asked to rate their feelings **at this moment** by pressing the keyboard. Similar to the dot-probe task, a blank screen would also appear between each question, lasting randomly between 3-7 seconds. It was designed to compare participants' gaze behaviour between pre-induction and post-induction blank slides for an additional exploratory analysis.

A slide on their anticipated future behaviour was shown following all ten questions. The question asked them to rate the likelihood that they anticipated themselves repeating what they were thinking about again. Once again, this data was collected for an additional exploratory analysis.

**Trait Shame and Guilt .** After completing all parts of the eye-tracking phase, participants were invited to return to their seats in the large room, where they were filling out the informed consent form. They were given a 3-page printed Test of Self-Conscious Affective (TOSCA) scale as the self-report measure of their trait emotions. It was designed to provide potential explanations if participants did not elicit the assigned emotion. Before they started the questionnaire, I told them that I would be sitting in the eye-tracker room until they completed the scale and that they should leave the questionnaire on its back (so that I wouldn't be able to see their answers) when they were done.

# Results

## Transparency

The primary data analysis plan was pre-registered before the start of data collection process (Appendix H). All relevant materials, including data and analysis codes are available online. Data were first cleaned in Microsoft Excel version 16.79.1 and then analysed in R version 2023.09.1.

## Registered Primary Analysis

### Data cleaning

I had three main categories of dependent measure: 1) eye-tracker data on fixation, saccade, and pupil diameter, 2) self-report state shame and guilt data indicated by keyboard presses, and 3) self-report trait shame and guilt data from printed TOSCA-3 scales.

As discussed in previous sections, the 2-minute period where participants were asked to think about the shame/guilt eliciting events was the main time of interest in this project, therefore, eye-tracking data within this time of interest (TOI) was first exported in its metric version from each eye-tracking recording from Tobii Lab Pro. The Tobii Lab Pro is equipped with a pre-set filter that transforms raw eye-tracking data into metrics in terms of fixation, saccades, and pupil diameter inside pre-designated AOIs. This project used this standardised Tobii fixation filter that transforms eye data into fixation when a gaze land in the AOI between 50 to 600 ms.

Then, the trait shame and guilt scores were assessed by adding up participants' numeric response to each questions according to the TOSCA-3 rubric. Also, state shame and guilt scores were assessed after keyboard responses were exported from each eye-tracking recording.

It was worth nothing that participants 1, 4, 6, 11, 16 were excluded from analysis because collected gaze sample were <70%, which exceeded the pre-designated exclusion criteria for track-loss.

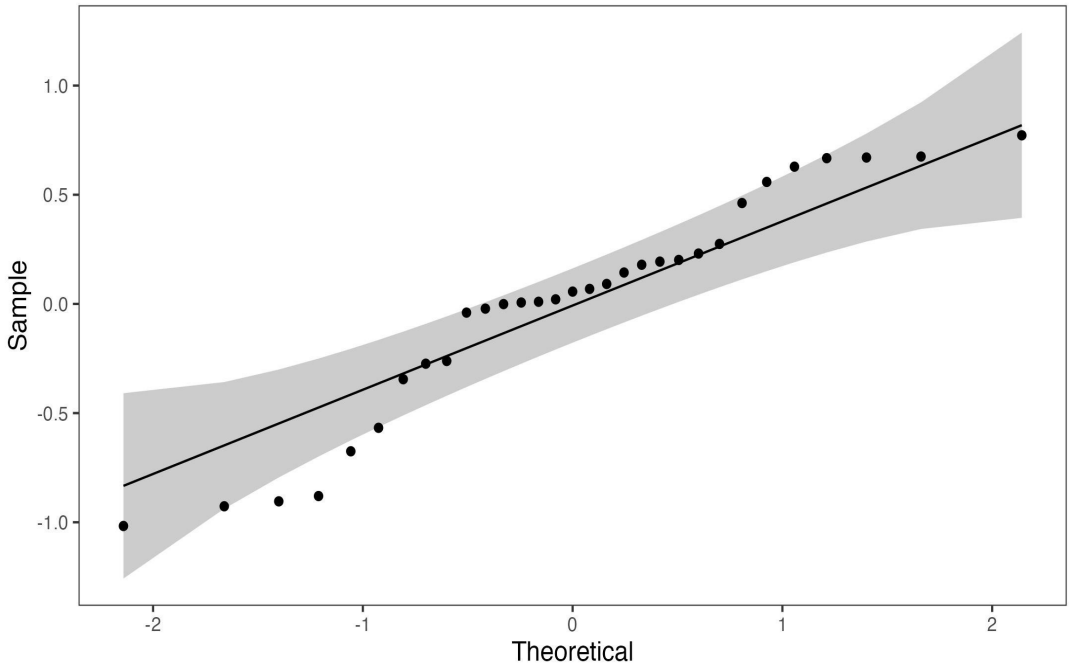
**Primary Analysis**

After all included participants' (N=30) were cleaned, the Excel data file was imported into R.

**Normality tests.** First, Shapiro's tests were performed on fixation duration, number of saccades, and pupil diameter to check whether the data were normally distributed. Unfortunately, all of them failed to conform the normal distribution (*ps*<0.05). This was, perhaps, not entirely unexpected due to the exceptionally small sample. However, this project still proceeded using parametric testing despite of the suboptimal normality because 1) for more direct comparison purposes and 2) more recent studies have showed that t-test is still a relatively robust test for non-normal population. As discussed in the previous sections, the dependent variable - fixation duration and saccades as measures of self-avoidance - in this current project is mostly the same as what were used in the Moneger et al. (2022). Therefore, using similar statistical testing would be helpful for us to compare the results in this study with results generated from the Moneger et al. study as an attempt to see whether changing measures of shame and guilt and how emotion were induced would lead to different findings. In addition, scholars have recently began to argue that normality test may not be of the primary necessity when it comes to running parametric tests (Weaver, 2011) as it naturally gets easier to fit into normality when a population size is large enough. Given the particularly small sample size in this current project, it was not surprising to find a non-normal distribution. Along with the small power that this project had, results in this project should only be considered as inferences for future large-scale studies. With that being

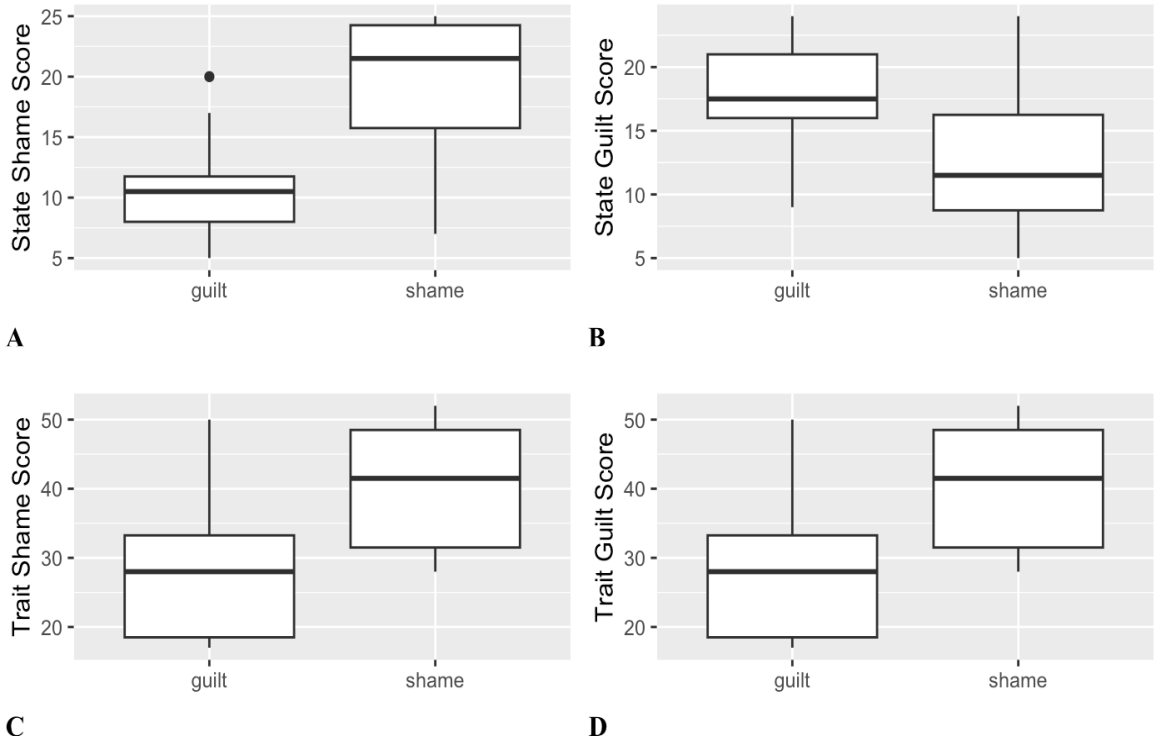
said, the normality q-q plot graph (Figure 2) still suggested a close to normality pattern of data in this project.

**Figure 2: Q-Q Plot on Normality**




**Manipulation checks.** Independent t-tests were then conducted between two experimental conditions (SHAME or GUILT) on their state shame and guilt scores as manipulation checks. Results showed that participants who were assigned to the experimental SHAME condition reported higher state shame score ($M$ = 19.25, $SD$ = 6.02) than those individuals who were assigned to the GUILT condition ($M$ = 10.571, $SD$ = 4.45) ($t$ (26.779) =4.624, $p$<0.001). Also, participants who were assigned to the GUILT condition reported higher state guilt score ($M$=16.44, $SD$=4.79) than those assigned to the SHAME condition ($M$ = 12.88, $SD$ = 6.11) ($t$ (27.143) =-2.430, $p$=0.022) suggesting that the manipulation worked.

**Figure 3: Manipulation Checks**




Here are four independent t-tests performed between experimental conditions (shame or guilt) on participants' a) state shame score, b) state guilt score, c) trait shame score, and d) trait guilt score. Result suggested that the manipulation was successful since those in the SHAME condition scored higher on both state and trait shame scales and those in the GUILT condition scored higher on both state and trait guilt scales.

**Duration of Fixation.** It was predicted that participants in the SHAME condition would exhibit less fixation on AOI during the 2-minute TOI than those in the GUILT condition.

An independent t-test was conducted between SHAME and GUILT experimental conditions on fixation duration during the 2-minute time of interest. Results showed that participants in the GUILT condition had a longer duration of fixation ($M$=5420, $SD$=7222.4) than those in the SHAME condition ($M$=316.6, $SD$=826.82) ($t$ (13.38)=2.677, $p$=0.019).

Then, as pre-registered, a multiple regression ($F$ (5, 24) = 6.158, $p$=0.0008, $R2$ = 0.562) was also performed to predict participants' fixation duration on their face reflections. Predictors were assigned experimental conditions, trait shame score, trait guilt score, the interactions between emotional conditions and trait shame, and the interaction between experimental conditions and trait guilt scores. This model suggested no main effect of trait guilt scores ($t$ (24) = -0.708, p=0.486) or interaction between experimental conditions and trait guilt scores ($t$(24) = 0.751, p=0.460). Nonetheless, a moderate (close to significant) negative correlation between the experimental SHAME condition and fixation duration was detected ($t$ (24) = -1.715, $p$=0.099). This model also suggested a strong interaction between experimental SHAME condition and trait GUILT score on fixation durations ($t$ (24) = 2.267, $p$=0.033). Finally, a particularly strong negative correlation was observed between trait shame score and participants' fixation duration ($t$ (24) =-2.886 $p$=0.008) (Figure 4.1, 4.2).

**Figure 4.1**

Shorter Fixation Duration Predicted by Higher Trait Shame Score While Participants in Guilt Condition Exhibited Longer Fixation Than Those in Shame Condition

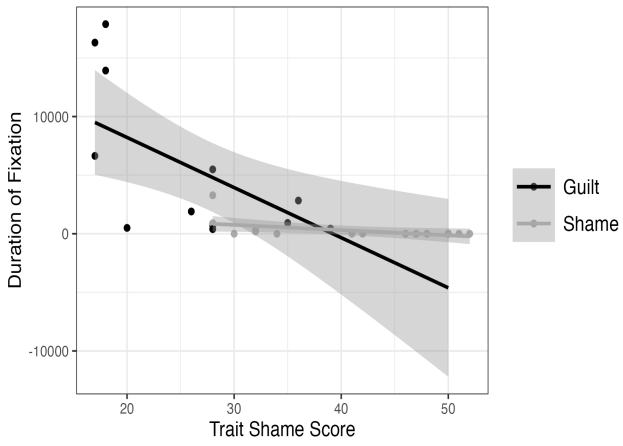
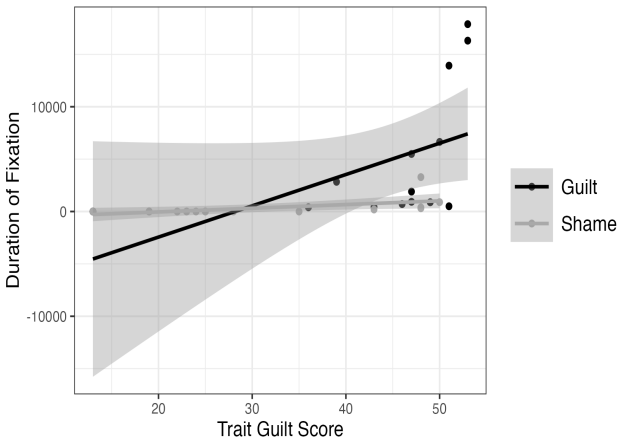



**Figure 4.2**

Longer Fixation Duration Predicted by Higher Trait Guilt Score While Participants in Guilt Condition Exhibited Longer Fixation Than Those in Shame Condition



**Number of Saccades.** Similarly, I hypothesised that participants in the SHAME condition would exhibit less saccades on AOI during the 2-minute TOI than those in the GUILT condition.

Here, an independent t-test was performed between SHAME and GUILT experimental conditions on the number of saccades that occurred during the 2-minute time of interest. Results showed that participants in the GUILT group had a higher number of saccades ($M$=2.75, $SD$=2.44) than those in the SHAME group ($M$=0.38, SD=0.81) ($t$(13.742)=2.512, $p$=0.025).

Another multiple regression model was performed to predict participants' number of gaze saccades on their face reflections. The same predictors were applied here in this model again, namely, assigned experimental conditions, trait shame score, trait guilt score, the interaction between emotional conditions and trait shame score, and the interaction between emotional conditions and trait guilt scores ($F$ (5, 24) =4.487, $p$=0.007, $R2$=0.468). Similar to the last regression model where fixation duration was used as the dependent variable, in this model, no main effects were found between number of saccades and the trait guilt score ($t$ (24) = --1.027, $p$=0.315) or the interaction between emotional conditions and trait guilt scores ($t$ (24) = 1.147, $p$=0.263). However, a moderate negative correlation was found between the experimental SHAME condition and the number of saccades on the face reflection ($t$ (24) = --1.818, $p$=0.081). Also, trait shame was found to be negatively correlated with saccades ($t$ (24)=--2.627, $p$=0.015), whereas a positive interaction was found between experimental shame condition and trait shame scores ($t$(24)=2.083, $p$=0.048) (Figure 4.3, 4.4)

**Figure 4.3**

Fewer Number of Saccades Predicted by Higher Trait Shame Score While Participants in Guilt Condition Exhibited More Saccades Than Those in Shame Condition

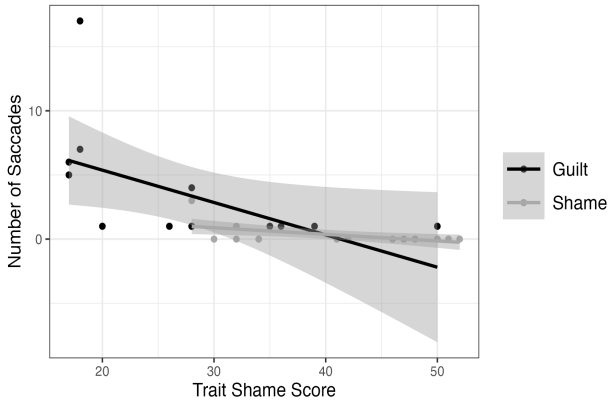
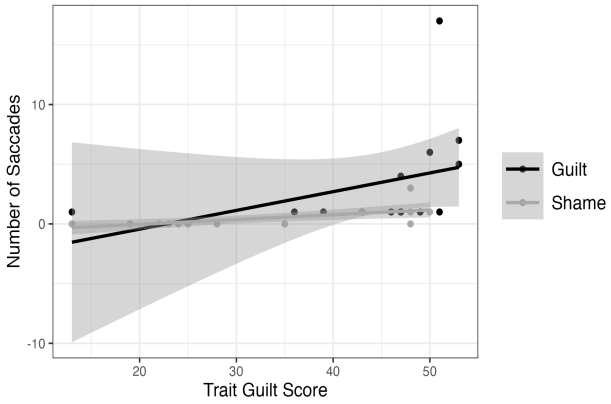



**Figure 4.4**

More Number of Saccades Predicted by Higher Trait Shame Score While Participants in Guilt Condition Exhibited More Saccades Than Those in Shame Condition




**Pupil Diameter.** Once again, an independent t-test was used to compare the SHAME and GUILT conditions on their pupil diameters during the 2-minute interval. It was predicted that participants in the SHAME condition would exhibit larger pupil diameter than those in the GUILT condition. However, results from the t-test showed no strong difference between SHAME and GUILT conditions on pupil diameter ($t$(26.412)=-1.071, $p$=0.204). Despite of the null result from this independent t-test, I still decided to proceed to perform a multiple regression because sometimes variables may still have multivariate relationships when other variables, such as trait shame and trait guilt score, are added even though there initially was no bivariate relationship between the two experimental conditions. Unlike the last two models, which were only concerned with gaze behaviour towards the AOI (face reflections), this model used participants' pupil diameter throughout the 2-minute critical time of interest regardless of where on the screen the eyes were looking. Predictors in this model were, once again, assigned experimental conditions, trait shame score, trait guilt score, the interaction between emotional conditions and trait shame score, and the interaction between emotional conditions and trait guilt scores ($F$ (5, 24) =0.949, $p$=0.468, $R2$=0.165). Unfortunately, no main effect was detected in this model ($F$ (5, 24) =6.158, $p$>0.05, $R2$=0.165).

**Window Analysis.** The Window Analysis on participants' gaze patterns between the SHAME and GUILT groups was originally pre-registered as one of the primary analyses. However, the R Package proposed for this analysis was found to be non-compatible with data generated from Tobii screen-based eye-trackers. Fortunately, it was discovered that Tobii Pro Lab has a feature for plotting window analysis graphs. Therefore, this pre-registered window analysis was not carried out as the primary analysis; instead, it was shifted to an exploratory analysis, which would be discussed in the following Exploratory Analysis section.

## Exploratory Analysis

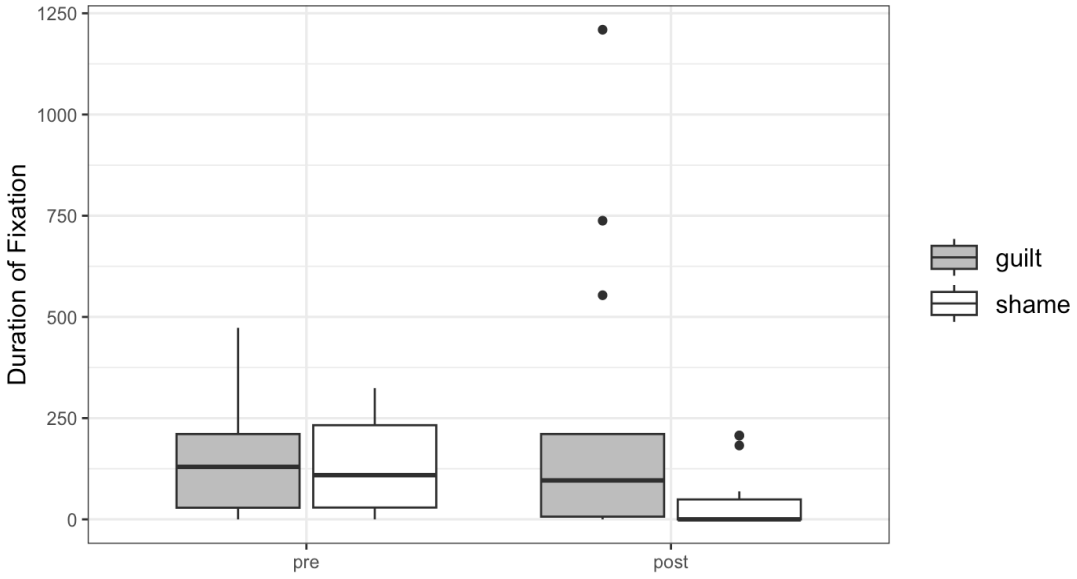
**Pre vs. Post Induction.** Apart from the registered analyses, I have also performed several analyses for exploratory purposes. First, in addition to the 2-minute time of interest, I was also interested in whether the induction of emotions (shame or guilt) had lingering effects on people's self-avoidance behaviour during post-induction blank intervals. Therefore, a two-way ANOVA was performed between the impact of induction and the emotion induced on fixation duration. Results suggested a strong main effect of experimental condition on fixation duration ($F$=4.309, $p$=0.042) and a marginal (close to significant) interaction between experimental condition and emotional induction ($F$=3.56, $p$=0.06) (Figure 5.1). Following the two-way ANOVA, a Tukey post-hoc test was also performed to determine the specific direction between the main effect of the experimental condition. The Tukey HSD test showed that after the 2-minute emotional induction, participants in the SHAME condition continued to show lower fixation on their face reflections than those in the GUILT condition (diff = -195.27, adjusted p= 0.034).

It is an interesting finding. Since no strong difference was detected between SHAME and GUILT conditions on gaze behaviour pre-induction, and such difference was later detected post-

induction (SHAME group lower than GUILT group). This may suggest potential self-withdrawal when participants were induced by feelings of shame.

**Figure 5.1**

Fixation Duration by pre/post Induction and Emotional Conditions




Strong difference between conditions were not initially detected prior to emotion induction (pre) but was detected post-induction. Specifically, participants in the SHAME group showed self-withdrawal whereas those in the GUILT group did not.

**Anticipated Behaviours.** In addition to self-avoidance behaviour, I also collected data on participants anticipated future behaviour by asking them to rate from 1-5 on the likelihood that they anticipated themselves doing the shame or guilt-eliciting behaviour again. Here, an independent t-test was conducted to investigate whether there is a difference in anticipated behaviour between participants in the SHAME and GUILT conditions. However, the t-test result showed the anticipated behaviour in SHAME condition ($M$ = 3.471, $SD$=1.49) was not strongly different from those in the GUILT condition ($M$=4.214, $SD$= 1.57) ($t$ (28.9)=1.429, $p$=0.161).

This finding is in contrast with previous research (as discussed in Introduction Section), where shame was found to be positively correlated with recidivism whereas guilt was found to be negatively correlated with recidivism.

**State Scale Versus Trait Scale.** By capturing differences in self-avoidance behaviour between SHAME and GUILT conditions, this project was designed as an attempt to introduce an eye-tracker as a potential way of distinguishing between shame and guilt. Two self-report questionnaires were used in this study as the manipulation check. However, I was also interested in investigating which of the two self-report scales is better at predicting self-avoidance behaviours as way an indirect way of distinguishing between shame and guilt. Therefore, a multiple regression model on the fixation duration was conducted once again, with both a composite state shame and guilt scale and the composite trait shame and guilt scale as predictors. The state composite scale was made by dividing the state shame scores by the state guilt scores. It means a higher positive score on the composite indicates a higher shame score, whereas a lower negative score indicates a lower guilt score. The trait composite scale was made in the same way. This regression model ($F$ (3, 27) = 6.14, $p$=0.003, $R2$=0.406) suggested that while the trait scale is strongly in reverse correspondent with participants's gaze behaviour ($t$(27)=-3.934, $p$=0.0005), the state scale is surprisingly not ($t$(27) = 1.535, $p$=0.136). It means that a higher score on the trait composite scale is strongly correlated with fewer eye fixations, which also indicates more self-avoidance behaviour. Therefore, according to this exploratory model, the trait shame and guilt scale (TOSCA-3) could be a better measurement for self-avoidance behaviours than the state shame and guilt scale (SSGS).

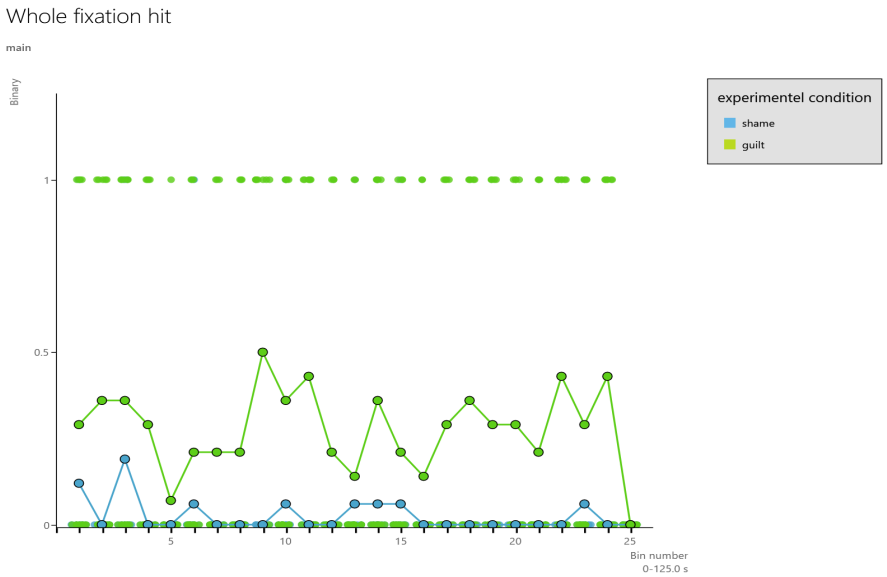
**Window Analysis.** As pre-registered, a window analysis was used to determine participants' gaze patterns in binned intervals during the TOI. However, instead of plotting it in

R, I decided to plot it in the Tobii Pro Lab software as I wasn't aware of this feature in Tobii at the time of pre-registration. The default plotting setting in Tobii Pro Lab was used to plot this graph (Figure 4.5). In this default setting, participants' gaze behaviours, which were captured at 60Hz, were binned into 500ms intervals. Binning refers to the process of grouping continuous time duration into discrete time intervals. It is a useful method in this project because analysing eye data at 60Hz is much more than necessary and is more difficult to interpret.

As we can see here, although gaze behaviours in the GUILT group consistently generated more fixation hits into AOI than those in the SAME group, there's a noteworthy peak of fixation at the very beginning of the TOI for participants in the SHAME group. A potential explanation could be that participants first noticed their facial reflections on the screen and decided not to look at it to fulfil their self-avoidance desire. It is interesting because it could suggest that instead of fixating at a place outside of AOI, people experiencing shame would also move their eyes to explore the reflective surface until they saw their own reflection. Then, consciously or unconsciously, they wanted to escape and avoid their own reflections, indicating a form of self-avoidance behaviour.

**Figure 4.5:**

Plot of eye fixation on AOI group by binned time intervals




Plot on participants fixation hit on AOI during 2-minute TOI over binned time intervals.

# Discussion

## Alternative Explanations

In sum, this project did not find enough evidence to completely reject the null hypothesises. Two hypothesises were made in the beginning of the project. First, we hypothesised that people in the SHAME condition would exhibit less self-avoidance behaviour than those in the GUILT condition. Although independent t-test supported this as people in the SHAME condition showed less fixation and saccades toward their face reflections, only the experimental SHAME condition had a marginal effect on both fixation and saccades after other factors, including trait shame and trait guilt scores were included in the multiple regression model. The second hypothesis was that people in the SHAME condition would exhibit larger pupil diameter than those in the GUILT condition. Result didn't reject null because no strong difference was detected between people in the SHAME and GUILT conditions on their pupil diameter. Instead of rejecting the hypothesise at once, let's discuss some potential alternative explanations for the results found in this project.

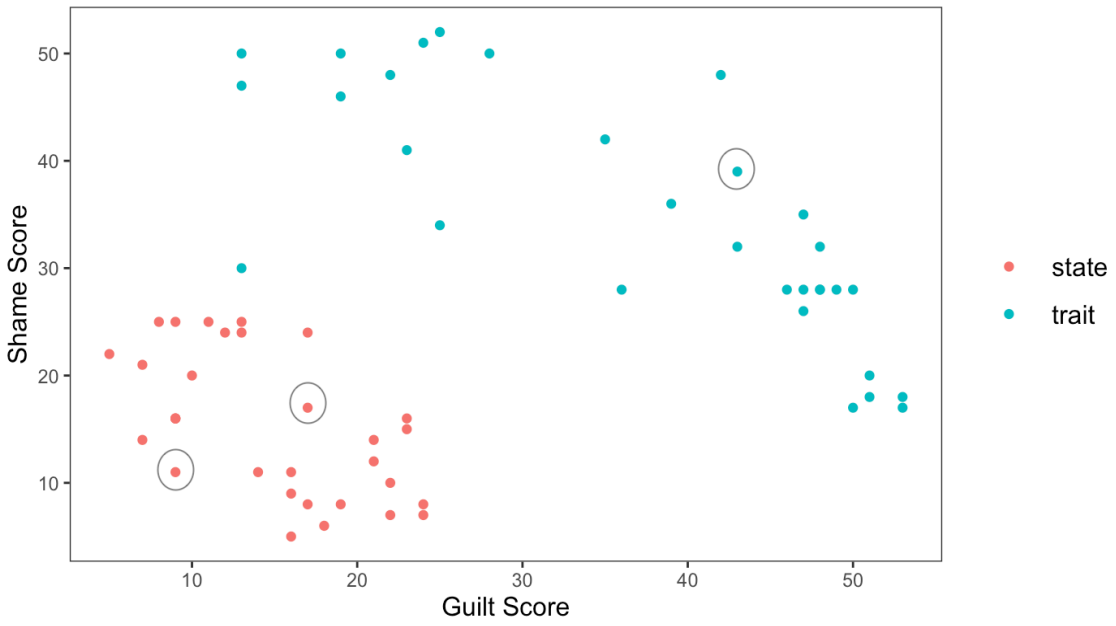
### Usefulness of a Composite Score Instead of Distinct Shame and Guilt Scores

The particularly small sample size in this project raised the possibility that individual factors may exert a larger-than-desired influence. For example, self-report styles may vary from person to person. Since both the state and trait scales treated shame and guilt as two separate scores, it was possible for a person who is more emotionally intense to exhibit self-avoidance behaviour while providing a high guilt score and an even higher shame score. Likewise, a person who does not prefer giving extreme ratings (1 or 5) may consciously choose the middle option (3) or more moderate choices despite of intense feelings experienced internally.

After plotting the trait and state data, some dots were observed on the top right corner (high trait shame and high trait guilt scores) or the bottom left corner (low state shame and low state guilt scores) (Figure 5). Therefore, one potential alternative explanation could be that the self-reports may not be the most valid measure in assessing people's emotions under a small sample size.

**Figure 5**

Scattered Dot Plot on Fixatoin Duration and Different Scale Types




This scatter plot illustrates individual scores from both the State Shame and Guilt Scale (SSGS) and the Test of Self-Conscious Affect (TOSCA) scale. Each dot represents an individual's guilt and shame scores, with the x-axis representing guilt scores and the y-axis representing shame scores. State scores are denoted by red dots, while trait scores are represented by blue dots. Three circled dots highlight instances where participants exhibited similar scores for both shame and guilt.

**Other Factors Affecting Pupil Dilation**

An alternative explanation for the observed null effect in the difference in pupil diameters between experimental conditions could be that emotional arousal may not be the sole factor

contributing to an increase in pupil diameter. Recent research has suggested that, in addition to emotional arousal, non-emotional tasks involving decision-making could also lead to pupil dilation, depending on participants' confidence level in their judgements. Specifically, pupil diameter is the largest when a person is receiving intensive emotional stimuli while having less confidence in their judgements (Oliva & Anikin, 2018). During the main Time of Interest (TOI) – the 2-minute induction phase – participants were directed to re-experience an emotionally intense incident that elicited either shame or guilt. As discussed at the beginning of this paper, feelings of shame and guilt typically involve morally relevant decision-making processes. Therefore, a plausible explanation for the null effect could be that individuals' pupil diameters vary depending on their levels of confidence specifically concerning the moral decisions made during the induction phase.

**Failed Emotion Induction**

The last potential explanation for the null effects observed between guilt conditions and gaze behaviours could be a failure to induce guilt. However, results from my manipulation checks would not support this alternative explanation because those in the GUILT condition scored higher in both state guilt and trait guilt scores than those in the SHAME condition, suggesting that guilt was successfully induced in the experiment.

## Limitations and Future Directions

### Small Sample Size

One major limitation of this project is its notably small sample size - comprising only 30 participants. Such a small sample size raises concerns about the validity and generality of the findings. For example, individual variables could be disproportionately pronounced in this study. As discussed previously, people may have different preferences in reporting their emotional feelings, leaving their state and trait scores not accurately capturing how they truly felt. Additionally, despite efforts made to standardise experimental instructions and setups, it was still challenging to maintain an identical environment across participants. For instance, the eye-tracking lab used in this project shares a non-soundproofing wall with the department theatre. During one experiment, the theatre started playing a movie, and the noise could have interfered with that participant's performance during the eye-tracking phase. Fortunately, when asked whether they noticed the noise next door, the participants responded that they did not notice any disturbance. Therefore, although it could be possible that the participant was still affected unconsciously, this experiment trial was not excluded.

Also, such a small sample size could not enable this project to capture the behaviour of a diverse population. In fact, most participants in this project were psychology students because more fliers were distributed during psychology classes than elsewhere on campus. Ideally, this would be manageable since topics related to this project, such as shame and guilt, are not explicitly taught in the psychology curriculum. However, it is worth considering that students who chose to study psychology share some similarities, including general interests in one's mental well-being and emotions, undermining the generalisability of applying the findings of this study to a more general population.

Furthermore, the small sample size also limited the statistical power of this study. As discussed in the Method section, this product could not provide sufficient power to a large, medium, or small effect size. Therefore, findings generated from this study should be viewed as insights for potential pathways and future replications with larger and more diverse populations are strongly encouraged.

**Suboptimal Normality, Floor Effect, and Outliers**

As mentioned previously, neither fixation duration nor saccades were found to conform to normal distributions. It was not unexpected due to this project's small sample size, and I decided to proceed to use pre-registered paramedic tests for comparison purposes. Nonetheless, a future study involving a larger population is still desired to replicate this project on normally distributed data. In addition to the subnormality, a floor effect on both eye fixations and saccades from participants in the experimental SHAME condition can be clearly observed in Figures 4.1, 4.2, 4.3, and 4.4. As the data suggested, most participants in the SHAME condition did not look at their face reflections throughout the TOI, yielding "0" for both fixation duration and saccades. While it may indicate a surprisingly strong effect of induced shame on self-avoidance, this floor effect could be problematic in terms of capturing the full effects of shame. Therefore, future studies could also explore whether there are methods to selectively induce various levels of shame and examine how these varying levels may affect self-avoidance differently compared to different levels of guilt, providing us with a more comprehensive understanding of their distinct impacts on self-avoidance behaviours.

Also, other than those that were excluded due to the large loss of gaze sample, no other recordings were excluded. An exclusion test was once performed on dependent variables in an attempt to identify recordings that decanted from more than 2.5 median absolute deviations from

the median. However, six recordings were identified as outliers, leaving the rest of the data insufficient to perform multiple regressions as pre-registered. Therefore, these outliers were not excluded, and their threat to this study's internal validity is acknowledged here.

**Validity of Self-Reports**

Apart from limitations from a statistical perspective, this study also faces methodological constraints. Two of the three predictors, namely state shame and guilt as well as trait shame and guilt, relied on self-report measures. Participants were briefly introduced to the distinction between shame ("I am a bad person") and guilt ("I did a bad thing") before providing self-reports and were instructed to contemplate either shame or guilt. Consequently, demand characteristics may have occurred, as participants might not have answered the state and trait questionnaires based on their true feelings but rather considered what they **should** feel in that particular condition. However, since the primary goal of this project was to develop another measurement - the eye-tracker - to distinguish between shame and guilt, it would be contradictory to its own goal if the study relied on using established shame and guilt scales to retrospectively divide participants into conditions.

That said, future studies should also strive to establish more valid methods for differentially inducing shame and guilt under experimental settings. With an established method to elicit shame and guilt, respectively, experimenters can confidently determine the conditions to which participants are assigned and which emotion is being elicited without relying solely on self-reports. Subsequently, the validity of using eye trackers in distinguishing between shame and guilt can be studied with increased confidence, as the experimental conditions would be more accurately controlled and defined.

### The Mogener et al. study and Implications

Findings in this project generated a mixed attitude towards previous related research. Although this study adapted various measures used in the Moneger et al. study, including the modernised version of the mirror paradigm and the use of eye-trackers, results are vastly different between this current project and the Moneger et al. study. In the Moneger et al. study, only the trait guilt-proneness, but not shame, was found to be correlated with self-avoidance behaviour, whereas in this project, only shame, but not guilt, was found to be correlated with self-avoidance behaviour, and this relationship is only moderate. On the one hand, this current project contradicts the most recent attempt to empirically study shame and guilt in terms of gaze behaviours (Moneger et al., 2022). On the other hand, this moderate effect was in line with most theoretical models that distinguish between shame and guilt, including the original Objective Self-Awareness Theory (OSA) and the antecedent model of shame and guilt, where shame is posited to be correlated with hiding and avoidance (Duval & Wicklund, 1972; Tangney, 2007).

However, this supportive result was only in the bivariate relationship between emotional conditions and gaze behaviours. After adding other regressors, as shown in the regression models, the correlation between experimental SHAME condition and gaze behaviours was reduced to a marginal effect. Furthermore, the positive correlation between experimental GUILT condition and gaze behaviours was diminished in the regression model. This exciting effect of trait shame and guilt pointed us to a new question: “What does it take to overwrite one’s trait emotions?” Findings in this study suggest it depends - it really takes a lot (Spielberger et al., 1971). As existing theories mean, trait emotions are relatively stable for each individual across different situations, and it was surprisingly difficult to overwrite one’s trait shame by inducing guilt. Since all participants were randomly assigned into either shame or guilt conditions without

knowing their trait shame and guilt scores, 3 participants in the shame condition had higher trait shame than guilt scores in the later TOSCA scale. Interestingly, eye-tracking results showed that all of them exhibited gaze fixations toward their face reflections, whereas none of the other participants in the same condition (who scored higher in trait shame than trait guilt scores) did. In other words, among all participants who induced shame, those who had higher trait guilt than shame scores protected them from exhibiting self-avoidance behaviour. However, none of the participants assigned to the guilt condition showed higher trait shame and guilt scores. Therefore, no inferences could be made regarding trait guilt versus inducing guilt.

## Conclusion

In conclusion, this current project aimed to investigate whether eye-tracking technology can be used to distinguish between shame and guilt by measuring people's self-avoidance behaviour using the modernised version of the mirror paradigm. A total of 35 participants were recruited, and 5 of them were excluded, leaving a total of 30 participants in this study. This project experimentally induced shame and guilt by asking participants to recall an autobiographical experience that either elicited shame or guilt. Using the Tobbi eye-tracker, self-avoidance behaviour was measured by people's gaze behaviour (fixation duration and number of saccades) towards their own face reflection during the 2-minute critical time of interest. Results suggested that the manipulation was successful as participants in the shame condition had higher state shame scores, measured by the state shame and guilt scale, than their counterparts in the guilt condition, whereas those in the guilt condition had higher guilt scores than their counterparts in the shame condition. Two hypotheses were made prior to the experiments: 1) participants in the SHAME group would exhibit more self-avoidance behaviour than those in the GUILT group, and 2) participants in the SHAME group would exhibit higher pupil phasic

activity than those in the GUILT group. Unfortunately, only marginal effects were found in this study. The first hypothesis was partially supported as, on the one hand, the t-tests suggested that those in the GUILT condition exhibited more fixation and saccade than those in the SHAME condition. On the other hand, the multiple regression models suggested that this negative correlation between shame and gaze behaviours were reduced once other regressors, such trait shame and guilt were involved. The second hypothesis, unfortunately, was not supported because neither the independent t-test nor the regression model showed the difference between shame and guilt on pupil diameter.

In addition to the main analyses, a series of exploratory analyses were conducted, and although the results from these analyses are considered exploratory and should be interpreted with caution, they revealed some intriguing trends. First, when comparing fixation duration before and after emotional induction, the results suggested a potential self-withdrawal response to feelings of shame. Specifically, while no differences between experimental conditions were observed in fixation durations before emotion induction, participants in the SHAME group exhibited less fixation than those in the GUILT group after being induced with shame.

Contrary to existing theories, no significant difference between experimental conditions was found in reported anticipated recidivism. Additionally, when comparing the trait scale (TOSCA) with the state scale (SSGS), the results suggest that the trait TOSCA was more in correspondence with self-avoidance gaze behaviours, implying that future studies may benefit from using this scale to measure shame and guilt. Nevertheless, it is essential to emphasise that findings from these exploratory analyses should be considered as suggestive or guiding for future investigations.

This project serves as a pioneer in using eye trackers to distinguish between shame and guilt. It contributes to the current theoretical frameworks by using a modern version of the mirror paradigm to differentiate shame and guilt from participants' self-avoidance behaviours. Due to the time and resource constraints, this study has a small sample size and insufficient power. However, the importance of growing out of self-report measures and developing reliable eye-tracker systems to detect shame and guilt cannot be over-exaggerated. Such an objective measure of shame and guilt will bring significant contributions to potential cross-linguistic studies that examine shame and guilt in non-native English speakers, developmental research on participants who cannot read or write, or even clinical studies on potentially autistic patients facing challenges in self-reporting emotional experiences.

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Rüsch, N., Corrigan, P. W., Bohus, M., Jacob, G. A., Brueck,

# Appendix A: IRB Ethic Approval

Bard College Institutional Review Board

Date: 10/30/2023
To: Shuai Shao
Cc: Justin Hulbert; Nazir Nazari
From: Ziad M. Abu-Rish, IRB Chair
Re: Pupil activity under different emotional states - an eye tracker study

**DECISION: APPROVAL**

Dear Shuai Shao:

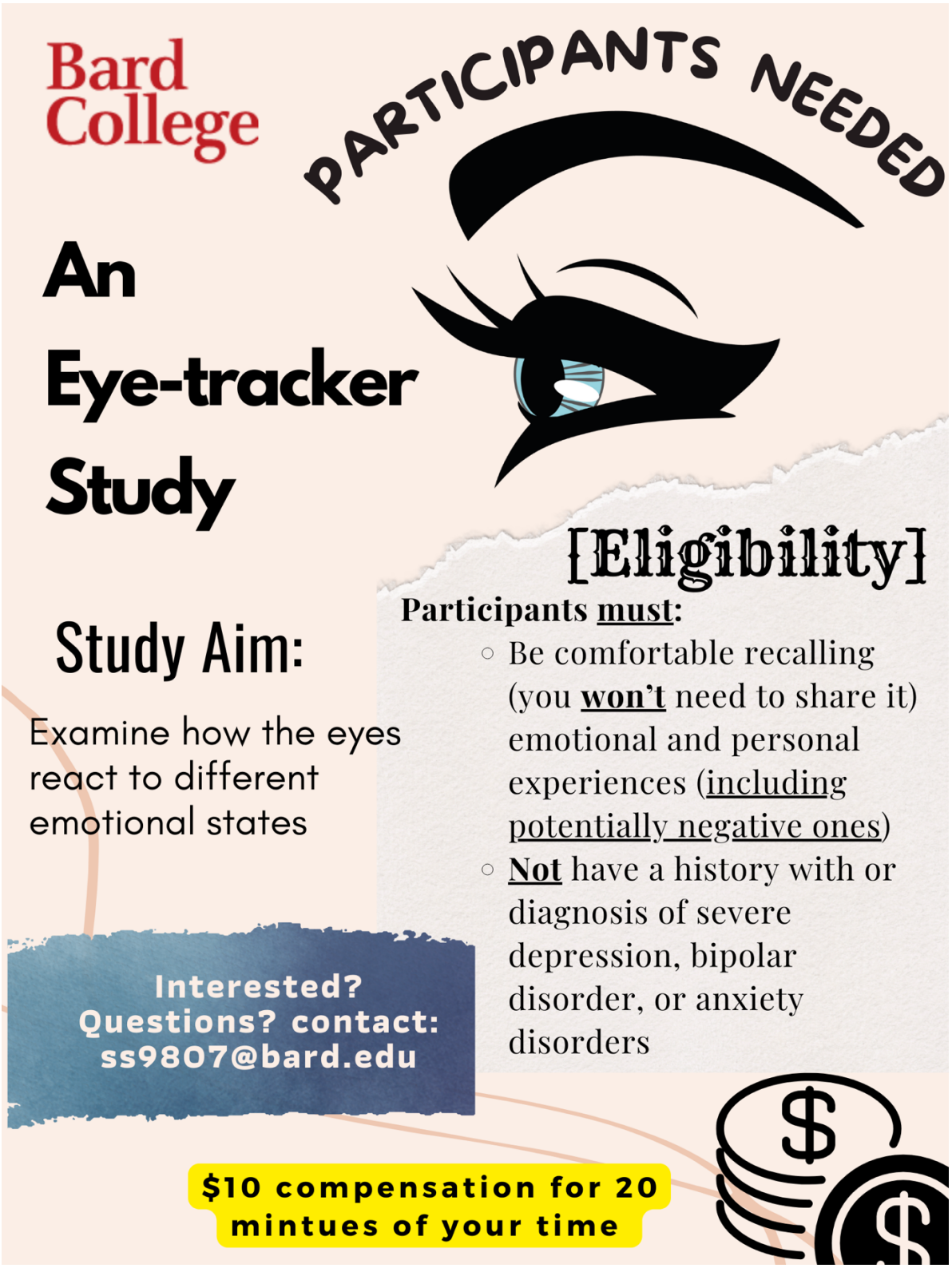
The Bard IRB committee has reviewed your revised proposal. Your application is approved through October 30 2024. Your case number is 2024OCT30-SHA.

Please notify the IRB if your methodology changes or unexpected events arise.

We wish you the best of luck with your research.

Ziad M. Abu-Rish, Ph.D.
IRB Chair
Associate Professor of Human Rights and Middle Eastern Studies
Bard College
zaburish@bard.edu

Appendix B: Recruitment Flier



Appendix C: State Shame and Guilt Scale

**State Shame and Guilt Scale (SSGS)**

The SSGS is a self-rating scale of in-the-moment (state) feelings of shame, and guilt experiences. Ten items (five for each of the two subscales) are rated on a 5-point scale Likert scale. The following are some statements which may or may not describe how you are feeling **right now**. Please rate each statement using the 5-point scale below. Remember to rate each statement based on how you are feeling **right at this moment**.

| | Not feeling this way at all | | Feeling this way somewhat | | Feeling this way very strongly |
|---|---|---|---|---|---|
| 1. I want to sink into the floor and disappear. | 1 | 2 | 3 | 4 | 5 |
| 2. I feel remorse, regret. | 1 | 2 | 3 | 4 | 5 |
| 3. I feel small. | 1 | 2 | 3 | 4 | 5 |
| 4. I feel tension about something I have done. | 1 | 2 | 3 | 4 | 5 |
| 5. I feel like I am a bad person. | 1 | 2 | 3 | 4 | 5 |
| 6. I cannot stop thinking about something bad I have done. | 1 | 2 | 3 | 4 | 5 |
| 7. I feel humiliated, disgraced. | 1 | 2 | 3 | 4 | 5 |
| 8. I feel like apologizing, confessing. | 1 | 2 | 3 | 4 | 5 |
| 9. I feel worthless, powerless. | 1 | 2 | 3 | 4 | 5 |
| 10. I feel bad about something I have done. | 1 | 2 | 3 | 4 | 5 |

**Scoring <u>Each scale consists of 5 items:</u>**
**Shame -** Items 1, 3, 5, 7, 9
**Guilt -** Items 2, 4, 6, 8, 10
All items are scored in a positive direction.

Total Shame (25 max): _____

Total Guilt (25 max): _____

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Appendix D: Test of Self-Conscious Affect (TOSVA-3)

## Test of Self-Conscious Affect, Version 3 (TOSCA-3S)*

*TOSCA-3S is to be handed out at the end of session 1.*

Below are situations that people are likely to encounter in day-to-day life, followed by several common reactions to those situations.

As you read each scenario, try to imagine yourself in that situation. Then indicate how likely you would be to react in each of the ways described. We ask you to rate *all* responses because people may feel or react more than one way to the same situation, or they may react different ways at different times.

For example:

**A.** You wake up early one Saturday morning. It is cold and rainy outside.

| | not likely very likely |
|---|---|
| **a.** You would telephone a friend to catch up on news. | 1 · · 2 · · · 3 · · · 4 · · · 5 |
| **b.** You would take the extra time to read the paper. | 1 · · · 2 · · · 3 · · · 4 · · · 5 |
| **c.** You would feel disappointed that it's raining. | 1 · · · 2 · · · 3 · · · 4 · · · 5 |
| **d.** You would wonder why you woke up so early. | 1 · · · 2 · · · 3 · · · 4 · · · 5 |

In the above example, I've rated *all* of the answers by circling a number. I circled "1" for answer (a) because I wouldn't want to wake up a friend very early on a Saturday morning—so it's not at all likely that I would do that. I circled a "5" for answer (b) because I almost always read the paper if I have time in the morning (very likely). I circled a "3" for answer (c) because for me it's about half and half. Sometimes I would be disappointed about the rain and sometimes I wouldn't—it would depend on what I had planned. And I circled a "4" for answer (d) because I would probably wonder why I had awakened so early.

Please do not skip any items—rate all responses.

**1.** You make plans to meet a friend for lunch. At five o'clock, you realize you have stood your friend up.

| | not likely very likely |
|---|---|
| **a.** You would think, "I'm inconsiderate." | 1 · · · 2 · · · 3 · · · 4 · · · 5 |
| **b.** You'd think you should make it up to your friend as soon as possible. | 1 · · · 2 · · · 3 · · · 4 · · · 5 |
| **c.** You would think, "My boss distracted me just before lunch." | 1 · · · 2 · · · 3 · · · 4 · · · 5 |

* Developed by June Price Tangney and others, *The Test of Self-Conscious Affect* (TOSCA-3S) (Fairfax, VA: George Mason University, 2000).


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**2.** You break something at work and then hide it.

| | not likely very likely |
|---|---|
| **a.** You would think, "This is making me anxious. I need to either fix it or get someone else to." | 1 · · · 2 · · · 3 · · · 4 · · · 5 |
| **b.** You would think about quitting. | 1 · · · 2 · · · 3 · · · 4 · · · 5 |
| **c.** You would think, "A lot of things aren't made very well these days." | 1 · · · 2 · · · 3 · · · 4 · · · 5 |

**3.** At work, you wait until the last minute to plan a project, and it turns out badly.

| | not likely very likely |
|---|---|
| **a.** You would feel incompetent. | 1 · · · 2 · · · 3 · · · 4 · · · 5 |
| **b.** You would think, "There are never enough hours in the day." | 1 · · · 2 · · · 3 · · · 4 · · · 5 |
| **c.** You would feel, "I deserve to be reprimanded for mismanaging the project." | 1 · · · 2 · · · 3 · · · 4 · · · 5 |

**4.** You make a mistake at work and find out a co-worker is blamed for the error.

| | not likely very likely |
|---|---|
| **a.** You would think the company did not like the co-worker. | 1 · · · 2 · · · 3 · · · 4 · · · 5 |
| **b.** You would keep quiet and avoid the co-worker. | 1 · · · 2 · · · 3 · · · 4 · · · 5 |
| **c.** You would feel unhappy and eager to correct the situation. | 1 · · · 2 · · · 3 · · · 4 · · · 5 |

**5.** While playing around, you throw a ball, and it hits your friend in the face.

| | not likely very likely |
|---|---|
| **a.** You would feel inadequate that you can't even throw a ball. | 1 · · · 2 · · · 3 · · · 4 · · · 5 |
| **b.** You would think maybe your friend needs more practice at catching. | 1 · · · 2 · · · 3 · · · 4 · · · 5 |
| **c.** You would apologize and make sure your friend feels better. | 1 · · · 2 · · · 3 · · · 4 · · · 5 |


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**10.** You are taking care of your friend's dog while she is on vacation and the dog runs away.

| | not likely very likely |
|---|---|
| **a.** You would think, "I am irresponsible and incompetent." | 1···2···3···4···5 |
| **b.** You would think your friend must not take very good care of her dog or it wouldn't have run away. | 1···2···3···4···5 |
| **c.** You would vow to be more careful next time. | 1···2···3···4···5 |

**11.** You attend your co-worker's housewarming party, and you spill red wine on a new cream-colored carpet, but you think no one notices.

| | not likely very likely |
|---|---|
| **a.** You would stay late to help clean up the stain after the party. | 1···2···3···4···5 |
| **b.** You would wish you were anywhere but at the party. | 1···2···3···4···5 |
| **c.** You would wonder why your co-worker chose to serve red wine with the new light carpet. | 1···2···3···4···5 |


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### *Scoring Sheet for the TOSCA-3S*

The TOSCA-3S scenarios that you just responded to were created from the personal experiences of several hundred college students and non-college adults. Your responses can now be used to calculate your scores for Shame Self-Talk, Guilt Self-Talk and Blaming Others.

Transfer your circled answers from the TOSCA-3S to the lines below. For example, if you answered a "4" for item 1a, enter a 4 under the column labeled "Shame Self-Talk" on the line next to 1a. If you entered a "1" for item 1b, enter a 1 under the column labeled "Guilt Self-Talk" on the line next to 1b, and so on. Carefully transfer your responses, because the order for a, b and c will be different for each question.

When you have finished transferring your answers, add up your score for each column. For example, your "Shame Self-Talk Total" score will be the total of all of the numbers written in the first column. Compare your total scores to the scoring interpretation on page 24.

| **Shame Self-Talk** | **Guilt Self-Talk** | **Blaming Others** |
|---|---|---|
| 1a _____ | 1b _____ | 1c _____ |
| 2b _____ | 2a _____ | 2c _____ |
| 3a _____ | 3c _____ | 3b _____ |
| 4b _____ | 4c _____ | 4a _____ |
| 5a _____ | 5c _____ | 5b _____ |
| 6b _____ | 6c _____ | 6a _____ |
| 7c _____ | 7b _____ | 7a _____ |
| 8a _____ | 8c _____ | 8b _____ |
| 9b _____ | 9c _____ | 9a _____ |
| 10a _____ | 10c _____ | 10b _____ |
| 11b _____ | 11a _____ | 11c _____ |
| = _____ | = _____ | = _____ |
| Shame Self-Talk Total | Guilt Self-Talk Total | Blaming Others Total |


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Appendix E: Consent

## Consent

**Project title:** Pupil Activity under different emotional states - An Eye Tracker Study
**Researcher(s):** Shao Shuai (ss9807@bard.edu)
**Supervisor:** Professor Justin Hulbert (jhulbert@bard.edu)

You are invited to take part in a research study we are conducting. This study has received ethical approval from the Bard College IRB and takes approximately 25-30 minutes of your time.

Before you decide whether to agree to take part, it is important for you to understand the purpose of the research and what is involved as a participant. Please read the following information carefully and get in contact if there is anything that needs to be clarified or if you would like more information.

**What is the purpose of the study?**
We are interested in investigating people's pupil activity under a variety of emotional states.

**Why have I been invited to take part?**
You have been invited because you are over 18 and are a student at Bard College.

It is also *important that you don't have a visual condition called strabismus (commonly referred to as having "crossed eyes") or severe vision loss that hasn't been corrected by the use of glasses or contact lenses*, which you are welcome to wear during the experiment if need be.

*Taking part in this study may involve experiencing potentially negative emotions and recalling personal experiences. Therefore, it is strongly discouraged to participate in this study if you have depression, bipolar, or anxiety disorders.*

**Do I have to take part?**
Your participation is voluntary, and you do not have to agree to take part. If you do agree to take part, you can withdraw at any time, without giving a reason and without any negative consequences such as prejudice or penalty. You will still be compensated even if you withdraw.

**What is going to happen during the study?**
After you sign up for the study, we will first situate you in front of the eye-tracking device where you will be asked to press the keyboard when a dot pops up according to its

position (e.g. press “f” when it pops on the left side of the screen ot “j” when it pops on the right side of the screen). You will also be asked to think about certain experiences in your life and fill out some short questionnaires to assess your emotions. In doing so, you may be asked to recall some personal experiences that may bring up a variety of emotions, including potentially negative ones. While you will be asked to report your emotional state, *you will not be asked to record or share your personal experiences with the researcher.*

**Are there any potential risks involved?**
Again, taking part in this study may involve experiencing potentially negative emotions and recall of personal experiences. *Therefore, it is strongly discouraged to participate in this study if you have depression, bipolar, or any anxiety disorders.*

However, as an attempt to minimise such discomfort, you will not be asked to share, in any way, orally or in writing, your personal experiences. I, as the experimenter, will sit in the opposite corner of the room during the experiment, so will not be able to see your answers and responses.

Remember, you may withdraw from the study at any time.

**Will there be any physical discomfort?**
Although we will be collecting eye-tracking/pupillometry data, we use a remote eye-tracker that records the direction of your gaze and how big your pupils are using a safe infrared camera that has been widely used in infancy research and young participants. There should not be any physical discomfort beyond needing to stay relatively still for approximately 25-30 minutes. Again, it is perfectly safe to wear glasses and contact lenses throughout the experiment.

We do ask you to try to keep your head still for the 25-30 minutes of the experiment, so you may feel slightly tired afterwards. However, small movements can be tolerated by the eye-tracker as long as there are no big movements, such as standing up or leaning forward abruptly.

**Can I withdraw from the experiment?**
You are free to leave the experiment at any time without having to give a reason for withdrawing and without any negative consequences, such as prejudice or penalty.
For more information on your right to withdraw any data identifiable to you in relation to this study, please refer to the privacy notice below.

**Will I receive any compensation for taking part?**
You will receive $10 as a token of our appreciation.

**Will my data be kept confidential?**
All information obtained during the study will be kept confidential and if the data is published it will not be identifiable as yours. All of the data collected in this study will be coded in an unidentifiable manner (using only an arbitrary number string to identify linked data) and kept strictly confidential. Links between ID numbers and personal information will be kept under password protection. Signed consent forms will be stored separately from the study data in a locked room of Preston Hall, by my faculty supervisor Professor Justin Hulbert. Local digital data will be stored in password-protected computer files, accessible only to me and my faculty supervisor Justin Hulbert.

**What will happen to the results of the project?**
No personal data will be shared, however, anonymised (i.e., not identifiable) data will be submitted as my Senior Project and may be used in future publications, reports, presentations, web pages and other research outputs. At the end of the project, anonymised data will be archived and available in the Bard College Library and online through the Bard Digital Commons. All research data and records needed to validate the research findings will be stored for 10 years after the end of active data collection. After 10 years, all stored data will be destroyed.

**Who do I contact if I have any questions or concerns about this study?**
If you have any further questions or concerns about this study, please contact the experimenter [Shao, Shuai at ss9807@bard.edu] or her faculty supervisor [Justin Hulbert at jhulbert@bard.edu].

If you have questions about your rights as a participant, please contact the [Institutional Review Board at irb@bard.edu].

Thank you for reading this information and considering taking part in this study.

If you agree to participate, please sign in the space below.

# Appendix F: Debrief

**Debrief**

Project name: Pupil activity under different emotional states - an eye tracker study

Sometimes in research it is necessary not to tell the participants the hypothesis until after they've completed the tasks because doing so may alter their behavior (and therefore invalidate conclusions regarding the results). In this instance, I couldn't reveal the full purpose of this experiment until now because I didn't want you to think about your personal experience before you were asked to think about it, as it otherwise could have affected the behavior of your eyes early in the experiment when I was collecting baseline data. We needed you, your mind, and your eyes to be in a neutral state during that baseline period so that I could compare them to your state after thinking about an amoral behavior.

**Now I would like to tell you the whole purpose of this study:**
Previous research suggests that certain feelings of shame are linked with potentially maladaptive responses (such as avoidance and withdrawal) while feelings of guilt are linked with more adaptive responses, such as apologizing behavior and trying to make amends (Lewis, 1971; Tangney et al., 2011). However, in recent years, there has been increased criticism in the literature of previous studies' reliance on subjective self-report and psychologists are interested in developing objective measures to differentiate between shame and guilt. Therefore this study aims to investigate the difference between shame and guilt using eye-trackers.

**How was this tested?**
In this study, you went through 4 phases. First, you were asked to complete a trait shame and guilt questionnaire to measure whether you are the type of person who are more prone to feel shame or guilt. Then you were asked to perform a dot-probe test. The test itself was unrelated to the study, but it was designed to get you accustomed to the reflection of yourself in the computer monitor. Then, you were asked to write about a personal amoral experience and then complete a questionnaire that measures your feeling of shame or guilt at that moment. We are particularly interested in your eye-movement patterns during this section of the experiment. Specifically, we recorded data on your pupil phasic activity and fixation on the reflections of yourselves during this phase. Your pupil phasic activity is the change in your pupil size when there is a stimulus present.

**Hypotheses and main questions:**
We expect to find that higher pupil phasic activities when people are feeling ashamed than when people are feeling guilty. We also expect that people will exhibit reduced eye fixation on their own reflection if they are feeling ashamed, rather than feeling guilty.

**Why is this important to study?**
Shame and guilt are important types of moral and self-conscious emotions, making them crucial for us to live a moral, civilized, and productive life. To understand how we can make the right decisions and live such moral lives, we have to understand why people may have different

reactions when they (occasionally) make amoral decisions. For example, why some people are more likely to repeatedly make mistakes while others don't? Previous studies have attempted to investigate whether shame and guilt have different functions when it comes to future wrongdoings. However, their conclusions are largely inconsistent and their measure of emotionality was limited to self-report. Since self-report questionnaires can be problematic due to a lack of validity and demand characteristics, this project aims to investigate whether we can develop an objective measure using an eye tracker to differentiate between shame and guilt.

**What if I want to know more?**
If you are interested in learning more about the difference between shame and guilt, you may want to consult the experimenter [Shao, Shuai at ss9807@bard.edu] or her faculty supervisor [Justin Hulbert at jhulbert@bard.edu].

If you have questions or concerns about your rights as a participant in this experiment, please contact the Institutional Review Board (IRB) at irb@bard.edu.

If you would like to withdraw from the study, please tell me now. Your data will not be stored and your compensation will not be affected.

**If you find yourself experiencing challenging feelings or circumstances, please consider reaching out to one of these helpful services:**
BRAVE: 845-758-7777 (ask for BRAVE)
Counselling Service: 845-758-7433 or counselingservice@bard.edu

Thank you again for your participation.

Appendix G: Picture of the Eye-Tracker Room

# Appendix H: Pre-registration

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**Shame vs. guilt in self-avoidance - an eye tracking study (#149741)**

**Created:** 11/04/2023 02:34 PM (PT)

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This is an anonymized copy (without author names) of the pre-registration. It was created by the author(s) to use during peer-review.
A non-anonymized version (containing author names) should be made available by the authors when the work it supports is made public.

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**1) Have any data been collected for this study already?**
No, no data have been collected for this study yet.

**2) What's the main question being asked or hypothesis being tested in this study?**
Main question: To examine whether eye-tracking can be used as an objective measure to differentiate between shame and guilt by examining people's pupil phasic activity patterns and self-avoidance behaviours
Hypothesis 1: People would exhibit more self-focused avoidance (measured as shifts away from their own reflection observed on a computer screen placed in front of the participants) when they are experiencing shame than guilt
Hypothesis 2: People's pupils' phasic activity would be higher (indicating higher cognitive load and brain activation brought by rumination and thoughts of withdrawal) when people are experiencing shame than guilt

**3) Describe the key dependent variable(s) specifying how they will be measured.**
Self-focused avoidance: measured as shifts away from their own reflection observed on a computer screen in front of them when they are asked to recall an autobiographical experience
Phasic Activity: measured by eye-tracker
Manipulation check: participants' trait shame and guilt are also measured at the end of the study using TOSCA - 3.

**4) How many and which conditions will participants be assigned to?**
Each participant will be randomly assigned to 1 of 2 conditions by the computer: shame or guilt. All participants will be given a clear description of distinguishing between shame and guilt. Then, based on the group that they were assigned to, they will be either asked to "spend 3 minutes and think about one incident when you did something socially amoral that made you feel guilt" or to "spend 3 minutes and think about one incident when you did something socially amoral that made you feel shame".

**5) Specify exactly which analyses you will conduct to examine the main question/hypothesis.**
I will start analysing my eye-tracking data using the eye tracking package to clean and prepare my data. Following are the specific steps that I plan to take:
1. Data Preparation
The area of interest (AOI) in this study is the area on the computer screen that shows participants' face reflections.
I will set non-AOI looks as valid data. Although many eye-tracking paradigms are interested only in participants' gaze inside their area of interest, simply treating non-AOI looks as lost makes it difficult to interpret an increase or decrease in any single AOI because the experimenter does not know, in this case, whether such change in gaze is due to overall increase in attention and fixation or only increased for that specific AOI. Such comparison across conditions is important for this study.
2. Window analysis
This is the primary analysis that I'll use to see whether there is a change in participants' gaze toward their self-reflection within my primary time window of interest: the 3 minutes they spend for autobiographical recall.
3. I will also perform a simple independent t-test to determine whether a difference exists between guilt and shame conditions.

Self-report data: participants' scores on the TOSCA-3 (in paper) and SSGS (computer-based)
1. Calculate both their trait guilt-and-shame and state guilt-and-shame scores, using the scoring system bundled with the questionnaires.
2. Global linear regression model on the number of saccades and the duration of eye fixation on AOI

**6) Describe exactly how outliers will be defined and handled, and your precise rule(s) for excluding observations.**
1) participants will be excluded if there is more than 25% track-loss during my main time of interest (when they were asked to spend 3 minutes to recall a personal experience of shame/guilt);
2) participants will be excluded when they fail to answer more than 2 of the SSGS questions that are used to assess their state of guilt and shame;
3) participants will be excluded if they do not complete the entire eye-tracking procedure;
4) participants will not begin the eye-tracking procedure, thus excluded if there was more than 25% track-loss during both of the initial calibration processes ( participants may be calibrated for a second time if their first-time calibration has more than 25% track loss)

**7) How many observations will be collected or what will determine sample size? No need to justify decision, but be precise about exactly how the number will be determined.**

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A total of 25 participants will be recruited, and I aim to have at least 20 participants who successfully complete the experiment and not excluded by the exclusion criteria listed above.

**8) Anything else you would like to pre-register? (e.g., secondary analyses, variables collected for exploratory purposes, unusual analyses planned?)**

These are the exploratory analyses that I may conduct if there's time

1. Growth curve analysis (exploratory)

It will be conducted to see how people's pupil phasic activity (pupil diameter) changes differently over time between guilt and shame trials.

2. Estimating divergence analysis (exploratory)

This is used to determine whether there is a time-point for divergence in participants' gaze between guilt and shame conditions.