# FEMININE INTUITION: DOES IT ENABLE FEMALES TO IDENTIFY THE MICRO-EXPRESSION OF ANGER IN MALES?

**By**

**Kendall Ursula Rhodes**

**A mini-dissertation in partial fulfilment of the requirements for the degree**

**MA (RESEARCH PSYCHOLOGY)**

**in the Department of Psychology at the**

**UNIVERSITY OF PRETORIA**

**FACULTY OF HUMANITIES**

**SUPERVISOR: DR NICOLEEN COETZEE**

**CO-SUPERVISOR: PROF PEET DU TOIT**

**2015**

***The financial assistance of the National Research Foundation (NRF) towards this research is hereby acknowledged. Opinions expressed and conclusions arrived at, are those of the author and are not necessarily to be attributed to the NRF.***

**UNIVERSITY OF PRETORIA**

**FACULTY OF HUMANITIES**

**RESEARCH PROPOSAL & ETHICS COMMITTEE**

# PLAGIARISM DECLARATION

Full name: ___Kendall Ursula Rhodes _____

Student Number : __29013390_____

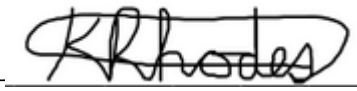
Degree/Qualification: ___MA Research Psychology_____

Title of thesis/dissertation/mini-dissertation:

Feminine Intuition: Does it Enable Females to Identify the Micro-Expression of Anger in Males?

I declare that this thesis / dissertation / mini-dissertation is my own original work. Where secondary material is used, this has been carefully acknowledged and referenced in accordance with university requirements.

I understand what plagiarism is and am aware of university policy and implications in this regard.

_____  ____ _____01/11/2015_____

**SIGNATURE** **DATE**

## ACKNOWLEDGEMENTS

I would like to first and foremost thank God and my parents for all their support in my studies. They have provided a structured background that has afforded me the opportunity and discipline needed to complete this degree. To my supervisor, Dr Coetzee, I would like to say thank you for your belief in me and for being so willing to help and answer questions to aid this study. This study was difficult in design and execution and I would not have been able to do it without her help and supervision. I would also like to thank my co-supervisor, Prof Peet du Toit, who helped me with the execution of the study. I would also like to thank Michael Kleynhans who trained me to use the physiological measures and helped me book and set up the laboratory. Lastly, I would like to thank the National Research Foundation for their scholarship and understanding of the process of a dissertation in Research Psychology. Without their financial aid I would not have been able to complete this research.

# ABSTRACT

Intuition is a construct that has resulted in much debate over the years. The present study attempts to enhance the study of intuition as well as micro-expression recognition by delving into feminine intuition and females' ability to identify the micro-expression of anger in males. The study compared females' psychophysiological responses to superimposed images of malicious males and superimposed images of non-malicious males. The study was conducted using a mixed methods design in that both quantitative and qualitative data were collected. The quantitative analysis was conducted on 22 participants of whom five were used in the qualitative analysis. Both physiological (heart rate, heart rate variability, breathing rate and estimated core temperature) and psychological (psychological interview and eye tracking data) were obtained for the study. The results of the study indicate that while females are able to identify the micro-expression of anger in males, they only respond psychologically and not physiologically to this expression.

Key Words:
Intuition, feminine intuition, micro-expressions, facial expressions, anger, psychophysiology.

# TABLE OF CONTENTS

Chapter 3

## LIST OF FIGURES

## LIST OF TABLES

# CHAPTER 1

# INTRODUCTION TO STUDY

## 1.1 INTRODUCTION

In his book entitled 'The Gift of Fear', Gavin de Becker describes a woman named Kelly who, he claims, was ultimately saved by fear (1997). De Becker listens as Kelly describes her encounter with a rapist and murderer and leads her to a 'eureka' moment in which she realises that she saved her life by listening to what her body was telling her to do. She realises that she was unknowingly picking up clues throughout her experience and responding to these clues saved her life.

It is likely that everyone has at some point in their life said or heard someone say "I just had a gut feeling…" or "I could feel something was wrong". These feelings about an event that has happened or has yet to happen are referred to as intuitive perceptions or intuition (McCraty, Atkinson & Bradley, 2004a; McCrea, 2010). McCraty et al. (2004a) describes intuition as the immediate sense or perception of information that is usually outside the range of normal cognitive processes. This means that the person is not consciously aware that this processing is happening, like Kelly in de Becker's book.

Kelly goes on to say that she knew she had to get out of the house or she would be killed. She says this even though she did not know the man had killed his previous victims. McCraty et al. (2004a) explain that when an individual has an intuitive response the information is perceived as being certain to both body and mind. The researchers further explain that this certainty is beyond a question or a doubt for the individual and can therefore be said to be absolute for that individual (McCraty et al., 2004a, McCrea, 2010). This study delves into the intuitive response of females to potentially malicious males. A glimpse of this absolutist feeling of the intuitive response comes through in the qualitative responses acquired from the participants as they explain that they 'would definitely not trust him' (participant 21) or that 'he looks friendly' (participant 22).

The feeling of having a certain, complete sense of something is dissimilar to the experience of normal awareness where the contents of which the perception is composed, is built upon in increments (McCraty et al., 2004a). Intuitive feelings, therefore, produce a different experience for an individual than normal awareness. For example, if a person is asked a question to which they know the answer because they have read it in a textbook they may

answer the question with a fair amount of confidence; however, when given an opposing view from another accredited source they may not be as confident in their initial response because their awareness is being built upon rather than being static and certain. This is normal awareness (McCraty et al., 2004a).

Intuitive awareness on the other hand would be certain and remain certain. In short, normal awareness is updated through sensory perceptions as the experience unfolds whereas intuition is an immediate sense of complete certainty about the situation (McCraty et al., 2004a).

Multiple authors have different theories about intuitive perceptions; for example, Sarbin, Taft and Bailey (1960) argued that intuitive perceptions are simply cognitive extrapolations based on forgotten memories that make their way into consciousness. This implies that intuitive perceptions are limited to prior experience, which is not always true. It can be theorised that a person, like Kelly, may have an intuitive feeling about someone they have never met in a situation in which they have never been. This study tests such an experience as the participants had never been in such a setting, did not know the men in the pictures and were asked to intuitively respond to them.

Loye (1983) furthered the study of intuition and suggested that there is a dome of information that is held outside of normal conscious awareness and is accessed by intuitive perception. He theorises that facial expressions lie in this dome and that people are not consciously aware of their processing of facial expressions. People can train themselves to read body language and facial expressions through books or online tests and then maybe their processing of facial expressions may be less intuitive and more mechanical; however, until this is done, the process is theorized as intuitive (Loye, 1983).

According to Schmidt and Cohn (2001), the social intentions and motivations of people are signalled through the face. This implies that facial expressions are one of the most important aspects in a social interaction. Malicious intentions could therefore be seen through facial expressions. For example, an attacker might show the micro-expression of anger that triggers an intuitive response: ‘he is going to kill me’. The response reached is based on the intuition that was triggered by the micro-expression. A decision was, therefore, made to combine the topics of facial expression (through the use of the term ‘micro-expression’) and intuition (measured both physiologically and psychologically) to form this study.

## 1.2. RESEARCH PROBLEM

Research on the issue of feminine intuition in combination with females' response to the micro-expression of anger (both physiologically and psychologically) is scarce. Although research had been conducted on females' responses to potentially threatening facial expressions (anger or fearful expressions); no studies have been conducted on both the psychological and physiological responses of these females. Literature combining psychological and physiological aspects in relation to intuition is also scarce. The present study is, therefore, of great importance as there is a clear gap in literature pertaining to this topic. This study advances the body of knowledge in the following fields: intuition, micro-expressions, psychophysiology and mixed method designs; and aims to expand the body of knowledge about feminine intuition and females' identification of potentially malicious men.

The malicious males used in the study were comprised solely of males who have committed any number of acts that have resulted in the killing of three or more people (see 1.3.4.). The study aims to determine whether females' identify the micro-expression of anger in malicious males and whether they respond differently because of this expression. If one can show that women respond differently, either physiologically or psychologically, to malicious males then further research can be conducted to identify the reasons. These reasons would have implications for the future of women as a gender.

The positive identification of the micro-expression of anger, as well as concurrent psychological and physiological responses could result in preventative intervention techniques for women in various potentially dangerous situations. Smith and Segal (2015) noted that if an individual knows their abuser's red flags they could promote their own safety. One could therefore theorise that through the promotion of the identification of malicious males through their facial expressions, whether it be physiologically, psychologically or both, abused women could identify their abuser's red flags and therefore get out of the situation before it happens. This study, therefore, expands and enriches present research and promotes further research in the fields mentioned.

## 1.3 MAIN CONCEPTS

### 1.3.1. Micro-expression

Moritz (2011) defines the term 'micro-expression' as minute muscle changes, lasting a fraction of a second, that indicate the emotion that a person is consciously or unconsciously feeling. The term 'micro-expression' in this study will refer to the facial expression associated with the micro-expression of anger rather than the micro-expression itself.

### 1.3.2. Female

The researcher has chosen to limit her study to feminine intuition and, therefore, has limited her sample to female participants. The term 'female' can be defined in two ways – either referring to sex or to gender. When using the term 'female' with regards to sex, the definition is biological, meaning the individual is genetically and physiologically male or female. A female individual will therefore have two X chromosomes, a uterus and a vagina (American Psychological Association, 2011). Gender, however, constitutes behavioural roles and actions seen as socially acceptable for males or females (American Psychological Association, 2011). The researcher defined the term 'female' as an individual who defines themselves as female and portrays a female role in society. This definition refers to behaviour and therefore refers to gender rather than sex (American Psychological Association, 2011).

### 1.3.3. Feminine intuition

Hogarth (2001) explains that intuition in decision making is a rapid process carried out in an individual's unconscious. The term 'intuition' in this study is based on this explanation and can be surmised as a 'gut feeling' females experience when in potentially dangerous situations. Intuition is not limited to females but this study only covered feminine intuition.

### 1.3.4. Malicious male

A malicious male is defined as an individual who has committed any number of acts that resulted in the death of three or more individuals. The malicious males are not limited to committing the acts themselves but could have ordered others to commit the acts. These acts

must have been purposeful and done with little to no remorse. This study would only make use of malicious males. Due to time and cost restraints malicious females were not included.

#### 1.3.5. Superimposed image

The researcher used superimposed images to control for confounding variables such as the identification of one of the males. A superimposed image is defined by the researcher as a composition of multiple images put together to form one image. The software used to make these superimpositions is called 'Psychomorph'. The program averages physiological markers such as the nose, cheeks, eyebrows, eyes and chin to create one image.

#### 1.3.6. Psychophysiological arousal

Psychophysiological arousal involves both psychological and physiological mechanisms and therefore allows for implicit assessment of the underlying mechanisms of behaviour (Winkielman & Cacioppo, 2001). It contains both quantitative and qualitative aspects that were measured and recorded by the researcher using a mixed method design.

## 1.4. AIMS AND OBJECTIVES OF THE STUDY

### 1.4.1. Aim

The aim of this research study is to ascertain females' ability to identify the micro-expression of anger in males.

### 1.4.2. Objectives

To attain this aim the following objectives and research questions were set:

- To ascertain whether the images of the malicious males shown to a group of females portray the micro-expression of anger. To determine this objective, the following research question was formulated:
    - Do the images of the malicious males shown to a group of females portray the micro-expression of anger?

- To identify the psychological signs that accompany females' recognition of the micro-expression of anger. To determine this objective, the following research question was formulated:

    - Are there psychological signs that accompany females' recognition of the micro-expression of anger?

- To identify physiological signs that accompany females' recognition of the micro-expression of anger. To determine this objective, the following research question was formulated:

    - Which physiological signs accompany females' recognition of the micro-expression of anger?

- To identify differences between the psychological responses of females to a superimposed face composed of malicious males and a superimposed face composed of non-malicious males. To determine this objective, the following research question was formulated:
    - Are there differences between the psychological responses of females to a superimposed face composed of malicious males and a superimposed face composed of non-malicious males?

- To identify differences between the physiological responses of females to a superimposed face composed of malicious males and a superimposed face composed of non-malicious males. To determine this objective, the following research question was formulated:
    - Are there differences between the physiological responses of females to a superimposed face composed of malicious males and a superimposed face composed of non-malicious males?

- To identify the difference between the psychological and physiological responses of women to a superimposed face composed of malicious males. To determine this objective, the following research question was formulated:

- Are there differences between the psychological and physiological responses of women to a superimposed face composed of malicious males?

- To identify the difference between the psychological and physiological responses of females to a superimposed face composed of non-malicious males. To determine this objective, the following research question was formulated:

  - Are there differences between the psychological and physiological responses of women to a superimposed face composed of malicious males?

## 1.5. CHAPTER OUTLINE

The following is an outline of the remaining chapters included in this dissertation:

- **Chapter 2: Literature Review**
  The literature review will consist of a comprehensive summary of research that has been conducted on psychological and physiological intuition; micro-expressions and micro-expressions of anger; facial expressions and facial expressions of anger.

- **Chapter 3: Methodology**
  The methods used for both the collection and analysis of the data will be discussed in this chapter.

- **Chapter 4: Results**
  This chapter will include the results from both the qualitative and statistical analysis and the interpretation thereof.

- **Chapter 5: Discussion, Recommendations and Conclusion**
  This chapter will include the interpretation and discussion of the results from Chapter 4, taking the literature and theory discussed in the previous chapters into account.

## 1.6. CONCLUSION

In conclusion, this chapter has introduced intuition and facial expression and given definitions to terms that are used throughout this study. The following chapter provides literature on both intuition and facial expression as well as any other literature pertaining to these topics. Chapter two also covers some literature on the field of psychophysiology.

# CHAPTER 2
# LITERATURE REVIEW

## 2.1. INTRODUCTION

In this chapter, the researcher will provide a review of recent literature related to the research aim, objectives and research questions of the study. The chapter has been divided into three main sections namely, intuition, micro-expressions and anger. The intuition section includes the definition of intuition and a discussion of recent literature on intuition. This includes but is not limited to the psychology of intuition and the physiology of intuition. The micro-expression section covers a definition of micro-expressions, the recognition of micro-expressions and responses to micro-expressions. The psychology and physiology of micro-expressions is also covered. A section specifically devoted to the emotion of anger is provided in which a description of anger is covered. The micro-expression of anger is also discussed in this section.

## 2.2. INTUITION

### 2.2.1. Definition

Theories about intuition have been around for many years. The earliest writings on intuition were written by Sarbin et al. in 1960. In their book, the researchers argued that intuitive perceptions are merely cognitive extrapolations based on forgotten memories that seep into conscious awareness. This would mean that all intuitive perceptions would need to be based on a past experience from which an intuitive perception could be formed. Theories about intuition have since evolved, recognising that not all intuitive decisions could have been based on forgotten memories. Loye (1983) advanced the field of intuition by suggesting that there is a dome of information that is held outside of normal conscious awareness that is accessed by intuitive perception. This dome of information is not accessed through normal conscious processes but is accessed through intuition. This implied that intuitive perceptions were not based on past memories alone as this dome of information was not built through life experience (Loye, 1983).

McCraty et al. (2004a) used two sources to formulate a definition for intuition, namely the Oxford dictionary and research conducted by Roberto Assogioli. The Oxford dictionary

defines intuition as the skill of understanding something without conscious reasoning (Intuition, 2015) while Assajoli (1971) defined intuition as "a synthetic function in the sense that it apprehends the totality of a given situation or psychological reality. It does not work from the part to the whole -- as the analytical mind does -- but apprehends a totality directly in its living existence" (p. 27). Based on these definitions, McCraty et al. (2004a) defined intuition as a certain feeling about something distant or an event yet to happen. This feeling is immediately sensed and, as discussed in (1.1), is outside the range of normal cognitive processing. Adding to these definitions, McCrea (2010) defined intuition simply as "a 'gut feeling' about the rightness or wrongness of a person" (p. 1). For the purposes of the present study, intuition was defined as a 'gut feeling' that is immediate, certain and falls outside the range of normal conscious awareness (meaning the individual is not consciously aware of the process involved or how the decision has been achieved). What follows is a discussion of the psychology of intuition.

### 2.2.2. The psychology of intuition

The psychology of intuition is a vital aspect of the study. This is due to the psychophysiological nature of the study. A firm grasp of the psychology of intuition promoted a full understanding of the theory of intuition. Thompson (2014) wrote a chapter devoted to what intuitions are and are not. The researcher described the controversy around intuition and attributes these controversies to the fact that there are multiple types of intuitions employed in various situations. Thompson (2014) further argued that casting these different types of intuitions into one mould could be disadvantageous to research. Researchers must, therefore, describe the type of intuition their study fits and characterise the intuition to fit their definition. Thompson provides multiple models of intuitions to describe the various types of intuitions and their characteristics. He gives a total of four different models of intuitions namely, intuitions as type 1 judgements, intuitions as memories, intuitions as metacognition and intuitions as feelings. The model described by Thompson that fits the present study best is intuitions as type 1 judgements. This is due to the decision making aspect of the research. The remainder of the chapter will therefore be split into two sections. The first section covers intuition and the dual process theory. Specific reference is made to Thompson's 'intuitions as type 1 judgements' model in this section. The second section covers intuitions and domain expertise, which is another aspect covered by intuition based literature. All literature is

discussed with specific reference to literature on intuition and decision making as these are the main themes of the study.

#### *2.2.2.1. Intuitions and the dual process theory*

The first type of intuition described by Thompson (2014) is 'intuitions as type 1 judgements' (p. 40). Based on Thompson's work, the following discussion has been divided into three subsections namely, the architecture of dual-process theories, intuitions as an autonomous set of systems and intuitions as natural assessments. All of these subsections are based on explaining intuition in forming judgements or making decisions.

According to cognitive psychology, when one makes a decision, one of two processes is employed (Thompson, Turner & Pennycook, 2011; Usher, Russo, Weyers, Brauner & Zakay, 2011). This forms the basis of all dual-process theories and Thompson (2014) provides a description of the two processes employed. The first process (hereafter referred to as process A) is described as automatic, fast, and implicit, whilst the second process (hereafter referred to as process B) is analytical, rule based and deliberate. It is theorised that the first process gives rise to intuitive perceptions. According to the dual process theory, the participants in the study would therefore be employing process A when making their intuitive judgements (Thompson, 2014).

Dual process theories in decision making have been theorised and studied by multiple authors (Thompson et al., 2011; Usher et al., 2011). Usher et al. (2011) conducted four experiments to further the literature on dual process theories and decision making. These four experiments were mainly an attempt to determine if the use of process A (the automatic or intuitive process) is the best for making complex decisions. Their first experiment was aimed at replicating the unconscious thought effect and included 52 participants. The procedure followed for the experiment consisted of four stages. In the first stage the participants were told that the experiment was about decision making. Participants were asked to rank a list of given attributes of either a car or a holiday in order of importance. This was then used by a computer program to the construct material for stage 2. This stage involved the participants forming an overall impression of either the car or the holiday. The participants were also given information about alternative descriptions they could possibly give. The experiment included 4 alternatives that ranged from the best option (option A: the highest ranked positive attributes were included) to the worst option (option D: lower ranked attributes and negative

attributes were included). These alternatives were constructed from the attribute rankings the participants gave in stage 1. The best and worse options were therefore based on each participant's responses.

Participants were then divided into one of two groups (stage 3) (Usher et al., 2011). The first group was called the 'think' group. This group were asked to think about the best option for 3 minutes based on the given information. The second group was called the 'distraction' group. The participants in this group were given anagrams to solve for 3 minutes. After the 3 minutes the groups were asked to enter their ranking for each of the alternatives (stage 4). Usher et al. (2011) found that the participants in the 'distraction' group were more likely to choose the best alternative whilst participants in the think group were more likely to choose the worst alternative. This implies that more preferable decisions are obtained when one uses intuitive judgements. The second, third and fourth experiments aimed to further validate this implication.

The second experiment of the four conducted by Usher et al. (2011), aimed to test affective mind-sets versus analytical mind-sets and included 36 participants. The participants included in this experiment were not the same participants who partook in the first experiment. Participants were divided into two groups namely, the affective/experiential group and the analytical group (stage 1). Participants in the affective group were asked to draw the emotional state they were in at that specific time. They were asked to do this for 3 minutes. The analytical group on the other hand were given mathematical queries to complete for 3 minutes. The researchers did this to place the participants in an analytical or affective mind-set (frame of mind). Usher et al. (2011) theorised that participants in the affective mind-set were more likely to use intuition in their responses whilst individuals in the analytical group were more likely to use an analytical thought process.

In the second stage of the second experiment the participants were given information (car attribute combination) about four cars (Usher et al., 2011). The participants were then asked to evaluate and provide their preference for each car. The results showed that the intuitive group gave the car with the best attributes the highest rank with a standard deviation of 10.0. The analytical group's responses ranged from the best option to the worse with a standard deviation of 14.7.

Usher et al. (2011) then approached their third and fourth experiments with a "real-life" approach to mimic decision making in real-life (Usher et al., 2011). The researchers chose to use the real-life decision of choosing a flatmate in their final two experiments. The third experiment was aimed at testing analytical mind-sets versus intuitive mind-sets and included 24 participants. The participants were split into two groups, the intuitive group and the analytical group. The intuitive group were told that "research has shown that the best decisions are the ones made using intuition" (p.7). They were also told that they will be given time to make a decision but making quick decisions is usually best. This placed the participants in an intuitive mind-set. The analytical group was told that "research has shown that the best decisions are the ones made using logic and rational thought" (p. 7). Each of the participants was shown 12 attributes for three potential flatmates. The first flatmate's attributes were 66% positive whilst the third flatmates attributes were only 33% positive. The results of this experiment showed that the intuitive group chose the better option more often than the analytical group. This result is consistent with the first two experiments that showed that when making decisions, intuitive thinking results in better decisions than analytical thinking.

In the last experiment (the fourth experiment), Usher et al. (2011) put distraction (included in experiment 1) and intuition together. This experiment was a repetition of experiment three but, in addition to the analytical and intuitive mind-sets, a distraction/think operation was added. The researchers' aim with this experiment was to further validate the results from the real-life decision making experiments. A total of 29 participants were included in this experiment. As in experiment 3, the participants were randomly assigned to one of the two experimental groups (intuitive or analytical mind-set). The method was the same as experiment 3, however, a reasoning task (analytical group) or an anagram task (intuitive group) was given to the participants. The researchers found a significant difference in favour of the intuitive-distraction group with this group choosing the better flatmate.

From these four experiments the researchers concluded that the intuitive process outperforms the analytical process when it comes to value integration (Usher et al., 2011). Value integration is the process by which a person places value on certain mind-sets or constructs on which a complex decision is based. According to the researchers, value integration is vital when making complex decisions. The research conducted on dual process theories and the value of intuitive judgements in decision making has positive implications for the present

study. The findings of these studies indicate that intuitive processes are better than analytical processes in decision making and therefore one could conclude that the use of intuition in determining the intent (malicious or not) of a person is important.

The finding that intuitive processes are better than analytical ones in decision making is not limited to the research conducted by Usher et al. (2011). Djiksterhuis, Bos, Nordgren, & van Baaren, (2006) conducted four studies before Usher et al. to determine whether intuition in decision making is better than analytical thinking. The researchers' main aim was to determine the relation between deliberation (conscious versus unconscious thought) and complexity and quality of choice. They termed their hypothesis the 'deliberation-without-attention effect' (p. 1006). In their first study, Djiksterhuis et al. (2006) asked participants to evaluate 4 cars. These cars, as in the studies conducted by Usher et al. (2011), varied according to their number of positive attributes but also varied according to complexity. The researchers gave more complex cars more attributes. This was done because the researchers theorised that a more complex decision has more information. The participants were split into two groups with one group being given time to think about the decision and the other group was given a distraction. The researchers found that unconscious/intuitive thinkers (those given the distraction) performed fairly well in both complex and simple tasks while the conscious/analytical thinkers performed better on simple tasks and worse on complex tasks.

The second study undertaken by Djiksterhuis et al. (2006) was a replication of their first study, however, consumers were asked to rate their overall attitude about the car rather than choose the most desirable car. The researchers found that conscious thinkers performed significantly better on simple tasks as opposed to unconscious thinkers. However, when given the complex task the unconscious thinkers performed significantly better than conscious thinkers.

In their third and fourth studies, Djiksterhuis et al. (2006) asked participants about a product that they had recently bought. The products ranged from simple products such as clothes to complex products such as furniture. The researchers asked a range of questions about the process of buying the product, the thought process behind the purchase and the satisfaction of the purchase. The results indicated that the more a consumer thought about a simple product, the higher their overall satisfaction. On the other hand it was found that the more a consumer thought about a complex decision, the lower their overall satisfaction. Djiksterhuis et al.

(2006) therefore concluded from these studies that when it comes to complex decisions, intuition is better than analytical thinking. The researchers therefore reached the same conclusion with regards to intuition in decision making as Usher et al. (2011).

Thompson et al. (2011), like Usher et al. (2011) and Djiksterhuis et al. (2006), also conducted four experiments on dual process theory. However, unlike Usher et al. (2011) and Djiksterhuis et al. (2006), Thompson et al.'s focus was more on when individuals engage each process rather than the validation of intuitive decision making over analytical decision making. Thompson et al. describe what they call the 'Feeling of Rightness' (FOR), which is a metacognitive experience that accompanies intuitive judgements. This FOR could, according to the researchers, signal when further analysis of a decision is needed. The researchers theorise that a low FOR promotes a more analytical thought process (process B) before a decision is made. Their first experiment included 30 participants and aimed to answer the question: why do some decisions require further analysis whilst others do not? The researchers therefore tested whether a low FOR indicated the need for further analytical thought (process B). This test was done by giving participants 66 conditional statements and asking them to evaluate whether the condition was logical (indicated as 'yes') or illogical (indicated as 'no'). Each of their responses was followed by a question around their FOR. The participants were split into two groups namely, the free response group and the two response group. The free response group were given an unlimited amount of time to answer while the two response group was told that they needed to give two responses. The first response was a time constrained response and the participants were told to answer as quickly as possible. The participants were then asked to give their FOR after which they were shown the condition again to give their second response that was not time limited.

The researchers found that when a participant felt as though their decision was incorrect (low FOR), they employed process B (analytical thinking) (Thompson et al., 2011). Thompson et al. (2011) then increased the validity of their findings by conducting a second experiment that increased the complexity of the tasks. This experiment was conducted with 48 participants and was done in the same way as experiment 1 in order to make the results comparable. The results of this experiment were a replication of experiment 1 and confirmed that analytical thinking is employed when a low FOR was felt.

To further support their results, Thompson et al. (2011) then conducted two more experiments. These subsequent experiments aimed to test whether conflicting information would influence the FOR and therefore the activation of process B processing (Thompson et al., 2011). These two experiments were based on real-life problems as they included evaluations of the personality of people and whether they fit into a certain group. In the first of these two experiments, 128 participants were split into four groups namely, congruent (no conflicting statements were given about a person), incongruent (conflicting statements were given about a person), neutral (neutral statements were given about a person) and overall (an overall statement was given about a person). The participants were put through a similar procedure as the first two experiments; however, instead of giving the participants a binary (yes or no) response list, they were given a scale ranging from 0 to 100 on which they could rate whether the person belongs to a particular group (for example, whether a person looks like a doctor). Thompson et al. (2011) found that conflicting information was paired with a low FOR that promoted further analytical thinking (process B). For example, when an individual is given information about another individual that did not feel true (low FOR), they would process that information further through analytical thinking.

In the last experiment the researchers aimed to manipulate the rate at which an answer could be attained by testing quantified syllogisms (Thompson et al., 2011). This experiment tested conclusions that were congruent with the Min Heuristic and conclusions that were not congruent with the Min Heuristic. The Min Heuristic is a premise that conclusions can be attained through a non-logical process by using the informativeness of the statement. The principle is that conditions are more informative when they include ‘all’ or ‘some’ information and are least informative when they include ‘no’ information.

This experiment was conducted with 64 participants with the same procedure being used as the procedure of Thompson et al.’s (2011) experiment 1 and 2. The researchers found that the FOR was lower when shown a non-min statement while min statements resulted in a high FOR. Thompson et al. (2011) found that the higher the answer fluency, the higher the FOR and the less analytical processing is required. The researchers concluded that a metacognitive experience (e.g. high or low FOR) accompanies an initial answer that mediates the need for analytical processing. This study, therefore, built on the studies conducted by Usher et al. (2011) and Djiksterhuis et al. (2006) by providing more information about when analytical processing (process B) is needed over and above the intuitive process (process A).

Alós-Ferrer and Hügelschäfer (2012) decided to approach the dual process from a different angle and, like Thompson et al. (2011), included a metacognitive experience in their research. Their metacognitive experience was termed the 'faith in intuition' and is described as the confidence an individual has in their intuitive decision. Their study included two experiments; the first of which was aimed at determining whether overweighting or underweighting prior information was possible. This experiment therefore tested two heuristics namely, the representativeness heuristic (prior information is given a lower weight when a decision is made) and the conservatism heuristic (prior information is given a higher weight when a decision is made). The researchers used the faith in intuition scale, a 15-item self-report questionnaire, to determine participants' faith in their intuitive responses. Alós-Ferrer and Hügelschäfer (2012) found that individuals who are more intuitive are more likely to overweight new information, thus displaying the representativeness heuristic. In their explanation of the results, they theorised that intuitive individuals place a higher weight on information as it is received and therefore the newest information will always receive the highest weight.

In their second experiment, Alós-Ferrer and Hügelschäfer (2012) added reinforcement, which is described as providing some form of support for a decision. Reinforcement has been emphasised in human learning where success results in an increase in action while failure results in a decrease in action (Alós-Ferrer & Hügelschäfer, 2012). The researchers conducted an experiment on 46 participants. Participants were asked to choose a ball from one of two urns. Each urn contained blue balls and green balls. The participants were given an incentive for picking a certain coloured ball (for example picking a blue ball resulted in an incentive while picking a green ball resulted in the participant receiving nothing). The participants were then asked to replace the ball and choose again. The researchers postulated that the second choice would be based on which urn would deliver the most balls of the right colour. However, the researchers formulated the experiment in such a way that if the participant chose from the urn on the right, Bayes rule (the probability of an event as determined by updating ones prior belief based on new information) and the reinforcement heuristic would be aligned. This means that the correct urn and the urn that had the highest probability to be correct based on prior information would be the same urn. If the participant chose from the urn on the left first, Bayes' rule and the reinforcement heuristic would be conflicting. The reinforcement heuristic is described when an individual stays with their choice due to a reinforcement received. Alós-Ferrer and Hügelschäfe's (2012) results indicate that individuals

with high faith in intuition are more susceptible to the reinforcement heuristic than individuals with low faith in intuition. This means that individuals who are more intuitive (higher faith in intuition) are more vulnerable to reinforcement, thereby influencing intuitive judgements. The findings of this study were kept in mind when the psychological interview was conducted in the present study since any positive or negative response by the interviewer could be taken as a form of reinforcement.

In conclusion, dual process theories have been researched by multiple authors. The use of process A (intuitive responses) has been found by multiple researchers to result in better decisions. This is, however, not to say that all intuitive decisions result in positive outcomes. Process B (analytical responses) are needed when a low FOR or faith in intuition (metacognitive experiences) is felt. Cognitive processes, however, are not the only construct that plays a role in the use of intuition. The next section covers the role domain expertise plays when making intuitive decisions.

#### *2.2.2.2. Intuition and domain expertise*

Dane, Rockmann and Pratt (2012) conducted a study that tested the effectiveness of intuitive decision making versus analytical decision making taking domain expertise into account. A person can be said to have domain expertise when they are knowledgeable and proficient in the topic or skill at hand. Dane et al. conducted two studies based on their hypothesis that the effectiveness of intuition is better when domain expertise is high. The first study was conducted with 184 participants who were asked to rate the difficulty of multiple basketball shots from video clips that had been pre-recorded. Participants were assigned to one of two conditions, the intuitive condition and the analysis condition. The domain expertise of the participant was determined based on their prior experience to competitive basketball. The results indicate that the intuitive group's task performance was improved with high domain expertise.

The second study included 239 participants who were asked to view and judge the authenticity of designer handbags (Dane et al., 2012). As in the previous study, the participants were divided into two groups, the intuitive group and the analytical group. The participants were shown a handbag for a set amount of time and asked to determine whether the handbag was real or fake. In this study, the researchers determined domain expertise based on implicit and associative learning. A domain expert was, therefore, determined as a

participant who owned designer handbags as they would have interacted more with these types of bags and would, therefore, be more sensitive to specific product related features. The study findings were a replication of the first study. The researchers therefore proved their initial hypothesis that intuitive decisions are improved when paired with high domain expertise (Dane et al., 2012).

Further research in the field of domain expertise and intuition is found in the medical field. Stopler et al. (2011) provided a review of literature on intuition in general medical practitioners' diagnostic reasoning. Their review covers decision making and problem solving in the medical field with regards to intuition. Through their review the researchers proposed that gut feelings are of importance in the medical field and should not be taken lightly. The researchers suggested teaching intuition to medical practitioners and proposed that these teachings could promote correct use of intuitive judgements. The correct use of intuition is described as listening to a sense of alarm whilst not forgetting their practical analytical training. The teaching of intuition is further elaborated on in 2.2.3.

Brien, Dibb and Burch (2011) conducted an interpretative phenomenological qualitative study on intuition in homeopathic decision making. The researchers conducted semi-structured, in-depth, face-to-face- interviews with experienced homeopaths. The questions in the interviews were focused on their definition of intuition, their views of intuition and their use of intuition in their practice. Brien et al. (2011) discovered that homeopaths, like medical practitioners, make use of intuition in their practice. The researchers further found that when it comes to prescriptions, homeopaths rely on both intuition and deductive reasoning (Brien et al., 2011).

It can therefore be concluded from the literature that domain expertise does help intuitive judgements. In light of the above discussions, one can conclude the following about the psychology of intuition:

- An intuitive response involves the employment of an automatic process referred to as process A;
- Intuitive processes result in better decision quality especially in the case of complex decisions;
- When individuals have a low feeling of rightness about the decision they are making they are more likely to employ process B (analytical thinking);

- A low faith in intuition results in the employment of process B (analytical thinking); and
- Domain expertise improves intuitive decision making.

It appears that, when studying the psychology of intuition, some individuals are more capable than others to make intuitive decisions. Researchers, however, believe that intuition could be taught. The next section takes an in-depth look at this belief.

### 2.2.3. Teaching intuition

It can be seen from 2.2.2 that intuition is important in decision making. It is for this reason that studies have been conducted to determine if intuition could be taught. Seligman and Kahana (2009) wrote a conjecture on intuition and, more specifically, the teaching of intuition. In their conjecture the researchers explain how intuition can be taught through two methods.

The first method involves brute force and the second method involves verbal teaching. In their explanation of the brute force approach the researchers make use of the 'sexing' chicken study done by Myers (2002). This experiment showed that people could be taught to determine the sex of baby chickens at a glance by regularly exposing them to chickens and allowing them to practice identifying the sex of chickens. The decision as to whether the baby chicken was a male or a female therefore became intuitive through experience (Myers, 2002).

The second method does not involve practice but is based purely on verbal teaching. In the verbal teaching approach a person is told a story that includes a lesson to be learnt. The premise is that when this person is placed in a similar situation to the one in the story, the person will base their reaction on the lesson learnt from the previously heard story. Seligman and Kahana (2009) proposed that the story provides a past experience and therefore gives the person the ability to make an intuitive decision. The main difference between the verbal teaching approach and the brute force approach is the quality of the experience. The brute force approach results in actual past experience while the verbal teaching approach results in taught imagined experience. The researchers found that, due to the difference in the quality of the experience, the verbal teaching approach is not as effective as the brute force approach (Seligman & Kahana, 2009).

The main problem with the brute force approach is that it is not always possible to obtain the actual past experience required before the intuitive response is needed (Seligman & Kahana, 2009). As an example the researchers described a surgeon who has to perform a surgery for the first time. The surgeon needs to be able to make intuitive judgements if necessary, but does not have the past experience on which to build these intuitions. Seligman and Kahana (2009) therefore suggested a possible alternative to the brute force approach. The proposed approach was virtual simulations in which the surgeon could perform virtual surgeries. This would allow the surgeon to obtain the prior experience needed to make intuitive decisions without having any actual prior experience (Seligman & Kahana, 2009).

Intuition can therefore be taught through different methods with brute force being the better method. However, in the absence of brute force, one could consider using simulations to teach individuals how to make intuitive decisions. In the next section, a discussion will be presented on intuition and how it could be used to conduct non-verbal decoding.

### 2.2.4. Intuition and non-verbal decoding

Decoding, amongst other things, relates to the interpretation of non-verbal cues such as facial expressions. One of the most notable researchers on the issue of intuition and non-verbal decoding is McCrea (2010). McCrea (2010) conducted research on intuition and insight. According to him, insight was related to a 'eureka' moment. This moment is described as a sudden knowing or understanding that comes as unconscious deliberation moves into conscious awareness. Insight, therefore, has an incubation period in which the problem sits before the recognition of the solution is reached (McCrea, 2010). This is different from intuition as intuitive judgements are arrived at automatically and seemingly without cognitive processing (McCrea, 2010). McCrea explained that insight is secondary to intuition as it requires processing while intuition is automatic.

A lot of McCrea's (2010) research was based on work conducted by Lieberman (2000). According to Lieberman (2000), nonverbal decoding could provide information about people's emotions, intentions and attitudes. He noted that intuition plays a vital role in non-verbal decoding (Lieberman, 2000). Despite the important contributions of McCrea (2010) and Lieberman (2000), it seems that little was done to research the matter further. For this

reason the present study is of importance since it investigates the role of intuition in the non-verbal decoding of facial cues or micro-expressions.

The above discussions made it clear that intuition has both psychological and cognitive components. These components, however, do not exist in isolation and are often accompanied by a physiological component. The physiology component related to intuition will hence be discussed next.

### 2.2.5. The physiology of intuition

McCrea (2010) was not only known for his research on intuition and non-verbal decoding, he also did some work on the study of the physiology of intuition. As was the case with his research on decoding, he once again used the findings of Lieberman (2000) as a point of departure for his own research.

When studying their findings, it seems that both researchers noted that areas in the basal ganglia of the brain play a role in the experience of intuition (Lieberman, 2000; McCrea, 2010). They both hypothesised that the putamen, which is also implicated in nonverbal encoding, is involved in encoding (converting information into a construct to be stored in the brain) intuitions while the caudate is involved in decoding (deciphering the encoded information) intuitions (Lieberman, 2000; McCrea, 2010). Both of these areas are situated in the basal ganglia of the brain. McCrea (2010), however, believed that the amygdala also played a role in the experience of intuition. According to him, the amygdala and the basal ganglia play a two-way role in intuition. This two-way role involves positive and negative affective appraisal systems. McCrea noted that the amygdala is involved in controlling physiological responses to negative stimuli. According to him, this confirms that the amygdala and the basal ganglia work hand in hand in intuition. One could, therefore, assume that a physiological response would be elicited in response to a negative intuition about a person. Unfortunately, McCrea never pursued the matter further and, since little is known about the brain structures involved with intuition, more research is needed on the issue.

A visual representation of the brain structures involved with intuition can be found in figure 2.1.

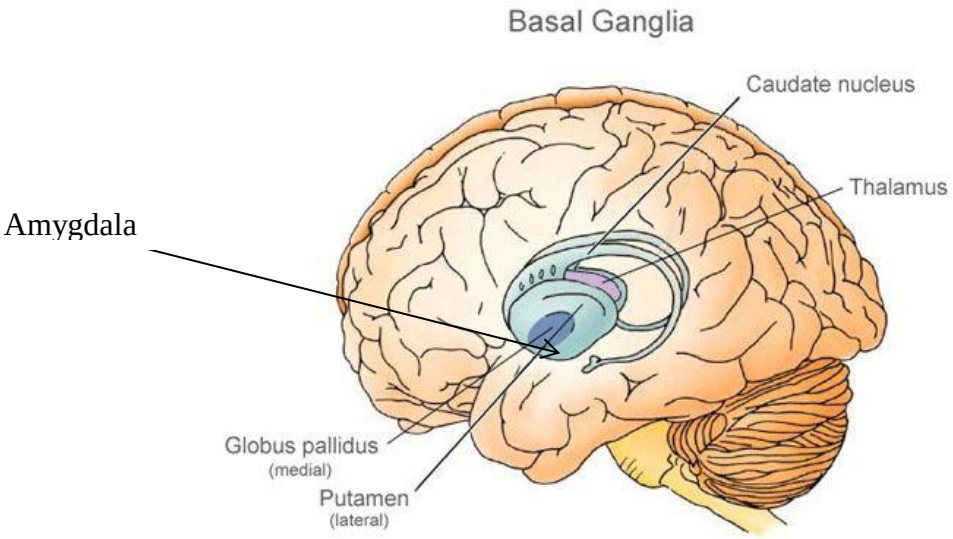



Figure 2.1. The amygdala and the brain structures of the basal ganglia (Andrei, 2013)

In other research conducted on the physiology of intuition, McCraty et al. (2004a) conducted a study that investigated the progressive dimension of intuition by using electrophysiological measures. He and his co-researchers adopted their experimental design from a study conducted by Radin (1997), whose experiments were designed to evoke emotional responses to emotionally arousing or calming photographs. McCraty et al.'s experimental procedure included skin conductance level, photoplethysmographic (skin blood flow), brain activity as well as heart activity measures. In order to study the brain and heart activity, the researchers made use of an electrocardiogram (ECG) and an electroencephalogram (EEG). They conducted the experiment on twenty-six adults and found that the heart as well as the brain appears to receive and respond to an event before it happens (McCraty et al., 2004b). Furthermore, the heart appears to be the first point of contact for intuitive information. McCraty et al. (2004a; 2004b) concluded from their research that intuition involves a system wide process, meaning it involves both the heart and the brain. They noted that other bodily systems might also play a role but suggested further research on the matter.

McCraty et al.'s (2004a; 2004b) findings are consistent with the results yielded by an experiment conducted by Radin (2004). During the experiment, participants were shown either calm scenes, happy people, or erotic or violent imagery. Radin tested participant's

electrodermal activity (fluctuations in skin electrical resistance) during four conditions. These four conditions used various measures to monitor the electrodermal activity of the participant. The researcher found that the respondents reacted physiologically to the image before the image was seen by the participants. Radin termed this response a presentiment and defined it as a precognition of the autonomic nervous system of an individual.

In light of the above discussion it is concluded that intuition is not only a function of certain brain processes, but that the heart also plays a role in the experience thereof. Radin's (2004) work furthermore indicated that intuition could be perceived as a form of arousal that takes place in the autonomic nervous system.

### 2.2.6. Intuition, micro-expressions and trust

Before moving onto a discussion of micro-expressions, this section covers the overlap in research on intuition and micro-expressions, with specific reference made to the social judgement of trust.

Trust, or trustworthiness, refers to the firm belief that a person is reliable (Trust, 2015). Porter and Ten Brinke (2009) conducted a study to determine the effects of intuitive decisions regarding the trustworthiness of an individual. The study was conducted within the context of the courtroom to investigate how intuition could influence decisions regarding the trustworthiness of an individual and resultantly lead to a guilty verdict. The researchers investigated the Dangerous Decision Theory (DDT) in their research. According to this theory, poor decisions could be made as a result of the facial cues displayed by the accused. It is called the DDT because such decisions might culminate in unjust rulings. Their study included 80 participants who were required to evaluate the culpability of a series of criminals who had committed a crime. The crimes ranged from minor to major crimes and the explanation of the crime was paired with a photograph of the culprit. The trustworthiness of the photographs of the culprits was tested prior to the main test. This was done to allow the researchers to test whether major crimes were judged more leniently when paired with a trustworthy face. The results showed that participants who were shown untrustworthy faces came to a conclusion faster and had more confidence in their ruling than when they were shown trustworthy faces. Porter and Ten Brinke (2009) concluded that untrustworthy faces

are judged more harshly than trustworthy faces and the intuitions about trustworthy faces are more positive than those of untrustworthy faces.

Since Porter and Ten Brinke (2009) found evidence for the existence of the DDT, they called for training programs, on the issue, to be implemented in law schools so that judges do not make poor decisions based on individuals' expressions. Porter and Ten Brinke's (2009) research showed that intuition and facial micro-expressions have an impact on the amount of trust a person will place in someone else.

In conclusion, intuition has been defined and discussed with reference to existing literature. The next section of this chapter covers micro-expressions, which is another important construct under investigation in the present study.

## 2.3. MICRO-EXPRESSIONS

### 2.3.1. Definition

It is believed that the intentions and motivations of people could be seen through facial expressions (Schmidt & Cohn, 2001). These expressions could either be specific within a culture or universal. A micro-expression can indicate one of six universal emotions namely, anger, disgust, fear, sadness, happiness and surprise (Shen, Wu & Fu, 2012). As defined in 1.2.1, the term 'micro-expression' refers to minute muscle changes, lasting a fraction of a second, that indicate the emotion that a person is consciously or unconsciously feeling (Moritz, 2011). As was mentioned in 1.2.1, the timing of the expression in the present study was not limited to a fraction of a second. The term 'micro-expression' will therefore be used interchangeably with the term facial-expression. The following sections include discussions of both facial expressions and micro-expression. Since this study focuses specifically on the universal expression of anger, this construct will be discussed in a separate section (see 2.4).

### 2.3.2. The recognition of micro-expressions and the enhancement of that recognition

Stewart, Waller and Schubert (2009) conducted a study to determine the effect of micro-expressions on speeches delivered by politicians. Their study included 206 university students who were split into a control group and a test group. The control group was exposed

to a speech given by George H. Bush in 1990. The content of the speech was about the US military's response to the war in Kuwait. Before the speech had been shown to the test group, the researchers deleted all the micro-expressions where Bush is smiling. The results indicated that the control group, who were exposed to his micro-expressions, felt more positive about the speech than the test group. Stewart et al. (2009) concluded that micro-expressions could alter a person's response to a speech. This study has not only shown that individuals are able to recognise a micro-expression, but that it will also have an impact on how they react to the person expressing the micro-expression.

It can be seen that the impression of an individual is influenced by micro-expressions but how are micro-expressions recognised? Matsumoto and Hwang (2011) conducted a study on training in micro-expression recognition. The researchers explained that the recognition of micro-expressions could help an individual in a situation where interpersonal skills are required. 'Doctors' were one such example given by the researchers. The researchers explain that a doctor needs to develop rapport with a patient and the recognition of micro-expressions could help them achieve this. In their first study, they recruited 81 participants who were employees of a retail store. The participants were placed in either a training group or a comparison group. Members of the training group were given micro-expression recognition training via a micro-expression recognition training tool (a tool developed to train people in micro-expression recognition) while members of the comparison group were not. Participants were then tested via a fixed choice (only one choice could be made) response test where they were shown a micro-expression and were asked to identify it. Matsumoto and Hwang (2011) found that micro-expression recognition could be improved by training.

Matsumoto and Hwang (2011) then conducted a follow-up study where the participants were professionals. In this study, 25 psychologists and lawyers formed the training group while 30 individuals from the same professions were placed in the comparison group (Matsumoto & Hwang, 2011). The training group received the same training as the retail store employees. Matsumoto and Hwang (2011) found that the training group responded quicker than the comparison group in recognising micro-expressions and that they were more accurate in identifying the micro-expressions. The researchers further found that the skills were retained 2-3 weeks after the training had taken place. It was hence concluded that training in micro-expression recognition is effective (Matsumoto & Hwang, 2011).

Hurley (2011) conducted a similar study on training in micro-expressions and found similar results to that of Matsumoto and Hwang (2011). The study included 306 participants who were randomly assigned to one of nine groups. The first three groups were training groups, the second three groups were reinforcement groups, and the final three groups were control groups. Hurley recorded participant's accuracy in micro-expression recognition at four time intervals to determine the long term effects. Once again, training resulted in improved micro-expression recognition. Hurley (2011) also found that the magnitude of the improvement was based on the training technique employed as well as the knowledgeability of the trainer.

It is important to note, however, that not all individuals will benefit from such training. Endres and Laidlaw (2009) conducted a study on 24 first year medical students. The communication skills of each of the participants were tested by using an Objective Structured Clinical Exam. The participants were then trained in micro-expression recognition through the Micro-Expression Training Tool (METT). The pre-training results indicated no significant difference in micro-expression recognition between participants with high communication skills and participants with low communication skills. However, after training, participants with high communication skills showed a significant improvement in micro-expression recognition. Participants with low communication skills did not benefit from the training. It therefore seems that the quality of communication skills of an individual has an impact on one's ability to learn to recognise micro-expressions.

It seems that communication skills are not the only factors that could impact an individual's ability to learn to recognise micro-expression. Hurley, Anker, Frank, Matsumoto and Hwang (2014) conducted a series of studies on the accuracy and improvement of micro-expression recognition by taking diverse background factors into account. Their first two studies focused on the influence of personality traits such as openness, extraversion and conscientiousness on micro-expression recognition. These studies included 334 participants who were split into one of four groups. Three of the groups were training groups that varied in their method of training. The fourth group was a control group who received no training. The researchers discovered that younger participants who had a high level of openness to experience were better at micro-expression recognition. However, after training, the influence of the background factors such as the level of openness dissipated (Hurley et al., 2014).

The study that followed focused on the influence that past law enforcement experience or past micro-expression training might have on micro-expression recognition (Hurley et al., 2014). This study was conducted with 127 Behavioural Detection Officers who are tasked with detecting suspicious behaviour and security risks. Hurley et al. (2014) noted that prior micro-expression training and law enforcement experience were better predictors of micro-expression recognition when compared to demographic or personality factors. They also found that recognition could be improved by undergoing training more than once (Hurley et al., 2014). A possible explanation for this is that the subsequent training sessions serve to reinforce what had been learned in the previous training sessions.

There also seems to be constructs beyond personality factors, such as good communication skills, and external factors, such as training, that influence micro-expression recognition. Hormones also appear to play a role. Lischke et al. (2012) conducted a study on oxytocin and its influence on the encoding as well as recognition of facial expressions. The study included 47 male participants. The researchers used eye tracking technology in conjunction with a dynamic facial recognition task as measurement instruments in their study. Participants were divided into experimental and control groups. The control group was given a placebo to control for any confounding variables while the experimental group received oxytocin. The researchers recorded participant's visual attention through the use of an eye tracker. Lischke et al. (2012) concluded that oxytocin does improve the recognition of facial expressions while having no influence on visual attention.

From the above it is clear that diverse factors, ranging from training to good communication skills to levels of oxytocin have an impact on the recognition of facial expressions. When looking at these constructs holistically, one could conclude that individuals who experience good psychological and physiological well-being would perform better in recognizing facial expressions than individuals suffering from illness or psychological disorders. More research is however needed on the matter.

### 2.3.3. Duration, motion and other aspects that influence recognition of micro-expressions

Previous discussions have shown that the recognition of micro-expressions could be influenced by multiple factors. In addition to these, Yan, Wu, Liang, Chen and Fu (2013) also

discovered that duration and motion influence the recognition of micro-expressions. They conducted a study on the duration of micro-expressions. Twenty-two (22) participants were recruited for the study. Participants were asked to control their emotions whilst watching videos. They were told that the better they could control their emotions, the higher their social success in the experiment. Yan et al. (2013) noted that the upper limit for the duration of a micro-expression is around 500 milliseconds. The lower limit was found to be around 166 milliseconds, however, even lower durations appeared also to be possible. Only two participants were able to control their expressions, thereby indicating that micro-expressions cannot be controlled.

Shen et al. (2012) also conducted a study on the effect of duration on the accuracy of recognising micro-expressions. The researchers conducted two experiments to determine whether the duration of exposure might influence the accuracy of recognition of micro-expressions and whether training could influence micro-expression recognition. In the first experiment, the researchers recruited eleven participants who were asked to determine the micro-expression of faces flashing on the screen. The duration of the image shown was varied from 40 milliseconds to 300 milliseconds. They found a positive correlation between the time in which an individual was shown a micro-expression and the recognition accuracy. This positive correlation levelled off at around 200 milliseconds. The second experiment was conducted with twelve participants who were put through a similar procedure as the first experiment. However, before the experiment started, participants were required to go through what was called ‘an intensive practice’. This practice required participants to be able to identify the correct micro-expression in two consecutive runs. The actual experiment started after the participants had passed this practice. The results indicated that micro-expression recognition improves with training and Shen et al. (2012) concluded that the processing of the human face is done in milliseconds.

Moriya, Tanno and Sugiura (2013) furthered the study of duration in facial expression recognition with specific focus being placed on the effects of repeated exposure to the expression combined with a short presentation time of the expression. The researchers conducted an experiment in which participants were shown happiness prone expressions and anger prone expressions for 500 milliseconds repeatedly. The results of the experiment indicated that participants who were exposed to a facial expression multiple times had dampened responses to that expression. This resulted in a heightened response to other facial

expressions. For example, participants who were shown angry-prone individuals repeatedly became less sensitive to angry expressions and more sensitive to happy expressions. The researchers further found that individuals who are perceived as being angry are evaluated as being untrustworthy. This was also found in multiple older studies (Oosterhof & Todorov, 2009; Todorov & Duchaine, 2008). As a result of these findings, Moriya et al. (2013) placed a lot of emphasis on the importance of facial expression evaluation as this may signify a threat or danger especially when a negative expression (such as anger) is seen in an individual.

The above discussions illustrate that duration should be seen as an important factor influencing micro-expression recognition. Although the studies investigated different durations, it should be noted that a positive relationship was found between duration and micro-expression recognition throughout these studies. Studies had also shown that micro-expressions can be recognised in milliseconds but the longer one sees the micro-expression, the better the recognition accuracy. However, when it comes to repeated exposure, the more one is exposed, the lower the sensitivity to that expression.

Another important factor that influences micro-expression recognition is the pairing of the expression with a stimulus concept such as “happy”. Halberstadt, Winkielman, Niedenthal and Dalle (2009) conducted a study with 27 participants who were taken through an experimental procedure aimed at determining the influence of a stimulus concept on the recognition of a micro-expression. The participants were first shown 18 morphed faces (face that showed various expressions) and 18 ideographs (a Chinese character indicating an idea). These were shown to participants for 30 seconds. The participants were then asked to think about pairing the face or ideograph with one of the stimulus concepts shown to them (“happy”, “angry” etc.). Afterwards, participants had to perform one of two tasks, either a viewing task or a recognition task. In the recognition task the participants were shown a movie from which the morphed face was obtained. They were then asked to pause the movie at the exact moment the morphed face appeared on the screen. In the viewing scenario, participants were shown the morphed face or ideographs again without the stimulus concepts. The researchers recorded EMG (electromyography) responses throughout this phase of the experiment. EMG records the facial response of the participant in terms of their muscle activation. After the participants had completed the task, they were shown the morphed faces or ideographs again and asked to recall the stimulus concept. Halberstadt et al. (2009) found that smiling related EMG activity was initiated by happy faces rather than angry faces. The

researchers further found that when pairing a face with an ambiguous facial expression and a stimulus concept (e.g. 'happy'), the participants perceived the facial expression portrayed as being congruent with the concept shown. This research indicates that when an individual is shown an expression that is difficult to recognise, they would see the expression most congruent with the stimulus concept given (such as happy) (Halberstadt et al., 2009). This implies that the recognition of expressions is not always concrete and could potentially be altered by extra information.

In light of the above discussions it is now concluded that duration and the pairing of a stimulus concept with the micro-expression are both important factors in facial expression recognition. The next section covers how individuals respond to micro-expressions. This is different from recognition as recognition involves the identification of the expression while the response incorporates what the individual does when recognising the expression.

### 2.3.4. Responses to micro-expressions

Studies have been conducted on people's responses to the portrayal of facial expressions and have found that people do not simply mimic the facial expression they are being shown, but rather experience the perceived emotion (Magnée, Stekelenburg, Kemner & de Gelder, 2007). One of the most notable studies conducted within this context was done by Magnée et al. (2007). These researchers conducted two studies to prove that people do not simply mimic the expression they are shown, but they also recognise the expression. Each experiment was conducted with thirteen participants with the first study being limited to male participants. In the first study, Magnée et al. (2007) tested the participants' responses to faces portrayed as images and voices paired with the faces. The pairing consisted of congruent pairs as well as incongruent pairs. The researchers found increased corrugator (towards the medial end of the eyebrow) muscle activity in response to fearful expressions (Corrugator muscle, n.d.). Happy expressions on the other hand produced zygomatic muscular activity, which is the muscle used when smiling (Zygomaticus major, 2015). The second study was extended to include body posture. In this study participants' facial responses were recorded while they were exposed to happy and fearful body postures (Magnée et al., 2007). This study investigated the comparison of individual responses to body postures and facial expressions. The results indicated that facial responses are more readily expressed when shown facial expressions as

opposed to body postures. These results therefore indicate that facial expressions elicit a response more readily than body postures (Magnée et al., 2007).

Recognising a micro-expression therefore elicits a response that is congruent with the emotion recognised. No recent studies were found indicating other responses but one does think the responses explained above make sense. This intuitive feeling is based on past experience in which one sees a person smiling and then finds themselves smiling. The next section covers the psychology of recognition. This section includes discussions of factors such as lie detection and trustworthiness judgements.

### 2.3.5. The psychology of recognition

Research conducted relating to lie detection has shown that micro-expressions have a positive influence on the latter (Greely & Illes, 2007; Martin, 2009; Porter & ten Brinke, 2010; Shen et al., 2012; Vrij, Granhag, & Porter, 2010). When one thinks of lie detection the premise of trust comes to mind as one could assume from experience that when a lie is exposed the trust between individuals is broken. Porter, England, Juodis, Ten Brinke and Wilson (2008) conducted a study on trustworthiness judgements in micro-expression recognition. Thirty (30) participants were included in the study and were shown 17 images of trustworthy individuals (humanitarians or Nobel Peace prize winners) and 17 images of untrustworthy individuals (Americas most wanted). Participants were asked to rate each face according to their trustworthiness. Porter et al. (2008) discovered no significant differences between the rating of trustworthy and untrustworthy individuals. They concluded that intuitive judgements are not very accurate when it comes to determining the trustworthiness of an individual (Porter et al., 2008).

Carr, Korb, Niedenthal and Winkielman (2014) also included a measure of trustworthiness in their study on social judgements. The researchers conducted a study to test the influence of movement onset asymmetries (when a facial expression starts on one side of the face) on social judgements. The researchers conducted their study on 68 participants who were exposed to avatars showing dynamic facial expressions starting on either the left hand side of the face or the right hand side of the face. Carr et al. (2014) noted how trustworthy participants deemed the avatar to be when experiencing the facial expression of the avatar as spontaneous. The researchers also noted the emotional intensity participants saw in the facial

expression of the avatar. The results showed that facial expressions that started on the left side of the face were evaluated as more spontaneous. Happy faces were evaluated as being more trustworthy than angry faces and angry faces were evaluated as being more intense. The researchers concluded that social judgements are based on dynamic cues of facial expressions with angry faces being evaluated as less trustworthy (Carr et al., 2014).

Although it has been discovered that intuitive judgements are not very accurate when it comes to determining the trustworthiness of an individual (Porter et al., 2008), social judgements could be formed based on dynamic cues of facial impressions. This implies that dynamic cues provide more information that allows an individual to make an accurate social judgement such as whether an individual is trustworthy.

As this study is a psychophysiological one and the psychology of recognition has been discussed, the following section covers the physiology of recognition.

### 2.3.6. The physiology of recognition

As with intuition, facial recognition comes with certain physiological responses. Various research studies discuss the role of the amygdala in facial expression threat detection and state that the amygdala plays a critical role in mediating both the physiological as well as the behavioural response to threats (Carré, Fisher, Manuck & Hariri, 2012; Johnstone et al., 2005; Manuck, Brown, Forbes & Hariri, 2007; Mogg, Garner & Bradley, 2007). Manuck et al. (2007) conducted a study with 13 individuals in which the reactivity of the amygdala to threatening (angry and fearful facial expressions) facial expressions was tested. The aim of the study was to determine if the amygdala would respond to facial expressions that elicited fear in the participants. The researchers used functional magnetic resonance imaging (fMRI) technology to record the brain activity of the individuals as they responded to the facial expressions. Manuck et al. (2007) discovered that the amygdala was activated in response to these threatening images.

Johnstone et al. (2005) also conducted a study on the stability of the response of the amygdala to fearful facial expressions using multiple fMRI scans. The study was conducted on 15 participants whose response to both fearful facial expressions and neutral facial expressions was recorded. The researchers found that there is test- retest reliability in the amygdala's response to fearful expressions (Johnstone et al., 2005).

Yet another study was conducted on the role of the amygdala in the recognition of facial expressions; this time by Adolphs (2006). He studied a patient with damage to her amygdala and her resultant inability to recognise certain facial expressions. The experiment focused on the fear facial expression and showed the patient faces that were only partially visible. Adolphs did not only include the patient in the study but also included healthy participants. The participants and the patient were asked to determine whether the face they had been shown was happy or fearful. Adolphs found that the eyes and the mouth were the best determinates of the facial expression. However, the patient with damage to her amygdala could not determine the expression when only the eyes were shown. He also determined that the patient did not direct her gaze to the appropriate region (the eyes) and therefore could not determine the expression on the face. Based on the findings of his research, Adolphs concluded that the amygdala is pivotal in the association of the facial representation and the emotion connected to that expression. It seems that once the amygdala is activated, it would trigger an autonomic physiological response in the observer, such as sweaty palms or increased heart rate.

Sato et al. (2011) also studied the role of the amygdala in facial expression recognition. Their participants suffered from pharmacologically intractable focal epilepsy. After they had received intracranial electrode implants, Sato et al. (2011) wanted to determine how quickly these participants' amygdalae would respond to facial expressions. The study was conducted on six participants. The experiment consisted of images depicting fearful, happy and neutral facial expressions being shown to the participants. The amygdalae response times were recorded by monitoring the implants of the participants. The results indicated a response time of between 50 to 150 milliseconds with the responses to fearful expressions being processed the fastest (Sato et al., 2011).

It is concluded from the above that the amygdala plays a vital role in micro-expression recognition. This role is not only limited to the recognition of the expression but extends to the experience of associated emotions such as happiness or fear. One can also conclude that the amygdala is responsible for the physiological response that should be seen in response to certain facial expressions such as anger.

It should be noted, however, that apart from the amygdala, certain hormones also seem to play a role in the recognition of micro-expressions. Zilioli, Caldbick and Watson (2014) conducted

research on the testosterone fluctuations of males and females in response to micro-expressions. Happy and angry micro-expressions were shown to participants. These were depicted by members of the same sex or the opposite sex to that of the participants. The study included 85 men and 79 women. The researchers discovered that participants would look at images, regardless of the facial expression, of the opposite sex for longer than they would images of their own sex. The researchers also found that salivary testosterone was higher when participants were looking at a member of the opposite sex. Interestingly, women had a higher testosterone increase in response to angry facial expressions portrayed by males and females. Zilioli et al. (2014) concluded that females are more likely to respond physiologically to angry facial expressions, regardless of the gender of the person to whom the facial expression belong. This implies that females have a more instinctual heightened response to potential danger than males. This spike in testosterone indicates a clear distinction in the responses of females to the facial expression of anger (Zilioli et al., 2014).

A further discussion of fearful facial expressions and their responses is discussed in the next section (2.4). This discussion will be related to the expression of anger and threat detection.

## 2.4. ANGER

### 2.4.1. Definition of anger

Anger is defined by the Oxford dictionary as an intense feeling of irritation, unhappiness, or aggression (Anger, 2015). It can also include unfriendliness and is a universal emotion (as described in 2.3.1). This section is aimed at providing an explanation of anger and the micro-expression of anger as this is one of the main constructs being investigated in the present study.

### 2.4.2. The micro-expression of anger

Moritz (2011) describes the micro-expression of anger as follows: eyebrows pulled down and together, a thinned mouth, sunken eyes and expressionless cheeks. Williams and Mattingley (2006) conducted a study on a group of 78 male and 78 female participants. The researchers included both angry and fearful faces in their experiment in an attempt to see if there was a difference in participants' responses. They did this because both of these expressions elicit fear; however, the person expressing the emotion of anger could be deemed a possible source

of danger. The expressions were presented to participants as part of a collection of neutral expressions. Williams and Mattingley (2006) found that the identification of the facial expression of anger is highly accurate in both males and females. In their study, participants were able to identify angry faces more quickly than fearful faces, with males identifying angry faces more quickly than females. The researchers concluded that the detection of angry male faces is prioritised by males and females. This prioritisation could be seen as an attentional bias. This attentional bias occurs because humans have an internal need to survive. Because of this need, individuals are able to note dangerous situations almost immediately. This includes situations in which anger could be seen in the facial expression of an individual (Williams & Mattingley, 2006).

Since survival appears to be so important, one could assume that highly anxious individuals would display higher levels of attentional bias to angry facial expressions. This premise has been theorised by multiple authors (Carré et al., 2012; Cooper & Langton, 2006; Mogg et al., 2007; Tran, Lamplmayr, Pintzinger & Pfabigan, 2013). Mogg et al. (2007) conducted research on the gaze of anxious individuals to fearful and angry faces. Their study included 49 individuals who were split into two groups namely, the low anxiety group and the high anxiety group. The group allocation was based on the State-Trait Anxiety Inventory developed by Spielberger (2010). The researchers found that a higher propensity of participants directed their gaze towards intense threat related expressions. The researchers also noted that highly anxious individuals tended to direct their gaze at intense threat-related expressions (fearful expressions and expressions of anger). This implies that highly anxious individuals are more attentive to potentially threatening situations, whether this is perceived through an expression of fear or anger. Mogg et al. (2007) also discovered a lack of difference in responses between the fearful and angry expressions. The researchers postulated that the initial attention may be the same for the two different expressions but the maintained attention may be different with fearful expressions needing more attention to foster an appropriate response. This research did not separate the differences between males and females, an aspect that was then researched by Tran et al. (2013).

Tran et al. (2013) conducted the dot probe task with 347 individuals. The dot probe task is a task in which participants are shown two different facial expressions, for example a happy face and an angry face, on either side of a screen. These two images are both shown for 30 milliseconds. After 30 milliseconds the images disappear and a dot appears on one side of the

screen where one of the images was. The participant's task is to indicate, as fast as possible, which side of the screen the dot appeared. A slower response was elicited when the individual was looking at the side of the screen that did not show the dot. This indicated which image they were focusing on and therefore their attentional bias. The researchers found that, congruent with previous studies, females with high anxiety levels show attentional bias towards the facial expression of anger whilst males show a bias towards facial expressions of happiness (Tran et al., 2013).

Cooper and Langton (2006) also conducted a study that aimed to investigate attentional bias towards angry facial expressions. These researchers used a slightly different dot probe task to that of Tran et al. (2013). In this instance, participants were shown two dots and were asked to indicate whether the dots were horizontal or vertical. The study consisted of thirty participants who were shown a pair of faces (angry, happy or neutral) for either 100 milliseconds or for 500 milliseconds. The researchers used the two times as time stamps to determine whether time played a role in attentional bias. The results indicated that at 100 milliseconds participants were more attentive (attentional bias) to angry facial expressions than neutral ones. At 500 milliseconds, however, the results indicate avoidance of the angry expression. Cooper and Langton (2006) concluded that time plays a vital role in attentional bias or the avoidance of angry facial expressions.

From the above studies it can be concluded that individuals show attentional bias towards angry facial expressions. This attentional bias is however dependent on time as it has been found that the longer the face is shown, the lower the attentional bias would be towards the angry expression. This attentional bias towards angry expressions may be due to the perceived social intent behind the expression and the need to survive. The next section covers all the other aspects pertinent to the present study that were not discussed above.

### 2.4.3. Malicious males, anger and the micro-expression of anger

A discussion around the social intentions being signalled through micro-expressions and the detection of threat through fearful expressions (micro-expression of fear or anger) has been provided in 2.4.1 and 2.4.2. It is of interest to note that, whilst conducting the literature review for the present study, no literature pertaining specifically to malicious males, anger and the micro-expression of anger could be found.

### 2.4.4. The psychophysiology of the response to the micro-expression of anger in malicious males.

Research has shown that the combination of physiological markers and psychological markers could identify arousal (Stanners, Coulter, Sweet, & Murphy, 1979). The psychology and physiology of both intuition and micro-expression recognition has been discussed in 2.2.4 and 2.3.6. As was the case with the constructs mentioned in 2.4.3, no recent studies pertaining to the psychophysiology of the responses to the micro-expression of anger in malicious males could be found when conducting the literature review for the present study. This suggests that more research is needed in this area.

## 2.5. CONCLUSION

From the above discussions it is concluded that intuition is an automatic, unconscious response that is different to insight. A clear definition for intuition has been provided but no specific mention has been made to feminine intuition. This is due to the lack of research on this field. The psychology and physiology of intuition have also been discussed with a clear overlap being seen between the areas of the brain involved in intuition and the areas of the brain involved in micro-expression recognition. This will be discussed further in chapter 5.

It is clear from the discussions provided that, whilst research exists on the different constructs included in the present study, huge gaps still exist with regards to how these constructs relate to one another. More research is therefore needed to contribute to the existing body of knowledge. It can also be seen from the literature review that no evidence of research on these issues could be found in the South African context. It is therefore important that more local research is conducted on intuition and the role it plays in recognising universal expressions. Since the universal expression of anger signals that danger might be imminent, it is recommended that research should focus on micro-expressions of this kind.

Now that the central tenets of the study have been presented in the form of a literature review, the next chapter will discuss the research methodology employed when the present study was executed.

# CHAPTER 3
# RESEARCH METHODOLOGY

## 3.1. INTRODUCTION

The research methodology used in the study, will be discussed in this chapter. The chapter begins with a discussion of the research design that is followed by the theoretical point of departure. The sampling method used and ethical issues addressed during the study will also be discussed. The type of analysis employed in the study will also be mentioned. Lastly, issues related to the reliability and validity of the mixed methods research design will be addressed.

## 3.2. RESEARCH DESIGN

A mixed methods research design was employed in this study. Mixed methods is defined by Creswell and Clark (2007) as a research methodology in which both quantitative and qualitative data is collected. Traditionally, quantitative research is focused on numeric objective data whilst qualitative research is more focused on interpretative subjective data (Creswell & Clark, 2007; Graff, 2013; Patton, 2001; Teddlie & Tashakkori, 2011; Willig, 2008). The combination of these two methodologies that seemingly fall on opposite sides of the methodology spectrum needs to be conducted in a way that does not negate either of the two methodologies. Researchers have therefore proposed multiple typologies to conduct mixed methods research. The typology that was employed in the present study is Creswell and Clarks' (2007) mixed method design of triangulation. In this design, both qualitative and quantitative data are collected and analysed separately. The collection of this data in the present study was conducted sequentially (one after the other). The data were analysed separately using specific analytical methods for quantitative and qualitative research. The results of the quantitative analysis and qualitative analysis were then combined to form an integrated interpretation of the data. The conclusions, based on this integrated interpretation, are provided in Chapter 5.

## 3.3. PARADIGMATIC POINT OF DEPARTURE

Qualitative and quantitative research designs adopt different stances with regard to their views on reality (Rocco, Bliss, Gallagher, & Pérez-Prado, 2003). Quantitative research lies within a

realist ontology (some degree of reality is known) and falls under the positivist or postpositivist paradigm. Qualitative research, on the other hand, lies within a relativist ontology (reality is socially constructed) and falls under the interpretivist paradigm. Mixed methods research therefore takes a pragmatic stance with regards to ontology and knowledge claims as it attempts to take both realism and relativism into account.

Creswell (2009) discusses some qualities of pragmatism, reflecting its relationship with mixed methods research. He describes the flexibility of pragmatism in that it is not bound to one reality, method, technique or truth; pragmatism therefore provides the researcher with the freedom to create reality and truth in the moment. Creswell further explains that pragmatic researchers are bound to the 'what' and 'how' and mixing methodologies provides a path to answering these questions. It is for this reason that a dialectical position was taken in the present study. This position, according to Greene and Caracelli (1997), assumes that research is stronger when it combines research paradigms. Therefore it combines aspects of interpretivism and postpositivism into one harmonious metaparadigm. Through this combination, dialectical researchers are able to remain aware of the benefits of drawing from two paradigms' with different understandings of knowledge and reality. This metaparadigm therefore promotes a fuller understanding of human phenomena (Greene & Caracelli, 1997; Rocco et al., 2003).

### 3.4. SAMPLING METHOD

Non-probability convenience sampling was used to obtain the sample. Convenience sampling is based on the access to, and availability of participants (Babbie, 2005; Gravetter & Forzano, 2012). Non-probability sampling holds the premise that the probability of any individual being included in the study is unknown (Gravetter & Forzano, 2012; Struwig & Stead, 2001). This is true in convenience sampling as the sample obtained is based on the availability of participants. Owing to the explanation of non-probability convenience sampling, this sampling method was used due to the availability of participants. The participants were available to the researcher because of two reasons namely, easy accessibility to the university used in the study and the willingness of the co-supervisor of the study to introduce the researcher to the lecturers in his department. The sample was obtained at the main campus of a South African university. The co-supervisor of the study oversaw the Physiology programme on the main campus. He granted the required permission to recruit participants

from the physiology department at the university. The researcher obtained consent from the physiology lecturers to make announcements about the research in their classes.

Upon receipt of consent from the lecturers, the researcher personally extended invitations to participants to participate in the study. The announcement was given in the lectures and included an introduction to the researcher and the study. The students were informed that only female participants were required and a brief explanation of the study was given as follows: it was explained that those who took part in the study would be exposed to physiological instruments namely a Grinbath eye tracker and a Zephyr Bioharness (described in 3.7) and that the study would not take too much of their time. Intricate details of the study were not discussed as this could have biased the results. For example, if participants were informed that the identification of micro-expressions was one of the main aims of the study, the participants may have conducted research on micro-expression recognition before the study took place that would have confounded the results. The students were assured that the study would in no way harm them and that their results would remain confidential. A sign-up sheet was then circulated giving the students the opportunity to sign up for the study. The students were asked for their name, surname and email address, which would all be kept confidential.

The individuals who had expressed interest in the study were then emailed an information document that provided them with the information of the study (appendix F). They were also asked if they were willing to participate in the study and those who agreed were asked for possible times that suited their timetable. Once this information had been obtained, participants were slotted into time slots that suited both the participant and the researcher. Each participant was given a participant number before the study commenced.

## 3.5. SAMPLE OBTAINED

### 3.5.1. Quantitative physiological sample

The main aim when performing descriptive statistics is to provide a description of the sample in order to obtain a general idea of the characteristics of the sample (Evans, 2010; Howell, 1999). This description includes the mean, median and mode, dispersion measures and frequencies. The sample obtained for the quantitative part of this study consisted of 22 female participants. The mean age of the sample was 21.22 years (SD = 1.9) with a minimum age of 19 and a maximum age of 28. The group consisted of 18 participants who identified

themselves as white and 4 who identified themselves as black. Interestingly, only 1 of the participants who identified themselves as black was South African.

The demographic questionnaire used during the study also included questions around the participant's nationality, highest level of education, type of area in which they spent most of their life and type of area in which they were raised. In terms of nationality, 19 of the 22 participants were South African. The remaining 3 participants were from the Democratic Republic of Congo, Nigeria and Zimbabwe.

The highest level of education for the majority of the participants was Grade 12 with only 2 participants holding a 3 year degree. 55% of the participants identified the type of area they were raised in as "suburban" while the remaining 45% were split between small town (18%), urban (18%) and semi-urban (9%). These same percentages were mimicked in the area in which the participants had spent most of their lives.

### 3.5.2. Eye tracker sample and qualitative psychological sample

Although all 22 participants were interviewed for the psychological sample, a smaller sample of participants was randomly selected for the qualitative section of the research. This was done by placing each participant's participant number in a hat and randomly selecting 5 numbers one by one. Although the smaller sample was selected because of time and cost constraints, it must be noted that small sample sizes are generally found in qualitative research (Willig, 2008). Despite the smallness of these samples, researchers are still able to yield rich data by conducting in-depth analysis of the qualitative data collected. The qualitative sample consisted of four white participants from South Africa and one black participant from Zimbabwe. The mean age of the participants was 20.2 with a standard deviation of 0.84. All participants' highest level of education was matric. 60% of the participants were raised in suburban areas, 20% were raised in semi-urban areas and the final 20% were raised in an urban environment.

Table 3.1. *Participants' highest level of education*

| | *n* |
|---|---|
| Matric | 20 |
| 3 Year Degree | 2 |

## 3.6. IMAGES USED IN THE STUDY

Multiple images of well-known malicious males were identified to be used in the study. The photographs of these malicious males were obtained from 'www.worst-killers.com/index.htm'. The non-malicious male photographs were obtained from 'www.freedigitalphotos.net'. This website consists of various copyright-free photographs that are free for public use. Owing to the human right of privacy, the research has not included any reference to the specific images of the non-malicious males. The malicious males and non-malicious males were paired taking both age and race into account. This was done to control for possible confounding variables that may have arisen due to the faces being of different ages or races.

After the photographs were collected they were edited (resized and coloured to greyscale) and used to make four superimposed images (see 1.3.5). The superimposition of the photographs was achieved by using computer software called PsychoMorph (Chen & Tiddeman, 2010; Yu & Tiddeman, 2010). This programme superimposes the photographs while taking physiological markers into consideration. These markers are around the eyes, mouth, cheeks, chin, ears and nose. When the images are superimposed, an average between the various markers of the faces is calculated and the final product is formed from these averages. The final images used in the study are shown in figure 3.1. These images were then put into a slideshow that was shown to the participants (described in 3.8).

Image 1

Image 2

Image 3

Image 4

Figure 3.1. Images used in the study. Image 1 and Image 3 are comprised of non-malicious males and image 2 and image 4 are comprised of malicious males.

## 3.7. INSTRUMENTS USED IN THE STUDY

What follows is a description of the quantitative and qualitative instruments used in the study.

### 3.7.1. Quantitative physiological instruments

#### *3.7.1.1. Zephyr Bioharness*

The quantitative instrument used was a Zephyr BioHarness (see figure 3.3). This harness consists of a Zephyr BioModule (figure 3.2) that is fixed to a strap, a sticky plate or a vest. For the purpose of the study a strap was used. It was positioned in such a way that the Zephyr BioModule was on the side of the participant while the connection of the strap lay underneath the sternum (see figure 3.3).


Figure 3.2. Zephyr BioModule

The Zephyr BioModule saves the data internally but also submits the data to an antenna connected to a computer. The physiological measures recorded by this harness are heart rate, core body temperature, posture, heart rate variability, breathing rate, physiological load and ECG activity. For the purposes of the present study, the analysis of the measures included was limited to heart rate (number of beats per minute), core body temperature, heart rate variability (variations in heart rate) and breathing rate (breaths per minute). It was theorised that an intuitive response would illicit a physiological response (due to the activation of the autonomic nervous system and the amygdala as discussed respectively in 2.2.5).


Figure 3.3. Zephyr Bioharness with Strap

The Bioharness was calibrated and used according to the manufacturer's specifications.

#### *3.7.1.2. The Grinbath Eye Tracker*

The eye tracker records all eye movements as they move across a computer screen. These recordings can then be watched in various modes in the eye guide analyse program. These modes include bee swarms, heatmaps, gaze plots and clusters. Examples of these can be found in figures 3.4, 3.5, 3.6 and 3.7. The eye tracker was included in the study to provide further depth to the understanding of the recognition of the micro-expression of anger.

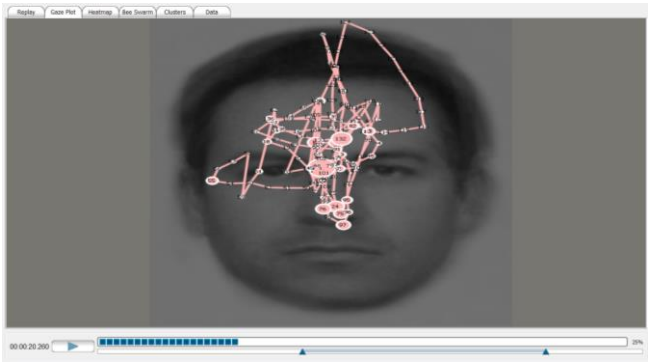


Figure 3.4. Gaze Plot

Figure 3.5. Bee Swarm

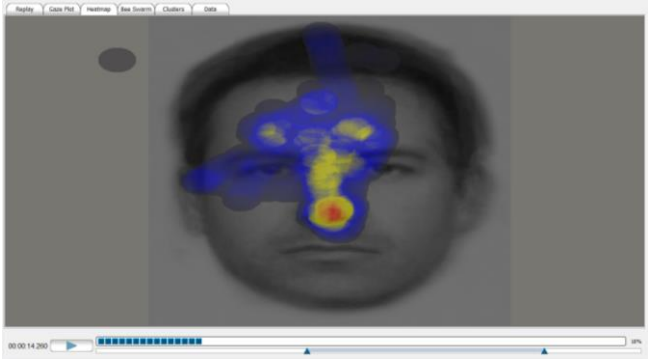


Figure 3.6. Heatmap

Figure 3.7. Clusters

The eye tracker was calibrated and used in accordance with the manufacturer's specifications. It should be noted that, although the eye tracker is a quantitative, objective measure of gaze, the results it yielded could only be interpreted in a subjective manner by studying patterns in the heatmaps.

### 3.7.2. Qualitative psychological instrument

The qualitative psychological instrument was a semi-structured interview (see Appendix B). According to Willig (2008), a semi-structured interview combines both formal interviewing and informal interviewing. This ensures a semi-structured interview with specific questions to address that answer the research question; however, the interview flow is more informal with open ended questions and a more conversational style.

## 3.8. DATA COLLECTION PROCEDURE

### 3.8.1. Pilot study

A pilot study was conducted prior to the onset of the study. The pilot study was conducted a year in advance and it included 3 white females with ages ranging from 22 to 24. The participants were shown 3 slideshows of varying lengths to determine the ideal number of images to be used, the length each image should be shown, and the ideal buffer (stimulus free image or background) that was used in between each of the images.

From the suggestions given by the pilot group the slideshow was refined to be used in the final study in the following way: the ideal length for each image to be shown was suggested as 30 seconds, which is supported by Porter et al.'s (2008) findings. These findings indicated an increase in accuracy especially amongst untrustworthy faces at 30s as opposed to 100ms.

The ideal length for the buffer was found to be 20 seconds. The reason given by the pilot study participants for the 20 second buffer was twofold. The participants explained that this amount of time was the perfect balance between maintaining attention and releasing ones reaction to the previous image. In the study mentioned previously that had been conducted by Porter et al. (2008), the researchers used 30 second intervals between images; however, this study alluded to questions being asked in between images, which was one of the main reasons for the researchers' choice of a 30 second interval.

The pilot study participants also suggested a countdown before each image to reduce the chance of confounding variables such as being startled when the image appears on the screen. A three second countdown was therefore placed before each image. The final suggestion from the pilot study group was to place a cross or plus sign in the centre of each buffer so that the participant had a focal point between images. A plus sign was placed in the centre of each of the blank slides inserted between the images. These slides also assisted with the calibration of the eye tracker during the analysis of the eye tracking data.

### 3.8.2 Deception in the study

As discussed in 3.4, only selected information was given to the participants before they consented to take part in the study. Thus the study involved the use of deception on the part of the researcher. The participants were told that the study would be divided into two sections that would happen sequentially. They were told that the first section would involve them wearing the Zephyr Bioharness as well as the Grinbath eye tracker whilst watching a slideshow comprised of four images. They were shown each of these instruments and an explanation of each was given. They were also told that in-between each image there would be a blank screen with a plus sign in the centre and a countdown would appear before each image. However, they were not told what the images were of, or what the main aim of the study was.

### 3.8.3 The data collection procedure used during the present study

The data collection for the present study took place in a laboratory room in the building that houses the Physiology department. Each participant was brought into the laboratory and given another copy of the information document that had been emailed to them after they volunteered to take part in the study (see Appendix F). They were asked to read through the information document and were then asked if they had any questions. The Zephyr Bioharness and the Grinbath eye tracker were then shown to the participants. Each instrument was explained in full and participants were then asked if they would be comfortable using them. After the instruments had been shown to participants, they were given another opportunity to ask any questions. The participants were also informed that in order for the Zephyr Bioharness and the Grinbath eye tracker to be as effective as possible, their weight, height and eye dominance would be recorded. They had also been told that whilst the eye tracker was being used, the lights would be switched off as the eye tracker performs better in a darker

environment. None of them had any objections to these arrangements. The final piece of information all the participants were given before signing the consent form was that the entire research process would be recorded with a video camera. Not only would the video recordings assist with the allocation of time stamps when participants were fitted with the Zephyr Bioharness, it would also serve as an additional source of information for when the semi-structured interviews were conducted. The video recordings were also used during the transcription of the semi-structured interviews in the latter stages of the study. Finally participants were informed that the data collected during this study would be used for future research. Participants were asked if they had any questions and/or objections. None of the participants had any objections and the informed consent document was then given to them to sign. Appendix E contains the consent form. Appendix D contains the script used by the researcher.

#### *3.8.3.1 Quantitative physiological data collection procedure*

The participants were fitted with the Zephyr Bioharness (see figure 3.3) first as a 10 minute baseline was needed before commencing with the actual measure. Whilst this baseline was being recorded, participants' height and weight were measured by the researcher. Their height was measured with a measuring stick and their weight was measured with a scale situated in the physiology laboratory. These measures were needed for the Zephyr Bioharness as the program used by the Bioharness (see figure 3.8) takes age, sex, weight and height into consideration when recording the physiological measures. The Bioharness was linked to the Omnisense analyse program to capture the physiological data. After all the physiological data had been captured, the data were exported to a Microsoft Excel file. An example of the Omnisense analyse program can be seen in figure 3.9.

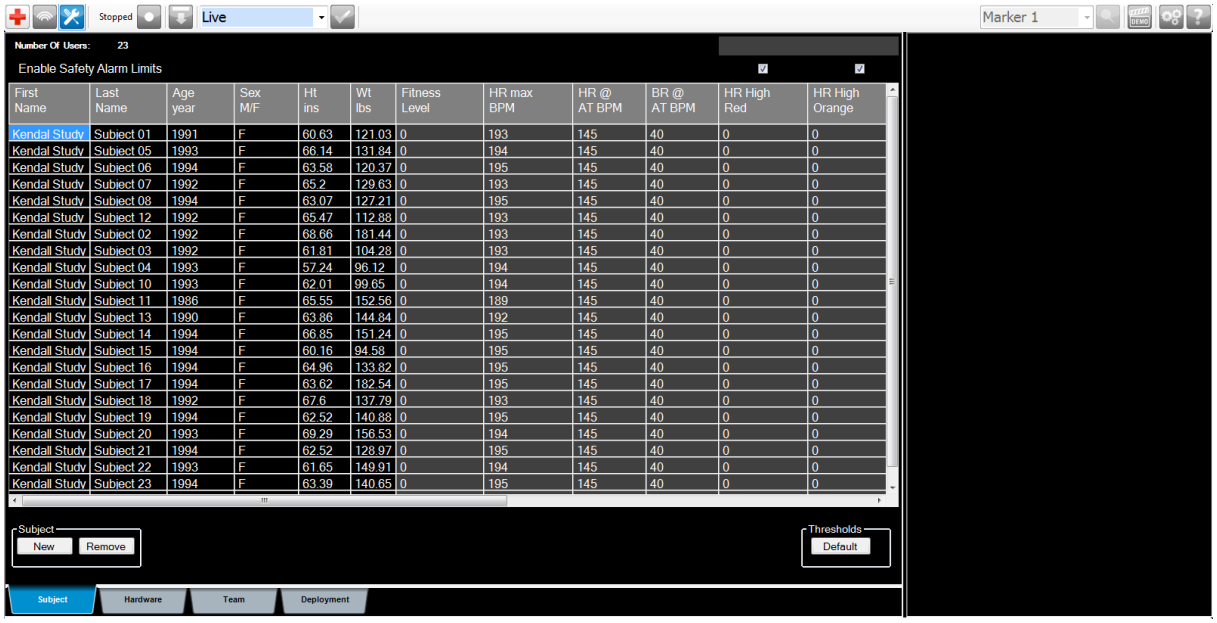



Figure 3.8. Omnisense Live. The age, sex, weight and height of the participant were entered into the program and a live recording from the Zephyr BioModule was made for each participant.

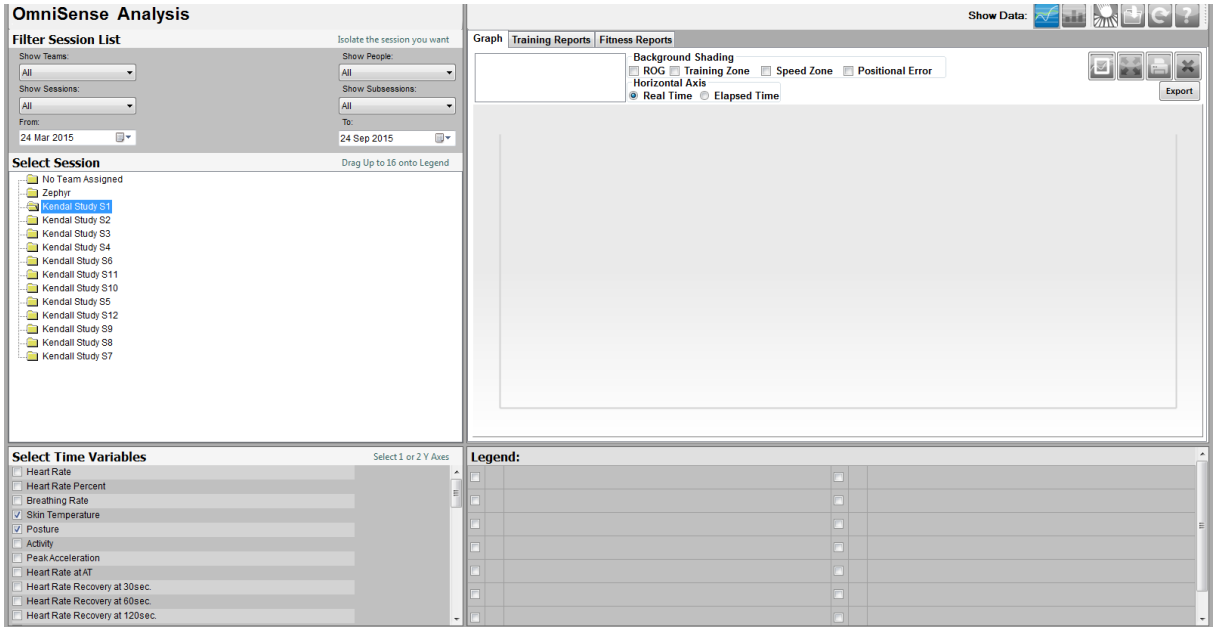



Figure 3.9. Omnisense Analyse program example.

The data from the Zephyr Bioharness and the Grinbath eye tracker were recorded while the participants watched the slideshow. The data collection procedure for the eye tracker is explained in 3.8.3.2.

#### *3.8.3.2. Eye Tracker data collection procedure*

The participant's eye dominance was determined whilst the baseline for the Zephyr Bioharness was obtained. For the eye dominance test, participants were asked to make a triangle with their thumbs and index fingers and focus on a water bottle that had been placed on a heightened stool. They were then asked to close one of their eyes and take note by how much the bottle moved. They then closed the alternate eye to see how much it moved. The dominant eye was determined by the eye with which the bottle moved the least amount out of focus.

After eye dominance was established, the eye tracker was fitted over the dominant eye. The lights in the lab were switched off and the participants were asked to sit slightly lower than eye lever to the computer screen. This was done so that the angle at which the participants were looking at the screen was slightly higher than one would usually look at a computer screen. This allowed for a better calibration of the eye tracker as the participants' eyes were more open when looking at the screen. The participants were asked to sit comfortably and to inform the researcher if they were uncomfortable at any time during the research process. The calibration process was then started.

During the calibration process, the participants were asked to inform the researcher if their eyes started becoming tired as this would affect data quality. The calibration included an activity where nine circles appeared individually on the screen. The participants were asked to focus on the centre of the circle until it disappeared and the next one appeared. A calibration result was then displayed on the screen (see figure 3.10). Once calibrated, the slideshow, which consisted of 4 images of male faces, was started. The 1$^{st}$ and 3$^{rd}$ image were of non-malicious males and the 2$^{nd}$ and 4$^{th}$ images were of malicious males.

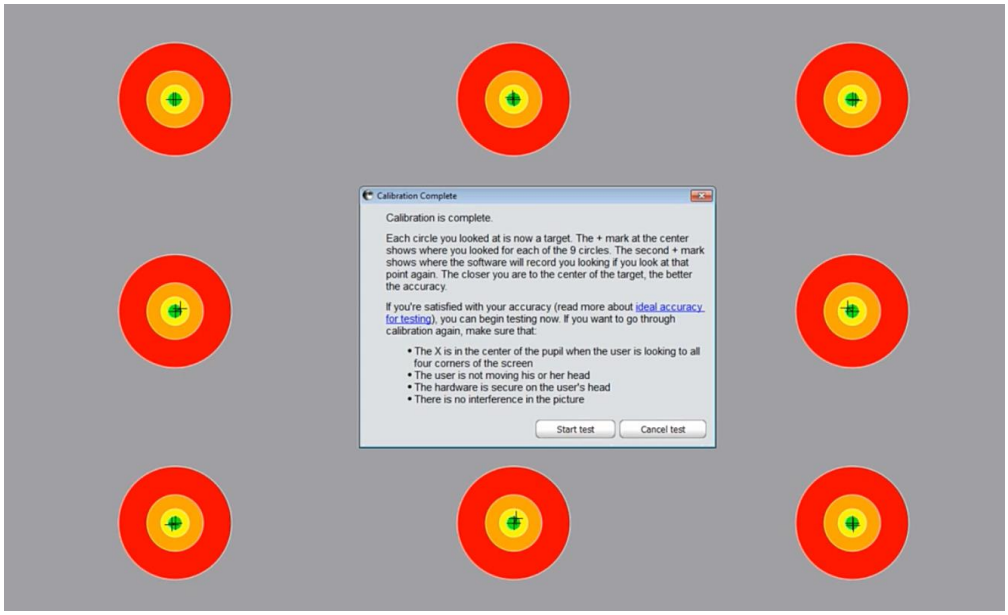



Figure 3.10. Example of a calibration for the eye tracker.

The data for the eye tracker was obtained whilst the slideshow was running. After completing the slideshow, the eye tracker was removed and the lights were switched on.

#### *3.8.3.3. Qualitative psychological data collection procedure*

After the eye tracker data had been captured, participants were asked to manoeuvre themselves so that they could still see the computer screen but could also talk to the researcher. They were then shown the images in the slideshow again and the semi-interview started (see 3.7.2). As was previously stated, the interview was video-recorded with the participants' consent. This gave the researcher the freedom of not taking notes and allowed for a more intimate interview.

### 3.8.4 Debriefing

As the study involved deception a debriefing session was held with each participant directly after their participation. Once both sections of the research had been completed the researcher informed the participant of the main aims of the research. The researcher explained that the main aim of the research was to ascertain females' ability to identify the micro-expression of anger in males. The researcher also explained that each of the images in the slideshow were either composed of malicious males or non-malicious males. They were also informed that they could contact the researcher with any questions after the research session and could

withdraw their consent without consequence. It was explained that counselling services would be organised should the participant feel that they need to talk to a counsellor regarding the research or emotions felt during the research. None of the participants required these services and none of the participants withdrew their consent.

## 3.9. ETHICAL CONSIDERATIONS

### 3.9.1. Informed Consent

As discussed in 3.8.3, informed consent (see Appendix E) was obtained prior to the start of the study. This consent was preceded by participants studying an information document when they entered the laboratory. This information document contained all the relevant information with regards to the study (see Appendix F) that was needed in order for participants to make an informed decision. Participants were given the chance to ask questions and were also given the opportunity to leave the study and withdraw their consent at any point during the research without any negative consequences.

The consent form, apart from guaranteeing confidentiality, also informed participants that their data would be used for future research and that the data would be kept in a secure location for a minimum of 15 years.

### 3.9.2. Confidentiality

The confidentiality of the participants and their responses were ensured through a numbering system in which each participant was given a number and referred to by this number throughout the research. The participant's names were only recorded on their consent forms that have no link to their answer sheets or the results from their participation.

### 3.9.3. Voluntary Participation

All participants were asked to volunteer to partake in the study. There was no incentive for them to take part and no coercion took place. It was explained that the participants could remove themselves from the study at any time with no consequence.

### 3.9.4. Data Storage

As mentioned in 3.9.1, the data collected from the study will be kept for a minimum of 15 years in the archives in the psychology department housed in the Human Sciences Building on the University of Pretoria main campus.

### 3.9.5. Deception

As was mentioned in 3.8.2, deception was used in the beginning of the study as the participants were not given the main purpose of the study before consenting to the study. This information was withheld to avoid a situation where the participants would actively search for the malicious male in the slideshow. It was explained to the participants that the main purpose of the research needs to be withheld and a full debriefing session would be held at the end of the session.

### 3.9.5. Debriefing

A debriefing session (see 3.8.4) was held with the participants in the laboratory directly after the data collection had been completed. This debriefing session was included as deception was used in the study. The research aims were explained in this debriefing session. Participants were given the main aim of the study and the use of the malicious and non-malicious males was explained. The participants were given the opportunity to withdraw their consent and to see a counsellor if needed. None of the participants indicated the need to see a counsellor or to withdraw their consent.

## 3.10. DATA ANALYSES

The analysis in this study was of both a quantitative and qualitative nature. Data from the Zephyr BioHarness was processed and analysed with SPSS version 22 for Windows. The data from the eye tracker was analysed using Grinbath's EyeGuide Analyze program. The qualitative data from the questionnaires was transcribed and thematic analysis was then conducted using ATLAS.ti version 7.

### 3.10.1. Quantitative Physiological Analyses of the Zephyr BioHarness

The Microsoft Excel data obtained from the export from the Omnisense analyse program (see 3.8.3.1 and figure 3.9) was imported into SPSS. Descriptive statistics were conducted on the data set to organize and summarize the descriptive variables in the study. The purpose of descriptive statistics is to describe the data (Gravetter & Forzano, 2012; Howell, 1999). The second form of analysis employed for the quantitative analyses was non-parametric statistics. Non-parametric techniques are useful when analysing small samples and when the data is not normally distributed (Pallant, 2010). Two forms of repeated measures analysis were employed in the study namely, the Friedman test (repeated samples test) and the Wilcoxon Signed-Rank test (related samples test). These tests were employed as the participants were exposed to four different stimuli and their responses to each of these stimuli were analysed.

### 3.10.2. Eye-tracker Data Analyses

As mentioned previously, the eye tracking datum was analysed using the Grinbath EyeGuide Analyze program. This specific program allows one to view the experiment as the participant viewed it. There are various modes in which the eye-tracking data can be viewed in this program (see Figures 3.4, 3.5, 3.6 and 3.7).

Specific preferences had to be set in the program to correct for any data offset that may have happened due to the equipment or movement by the participant. Due to time and cost restraints, a decision was made to analyse only the eye-tracker data for the five participants who were randomly selected to participate in the semi-structured interview (see 3.5.2). Another reason why only these five participants' eye tracker data had been analysed was that the information obtained from this instrument could be supported or refuted by information given during the semi-structured interview. The analysis consisted of watching the recordings made for each of the five participants in each of the various modes of the Grinbath EyeGuide Analyze. Screenshots were then taken for each of the four images in the Heatmap mode. This mode was chosen due to the ease of seeing the focal points of the participants on each image. The Heatmap mode traces the gaze of the participant with a thermal trail (see figure 3.6). The more a participant looks at a certain aspect of the image the more red that area becomes.

The screenshots were then used to make inferences about what the participant was focused on.

### 3.10.3. Qualitative Psychological Interview Analysis

There are many different ways to analyse qualitative data but the form of analysis that suits this study is thematic analyses. According to Braun and Clarke (2006), thematic analysis is flexible as it is not married to a particular theoretical paradigm. It can therefore be used in a variety of research methodologies.

As was stated in 3.5.2, only five participants were involved in this part of the research. These five participants' videos were studied and then analysed using Braun and Clarke's (2006) six steps of conducting thematic analysis. The first step is to familiarise oneself with the data. This was done by transcribing the data as well as reading and rereading the transcripts. In order to make the analysis more effective the responses of participants to malicious males were placed apart from responses to non-malicious males. These two documents were loaded individually into ATLAS.ti and analysed separately. The researcher read the transcripts multiple times and notes were taken about any ideas that arose while reading the transcripts. These ideas were used to systematically generate codes. These notes were recorded in the ATLAS.ti program as initial codes by highlighting the quote that references that code and adding a code name.

The codes were then organised into common themes from which a thematic map was created. This thematic map was created in the network tab of the ATLAS.ti program. Before the thematic map is created in the network tab, links between the codes were created. These links were used to reference associations and contradictions within the data. Once these links were made, the codes were reviewed. This review ensured that all codes were independent of each other and formulated in a clear manner. The next step involved the naming and defining of themes. These themes were created in ATLAS.ti by creating code families. Once these code families were created, the thematic map could be created. A thematic map was created for the responses to non-malicious males (see figure 4.5) and another one was created for the responses to malicious males (see figure 4.6).

The final step taken was to write up a report. A description of the production of this report has been provided in 4.4.1.6. It includes all data extracts related to the research problem and question. All themes with definitions will be clearly stated and examples from the data are provided.

## 3.11. RELIABILITY AND VALIDITY

'Validity' is defined as the ability of a study to answer the questions it intends to answer (Gravetter & Forzano, 2012). The term 'validity' encompasses internal and external validity. The degree to which a study is valid within the sample is the internal validity, and the degree to which the study can be generalised to the population is the external validity (Gravetter & Forzano, 2012). This study makes use of a mixed method design, therefore this section will be divided into two sections: quantitative: reliability and validity, and qualitative: credibility and trustworthiness.

### 3.11.1. Quantitative: Reliability and validity

To ensure internal validity all the variables for each participant remained as constant as possible (Gravetter & Forzano, 2012). This was done by keeping the laboratory setting constant for each participant. The explanations of the instruments and procedure was scripted and therefore remained as consistent as possible.

The reliability of a study is the degree to which a study can be reproduced with the same results (Gravetter & Forzano, 2012). Reliability was ensured by providing an extensive explanation of the procedures followed to ensure that reproduction of the study is possible.

### 3.11.2. Qualitative: Credibility and Trustworthiness

Quantitative research is concerned with reliability and validity while qualitative research is concerned with assessing the quality of the research (Smith, Larkin, & Flowers, 2009). Five principles that ensure a high quality qualitative study have been identified by Yardley (2000), namely sensitivity to context, commitment and rigour, transparency and coherence, and impact and importance. Each of these principles was upheld throughout the research process.

The researcher remained sensitive to the context the participants were in during the research process. Note was taken of any power relations that may have existed and how these potential power relations may affect the data collection. These notes were recorded and kept in mind throughout the research process.

In order to ensure commitment and rigour, time and attention was dedicated to the topic. This included finding a sample that would provide beneficial information to the study at hand. Close attention was also paid to the interpretation and analysis of the participants' interviews as well as the researchers own influence on the study. This influence was noted through self-reflection throughout the research process.

Transparency and coherence was ensured as all details of the research are included in this document. The problem and methodology have been clearly defined and, as with the quantitative section, replication of this study is possible.

Lastly, to ensure the importance of the study, the need for research of this kind has been provided in the discussion related to the 'Research problem' (see 1.2) and in the chapter containing the literature review. These discussions showed that whilst there were studies involving the constructs explored in the present study, no research was been conducted in which these constructs were taken into account simultaneously.

## 3.12. CONCLUSION

This chapter focused on the research methodology used when the study was carried out. In-depth descriptions were presented on how the data were collected and the measures that were used to collect this data. Mention was also made of how the researcher dealt with the ethical issues that arose during the course of the study. The next chapter will focus on the data analysis that was conducted on the data.

# CHAPTER 4
# RESULTS

## 4.1. INTRODUCTION

As mentioned in 1.4.1, the aim of this study was to ascertain females' ability to identify the micro-expression of anger in males. In order to achieve this aim the researcher chose to take a mixed methods approach in the form of triangulation. Following this quantitative and qualitative data were collected and analysed separately and were then combined in the interpretation phase. Therefore the present chapter was split into two sections namely, quantitative results and qualitative results. The combined interpretation of these results is then covered in Chapter 5.

## 4.2. QUANTITATIVE PHYSIOLOGICAL RESULTS

### 4.2.1 Non-parametric statistics

According to Pallant (2010) and Field (2009), non-parametric statistics are not restricted by the same assumptions that need to be taken into consideration for parametric statistics. According to Pallant (2010), non-parametric techniques are useful when analysing small samples and when the data is not normally distributed.

Two assumptions need to be taken into consideration when conducting non-parametric statistical analysis (Pallant, 2010). These assumptions are random samples and independent observations. However, when using repeated measures the assumption of independent observations can be ignored (Pallant, 2010). Repeated measures techniques test the same individual in multiple circumstances or various conditions. The participants were exposed to four different stimuli and their responses to each of these stimuli were analysed. It is for this reason that a form of repeated measures, non-parametric statistical analyses was needed. As a result, both the Friedman test and the Wilcoxon Signed Rank test were used during the analysis of the data.

The Friedman Test is a non-parametric test that is used when the same subjects are exposed to three or more stimuli or to three or more points in time (Pallant, 2010). It is an alternative to the parametric one way repeated measures analysis of variance (ANOVA). Repeated

measures analysis requires one continuous dependent variable and one categorical independent variable. The Friedman Test was used to determine if significant differences occur between the baseline and the images and between the images of malicious males and non-malicious males.

The Wilcoxon Signed-Rank test is the equivalent to the parametric paired samples t-test in which one categorical independent variable and one continuous dependent variable is needed. The test therefore requires that the same sample's data are compared on two occasions. The Wilcoxon Signed-Rank test was used to determine if further significant differences occur between the images of malicious males and non-malicious males.

The results yielded by these forms of statistical analyses are presented next.

#### *4.2.1.1. Baseline comparisons of the data yielded by the Zephyr Bioharness*

A baseline was established for all the physiological measures included in the present study. A Friedman test was conducted to determine if any significant differences occurred with regards to participants' heart rate and the four images they viewed. The results of the test (Table 4.1) indicate one significant difference across two time points (heart rate baseline and image 4 (malicious male) $\chi^2$ (4, $n$ = 22) = 14.877, p < .05). Inspection of the median values showed a decrease in heart rate from baseline (Md = 4.05) to Image 4 (malicious male) (Md = 2.34) with a large effect size (r = .76). The pairwise comparison in figure 4.1 shows the difference between the baseline and image 4.

Table 4.1. *Test of significant differences between the heart rate baseline and the heart rate for each image included in the slideshow.*

Each node shows the sample average rank.

| Sample1-Sample2 | Test Statistic | Std. Error | Std. Test Statistic | Sig. | Adj.Sig. |
|---|---|---|---|---|---|
| Heart Rate Image 4-Heart Rate Image 2 | .386 | .477 | .810 | .418 | 1.000 |
| Heart Rate Image 4-Heart Rate Image 3 | .409 | .477 | .858 | .391 | 1.000 |
| Heart Rate Image 4-Heart Rate Image 1 | .795 | .477 | 1.669 | .095 | .952 |
| Heart Rate Image 4-Heart Rate Baseline | 1.705 | .477 | 3.575 | .000 | .003 |
| Heart Rate Image 2-Heart Rate Image 3 | -.023 | .477 | -.048 | .962 | 1.000 |
| Heart Rate Image 2-Heart Rate Image 1 | .409 | .477 | .858 | .391 | 1.000 |
| Heart Rate Image 2-Heart Rate Baseline | 1.318 | .477 | 2.765 | .006 | .057 |
| Heart Rate Image 3-Heart Rate Image 1 | .386 | .477 | .810 | .418 | 1.000 |
| Heart Rate Image 3-Heart Rate Baseline | 1.295 | .477 | 2.717 | .007 | .066 |
| Heart Rate Image 1-Heart Rate Baseline | .909 | .477 | 1.907 | .057 | .565 |

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.
Asymptotic significances (2-sided tests) are displayed. The significance level is .05.

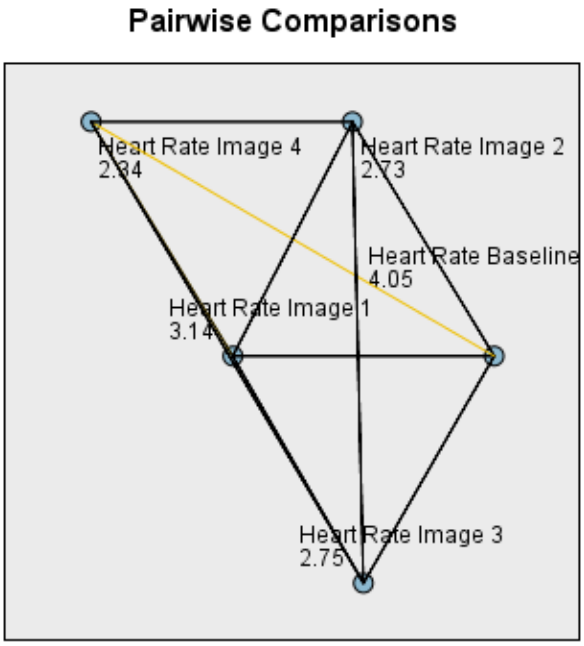



Figure 4.1. Pairwise comparisons of heart rate baseline compared to each image included in the slideshow.

The baselines for heart rate variability, breathing rate and estimated core temperature were also compared in relation to the images shown to the participants. Friedman Tests were also conducted during these analyses. No significant differences were found between any of the baselines and the four images.

Since a significant difference was found between the heart rate baseline and heart rate for image 4, a decision was made to determine if any of significant differences occur between this image and the following images:

- Image 1;
- Image 2; and
- Image 3.

A Wilcoxon signed rank test was used for the analysis. The results revealed a statistically significant reduction in heart rate between the heart rate of image 4 (malicious male) and the heart rate for image 1 (non-malicious male), $z = -2.068$, $p < .05$, with a large effect size ($r = .46$). Figure 4.2 shows a graph of the positive and negative differences obtained from the test. No other significant differences were found.

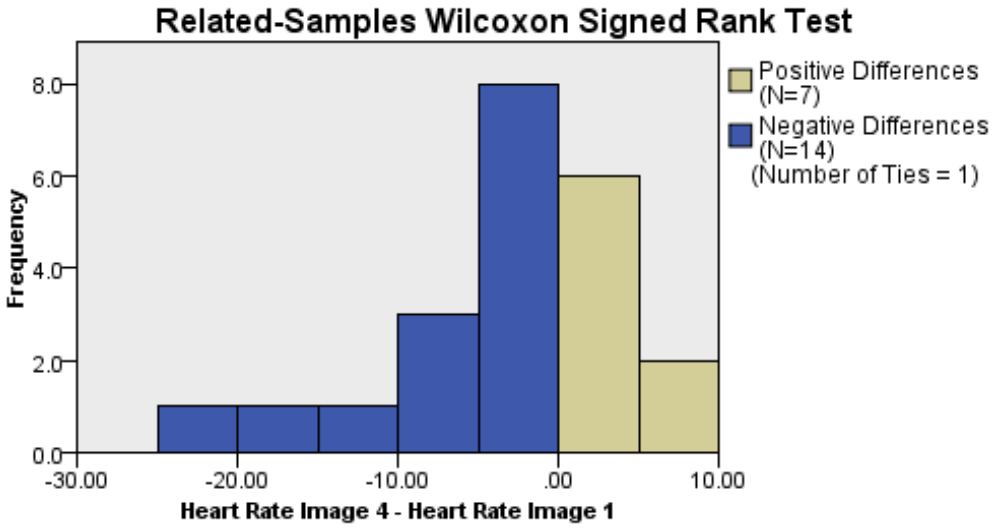



Figure 4.2. Positive and negative differences between the heart rate obtained for image 4 (malicious male) and image 1 (non-malicious male).

#### *4.2.1.2. Females' physiological responses to non-malicious males and malicious males*

After the baselines of the different physiological measures had been compared, another analysis was conducted. The aim of this analysis was to determine if significant differences occurred between the physiological responses of females' to non-malicious males and malicious males. This was done with regards to all the physiological constructs measured during the course of the study (see 3.7.1.1). For the purpose of this analysis, the mean rank of the images of the non-malicious males (image 1 and 3) were compared to the mean rank of the images of the malicious males (image 2 and image 4). Related Samples Wilcoxon Signed-Rank tests were used to test for any significant differences. The results yielded indicated no significant differences. A summary of the results is provided in table 4.2.

Table 4.2. *Summary of results for all physiological measures with tests between females' responses to malicious males and non-malicious males.*

| **Physiological measure** | **Hypothesis** | **Significance Value** | **Standardized Test Score (z score)** | **Standard Error** | **Result** |
|---|---|---|---|---|---|
| Heart Rate | There is no significant different in the heart rate of females when exposed to malicious and non-malicious males. | 0.140 | -1.477 | 30.802 | Fail to reject the null hypothesis. |
| Heart Rate Variability | There is no significant different in the heart rate variability of females when exposed to malicious and non-malicious males. | 0.507 | 0.664 | 24.847 | Fail to reject the null hypothesis. |
| Breathing Rate | There is no significant different in the breathing rate of females when exposed to malicious and non-malicious males. | 0.897 | 0.130 | 30.800 | Fail to reject the null hypothesis. |
| Estimated Core Temperature | There is no significant different in the estimated core | 0.317 | 1.000 | 0.500 | Fail to reject the null hypothesis. |

| | | | | | |
|---|---|---|---|---|---|
| | temperature of females when exposed to malicious and non-malicious males. | | | | |

### 4.2.2. Quantitative result conclusions

When reviewing the discussion above, it appears that two significant differences were found. The first one was between the baseline measure of heart rate and the heart rate measured when image 4 was viewed. The second significant difference occurred between the heart rate measured when image 4 was viewed and the heart rate measured when image 1 was viewed. As a result of these findings, it is assumed that there are some physiological signs evident when females are exposed to the superimposed images of malicious and non-malicious males. It appears that these physiological signs mostly involve heart rate.

## 4.3. EYE TRACKER RESULTS

The eye tracker results indicate that the participants mostly focused on the eyes and mouth of the face of both malicious and non-malicious males. This corresponds with the most prominent feature called out in the psychological interview that will be discussed in 4.4.1. Examples of the screen shots and explanations obtained for non-malicious males and malicious males are provided in figures 4.5 and 4.6. It can be seen from both figure 4.5 and figure 4.6 that the main focal points are the malicious and non-malicious males' eyes and mouth.

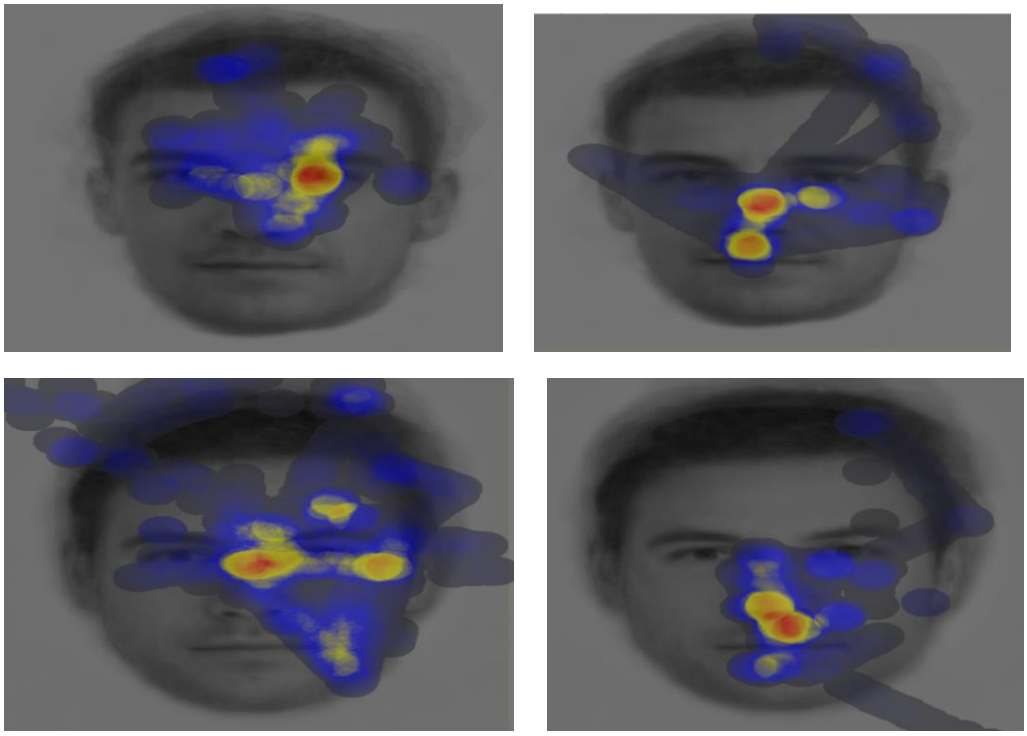


Figure 4.3. Eye tracking data for non-malicious males.

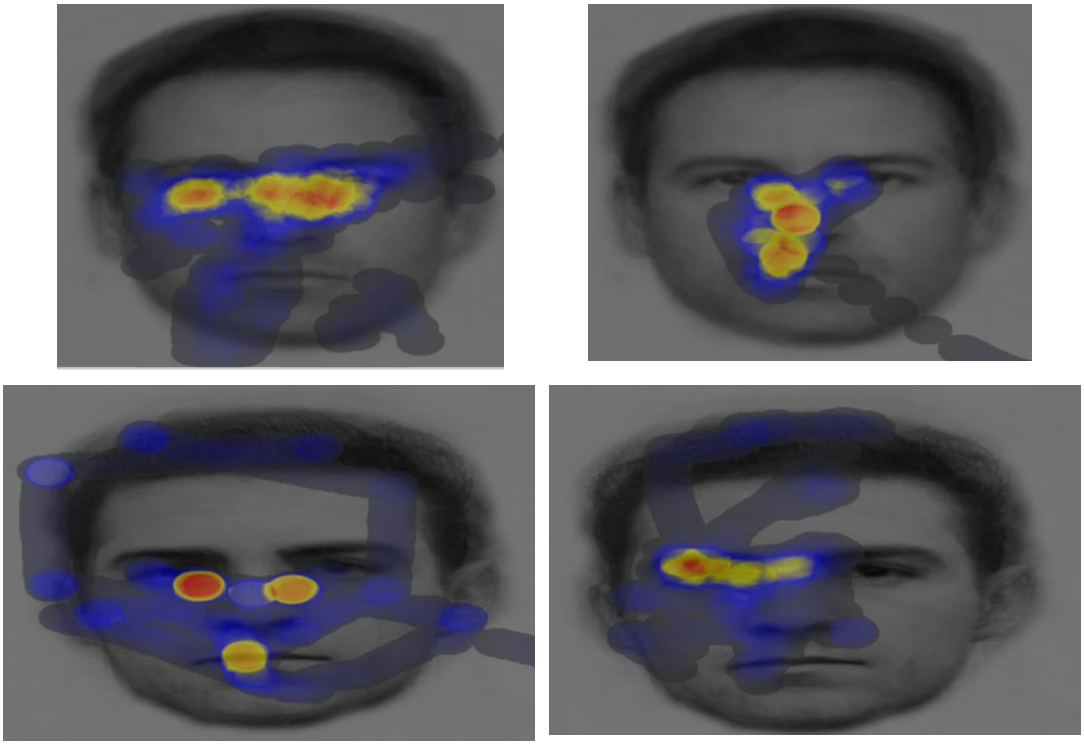


Figure 4.4. Eye tracking data for malicious males.

## 4.4. QUALITATIVE RESULTS

The following section contains a description of the qualitative thematic analysis and interpretation. The main aim of the qualitative section of the study was to identify females' psychological reaction to the micro-expression of anger as expressed by males. The qualitative data for the images was analysed in isolation and was separated into malicious males (Image 2 and 4) and non-malicious males (Image 1 and 3). This was done to enable a qualitative comparison of the psychological responses to malicious males and non-malicious males.

### 4.4.1. Results from the psychological interview

As discussed in 3.10.3, thematic analysis was used to analyse the qualitative data obtained from the semi-structured interview. The section will provide a description of the six phases included in thematic analysis as described by Braun and Clarke (2006). The final themes and explanations are provided as well as evidence to support these themes.

#### *4.4.1.1. Phase 1: Familiarising oneself with the Data*

The first phase as described by Braun and Clarke (2006) is to familiarise oneself with the data. This process began during the interview process as the researcher needed to remain fully present in the interview process. Further immersion happened while the researcher was transcribing the videos. The video provided more depth to the transcript and allowed for more data immersion since the body language of participants could also be noted.

After transcribing each interview, the immersion process was furthered through reading and re-reading the transcripts. The aim of the reading of the transcripts was not to search for meaning nor was it grounded within a specific theoretical framework. It was used to garner initial ideas and notes. The ideas and notes collected during this phase indicated the following:

- When referring to malicious males (image 2 and 4), participants found the males to be less trustworthy than the non-malicious males (image 1 and 3);
- Most participants focused on the eyes and mouth of the malicious and non-malicious males;

- Participants found the second image of the non-malicious males (image 3) to be the friendliest; and
- Participants found the first image of the malicious males (image 2) to be the least trustworthy.

#### *4.4.1.2 Phase 2: Generation of Initial Codes*

According to Braun and Clarke (2006), codes should identify a feature within the data that is of interest and will help achieve the research aim and objectives. The analysis was not dependent on a theoretical paradigm and was therefore dependent on the data itself. All coding was conducted through the ATLAS.ti program mentioned in 3.10.3. All notes from phase 1 were taken into account and codes were generated for non-malicious males and malicious males. The generated codes were collated with data extracts and can be found in tables 4.1 (data codes and relevant extracts for non-malicious males) and 4.2 (data codes and extracts for malicious males).

Table 4.3. *Data codes and Relevant Extracts for Non-Malicious Males*

| **Code Number** | **Code** | **Example Extract** |
|---|---|---|
| 1 | Attribute of male (approachable and open) | …he just looks like open and approachable… |
| 2 | Attribute of male (confidence) | …sure of himself. |
| 3 | Attribute of male (friendly) | um...quite friendly...um... |
| 4 | Attribute of male (relatability) | He makes me feel like I could actually relate to him… |
| 5 | Emotion elicited by male (confidence) | Also confident. |
| 6 | Emotion elicited by male (neutral) | Um...no, not, ya, no not really |
| 7 | Emotion elicited by male (relaxed) | Um...calm...just calm, relaxed and chilled. |
| 8 | Emotion elicited by male (sympathy) | ...I feel sympathetic. |
| 9 | Emotion felt by male (calm) | I think calm. |
| 10 | Emotion felt by male (happiness) | yes, he looks happy. |

| | | |
|---|---|---|
| 11 | Emotion felt by male (neutral) | I think he's just, sort of...how do you call it...like not really overly excited or overly sad, sort of in the middle. |
| 12 | Emotion felt by male (sadness) | Maybe sadness… |
| 13 | Emotion felt by male (satisfied) | I don't think it's happiness per say, its more...he's satisfied… |
| 14 | Facial expression (eyes smiling) | …eyes like just look like they are kind of like smiling. |
| 15 | Facial expression (eyes sparkle) | …like they've got like a sort of sparkle to them um… |
| 16 | Facial expression (smile) | …slight smile… |
| 17 | Facial expression (stare) | …the staring is a bit strong… |
| 18 | Familiarity | …he reminded me of someone I used to date... |
| 19 | Hiding his emotions | For me it seems like he is trying, he's hiding, he's trying to hide his emotions… |
| 20 | Most prominent features (eyebrows) | Eyebrows. |
| 21 | Most prominent features (eyes) | I would say his eyes… |
| 22 | Most prominent features (jawline) | …definitely his jaw line… |
| 23 | Most prominent features (mouth) | I think probably his, his mouth. Ya, he's got a nice mouth… |
| 24 | Most prominent features (nose) | Nose. |
| 25 | Natural to look at him | …he makes me feel natural to look at him. |
| 26 | Physical attraction (positive) | …he is pleasant to look at |
| 27 | Reason for most prominent feature (eyebrows) | …his eyebrows seems to, like, emphasise his the emotion in his eyes. |
| 28 | Reason for most prominent feature (eyes) | …they are strong, the staring is a bit strong, focused... |
| 29 | Reason for most prominent feature (jawline) | …prominent jawline… |

| | | |
|---|---|---|
| 30 | Reason for most prominent feature (mouth) | …maybe his mouth also coz it's also like very relaxed like he has a bit of a smile… |
| 31 | Reason for most prominent feature (nose) | …he had a big nose… |
| 32 | Trustworthy | Yes, so I would actually trust this person… |

Table 4.4.

*Data Codes and Relevant Extracts for Malicious males*

| **Code Number** | **Code Name** | **Example Extract** |
|---|---|---|
| 1 | Attribute of male (firm) | …just seems like a firm person… |
| 2 | Attribute of male (intimidating) | Intimidating… |
| 3 | Attribute of male (mean) | This person just looks really mean… |
| 4 | Attribute of male (scary) | He looked more scary…. |
| 5 | Attribute of male (seriousness) | The last guy just looks serious, like he's very serious… |
| 6 | Attribute of male (unapproachable) | …doesn't look like a friendly approachable sort of person… |
| 7 | Criminal look | He looks like a serial killer. |
| 8 | Emotion elicited by male (discomfort) | He makes me feel uncomfortable. |
| 9 | Emotion elicited by male (fear) | Scared. |
| 10 | Emotion elicited by male (negative) | I don't get good feelings when I look at him. |
| 11 | Emotion elicited by male (neutral) | …he didn't bring any specific feelings… |
| 12 | Emotion elicited by male (shame) | Well first of all I was feeling ashamed when I was... He...It's not pleasant looking at him… |
| 13 | Emotion elicited by male | …actually he makes me feel sorry for |

| | | |
|---|---|---|
| | (sympathy) | him… |
| 14 | Emotion felt by male (anger) | …doesn't look happy, he looks uh...sort of like angryish...ya… |
| 15 | Emotion felt by male (emotionless) | .It's almost like he doesn't have emotion himself like he's just staring, I think, ya I don't see any… |
| 16 | Emotion felt by male (focused) | …he looks like, like I said it looks like he is focusing on something or determined to do something… |
| 17 | Emotion felt by male (not calm) | …he doesn't look as calm as the previous one… |
| 18 | Emotion felt by male (sadness masked by seriousness) | Could be sad you know...could be masking the sadness with the seriousness… |
| 19 | Emotion felt by male (unhappy) | …um maybe unhappy like something is bothering him. |
| 20 | Emotion felt by male (worried) | he looks a bit worried… |
| 21 | Facial expression (dark eyes) | Ja, they look like dark and...Uh ya his eyes are like frowning, I don't know… |
| 22 | Facial expression (empty eyes) | …probably his eyes and just, ya because there's nothing there. There's no emotion there, he's just sort of staring… |
| 23 | Facial expression (lips pressed together) | …they are so, you see they are tightly pressed together… |
| 24 | Facial expression (not smiling) | …he is not smiling… |
| 25 | Facial expression (semi-frown) | …it's almost like he's semi-frownish… |
| 26 | Facial expression (staring) | …staring into your soul… |
| 27 | General anger | …not angry at anyone but angry at the world… |
| 28 | Most prominent feature (all | …all his features are like quite |

| | | |
|---|---|---|
| | features) | prominent, you know. Like he's got a square face, like that kind of harsh features. |
| 29 | Most prominent feature (chin and jawline) | …chin and his jaw line. |
| 30 | Most prominent feature (eyes) | I think his eyes look...quite like...unapproachable. |
| 31 | Most prominent feature (frown lines) | …the first thing I've noticed is his frown lines. |
| 32 | Most prominent feature (lips) | …he is not smiling. |
| 33 | Most prominent feature (mouth) | …mouth. |
| 34 | Not pleasuring to look at | …it's not as pleasuring to look at this guy as the previous one. |
| 35 | Physical reaction (avoidance) | I would run away from him, not exactly not run away but like ya stay away… |
| 36 | Preoccupied look | …he looks a bit...I don't know... preoccupied if I can say that. |
| 37 | Reason for discomfort elicited | His stare...so, staring into your soul. |
| 38 | Reason for most prominent feature (eyes) | …because there's nothing there. There's no emotion there, he's just sort of staring… |
| 39 | Reason for most prominent feature (mouth) | …he is not smiling, it's almost like he's semi-frownish. |
| 40 | Unsure trust | Not as much as the first person. |
| 41 | Untrustworthy | I would definitely not trust this person! |

#### *4.4.1.3. Phase 3: Searching for Themes*

Phase 3 involved analysing each of the codes found for each of the images and determining how these codes could be grouped into themes. The analysis involved careful consideration of each of the codes and systematically grouping the codes into, what Braun and Clarke (2006) call "theme-piles" (p. 89). These "theme-piles" are created in ATLAS.ti by creating code

families and are based on possible relationships that exist between the codes as well as the main objectives of the study. Initial thematic networks were generated for both malicious males and non-malicious males. These thematic maps can be found in figure 4.5 and 4.6 below. These thematic maps are quite complex as there are multiple relationships amongst the codes that result in the themes. These themes are discussed in more detail in the next phase and tables 4.5 and 4.6 provide the final themes with the final associated codes.

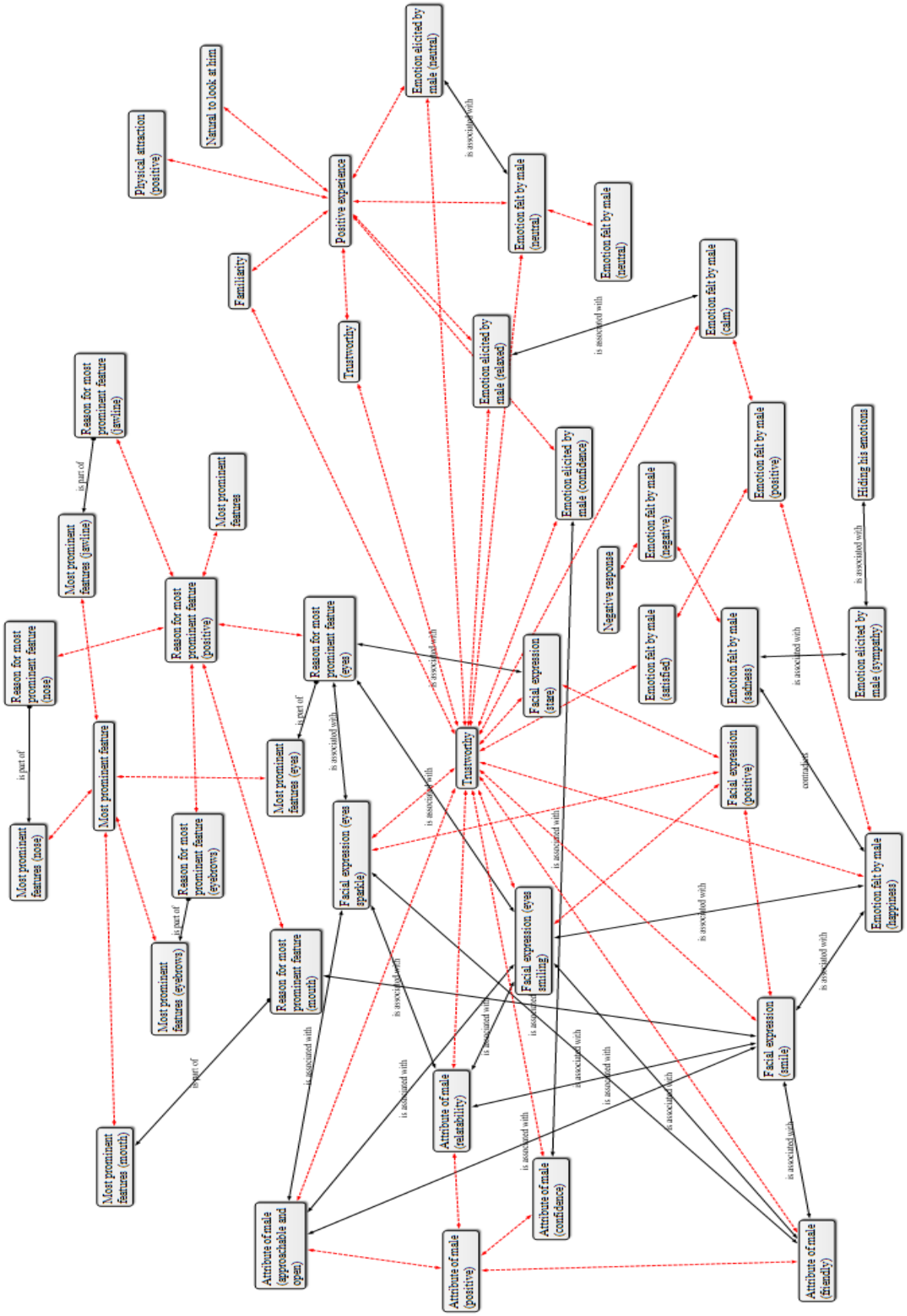



Figure 4.5. Initial Thematic Map for Non-Malicious Males

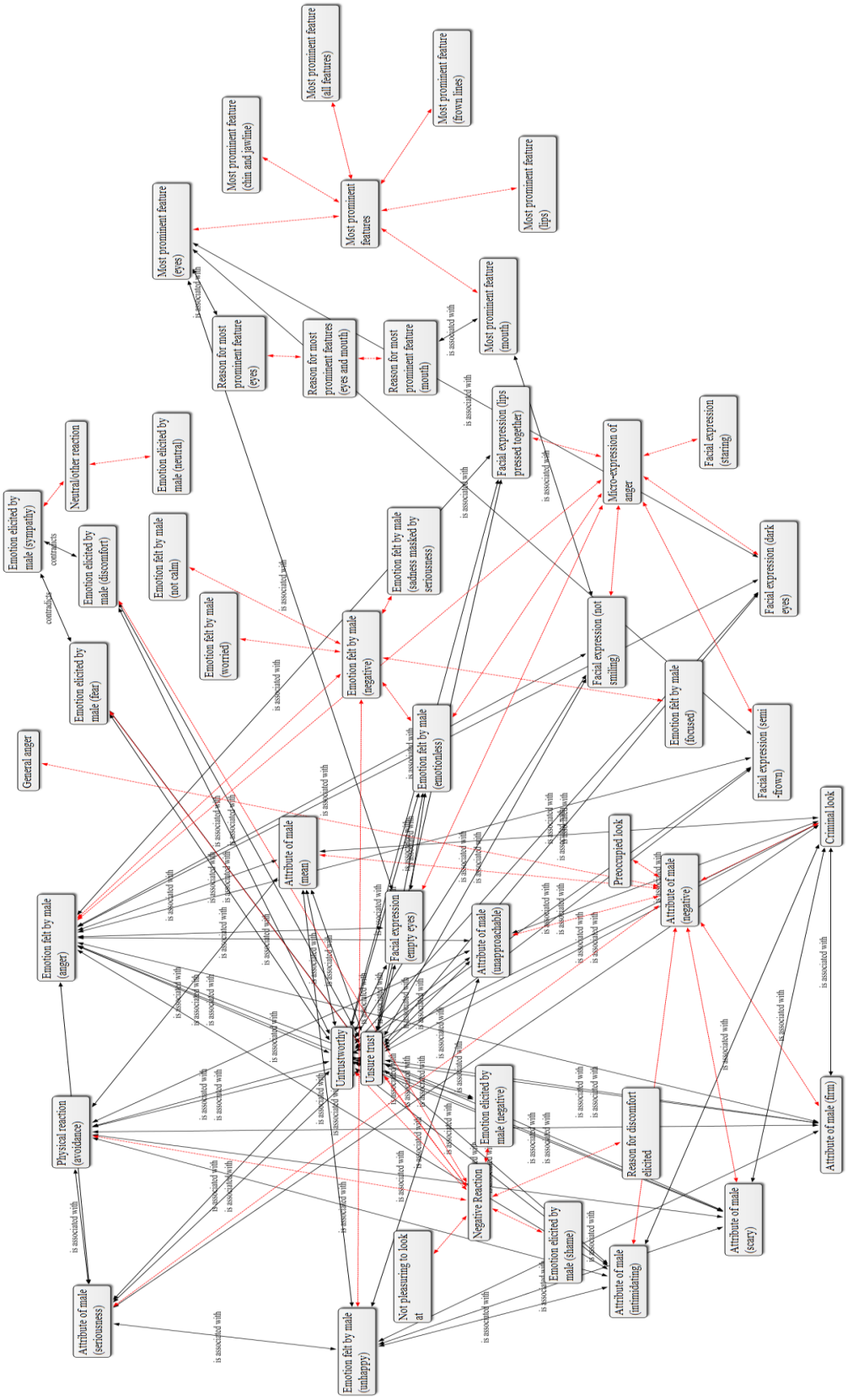



Figure 4.6. Initial Thematic Network for Malicious Males

#### *4.4.1.4. Phase 4: Reviewing Themes*

This phase included a review of the themes generated in phase 3. This was done by repeating phases 1 through 3 as well as further reading and re-reading of the transcripts. Some of the initial subordinate themes and superordinate themes in phase 2 were revised and the final themes were then created. The revisions include changing the term 'facial expression' to 'micro-expression' to be more in line with the aims and objectives of the study. The codes for each of the 'most prominent features' codes and the 'reasons for these features being chosen as the most prominent features' codes were combined into an overall code for the most prominent feature for that area. For example, for non-malicious males, codes 21 and 28 in table 4.1 were combined.

The positive attributes of the male (as indicated by females) and the positive and neutral emotions felt by the male (as indicated by females) were moved to the 'positive experience' theme. Finally, a theme for conflicting responses was added. This theme covered all responses that conflict with existing themes. This resulted in a total of five themes for non-malicious males. These themes with their codes are provided in Table 4.5.

Table 4.5. *Final Themes and Codes within Those Themes for Non-Malicious Males*

| **Theme** | **Codes** |
|---|---|
| **Conflicting responses** | • Emotion felt by male (sadness) |
| **Micro-expression (positive)** | • Emotion felt by male (calm)<br>• Emotion felt by male (happiness)<br>• Emotion felt by male (satisfied)<br>• Facial expression (eyes smiling)<br>• Facial expression (eyes sparkle)<br>• Facial expression (smile)<br>• Facial expression (stare) |
| **Most prominent feature** | • Most prominent features (eyebrows)<br>• Most prominent features (eyes)<br>• Most prominent features (jawline)<br>• Most prominent features (mouth) |

| | |
|---|---|
| | • Most prominent features (nose) |
| **Positive experience** | • Emotion elicited by male (confidence)<br>• Emotion elicited by male (neutral)<br>• Emotion elicited by male (relaxed)<br>• Emotion felt by male (neutral)<br>• Familiarity<br>• Natural to look at him<br>• Physical attraction (positive)<br>• Trustworthy<br>• Attribute of male (approachable and open)<br>• Attribute of male (confidence)<br>• Attribute of male (friendly)<br>• Attribute of male (relatability)<br>• Emotion felt by male (calm)<br>• Emotion felt by male (happiness)<br>• Emotion felt by male (satisfied) |
| **Trustworthy** | • Attribute of male (approachable and open)<br>• Attribute of male (confidence)<br>• Attribute of male (friendly)<br>• Attribute of male (relatability)<br>• Emotion elicited by male (confidence)<br>• Emotion elicited by male (neutral)<br>• Emotion elicited by male (relaxed)<br>• Emotion felt by male (calm)<br>• Emotion felt by male (happiness)<br>• Emotion felt by male (neutral)<br>• Emotion felt by male (satisfied)<br>• Facial expression (eyes smiling)<br>• Facial expression (eyes sparkle)<br>• Facial expression (smile)<br>• Facial expression (stare) |

| | |
|---|---|
| | • Familiarity<br>• Trustworthy |

In terms of the malicious males, unsure trust and untrustworthy were grouped together. This was done because when looking at the responses in terms of trust for malicious and non-malicious males, a very clear difference was seen. Malicious males were judged to be less trustworthy and therefore the theme untrustworthy was used. 'Negative reaction' was renamed 'negative experience' to align with the non-malicious males theme. Negative themes (attribute of male (negative), emotion felt by male (negative)) were combined with the negative experience theme. The 'reason for most prominent feature' codes (all codes made with reference to the reasons the females gave for identifying that feature as the most prominent feature) were also combined into an overarching theme entitled 'most prominent features'. As with non-malicious males, a theme for conflicting responses was added as there were some responses that were inconsistent with the other themes. The final themes and codes for malicious males is found in Table 4.6.

Table 4.6. *Final Themes and Codes within Those Themes for Malicious Males*

| **Theme** | **Codes** |
|---|---|
| **Micro-expression of anger** | • Emotion felt by male (anger)<br>• Emotion felt by male (emotionless)<br>• Facial expression (dark eyes)<br>• Facial expression (empty eyes)<br>• Facial expression (lips pressed together)<br>• Facial expression (not smiling)<br>• Facial expression (semi-frown)<br>• Facial expression (staring) |
| **Most prominent features** | • Most prominent feature (all features)<br>• Most prominent feature (chin and jawline)<br>• Most prominent feature (eyes)<br>• Most prominent feature (frown lines)<br>• Most prominent feature (lips) |

| | |
|---|---|
| | • Most prominent feature (mouth) |
| **Negative experience** | • Emotion elicited by male (discomfort)<br>• Emotion elicited by male (fear)<br>• Emotion elicited by male (negative)<br>• Emotion elicited by male (shame)<br>• Not pleasuring to look at<br>• Physical reaction (avoidance)<br>• Reason for discomfort elicited<br>• Unsure trust<br>• Untrustworthy<br>• Attribute of male (firm)<br>• Attribute of male (intimidating)<br>• Attribute of male (mean)<br>• Attribute of male (scary)<br>• Attribute of male (seriousness)<br>• Attribute of male (unapproachable)<br>• Criminal look<br>• General anger<br>• Preoccupied look<br>• Emotion felt by male (anger)<br>• Emotion felt by male (emotionless)<br>• Emotion felt by male (focused)<br>• Emotion felt by male (not calm)<br>• Emotion felt by male (sadness masked by seriousness)<br>• Emotion felt by male (unhappy)<br>• Emotion felt by male (worried) |
| **Conflicting responses** | • Emotion elicited by male (neutral)<br>• Emotion elicited by male (sympathy) |
| **Untrustworthy** | • Attribute of male (firm)<br>• Attribute of male (intimidating) |

| | |
|---|---|
| | • Attribute of male (mean)<br>• Attribute of male (scary)<br>• Attribute of male (seriousness)<br>• Attribute of male (unapproachable)<br>• Criminal look<br>• Emotion elicited by male (discomfort)<br>• Emotion elicited by male (fear)<br>• Emotion elicited by male (negative)<br>• Emotion felt by male (anger)<br>• Emotion felt by male (emotionless)<br>• Emotion felt by male (not calm)<br>• Emotion felt by male (unhappy)<br>• Facial expression (dark eyes)<br>• Facial expression (empty eyes)<br>• Facial expression (lips pressed together)<br>• Facial expression (not smiling)<br>• Facial expression (semi-frown)<br>• General anger<br>• Physical reaction (avoidance)<br>• Unsure trust<br>• Untrustworthy |

#### *4.4.1.5. Phase 5: Defining and Naming Themes*

In this phase clear names and definitions for each of the identified themes are provided. What follows are in-depth descriptions of each theme and the relation of that theme to the context of the study. Data extracts are also provided to further substantiate the themes. The themes are discussed in order of hierarchy with regard to the overarching aims and objectives of the study.

4.4.1.5.1. ‘Micro-expression (positive)’ and the ‘micro-expression of anger’

The first theme covers the micro-expression seen by the participants. The participants express a positive description of the micro-expression of the non-malicious males. This expression is described as calm, happy and satisfied with the specific facial features being labelled as a smile, a stare and having smiling eyes. The micro-expression (positive) theme was therefore defined as an identified expression that is positive, with specific features showing some form of happiness.

Females’ responses to the micro-expression of malicious males is in line with the definition given for the micro-expression of anger given in 2.4.2. The females describe the expression shown by malicious males as angry or emotionless and identify the following facial features: dark eyes, lips pressed together and a semi frown. The definition of the theme ‘micro-expression of anger’ was therefore stated as showing the facial features of the micro-expression of anger (defined in 2.4.2.) that results in a negative emotion seen in the male. This suggests that females were able to identify the micro-expression of anger in malicious males when shown an image of such a male.

Table 4.7. *Data Extracts for Micro-Expression (Positive) in Non-Malicious Males*

| **Participant** | **Data Extract** |
|---|---|
| 3 | … I can’t see him being angry or anxious or anything… |
| 8 | …he looks happy… |
| 5 | …I think he’s just, sort of...how do you call it...like not really overly excited or overly sad, sort of in the middle… |
| 15 | …eyes like just look like they are kind of like smiling… |
| 15 | …he has a bit of a smile… |
| 15 | …maybe his mouth also coz it’s also like very relaxed like he has a bit of a smile… |
| 5 | …like they've got like a sort of sparkle to them um (referring to his eyes)… |

Table 4.8. *Data Extract for Micro-Expression of Anger in Malicious Males*

| **Participant** | **Data Extract** |
|---|---|
| 5 | It's almost like he doesn't have emotion himself like he's just staring, I think, ya I don't see any… |
| 15 | …kind of like...hooded, like I don't know… (referring to the eyes) |
| 4 | …eyes are really like dark… |
| 8 | …they are so, you see they are tightly pressed together… (referring to his lips) |
| 8 | …it's almost like he's semi-frownish… |
| 15 | …I think his eyes look...quite like...unapproachable… |
| 8 | …he is not smiling… |
| 15 | He looks a bit like, sort of aggressive… |

4.4.1.5.2. 'Trustworthy' and 'untrustworthy'

The second most important themes in terms of the aims of the study are related to trust. Females found the non-malicious male to be trustworthy and the malicious male to be untrustworthy. When found trustworthy the participants answered 'yes' when asked whether they would trust the male. The trustworthy theme was therefore defined as definitive trust resulting in a positive feeling. This theme was also associated with the attribute of the male. For example, positive attributes such as approachability were associated with higher trust. Positive feelings elicited were also associated with this theme as males who made the participants calm and relaxed were identified as trustworthy. The most trustworthy individual identified by the participants was image 3, who was said to be the friendliest. Image 3's eyes were identified as having a certain sparkle and the way in which he smiled resulted in higher trust.

Malicious males were identified as being less trustworthy or not trustworthy at all, with participants' responses ranging from 'I would not trust this man!' to 'No (shakes head), I don't think so' (response to would you trust him). 'Untrustworthy' is therefore defined as having the least amount of trust or having no trust at all. This theme was also associated with negative feelings such as the sensed criminality of the male or negative attributes of the male such as intimidating and scary.

Table 4.9. *Data Extracts for Trustworthy in Non-Malicious Males*

| Participant | Data extract |
|---|---|
| 3 | I believe I could trust him. |
| 22 | Yes, so I would actually trust this person. |
| 22 | …more of a smile… |
| 3 | And I was relaxed looking at him… |
| 22 | He makes me feel like I could actually relate to him… |

Table 4.10. *Data Extract for Untrustworthy in Malicious Males*

| Participant | Data extract |
|---|---|
| 22 | I would definitely not trust this person! |
| 15 | I won't trust him. |
| 5 | No (shakes head), I don't think so… (response to would you trust him) |
| 15 | …doesn't look like a friendly approachable sort of person… |
| 22 | He looks like a serial killer. |
| 22 | He makes me feel uncomfortable. |

4.4.1.5.3. 'Positive experience' and 'negative experience'

The third themes identified are based on females' overall experience of the images. The experiences were found to be on opposite sides of a spectrum with regards to females' responses to non-malicious and malicious males. The responses to non-malicious males include a relaxed feeling elicited in females, a physical attraction ("he is pleasant to look at"), the openness and seemed approachability of the male. 'Positive experience' was therefore defined as an overall positive experience felt by the female elicited by both the positive attributes of the male and the positive emotions elicited.

'Negative experience', on the other hand, is defined by negative attributes and emotions elicited. These experiences include discomfort, avoidance, scary looks and bad feelings.

Table 4.11. *Data Extracts for Positive Experience in Non-Malicious Males*

| Participant | Data extract |
|---|---|
| 15 | …he looks the most friendly I'd say… (referring to image 3) |
| 22 | He makes me feel like I could actually relate to him. |
| 3 | And I was relaxed looking at him. |
| 3 | …he makes me feel natural to look at him. |
| 3 | …he is pleasant to look at… |
| 3 | Sure of himself. |
| 15 | …he just looks like open and approachable… |
| 8 | Ya, so confident, extra confident. |

Table 4.12. *Data Extract for Negative Experience in Malicious Males*

| Participant | Data extract |
|---|---|
| 15 | He looked more scary. |
| 22 | If someone would look at me in that way in real life I would feel very uncomfortable. |
| 22 | This person just looks really mean. |
| 15 | …doesn't look like a friendly approachable sort of person… |
| 5 | I don't get good feelings when I look at him. |
| 8 | I would run away from him, not exactly not run away but like ya stay away. |
| 15 | I was just like whoa this guy I wouldn't want to meet him like in a dark alley sort of thing. |
| 3 | …it's not as pleasuring to look at this guy as the previous one. |

4.4.1.5.4. 'Most prominent feature'

The most prominent features across both response sets (non-malicious and malicious males) were the eyes and the mouth. This theme includes both the mentioned most prominent feature as well as females reason for noting this as the most prominent feature. Although most reasons are in line with the micro-expression theme discussed in 4.4.1.5.1., data extracts have been included here to provide more information on the most prominent feature mentioned.

Other most prominent features included the jawline, nose, chin and frown lines (specifically for malicious males). The identified most prominent feature is in line with the results from the eye tracking data included in 4.3. The definition of the 'most prominent feature' is therefore stated as the feature that drew the attention and focus of the female and the females' reason for their focus being drawn to this feature.

Table 4.13. *Data Extracts for Most Prominent Features in Non-Malicious Males*

| **Participant** | **Data extract** |
|---|---|
| 5 | His eyes are, like they've got like a sort of sparkle to them…um...so ja they sort of make me smile a bit. |
| 22 | …his eyebrows seems to, like, emphasise his the emotion in his eyes. |
| 3 | …complements his hair line and his jaw structure and everything so...everything complements each other. (eyes) |
| 22 | …prominent jawline. |
| 15 | …maybe his mouth also coz it's also like very relaxed like he has a bit of a smile… |
| 22 | He had a big nose. |
| 3 | …the first thing I recognised is his mouth and his eyes. |
| 8 | …the lips, slight smile… |

Table 4.14. *Data Extract for Most Prominent Features in Malicious Males*

| **Participant** | **Data extract** |
|---|---|
| 8 | …the lips… |
| 5 | …probably his eyes. |
| 5 | …chin and his jawline. |
| 5 | …because there's nothing there. There's no emotion there, he's just sort of staring. (eyes) |
| 15 | …his mouth isn't...um maybe it is...I was gonna say his mouth looks like more welcoming but the more I look at it the more I think no maybe it doesn't. (mouth) |
| 3 | …the first thing I've noticed is his frown lines. |

4.4.1.5.5. ‘Conflicting responses’

The final theme covers the conflicting responses found within the responses to non-malicious males and malicious males. In terms of the non-malicious males, females indicated that they witnessed sadness in the non-malicious males. This conflicts with the positive experience theme defined in 4.4.1.5.3. ‘Conflicting responses’ are therefore defined across both non-malicious male and malicious males as responses that are in conflict with the other identified themes. These conflicts include feeling sympathy for the non-malicious males and identifying both non-malicious and malicious males’ emotional state as sad.

Table 4.15. *Data Extracts for Conflicting Responses in Non-Malicious Males*

| **Participant** | **Data extract** |
|---|---|
| 22 | For me it seems like he is trying, he's hiding, he's trying to hide his emotions… |
| 22 | ...I feel sympathetic. |
| 22 | Maybe sadness… (emotion felt by male) |

Table 4.16. *Data Extract for Conflicting Responses in Malicious Males*

| **Participant** | **Data extract** |
|---|---|
| 3 | Well first of all I was feeling ashamed when I was... He...It’s not pleasant looking at him. |
| 8 | Could be sad you know...could be masking the sadness with the seriousness. |
| 3 | …um maybe unhappy like something is bothering him… |
| 3 | …he looks a bit worried… |

At this point the following research questions have been answered:

- Do the images of the malicious males shown to a group of females portray the micro-expression of anger? Yes, the malicious males included in the present study portrayed the micro-expression of anger as the females were able to identify the micro-expression of anger in these males (see 4.4.1.5.1).

- Are there psychological signs that accompany females' recognition of the micro-expression of anger? Yes, the recognition of the micro-expression of anger is accompanied by a feeling of mistrust and overall negative experiences.

- Are there differences between the psychological responses of females to a superimposed face composed of malicious males and a superimposed face composed of non-malicious males? Yes, females found non-malicious males to be more trustworthy and the viewing of these images resulted in an overall positive experience. This was different to that of the experience of the malicious males and these males were found to be untrustworthy and resulted in an overall negative experience being had by the females.

#### *4.4.1.6. Phase 6: Production of the Report*

The final phase described by Braun and Clarke (2006) is the production of the report. This report is the final write-up of the thematic analyses and includes an in-depth discussion of the findings in relation to the study's research questions and relevant literature. As this is a mixed methods study, this will be done in relation to the quantitative results described in 4.2. This integrated discussion will be provided in chapter 5.

## 4.5. CONCLUSION

In this chapter, the results of both the quantitative and qualitative data analyses are provided. The quantitative results showed two significant differences. The first significant difference was between the heart rate baseline and the heart rate for image 4. The second significant difference was found between the heart rate for image 1 and the heart rate for image 4. The eye tracker results indicated that females mostly focus on the eyes and mouth of malicious and non-malicious males. The qualitative results indicate significant differences in responses

of females to malicious and non-malicious males with the malicious males being seen as less trustworthy and more ‘scary’. An integrated discussion of these results is provided in chapter 5. The results are discussed in reference to the main aim of the study and the objectives provided in 1.4. The conclusions that follow are based on this discussion. Finally the strengths and limitations of the research are discussed.

# CHAPTER 5
# DISCUSSION, LIMITATIONS, RECOMMENDATIONS AND CONCLUSIONS

## 5.1. INTRODUCTION

The previous chapter presented both the quantitative and qualitative results of the study. The quantitative results indicated that the heart rate of females was significantly different at the baseline and image 4 (malicious male). Further significant results were found between the heart rate of females when viewing image 1 (non-malicious male) and image 4 (malicious male). This indicated a physiological response of females to the image of this particular malicious male presented in the slideshow. The eye tracker results showed that females mainly focus on the eyes and mouth when looking at both malicious and non-malicious males. The qualitative results clearly indicated a difference in the psychological responses of females to malicious males. In this final chapter the quantitative and qualitative results will be combined into an integrated discussion. The chapter begins with a discussion of the aims and objectives of the study in relation to the results. The research questions stated in chapter 1 are recapped and answered. The themes arising from the qualitative analysis are discussed in relation to the quantitative results. Finally the limitations of the study are provided after which an exploration of possible future research is given.

## 5.2. DISCUSSION OF THE CONCLUSIONS TO THE AIM, OBJECTIVES AND RESEARCH QUESTIONS OF THE STUDY

This section starts with a recap of the aims and objectives of the study. The main aim of the study, as stated in 1.5.1, was to ascertain females' ability to identify the micro-expression of anger in males. To attain this aim various objectives were set. Each objective was accompanied by a research question. What follows is a discussion of each of these objectives and research questions in relation to the quantitative and qualitative results.

### 5.2.1. Do the images of the malicious males shown to a group of females portray the micro-expression of anger?

The first objective set was to determine whether the images of the malicious males used in the study portray the micro-expression of anger. As described in 2.3.1., anger is a universal emotion that is not culturally dependent. The emotion of anger is defined as an intense feeling

of irritation, unhappiness or aggression (Anger, 2015) and when this emotion is felt the micro-expression of anger is expressed. Micro-expressions are minute, muscle changes that last only a fraction of a second and indicate what that person is consciously or unconsciously feeling (Moritz, 2011). Therefore a micro-expression is expressed when an emotion is felt.

A specific definition was given for the micro-expression of anger in 2.4.2. This definition included the following features described by Moritz (2011): eyebrows pulled down and together, a thinned mouth, sunken eyes and expressionless cheeks. The first theme identified during the qualitative analysis was the 'micro-expression of anger' (see 4.4.1.5.1). Females' responses included the identification of dark, hooded eyes that are consistent with the sunken eyes identified by Moritz. The females also identified tightly pressed lips (consistent with a thinned mouth) and a semi-frown that indicated aggression or anger. The emotion of anger was also picked up by females as the emotion elicited by the malicious males.

It is therefore suggested that the micro-expression of anger is portrayed by malicious males as indicated by females' responses. This finding is consistent with the findings of Williams and Mattingley (2006) who found that the identification of the micro-expression of anger is highly accurate (see 2.4.2). This discussion affirms the research question related to females' ability to identify the micro-expression of anger in malicious males.

### 5.2.2. Psychological signs that accompany females' recognition of the micro-expression of anger

When discussing the psychological signs that accompany females' recognition of the micro-expression of anger two themes need to be discussed in detail. These themes, identified in 4.4.1.5, are specific to females' responses to malicious males namely, 'untrustworthy' and 'negative experience'. These two themes are discussed in detail in the next two sections.

#### *5.2.2.1. Untrustworthy*

The untrustworthy theme was identified when females expressed that they would not trust the malicious male. This theme was associated with negative attributes described by the females (e.g. intimidating, scary and unapproachable). This theme was also associated with negative emotions elicited in the females (e.g. fear and discomfort) and resulted in behavioural reactions in which the females noted that they would avoid the malicious male. This theme is also related to the 'micro-expression of anger' theme discussed in 5.2.1 as it shows that the

females picked up the malicious intent through the micro-expression and therefore wanted to avoid said malicious male. It is therefore concluded that the micro-expression of anger is associated with distrust. This is congruent with the results of Carr et al.'s (2014) research discussed in 2.3.5. The researchers conducted a study on 68 participants and asked participants to determine the trustworthiness of happy and angry facial expressions displayed through the use of dynamic images. The results indicated that angry facial expressions were associated with lower trust scores. As the present study included static images rather than dynamic images the conclusions of Carr et al's research can be extended to static facial expressions based on the present study.

#### *5.2.2.2. Negative experience*

The negative experience theme was associated with negative attributes, emotions elicited, emotions felt by the male and other experiential codes. Females deemed the malicious males to be untrustworthy, mean, scary and intimidating. All of these attributes resulted in negative emotions being elicited in the females. These emotions included discomfort and fear. The resultant behavioural reaction was also negative as the participants reported that they would avoid the malicious male.

Based on the discussion on the two themes ('untrustworthy' and 'negative experience') presented above, the psychological signs associated with the identification of the micro-expression of anger could be summarised as follows:

- Expressing distrust (theme: untrustworthy);
- Identifying negative attributes (e.g. intimidating, scary, mean, unapproachable and firm) (theme: negative experience);
- Identifying a negative emotion felt by the male (e.g. anger, emotionless, not calm and unhappy) (theme: negative experience);
- Identifying the male as a criminal (…he looks like a serial killer…) (theme: negative experience).

The research question with regards to the existence of clear psychological signs when females identify the micro-expression of anger is therefore confirmed.

### 5.2.3. Physiological signs that accompany females' recognition of the micro-expression of anger

According to the literature review conducted on the physiology of intuition (see 2.2.5.) and the physiology of recognition (see 2.3.5), the amygdala is activated in response to fear. Fear is an emotional reaction to a potential perceived threat such as an individual expressing the micro-expression of anger (Johnstone et al., 2005; Manuck et al., 2007; Mogg et al., 2007). Other brain structures involved are the putamen (involved in nonverbal encoding and encoding intuitions) and the caudate (involved in decoding intuitions) (Lieberman, 2000; McCrea, 2010). Nonverbal encoding and encoding intuitions refer to converting information received (either in the form of nonverbal cues or intuitions) into a construct that can be stored in the brain. Decoding intuitions on the other hand is when one deciphers the encoded information.

Although studies involved in the physiological response to the micro-expression of anger were able to suggest the involvement of certain brain structures, none of them could provide evidence that intuition is related to an autonomic response, behavioural reaction or an emotional response. The present study has provided detail on the physiological response and the psychological response of females to the micro-expression of anger. The physiological response could be equated to an autonomic response that would be elicited by the hypothalamus. The psychological response on the other hand could be seen as an emotional response elicited by the central cortex. In terms of the autonomic response, it is seen from the results (see 4.2) that two physiological responses were elicited. The first of which was a reduction in heart rate between the baseline and image 4 (malicious male). However, the researcher hypothesises that this significant difference cannot be attributed to the response to the image. This is due to the time lapse between the images and the time lapse of the slideshow. As mentioned in 4.2.1, a gradual decrease in heart rate, which resulted in a significant difference between two time points, was seen. This difference may be best explained by the time difference between the images and not the image of the malicious male. Another possible explanation is that the participants relaxed as the slideshow came to an end and their heart rate therefore decreased. The alternative explanations for this significant difference and the lack of significant differences between the other physiological measures, indicated to the researcher that an autonomic response is not being activated. As discussed in 2.3.6, when the amygdala is activated an autonomic physiological response is elicited

(Adolphs, 2006). This autonomic physiological response is identified by, for example, an increased heart rate that did not occur in the present study. It is therefore hypothesised by the researcher that the static images did not pose a real threat to the participant that resulted in the autonomic nervous system not being activated.

The same explanation can be applied to the second physiological response that resulted in a significant difference. This result was a reduction in heart rate between image 1 (non-malicious male) and image 4 (malicious male). It is therefore recommended in 5.5 that this research be replicated with alterations in the order of the images and the length each image was shown. Further studies should also concentrate on the optimal time for a physiological response to be recorded when shown an image of a malicious male. Dynamic images could also be included in future studies as these images may result in a higher threat level.

Due to the above explanation, the research question around the presence of physiological signs that accompany females' recognition of the micro-expression of anger cannot be confirmed and further research is needed on the topic.

### 5.2.4. Differences between the psychological responses of females to a superimposed face composed of malicious males and a superimposed face composed of non-malicious males

A clear difference was seen in some of the themes identified in the psychological responses of females to a superimposed face composed of malicious males and one composed of non-malicious males. This difference was clear when comparing the identified themes for the responses to malicious males and non-malicious males (see 4.4.1.5) with each other. The specific themes were:

- The 'micro-expression (positive)' (identified in non-malicious males) and the 'micro-expression of anger' (identified in malicious males) (see 4.4.1.5.1);
- 'Trustworthy' (identified in non-malicious males) and 'untrustworthy' (identified in malicious males) (see 4.4.1.5.2);
- 'Positive experience' (identified in non-malicious males) and 'negative experience' (identified in malicious males) (see 4.4.1.5.3);

The last two themes identified held similarities across responses. These themes were the 'most prominent feature' (see 4.4.1.5.4) and 'conflicting responses' (see 4.4.1.5.5). What follows is an in-depth discussion of each of these themes in reference to the objective and the research question.

#### *5.2.4.1. The 'micro-expression (positive)' (identified in non-malicious males) and the 'micro-expression of anger' (identified in malicious males).*

Participants reacted positively when shown the images of the non-malicious males. On the other hand, negative responses were generated when they were confronted with the images of the malicious males. The micro-expression females recognised for malicious males was that of anger while a more positive happy, calming micro-expression was described for non-malicious males. Williams and Mattingley (2006) conducted a study that aimed to identify the differences in responses to angry and fearful facial expressions (see 2.4.2). The researchers found that the recognition of the micro-expression of anger is highly accurate. They also found that the identification of the micro-expression of anger is prioritised by both males and females. The results of the present study are therefore collaborated by past research as the females were able to identify the micro-expression of anger.

#### *5.2.4.2. 'Trustworthy' (identified in non-malicious males) and 'untrustworthy' (identified in malicious males).*

In terms of trust, the malicious males were rated as less trustworthy than the non-malicious males. The decision of trust was based on multiple factors including whether positive or negative attributes were associated with the male, if positive or negative emotions were elicited by the male (positive or negative) and whether the male was overall experienced in a positive or negative manner. It seems that the more positives the females associated with a specific male, the more they appeared to be willing to trust him and regard him as trustworthy. Past literature has associated trust with micro-expressions and found that when an individual displays a negative facial expression such as anger they are identified as less trustworthy (Moriya et al., 2013; Oosterhof & Todorov, 2009; Porter & Ten Brinke, 2009; Todorov & Duchaine, 2008). Moriya et al. (2013) took their conclusion a step further by associating the identification of anger as an identification of threat. This relates to one of the future outcomes of the present study as the researcher would like to start intervention

techniques for females who may be in potentially dangerous situations. The intervention would promote females removing themselves from the situation when identifying a threatening facial expression.

#### *5.2.4.3. Positive experience' (identified in non-malicious males) and 'negative experience' (identified in malicious males).*

As can be seen in 5.2.4.2, positive experiences were associated with the non-malicious males. These experiences were the result of the positive emotions they elicited in the participants. The positive attributes of the non-malicious males added to them being experienced in a positive way. In contrast, malicious males were seen as more intimidating and scary. As a result, an overall negative experience was associated with these males. Stewart et al. (2009) conducted a study that aimed to determine whether micro-expressions in speeches can alter a person's reaction to said speech (see 2.3.2). The researcher's results indicated that the presence of micro-expressions can alter a person's response to that individual. In the present study the presence of the micro-expression of anger altered the females' experience in a negative way as the micro-expression is negative. When responding to the non-malicious males, females identified a positive micro-expression (see 5.2.4.2) that made their experience more positive.

#### *5.2.4.4. 'Most prominent feature'.*

Data yielded by the eye tracker and the semi-structured interview were used to determine the most prominent feature of both malicious and non-malicious males. The eye tracking data showed that the participants focused mostly on the eyes, mouth, eyebrows and nose of all the males in the slide show. The two most prominent features identified by females in the semi-structured interview were the eyes and the mouth. Upon data collection it became apparent that the most prominent features were influenced by the expression shown by the male. For example, when the male was perceived to be happy, the mouth was indicated as the most prominent feature (see 4.4.1). Adolphs (2006) found in his research that the eyes and mouth are the best determinants of a facial expression. This could be a possible reason why the participants chose to focus on these aspects of both the malicious and non-malicious male faces.

#### *5.2.4.5. 'Conflicting responses'.*

The conflicting response theme has to do with participants presenting a contradictory response to what other participants have said. For example, one non-malicious male was identified as friendly, approachable and calm by one participant and sad by another participant. It is assumed that one needs to take cognisance of such conflicting responses and determine whether they are normal reactions or does the possibility exist that the participant is projecting her own emotions onto the image. The researcher could not find research to confirm or refute this statement and therefore more attention is needed on this topic.

In light of the above discussions it is now assumed that differences existed between the female participants' psychological response to the superimposed face composed of malicious males and the superimposed face composed of non-malicious males. The research question on whether females react psychologically different to malicious males when their images are being compared with that of non-malicious males is therefore confirmed. The findings of the present study contradict the results of Porter et al. (2008) (see 2.3.5). Porter et al. conducted a study on 30 participants who were asked to determine the trustworthiness of 34 images. Half of the images were composed of trustworthy individuals (humanitarians or Nobel Peace prize winners) and the other half were composed of untrustworthy individuals (Americas most wanted). The researchers found that intuitive judgements are not very accurate when determining the trustworthiness of an individual. The present study, however, noted that female participants described the malicious males as untrustworthy.

The research question around the differences between the psychological responses of females to a superimposed face composed of malicious males and a superimposed face composed of non-malicious males is therefore confirmed. The differences are summarised as follows:

- Differences exist between the micro-expressions identified with positive micro-expressions being identified for non-malicious males and the micro-expression of anger being identified for malicious males;
- Differences exist between the trustworthiness ratings of the individuals with malicious males being less trustworthy than non-malicious males; and
- Differences exist between the overall experiences of the male with more negative experiences being associated with malicious males.

### 5.2.5. Differences between the physiological responses of females to a superimposed face composed of malicious males and a superimposed face composed of non-malicious males

As was discussed in 5.2.3, the quantitative results provided in 4.1 showed two significant differences between the physiological responses of females to non-malicious males and malicious males. The first significant difference occurred between the baseline heart rate and heart rate measured when image 4 (malicious male) was viewed. The second significant difference occurred between the heart rate measured when image 1 (non-malicious male) was viewed and the heart rate measured when image 4 (malicious male) was viewed. No literature could be found to explain the phenomenon and therefore it is postulated that the difference had to do with the order of the slides in the slideshow. Since the images were not rotated in the slideshow, there is no way of knowing whether the result is due to differences in the images or whether this was the result of time that had lapsed between viewing image 1 and image 4. The time each image was shown and the buffer time was based on a pilot study. These times were supported by Porter et al.'s (2008) study that indicated that 30 seconds was a sufficient time for each image to be shown. As this is the first study of its kind, more research is needed to find the optimal time for the duration of each image and buffer. It should also be noted that the issue of timing the slide show might have affected the results with regards to the physiological responses of the participants if shorter or longer times were used.

As was shown in 4.2.1.2, no other significant differences were found for any of the other physiological measures of heart rate variability, breathing rate or estimated core temperature when the images of malicious and non-malicious males were viewed. It is therefore proposed that the female participants of the study reacted physiologically in the same way to both the superimposed images of malicious and non-malicious males. This finding relates closely with the finding made in 5.2.3 and hence the same explanation might apply to both these findings. This explanation stated that the female participants were only exposed to static images of malicious and non-malicious males. Although they indicated that the malicious males were untrustworthy (see 5.2.2.1) and that they elicited a negative response (see 5.2.2.2), the latter realised that their exposure was limited to static images and that these males could not really cause them any harm. As a result of this, the hypothalamus would be notified that the participant was not in harms' way and an autonomic response would not be elicited (Gaab, Rohleder, Nater and Ehlert, 2005).

The research question around whether there are differences between the physiological responses of females to a superimposed face composed of malicious males and a superimposed face composed of non-malicious males is therefore refuted as no differences between the responses were found.

### 5.2.6. The difference between the psychological and physiological responses of females to a superimposed face composed of malicious males

Anger has been defined as a universal emotion; however, it can also be seen as a primary emotion (Zillmer, Spiers, & Culbertson, 2007). Primary emotions are emotions that are automatic (like micro-expressions) and are processed by the limbic system. Zillmer et al. indicated that these primary emotions are controlled by the amygdala which, from previous discussions, has been identified as playing a role in both the intuitive responses (see 2.2.5) and micro-expression recognition (see 2.3.6). However, the amygdala does not function in isolation. When a real threat is perceived, the central nucleus of the amygdala activates the hypothalamus (Gaab et al., 2005). This results in the activation of the autonomic nervous system that prepares the body for the fight-or-flight response.

In the present study it was discovered that female participants psychologically experienced a whole range of negative responses (see 5.2.2.1 and 5.2.2.2) when they viewed the images of the malicious males. These findings were, however, not supported by the quantitative part of the study as it was found that the female participants did not have any negative, physiological reactions to the images of the malicious males (see 5.2.3). When the literature is consulted on the issue, one would find that it is not an impossible situation.

The psychological response displayed by the participants when they viewed the images of the malicious males could be equated to experiencing cognitive anxiety. Cognitive anxiety is mostly a feeling that all is not well and that a threat has been perceived (Weinberg & Gould, 2011). Upon this experience, information is sent to the hypothalamus and other areas of the brain stem via the central nucleus of the amygdala (Gaab et al., 2005; Zillmer et al., 2007). The hypothalamus then sends signals to inhibitory and excitatory limbic sensitive structures called the pituitary and adrenal glands (Gaab et al., 2005). These structures then determine the level of threat and respond appropriately; for example, if the level of threat is high the body needs to be equipped to deal with that stressor and therefore the hypothalamic-pituitary-adrenal axis (HPA axis) is activated. Cortisol is then released to prepare the body to

physically deal with that threat. Therefore, in order for a physiological response to be elicited, the HPA axis needs to be activated. It appears from the study that while the pre-frontal cortex was activated, the threat was deemed as not serious and hence the HPA axis was not activated. This resulted in no physiological response being observed. Coetzee, Jooste and Mostert (2014) conducted research on rugby players' cognitive and somatic anxiety levels in response to an important rugby match. Their study included 20 male adolescents, half of which were first team rugby players and the other half did not participate in any sports. The researcher's measured levels of salivary cortisol to test the somatic anxiety and used a personality inventory (State-Trait Personality Inventory Form Y) and an anxiety test (Sport Competition Anxiety Test) to measure the cognitive anxiety levels. The results were exactly the same as the ones presented in the current study. The rugby players displayed cognitive anxiety but not somatic anxiety. The researchers theorise that the intensity of the cognitive anxiety elicited may be the determining factor for the somatic response. The anticipation of a big rugby match or seeing a malicious male on a computer screen is therefore not enough to elicit a somatic response.

The main difference between the study conducted by Coetzee et al. (2014), and the present study is the inclusion of the measurement of cortisol levels. The present study did not include a measurement of cortisol levels to measure if a stress response was elicited in participants and therefore further studies are needed on the matter.

From the above discussion it is clear that there were no differences between the psychological responses of females to a superimposed face composed of malicious males and the physiological responses of females to a superimposed face composed of malicious males. While no real differences were identified for the physiological responses to the males, the psychological responses provided a multitude of information. The research question around whether there are differences between the psychological and physiological responses of women to a superimposed face composed of malicious males is therefore confirmed as a psychological response was elicited while no physiological response was elicited. However, further research may show otherwise if conducted with dynamic images (see 5.5).

### 5.2.7. The difference between the psychological and physiological responses of females to a superimposed face composed of non-malicious males

The results indicated that none of the physiological responses of females to non-malicious males were significantly different to the baseline (see 4.2). The females did however respond psychologically to the non-malicious males. As discussed in 5.2.4, females responded positively to the non-malicious males with the identified themes being: micro-expression (positive), trustworthy and positive experience. It was therefore concluded that there was a difference between the psychological responses and the physiological responses of females to non-malicious males. The research question asking whether there are differences between the psychological and physiological responses of women to a superimposed face composed of malicious males is therefore confirmed.

## 5.3. LIMITATIONS OF THE STUDY AND RECOMMENDATIONS FOR FUTURE RESEARCH

The study was limited with regards to the sample, equipment used and time allocated. In terms of the sample, a relatively small sample size was used for the quantitative physiological section. This was due to both equipment and time constraints. The sample was not representative of the entire population of females. This limits the generalization of the findings. The use of a larger, representative sample would promote more generalizable findings and advance the goals of the study. Further studies including males in the sample are also suggested as the present study was limited to female responses and feminine intuition. Studies could also be conducted on same gender responses to different micro-expressions (e.g. females' responses to the micro-expression of anger expressed by females or males' responses to the micro-expression of anger as expressed by males). These studies would broaden the research in the field thereby promoting the growth of this research area.

In terms of the equipment used for the study, the eye tracker did not provide pupil dilation data that may have provided more information on the arousal levels of the participants in response to the different images. The participants were also asked to sit as still as possible due to the calibration of the eye tracker. This limitation of movement may have distracted the participants and resulted in data of a lower quality. This also limited the Zephyr Bioharness data as postural changes could not be included in the analysis. It is recommended that a future study be conducted with a non-restraining eye tracker. This would provide information on the

distance the participants place between themselves and the males when responding to malicious and non-malicious males. The researcher theorises that individuals would place more distance between themselves and malicious males in comparison to non-malicious males. This theory has arisen from some responses in the psychological interview in the present study around the avoidance of the malicious male.

The non-malicious males used in the study were images obtained off of a free image website. These images were not necessarily neutral (even though the females mostly identified the males as neutral) and may have created an unjust comparison. It is recommended that future research should be done on the difference in responses of females to malicious males and neutral males (proven to be neutral through extensive prior testing) to determine whether the neutrality of the males influences the responses. Future research could also include response differences between malicious males and petty criminals (criminals who commit non-malicious crimes).

The time each image was shown and the buffer time in the slideshow (time between each image) was based on a pilot study. These times were supported by Porter et al.'s (2008) study (see 3.8) however, as this is the first study of its kind in South Africa, more studies will need to be conducted to find the optimal time for each image and buffer to be shown. This is suggested as different results may have been obtained for the physiological responses if shorter or longer times were used.

The physiological measures were limited in the study as not all measures were analysed and reported. Future studies could include more physiological measures such as brain imaging. A possible next step for the study is to replicate the current method and include fMRI analyses to establish what areas are and are not being activated when a participant is viewing the images. This could also answer the question: if the amygdala is being activated why is there no resultant heart rate, heart rate variability, breathing rate or estimated core temperature change?

The timings of the slideshow are another limitation of the study as there was no concrete literature to indicate whether the times used were optimal. The research includes a pilot study as well as considerations from previous research (see 4.8) however, this research did not take the response time of the physiological measures into account. Previous research on facial expression detection has provided optimal times (see 2.3.3) however, none of these studies

included the physiological measures included in the study (e.g. heart rate, breathing rate, heart rate variability and estimated core body temperature). Future studies looking at alternating the slideshow length and measuring the physiological responses at different time stamps are recommended.

In addition to the factors discussed above, dynamic facial expressions may have altered the results of the study. Bould and Morris (2008) conducted a study on the influence of motion in micro-expression recognition that included three experiments. Each experiment included a dynamic facial expression that was obtained by asking actors to display each of the 6 universal expressions while being recorded. The first experiment included 85 individuals who were shown three movement conditions namely, a single static image, multiple static images and a single dynamic image. The findings indicated that the recognition of the facial expression when shown with the dynamic image was easier than facial expression recognition across all emotions when compared to the single static image. The second experiment replicated the first experiment with one main alteration: the intensity of the expressed emotion was altered. This experiment was conducted with 68 participants and the findings indicated that movement in the facial expression had less of an impact when the task at hand was to identify intense facial expressions. It was therefore concluded that motion aids micro-expression recognition but these improvements are minimised when intense facial expressions are shown. A future study could replicate the present study with dynamic facial expressions.

## 5.4. CONCLUSION

This study was the first study of its kind in South Africa. It ascertained females' ability to identify the micro-expression of anger in males. From the discussions presented in this chapter it is clear that, whilst no physiological response was seen in the study, females did identify the micro-expression of anger in malicious males. The study has also shown that the most prominent facial features for both malicious and non-malicious males were the mouth and the eyes. Finally, a clear difference was seen between the psychological responses of females to non-malicious males and malicious males. The limitations of the study have been discussed and include:

- Sample limitations in terms of size and gender;
- Equipment limitations in terms of the eye tracker;
- Limitations due to the images used; and

- Slideshow limitations in terms of the time each image was shown and the time in-between each image.

Recommendations for future research have been suggested covering all of the limitations identified in the present study. These future research studies will grow the body of knowledge around intuition, micro-expression recognition and the psychophysiological responses to each of these.

# REFERENCE LIST

Adolphs, R. (2006). Perception and emotion: How we recognize facial expressions. *Current directions in psychological science*, *15*(5), 222-226.

Alós-Ferrer, C., & Hügelschäfer, S. (2012). Faith in intuition and behavioral biases. *Journal of Economic Behavior & Organization*, *84*(1), 182-192.

American Psychological Association [APA]. (2011). Definition of terms: Sex, gender, gender identity, sexual orientation. Retrieved February 21, 2015, from http://www.apa.org/pi/lgbt/resources/sexuality-definitions.pdf

Andrei, M. (2013). MRI shows a decrease in volume in certain brain regions of professional fighters. *ZME Science*. Retrieved 29 September 2015, from http://www.zmescience.com/research/studies/brain-fighter-caudate-amygdala-26032013/

Anger. (2015). Oxford Dictionaries. Retrieved September 20, 2015, from http://www.oxforddictionaries.com/definition/english/anger

Assajoli, R. (1971). Psychosynthesis. *New York: Viking.*

Babbie, E. (2011). *The practice of social research*. Cengage Learning.

Bould, E., & Morris, N. (2008). Role of motion signals in recognizing subtle facial expressions of emotion. *British Journal of Psychology (London, England: 1953)*, *99*(2), 167–189. doi:10.1348/000712607X206702

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77-101. ISSN 1478-0887.

Brien, S., Dibb, B., & Burch, A. (2011). The use of intuition in homeopathic clinical decision making: An interpretative phenomenological study. *Evidence-based Complementary and Alternative Medicine : eCAM*, *2011*. doi:10.1093/ecam/nep153

Carr, E. W., Korb, S., Niedenthal, P. M., & Winkielman, P. (2014). The two sides of spontaneity: Movement onset asymmetries in facial expressions influence social judgments. *Journal of Experimental Social Psychology*, *55*, 31-36.

Carré, J. M., Fisher, P. M., Manuck, S. B., & Hariri, A. R. (2012). Interaction between trait anxiety and trait anger predict amygdala reactivity to angry facial expressions in men but not women. *Social Cognitive and Affective Neuroscience*, *7*(2), 213-221.

Chen, J. F., & Tiddeman, B. (2010). Multi-cue facial feature detection and tracking under various illuminations. *International Journal of Robotics and Automation*, *25*(2), 162–171.

Coetzee, N., Jooste, M., & Mostert, S. N. (2014). Measurement of cognitive and somatic anxiety amongst first team high school rugby players: sport psychology. African Journal for Physical Health Education, Recreation and Dance, 20(3), 1249-1260.

Cooper, R. M., & Langton, S. R. (2006). Attentional bias to angry faces using the dot-probe task? It depends when you look for it. *Behaviour Research and Therapy*, *44*(9), 1321-1329.

Corrugator muscle. (n.d.) *Farlex Partner Medical Dictionary*. (2012). Retrieved September 27 2015 fromhttp://medical-dictionary.thefreedictionary.com/corrugator+muscle

Creswell, J. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches*. SAGE Publications, Incorporated.

Creswell, J. W., & Clark, D. V. L. P. (2007). *Designing and conducting mixed methods research* (1st ed.). Sage Publications, Inc.

Dana, L. P. (Ed.). (2011). *World encyclopaedia of entrepreneurship*. Edward Elgar Publishing.

Dane, E., Rockmann, K. W., & Pratt, M. G. (2012). When should I trust my gut? Linking domain expertise to intuitive decision-making effectiveness. *Organizational Behavior and Human Decision Processes*, *119*(2), 187-194.

De Becker, G. (1997). *The gift of fear*. Bloomsbury.

Dijksterhuis, A., Bos, M. W., Nordgren, L. F., & Van Baaren, R. B. (2006). On making the right choice: The deliberation-without-attention effect. *Science*, *311*(5763), 1005-1007.

Ekman, P. (2003). Darwin, deception, and facial expression. *Annals of the New York Academy of Sciences*, *1000*(1), 205-221.

Elfenbein, H. A., & Ambady, N. (2002). Is there an in-group advantage in emotion recognition?. *Psychological Bulletin, 128*(2), 243-249.

Endres, J., & Laidlaw, A. (2009). Micro-expression recognition training in medical students: a pilot study. *BMC Medical Education, 9*(1), 47.

Evans, J. R. (2010). *Statistics, Data Analysis, and Decision Modeling* (4th ed.). Upper Saddle River, New Jersey: Pearson.

Field, A. (2009). *Discovering statistics using SPSS*. London: Sage.

Gaab, J., Rohleder, N., Nater, U. M., & Ehlert, U. (2005). Psychological determinants of the cortisol stress response: the role of anticipatory cognitive appraisal. *Psychoneuroendocrinology, 30*(6), 599-610.

Graff, C. (2013). Mixed methods research. In H. Hall & L. Roussel, Evidence-Based Practice: An Integrative Approach to Research, Administration and Practice (pp.45-64). *Jones & Bartlett Learning*.

Gravetter, F. J., & Forzano, L.-A. B. (2012). *Research methods for the behavioural sciences* (4th International edition.). USA: Wadsworth.

Greely, H. T., & Illes, J. (2007). Neuroscience-based lie detection: The urgent need for regulation. *American Journal of Law & Medicine*, 33, 377.

Greene, J. C., & Caracelli, V. J. (1997). Defining and describing the paradigm issue in mixed-method evaluation. *New Directions for Evaluation, 1997*(74), 5–17. doi:10.1002/ev.1068

Halberstadt, J., Winkielman, P., Niedenthal, P. M., & Dalle, N. (2009). Emotional conception how embodied emotion concepts guide perception and facial action. *Psychological Science, 20*(10), 1254–1261. doi:10.1111/j.1467-9280.2009.02432.x

Hogarth, R. (2001). *Educating Intuition*. Chicago: University of Chicago Press. Retrieved from http://www.press.uchicago.edu/ucp/books/book/chicago/E/bo3624460.html

Howell, C. (2013). *Intuition: Unlock the power!*. Exisle Publishing.

Howell, D. C. (1999). *Statistical methods for psychology* (5th ed). Essex, England: Pearson Prentice Hall.

Hurley, C. M. (2012). Do you see what I see? Learning to detect micro expressions of emotion. *Motivation and Emotion*, *36*(3), 371–381. doi:10.1007/s11031-011-9257-2

Hurley, C. M., Anker, A. E., Frank, M. G., Matsumoto, D., & Hwang, H. C. (2014). Background factors predicting accuracy and improvement in micro expression recognition. *Motivation and Emotion*, *38*(5), 700-714.

Intuition. (2015). Oxford Dictionaries. Retrieved September 20, 2015, from http://www.oxforddictionaries.com/definition/english/intuition

Johnstone, T., Somerville, L. H., Alexander, A. L., Oakes, T. R., Davidson, R. J., Kalin, N. H., & Whalen, P. J. (2005). Stability of amygdala BOLD response to fearful faces over multiple scan sessions. *Neuroimage*, *25*(4), 1112-1123.

Lieberman, M. D. (2000). Intuition: a social cognitive neuroscience approach. *Psychological Bulletin*, *126*(1), 109.

Lischke, A., Berger, C., Prehn, K., Heinrichs, M., Herpertz, S. C., & Domes, G. (2012). Intranasal oxytocin enhances emotion recognition from dynamic facial expressions and leaves eye-gaze unaffected. *Psychoneuroendocrinology*, *37*(4), 475-481.

Loye, D. (1998). *The sphinx and the rainbow: Brain, mind and future vision*. iUniverse.

Magnée, M. J., Stekelenburg, J. J., Kemner, C., & de Gelder, B. (2007). Similar facial electromyographic responses to faces, voices, and body expressions. *Neuroreport*, *18*(4), 369-372.

Manuck SB, Brown SM, Forbes EE, Hariri AR. (2007). Temporal stability of individual differences in amygdala reactivity. American Journal of Psychiatry. 2007;164:1613–1614.

Martin, C. W. (2009). *The philosophy of deception*. Oxford University Press.

Matsumoto, D. (2002). Methodological requirements to test a possible in-group advantage in judging emotions across cultures: Comment on Elfenbein and Ambady (2002) and evidence. *Psychological Bulletin*, *128*(2), 236-242.

Matsumoto, D., & Hwang, H. S. (2011). Evidence for training the ability to read microexpressions of emotion. *Motivation and Emotion*, *35*(2), 181-191.

McCraty, R., Atkinson, M., & Bradley, R. T. (2004a). Electrophysiological evidence of intuition: Part 1. The surprising role of the heart. *The Journal of Alternative & Complementary Medicine*, *10*(1), 133-143.

McCraty, R., Atkinson, M., & Bradley, R. T. (2004b). Electrophysiological evidence of intuition: Part 2. A system-wide process?. *The Journal of Alternative & Complementary Medicine*, *10*(2), 325-336.

McCrea, S. M. (2010). Intuition, insight, and the right hemisphere: Emergence of higher sociocognitive functions. *Psychology Research and Behavior Management*, *3*, 1–39.

Mogg, K., Garner, M., & Bradley, B. P. (2007). Anxiety and orienting of gaze to angry and fearful faces. *Biological Psychology*, *76*(3), 163-169.

Moritz, C. (2011). Micro-facial expressions 102 – anger, disgust and contempt. *Read Body Language*. Retrieved January 22, 2013, from http://readbodylanguage.wordpress.com/2011/05/16/micro-expressions-102-anger-disgust-and-contempt/

Moriya, J., Tanno, Y., & Sugiura, Y. (2013). Repeated short presentations of morphed facial expressions change recognition and evaluation of facial expressions. *Psychological Research*, *77*(6), 698-707.

Myers, D. (2002). *Intuition: Its powers and its perils*. Yale University Press.

Oosterhof, N. N., & Todorov, A. (2009). Shared perceptual basis of emotional expressions and trustworthiness impressions from faces. *Emotion*, *9*(1), 128.

Pallant, J. (2010). *SPSS survival manual*. Berkshire, England: McGrawHill.

Patton, M. Q. (2001). *Qualitative research*. John Wiley & Sons, Ltd.

Porter, S., & ten Brinke, L. (2009). Dangerous decisions: A theoretical framework for understanding how judges assess credibility in the courtroom. *Legal and Criminological Psychology*, *14*(1), 119–134. doi:10.1348/135532508X281520

Porter, S., & ten Brinke, L. (2010). The truth about lies: What works in detecting high-stakes deception? *Legal and Criminological Psychology*, *15*(1), 57–75. doi:10.1348/135532509X433151

Porter, S., England, L., Juodis, M., ten Brinke, L., & Wilson, K. (2008). Is the face a window to the soul? Investigation of the accuracy of intuitive judgments of the trustworthiness of human faces. *Canadian Journal of Behavioural Science, 40*(3), 171.

Radin, D. I. (1997). Unconscious perception of future emotions: An experiment in presentiment. *Journal of Scientific Exploration*, *11*(2), 163-180.

Radin, D. I. (2004). Electrodermal presentiments of future emotions. *Journal of Scientific Exploration*, *18*(2), 253-273.

Rocco, T. S., Bliss, L. A., Gallagher, S., & Pérez-Prado, A. (2003). Taking the next step: Mixed methods research in organizational systems. *Information Technology, Learning, and Performance Journal, 21*(1), 19.

Sarbin, T. R., Taft, R., & Bailey, D. E. (1960). Clinical inference and cognitive theory (Vol. x). Oxford, England: Holt, Rinehart & Winston.

Sato, W., Kochiyama, T., Uono, S., Matsuda, K., Usui, K., Inoue, Y., & Toichi, M. (2011). Rapid amygdala gamma oscillations in response to fearful facial expressions. *Neuropsychologia*, *49*(4), 612-617.

Schmidt, K. L., & Cohn, J. F. (2001). Human facial expressions as adaptations: Evolutionary questions in facial expression research. *American Journal of Physical Anthropology*, *Suppl 33*, 3–24.

Seligman, M. E. P., & Kahana, M. (2009). Unpacking intuition. *Perspectives on Psychological Science : A Journal of the Association for Psychological Science*, *4*(4), 399–402. doi:10.1111/j.1745-6924.2009.01145.x

Shen, X., Wu, Q., & Fu, X. (2012). Effects of the duration of expressions on the recognition of microexpressions. *Journal of Zhejiang University. Science. B*, *13*(3), 221–230. doi:10.1631/jzus.B1100063

Smith, J. A., Larkin, M., & Flowers, P. (2009). *Interpretative phenomenological analysis: theory, method and research*. London: SAGE.

Smith, M., & Segal, J. (2015). Domestic Violence and Abuse: Signs of Abuse and Abusive Relationships. *Helpguide.org*. Retrieved 29 September 2015, from http://www.helpguide.org/articles/abuse/domestic-violence-and-abuse.htm

Spielberger, C. D. (2010). State-Trait anxiety inventory. John Wiley & Sons, Inc.

Stanners, R. F., Coulter, M., Sweet, A. W., & Murphy, P. (1979). The pupillary response as an indicator of arousal and cognition. *Motivation and Emotion*, *3*(4), 319–340. doi:10.1007/BF00994048

Stewart, P. A., Waller, B. M., & Schubert, J. N. (2009). Presidential speechmaking style: Emotional response to micro-expressions of facial affect. *Motivation and Emotion*, *33*(2), 125-135.

Stolper, E., Van de Wiel, M., Van Royen, P., Van Bokhoven, M., Van der Weijden, T., & Dinant, G. J. (2011). Gut feelings as a third track in general practitioners' diagnostic reasoning. *Journal of General Internal Medicine*, *26*(2), 197-203.

Struwig, F. & Stead, G. B. (2001). *Planning, designing and reporting research*. Pearson South Africa.

Tamietto, M., Castelli, L., Vighetti, S., Perozzo, P., Geminiani, G., Weiskrantz, L., & Gelder, B. de. (2009). Unseen facial and bodily expressions trigger fast emotional reactions. *Proceedings of the National Academy of Sciences*. doi:10.1073/pnas.0908994106

Teddlie, C., & Tashakkori, A. (2011). Mixed methods research. *The Sage Handbook of Qualitative Research*, 285.

Thompson, V. A. (2014). What intuitions are... and are not. *The Psychology of Learning and Motivation*, *60*, 35-75.

Thompson, V. A., Turner, J. A. P., & Pennycook, G. (2011). Intuition, reason, and metacognition. *Cognitive Psychology*, *63*(3), 107-140.

Todorov, A., & Duchaine, B. (2008). Reading trustworthiness in faces without recognizing faces. *Cognitive Neuropsychology*, *25*(3), 395-410.

Tran, U. S., Lamplmayr, E., Pintzinger, N. M., & Pfabigan, D. M. (2013). Happy and angry faces: subclinical levels of anxiety are differentially related to attentional biases in men and women. *Journal of Research in Personality*,*47*(4), 390-397.

Trust. (2015). Oxford Dictionaries. Retrieved November 01, 2015, fromhttp://www.oxforddictionaries.com/definition/english/trust

Usher, M., Russo, Z., Weyers, M., Brauner, R., & Zakay, D. (2011). The impact of the mode of thought in complex decisions: Intuitive decisions are better. *Frontiers in Psychology*, *2*, 37. doi:10.3389/fpsyg.2011.00037

Vrij, A., Granhag, P. A., & Porter, S. (2010). Pitfalls and opportunities in nonverbal and verbal lie detection. *Psychological Science in the Public Interest*, *11*(3), 89–121. doi:10.1177/1529100610390861

Weinberg, R. S., & Gould, D. (2014). *Foundations of Sport and Exercise Psychology* (6th ed.). Illinois, USA: Human Kinetics.

Williams, M. A., & Mattingley, J. B. (2006). Do angry men get noticed? *Current Biology: CB*, *16*(11), R402–404. doi:10.1016/j.cub.2006.05.018

Willig, C. (2008). *Introducing qualitative research in psychology*. McGraw-Hill International.

Winkielman, P., & Cacioppo, J. T. (2001). Mind at ease puts a smile on the face: Psychophysiological evidence that processing facilitation elicits positive affect. *Journal of Personality and Social Psychology*, *81*(6), 989–1000.

Yan, W. J., Wu, Q., Liang, J., Chen, Y. H., & Fu, X. (2013). How fast are the leaked facial expressions: The duration of micro-expressions. *Journal of Nonverbal Behavior*, *37*(4), 217-230.

Yardley, L. (2000). Dilemmas in qualitative health research. *Psychology & Health*, 15(2), 215–228. http://dx.doi.org/10.1080/08870440008400302

Yu, M. & Tiddeman, B. (2010). Face detection and tracking with 3D PGA CLM.. In P. Richard & J. Braz (eds.), *VISAPP (2)* (pp. 44-53), INSTICC Press. ISBN: 978-989-674-029-0.

Zilioli, S., Caldbick, E., & Watson, N. V. (2014). Testosterone reactivity to facial display of emotions in men and women. *Hormones and Behavior*, *65*(5), 461-468.

Zillmer, E., Spiers, M., & Culbertson, W. (2007). *Principles of neuropsychology*. Cengage Learning.

Zygomaticus major. (2015). *Healthline*. Retrieved September 27, from http://www.healthline.com/human-body-maps/zygomaticus-major-muscle

# PILOT STUDY QUESTIONNAIRE

1. How would you rate the length of the slideshow?
    a. Too long
    b. Too short
    c. Just right
2. Were you able to concentrate solely on the slideshow? If not, what distracted you?
    _____
    _____
3. How would you rate the time each image was shown?
    a. Too long
    b. Too short
    c. Just right
4. Where you able to concentrate on each image for the entire time the image was shown?
    a. Yes b. No
5. If no, what was distracting?_____
    _____
    _____
    _____
6. How would you rate the time in between each image?
    a. Too long
    b. Too short
    c. Just right
7. Was the time in between each image distracting? If yes, why and give suggestions on how to rectify the distraction.
    _____
    _____
    _____
    _____
8. Comments:_____
    _____

Appendix A

# SEMI-STRUCTURED INTERVIEW

1. What emotions did you feel when you were looking at this man?
2. What emotions do you think he is feeling?
3. What would you say are his most prominent features?
4. Would you be able to trust him?

Appendix B

# FINAL IMAGES:

Appendix C

# SCRIPT

Hi, I'm Kendall Rhodes and I will be doing the study with you today. Here is the information document that I have already sent you. You can read through it again and then I will show you the equipment that is going to be used in the study.

This is the eye tracker. I don't know if you have seen one before but basically it gets fixed to your head with this band. I will then ask you to point the camera, which is this part (points towards camera), towards your eye as much as possible. I will then point this LED light towards your eye to illuminate your eye as much as possible. The LED light will not impair your vision and is not harmful in any way. When we are using the eye tracker I am going to turn the lights off. It just helps with the calibration of the eye tracker. I have opened some shutters to let in some light but if you are uncomfortable with the darkness at all please just let me know and I will make another plan. Are you comfortable with using this instrument?

This is the Zephyr Bioharness. I'm going to ask you to place it underneath your clothes so that this connection is underneath your sternum, basically underneath your bra, and this sensor is on your side. I will dampen the sensors slightly to help with conductivity. The strap goes around and fastens with a sliding mechanism (shows how to fasten the clip). In order to use the Zephyr effectively I am going to need to take your height and weight. Are you comfortable with this?

Okay, let me just tell you a little about the procedure. I am going to show you a slideshow. The slideshow itself isn't that long. It's about a minute and a half or so and it will consist of 4 images. Between each image is a blank screen with a plus sign in the centre. I'm going to ask you to please focus on that plus sign. It's just so that I can check if the eye tracker's calibration is off by any amount. After the plus sign has appeared a countdown will appear on the screen that says 3, 2, 1 and then the image will appear. The countdown is there so that you know the image is coming up and so that you don't get a fright that there's all of a sudden an image in the screen. When the image appears please feel free to explore it as you wish. Try to completely immerse yourself in the image and think of the image in a real life situation. This may be difficult but try your best. Think about what emotions are coming up for you and how the image is making you feel. After the last image I will stop the slideshow, turn the lights back on and then I will ask you a few questions about the slideshow. When I do the interview

I will show you the slideshow again so you don't have to remember the images and I am not going to test you in any way about the images you saw. The viewing of the slideshow as well as the interview will be videoed. This is so that I can check start and stop times for everything and then also so that in the interview I am not sitting there scribbling down what you are saying and possibly missing out on information or distracting you while you are trying to speak. Are you comfortable with this?

Okay so the first thing we are going to do is take your height and weight. I will then ask you to put the Zephyr on, you can go to the bathroom or you can do it here I'll move away. We will then start the baseline that will be 20min long. After about 15 minutes I'm going to put the eye tracker on so that we can do the calibration. Have you ever done an eye dominance test? Well we are going to do one so that we can check which eye to focus the eye tracker on. We will then place the eye tracker on your head and focus it towards your dominant eye. With the calibration I am going to ask you to look in the four corners of the screen, if the sensor tracks your eye as you look in each of the corners I will start a calibration test. For this test 9 circles will appear individually on the screen. They will start off big and get smaller until they disappear and the next one appears. I need you to focus on the centre of the circle until it completely disappears and then focus on the centre of the next one until it disappears and so on. This is because if you look at the side and then move in as it gets smaller the calibration will be off, but I will explain all of this again when we do the test. The calibration can take some time so if your eyes get tired at all please let me know and we will take a break. If everything is calibrated I will start the slideshow.

After the slideshow, I will do the interview as I mentioned and then I will debrief you. In this debriefing I will tell you what the study is about and explain everything. You can also ask me any questions you have about the study at that stage.

Do you have any questions?

Okay you can read and sign the consent form and we can begin.

Appendix D



# CONSENT FORM

**Researcher:** Kendall Ursula Rhodes
**Contact details:** Cell phone: 0727565045
Email: kendz_r@yahoo.com

**Dear Participant,**

Thank you for considering taking part in this research study. This document includes information regarding the study and your informed consent form. Please read through the information regarding the study carefully before giving your consent. The researcher is available should you have any questions.

## Consent Form

I, _____ (Print full name and surname) understand the research procedures set out in the information section of this document and hereby give consent to participate in the research study.

I understand that the data obtained from this study will be used for a MA Dissertation and may be used for other purposes, namely: research, teaching and public performance. I understand that the data from this research study will be kept for a minimum of 15 years and may be used for future research and consent to my data being used for this future research.

I understand that the results from this research study will be available to students, university staff and other researchers and consent to this as long as no personal information is included in these results.

Appendix E



**I have read, understood and agreed to the following statement as the conditions under which I have given this consent. I also understand that with written notice to the researcher, I can withdraw this consent at any time.**

Participant Name: _____

Signature: _____

Date: _____

Researcher Name: _____

Researcher Signature: _____

Date: _____

Appendix E

Humanities Building, Room 11 – 14
PRETORIA 0002
Republic of South Africa

Tel: 012 420 2329
Fax: 012 420 3479

nessa.augus@up.ac.za
www.up.ac.za/psych

# INFORMATION DOCUMENT

**Researcher:** Kendall Ursula Rhodes

**Contact details:** Cell phone: 0727565045

Email: kendallursularhodes@gmail.com

**Dear Participant,**

Thank you for considering taking part in this research study. This document includes information regarding the study and your informed consent form. Please read through the information regarding the study carefully before giving your consent. The researcher is available should you have any questions.

## Information regarding the study:

### Procedure

The study is divided into two sections which will be done consecutively. In the first section you will be wearing physiological instruments whilst watching a slideshow on a computer. In the second section you will be asked a few questions while the researcher goes through the slideshow with you. The slideshow consists of various images and each session will ideally last 1 hour at the most.

The following physiological measures will be used:

- An eye tracker
  - measures eye positions, movements, gaze and pupil dilation
- Zephyr Bioharness
  - Monitors and records various physiological measures

At the beginning of the study you will be shown each of the physiological instruments. Please feel free to ask the researcher any questions regarding these instruments.

If you decide to take part in the study the researcher will assign a random number in place of your name. All the data obtained from your participation will be entered and stored in a database using your randomly assigned number. Therefore no identifying information will be included in the data or the results.

The researcher will however keep your contact details to keep you informed throughout the study. The researcher will also contact you to set up a date for a feedback session which will happen at the end of the study. During this feedback session you will be given the results of the study and allowed to ask any questions.

As per university regulations all data collected during research studies need to be kept for a minimum of 15 years. This data can be used for research, teaching or public performance purposes. This data may also be used for future research purposes.

If at any point in the study you would like to withdraw you have the right to do so. If you have already consented to take part in the study and wish to withdraw your consent you may do so in writing to the researcher.

If you have any queries with regards to the study you may contact the researcher via email or cell phone. These details can be found at the top of the first page of this document and will also be given to you by the researcher.

**Please contact the researcher if you are interested in taking part in the study.**

Appendix F