

EVO-EXISTENTIALISM: FACING DEATH

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AFFIDAVIT

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ABSTRACT

Mortality awareness is a uniquely human phenomenon that the existentialists believed science was unable to explain. However, excluding the topic from scientific enquiry doesn't make as much sense as it previously did. The recent advances in evolutionary biology and neuroscience have provided new ways to access the previously inaccessible existential features of people. Mortality awareness exerts various psychological effects on people which motivate them to behave in different ways. In order to capture the scope of these responses I have developed an integrative defensive behavioural model comprised of six levels coinciding with the Threat Imminence Continuum (Fanselow and Lester, 1988), Survival Optimization System (Mobbs, 2015), A New Defensive Taxonomy (Ledoux and Daw, 2018) and Dennett's Tower of Generate and Test (Dennett, 1997). I argue that mortality awareness can result in a multitude of defensive behaviours, including fixed reaction patterns, learned habits as well explicit deliberate actions, and there may be competition between them. This range of defensive behaviours can be explained by the following key factors: The intensity of the reinforcer, proximity and appraised emotional intensity. A rigorous evolutionary approach to mortality awareness has not as yet been presented, however recently in psychology a theory has emerged called Terror Management theory (TMT) which has gained influence and support (Greenberg et al., 1986). The proponents of TMT argue that in order to cope with potentially debilitating fear of death, people engage with cultural ideas, beliefs, values, and concepts in an attempt to regulate this fear. People invent, absorb, and cling to cultural worldviews which ultimately avoid and suppress the awareness of death by providing a theory of reality that provides meaning, purpose, significance and the hope of immortality. Death awareness exerts motivational force on human behaviour due to the emotions of fear, anxiety, dread and terror that are associated with it. This is supported by the current findings in both TMT and biology which show that anxiety and fear motivate specific behaviours toward avoidance and continued survival. Hence the avoidance of death-related concerns seems natural. The avoidance and/or suppression of death was a position the existentialists were concerned about. In contrast most existentialists favoured acceptance but they were sceptical whether people could truly face their mortality and

accept it. However, recent research in neuroscience provides support for acceptance as a potential coping mechanism. An unlikely convergence presents itself between science and existentialism which provides scope for a cooperative approach.

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INTRODUCTION

“Death is not an event in life. Death is not lived through. If by eternity is not understood as endless temporal duration but timelessness, then he lives eternally who live in the present” (Wittgenstein 1921:88)

People encounter a rather unusual problem in their lives that sets them apart from the rest of the animal kingdom. The idea that humans are special or unique is common and compelling and there are a variety of traditional reasons why this has been believed. For one, it is clear that we need more from life than the rest of the creatures that live in this world. People seek meaning, rationality and fulfilment and one can argue that the natural world falls short in meeting these needs. But, are we so different that a special method of enquiry is needed to understand us compared to the rest of nature? The existentialists¹ can be read as supporting this view and they present several reasons as to why, and one such reason is the focus of this dissertation. The problem I am referring to is the awareness of mortality, and I can think of no other creature on earth that is aware of this fact. Death! There is a simple finality to the term. All things die and humans are no exception, but only humans face death as a fact of life.

Arguments have been presented by various authors in existentialism and more recently in psychology that claim this knowledge affects multiple aspects of our existence, and culminate in the claim that much of culture has been constructed in its defence. But what does this knowledge really mean for humanity? How should we face this fact of life? What implications, if any, does it have on our lives? Is it really possible that we created much of culture in its defence? Perhaps thoughts of death and mortality are best avoided or suppressed. However, if we are to face this fact of our existence, and it seems reasonable that we should; what is our best means of approach?

¹ Existentialists: Refers to the primary and secondary authors mentioned throughout the dissertation. It is noted that some primary authors may have rejected the term and that the term was attributed to them at a later stage. It's usage here allows for simplicity and does not affect the goals and outcomes of the research.

It is plausible to assume that death-related concerns have long plagued humanity and that mortality awareness can have various negative psychological effects. These topics received increased attention in the early 1900s with the rise of existentialism. The historical setting of the First World War and events such as the Influenza Pandemic brought death to the forefront of many people's minds and were some of the driving forces behind the existential movement. Similarly, today's Covid-19 pandemic is an extreme event that has brought death to the front of our awareness. Extreme experiences were of particular interest to the existentialists because they shed light on our limitations, and death in particular stands out. Questions pertaining to death were traditionally believed to be existential because mortality awareness is a uniquely human phenomenon and accordingly was thought to be unexplainable by science². There has, however, been recent work in psychology that studies awareness of death and responses to it, which presents us with a surprising convergence between science and existentialism.

This dissertation critically assesses this unexpected intersection between science, or more specifically evolutionary biology and neuroscience, and existentialism and suggests that there is much worthy of further analysis. Specifically, I believe there is enough common ground on emotion and death-related concerns to justify additional research where the two approaches overlap, and this is the crux of my position. These two topics do not exhaust the convergence, I have simply focused on them to try make a decent start exploring the area. There are other authors already dedicated to this bridge including Greenberg, Pyszczynski and Solomon (1986), Caruso and Flanagan (2018), Rolls (2018), Levy (2018) among others whom I reference for the task at hand.

This dissertation takes a scientific lens or keyhole approach to existentialism and shows that it is of valid interest to do so. This is achieved by looking at just two interesting and interconnected existential concerns mortality and emotion. The approach is interdisciplinary and draws from existentialism, evolutionary theory, neuroscience and

² Science: The term science is used for convenience to capture the fields of evolutionary biology, neuroscience and psychology which I discuss throughout the dissertation. It is noted that an open debate exists whether psychology is considered a science. However, this does affect my major aim of exploring death awareness and the responses to it from an evolutionary and neuroscientific perspective.

psychology. The integration is achieved by synthesising views from authorities in the fields who directly address topics relevant to my argument. The views I present here are by no means exhaustive of the topics they simply show that there is scope for what I have termed Evolutionary-existentialism (Evo-existentialism for short). This is worth trying, even if only speculatively, because there is real common ground and overlaps between the questions and the conclusions of existentialism and evolutionary brain science. In addition, these views are combined to produce a defensive behavioural model that accounts for much of our brain mechanisms and behaviour in light of such an abstract threat. I believe it is of valued interest to investigate existential concerns from a scientific perspective and here mortality and emotion serve as sufficient frame of reference. Finally, the views I present don't need to be regarded as true to show this scope exists. The dissertation explores the current and historical literature forming a conversation between the two fields that critically illuminates the topics. Science and existentialism need to talk and I believe they can both influence and inform one another.

Here is a brief preview of the synthesis I develop in the dissertation

How the human brain works can usefully be described as a tower or network consisting of five levels that are interconnected in a myriad of ways (Dennett, 1996). In terms of survival, these levels combine and function by promoting our behavioural flexibility in novel and recurring threatening situations, and have been co-adapted to deal with threats from our own species in the modern social world (LeDoux and Daw, 2018). The foundational level is made up of fixed neurological equipment which we share with a variety of species and correlates to fixed physiological arousal, responses and behaviour. The second level is made up of flexible learning equipment which are also found in an array of species. This learning equipment functions through trial and error encounters with the environment that are reinforcing based on positive or negative outcomes. The third level consists of even more powerful plastic equipment consistent with animals that have an internal capacity to pre-sort actions before acting and emit goal-directed behaviours. These systems interact with reinforcement learning and the fixed equipment to make up the brains and minds of an array of different organisms. The fourth level

correlates to higher-order deliberate and conscious abilities, such as advanced cognition, future-orientated thought and intentional action only found in humans and other great apes. Humans are aware of themselves, their actions, internally think, hypothesise, mentally time travel, create meaning, exhibit emotions and even cognitively regulate them. This higher-order level functions by providing an explicit platform that influences and modulates the other levels which is particularly useful in novel situations where our implicit and learned behaviours are insufficient to account for the circumstances at hand (Levy, 2018). The final level is captured by the ability to engage with other people and culture, using cognitive tools to further our flexible pre-selective skills (Dennett, 1996). All five levels are interconnected and even in competition with one another, and together they form a network that accounts for much of our brain mechanisms and behaviour. If one is to grasp and perhaps even predict human behaviour in response to death-related concerns and ultimately the knowledge of mortality, then it will need to be understood in terms of this web.

The second topic in this dissertation is emotion and there is an apparent link with survival and death-related concerns. In humans, emotions interact and are interconnected with the five levels because they are motivating, reinforcing and elicit fixed reaction patterns such as fight and flight. This is meaningful and useful because they characterise the significance of environmental stimuli in the form of an evaluative judgement and reinforce the positive or negative outcomes. Emotion can usefully be described as a filter of sorts through which the value of environmental stimuli are decoded (Rolls, 1999; 2018). Emotions contain a certain force, they invade our conscious minds, directing us how to act and play a role in how we create personal meaning.

The existential views were traditionally in opposition to the scientific because it was believed that certain unique characteristics of people exist that are inaccessible via the scientific method. This includes individualism, temporality, mortality awareness, anxiety and freedom which were all thought to be primordial conditions of our reality and only accessible through existential philosophical enquiry. The existentialists envisioned an image of persons as flexible, potential, autonomous, emotional, meaning-seeking beings

that cannot help but reach beyond what is possible. It was the subjective that was focused on with the aim of deriving meaning from lived experiences (Kaufmann, 1959). My focus is on just two of these unique characteristics: emotion and mortality awareness. Mortality awareness is a primordial condition yet it appears that humans have historically pushed death aside. The apparent historical suppression of death is a cause for concern, and thus some existentialists attempted to find the authentic way people should face this novel issue (Heidegger, 1962; Camus, 1942). Heidegger and Camus argued that death awareness affects us negatively because it poses a threat to our ambitions, rationality and meaning-making capacity often resulting in anxiety and fear. Generally speaking, their view was one of worry that we are not facing up to this fact of life. Regarding how to face death, they offered two possible solutions, avoidance and acceptance³. They further noted that it is a natural human need to seek security and safety, hence avoidance of death-related concerns seems natural (Gray, 1951). Although avoidance seems like a natural defence, they favoured acceptance as the best solution. However, they were sceptical that humans could truly achieve this. The existentialists were mostly concerned with how mortality affects personal meaning and emotion, particularly anxiety. These effects illuminated the importance of the topic, and because each individual human must inevitably face death. However, they were worried as to whether people could truly face their death and accept it. They further believed science couldn't help with the matter. However, an interesting convergence presents itself between science and existentialism that wasn't previously thought possible. The recent advances in evolutionary biology and neuroscience have provided new ways to analyse these unique characteristics of people providing insights that were previously unavailable.

In the last few decades, an interesting theory has come under the spotlight which has illuminated the unlikely bridge between existentialism and science and shows that it is not merely superficial. It is this unexpected overlap which sparked my initial interest in

³Avoidance: The action of keeping away from or not doing something (i.e. to avoid a threat or unpleasant stimulus.) In evolutionary biology the avoidance of threats is a dominant defensive strategy among intelligent organisms.

Acceptance: Emotional acceptance requires actively focusing attention on one's current mood, physiological arousal, associated stimuli, memories of past experiences and future-orientated thoughts and goals; while maintaining a non-judgemental stance.

the topics; and the theory in question is Terror Management Theory (TMT) (Greenberg et al., 1986) (Appendix), which has recently gained influence and support in psychology. This theory addresses the problem of mortality awareness and proposes that much of culture acts in its defence.

TMT is based on the writings of Ernest Becker (e.g. 1973). Becker was a cultural anthropologist whose research was greatly influenced by psychoanalysis and existential philosophy. In his writings, Becker argued that human beings are haunted by the fear of death like no other animal. Drawing on existential philosophy, Becker argued that the knowledge of our mortality has the potential to cause anxiety, fear and even terror, that can culminate in a nihilistic or absurdist stance. To cope with this existential fear, Becker claims that people have created a symbolic representation of reality called culture that ultimately convinces us that we will continue to exist after death. People subscribe to beliefs and associate themselves with cultural structures that convince them of either literal or symbolic immortality. A person can become a part of something that supersedes their mortality such as a nation, religion or group that is larger and more powerful than themselves and will continue to exist even after they are gone. Humans adhere to what Becker called cultural worldviews that give people a sense of meaning and value which helps them feel as though they can transcend their mortality (Becker, 1973).

TMT extends these insights of Becker and posits that fear of death underlies the human needs for personal and transcendent meaning and value and that this pursuit influences much of human behaviour (Pyszczynski et al., 2015). TMT argues that people use the same intellectual abilities that give rise to their mortality awareness to manage their potential for terror. People engage with cultural ideas, beliefs, values, and concepts in an attempt to regulate this fear. People adhere to cultural worldviews which ultimately avoid and suppress the awareness of death by providing a theory of reality that provides meaning, purpose, significance and the hope of immortality.

TMT is at least consistent with evolutionary biology because most animals including humans behave to avoid threats. Although a rigorous evolutionary approach to mortality

awareness has not as yet been presented, it seems only natural to assume that humans would behave to avoid or suppress this awareness. However, this was a view that the existentialists were concerned about. TMT has roots in existentialism yet one cannot help but notice that the theory lacks many of the important positions that the existentialists advocated. The existentialists wanted people to face their death and accept it. Additionally, they believed death awareness served an important function in humans.

In contrast to TMT, I take an integrative Evo-existential approach to the problem of mortality awareness, and this makes sense because of the common ground between the two fields that is both interesting and pertinent. It is reasonable that we should face our mortality, the question at hand is how?

PART 1: WHY EXISTENTIALISM AND SCIENCE WERE THOUGHT TO BE OPPOSED

People possess unique characteristics which separate them from other animals and things. But are we really so unusual that a different method of enquiry is needed to understand us compared to the rest of nature? The existentialists can be read as supporting this position and this explains why science and existentialism were thought to be opposed. But does this idea still make sense for contemporary human research? In this first chapter, I will be presenting a variety of reasons as to why science and existentialism were thought to be at odds. In short, the traditional existential view is that science is insufficient for understanding people.

What is existentialism? Existentialism has its origins in the late 19th century and can be defined as a philosophical approach which seeks to find the fundamental conditions of our existence and establish a justification for meaning out of those conditions (Barrett, 1958). As an approach existentialism is very practical focusing on the subjective experiences of individuals in real life situations. Many of the authors addressed acute human problems such as morality, meaning, suffering and death. These extreme experiences were of interest to the existentialists because they shed light on our limitations (Gray, 1951). Although existentialism has also been considered a movement as an approach it originated as a reaction to positivism. Positivism holds that the only valid way to acquire knowledge of the universe is through the application of the scientific method (Afshan, 2017: 136). In contrast, the existentialists believed that this form of analysis was insufficient to understand human beings. They were convinced that science was too mechanical in its approach and that if you applied science to people it does not capture who or what we truly are. Thus, the existentialists argued that the focus needed to be shifted away from science towards existence if we are to understand people.

It is noteworthy to mention that there was no universal doctrine that was advocated by all existentialists, and the philosophers who were branded as existentialists were in most cases very different from one another. Some of the authors that have been identified with

it are theists, atheists, and absurdists. On the side of the atheists, we have Nietzsche for example, and on the theistic side, we have Kierkegaard and Dostoevsky. For the absurdists the predominant author is Camus. In some cases, the ideas of these authors were obscure or incomplete, hence the synthesis of their work which we call existentialism today was left to the academic interpreters who followed suit. Although these philosophers were different from each other there were however points of consensus on various themes together with overlapping perspectives. These thinkers had a certain style of theorizing together with similarities in goals and ideas that resulted in them being grouped together to become what we call existentialists today. The relationships and points of consensus amongst the existentialists has been shown by a variety of academic interpreters including Gray (1951); Barrett (1958); Kaufman (1959); Magrini (2004); Korsnes (2013); Elpidorou and Freeman (2015); Aronson (2017); Crowell (2017); Wheeler (2018); and Caruso and Flanagan (2018), among others whom I reference for the task at hand.

In this chapter I critically examine the core themes and features in the movement many of which have been argued to be primordial or fixed conditions of human existence. These conditions were thought to show why humans are unique and separate to the rest of the animal kingdom and thus why science was insufficient to explain people. Although I argue that the existential approach doesn't make as much sense as it previously did, many of the views and ideas presented are interesting and relevant today. My initial focus is on identifying the unique characteristics of people which were thought to fall outside of science, and I hope to go on to show why this idea is no longer valid. However, my primary effort is on just two of these characteristics, emotion and mortality awareness, and I argue that many of the existential ideas are of valued interest for contemporary human research.

When one reflects on today's advanced technologies and techniques science is difficult to doubt. From the UHD screens that offer visual quality that seems to surpass real life, to the CERN LHC particle accelerator capable of accelerating protons near to the speed of light. In genetics the genome editing technology known as CRISPR which has been

adapted from naturally occurring bacteria allows scientists to manipulate genes in a manner that seems like science fiction. In terms of human research, the advances in evolutionary biology and the brain sciences have provided new ways to forward our understanding of ourselves. Evolution has given us a coherent way to explain how the simplest creatures could change over time eventually forming the complexity that is a human being. In addition, evolutionary biology has shown that we are animals bound by the same rules and laws as the rest, and is why we share certain traits and abilities. In neuroscience the development of brain imaging technologies such as fMRI coupled with recording devices such as EEG and various behavioural techniques have permitted scientists to investigate our complex characteristics and behaviours in a manner that wasn't previously thought possible. fMRI has already influenced research on perception, attention, learning, memory, language, intelligence, emotion, agency and motor control, and that's just to name a few. Furthermore, functional imaging has improved our understanding of brain injuries and neurological disease (Ahmed et al., 2006: 4). These advances in technology and methodology have provided new ways to analyse the previously inaccessible features of people and explains why a solely existential approach (which rejects experimental and empirical methods) is no longer valid.

1.1) INDIVIDUALISM

The first existential theme that I wish to draw attention to is individualism. As Crowell (2017) explains, existential philosophy begins with the idea that a philosophy of things or essences is insufficient for understanding human existence. The main justification behind this claim is that there are specific primordial characteristics of people that separate us from other animals and things and are inaccessible via scientific or metaphysical philosophical enquiry. One of the best ways to capture this idea is as Sartre famously stated “existence proceeds essence” (Sartre, 1989: 290).

One of the most famous and perhaps the most difficult of the initial authors to be associated with the movement is the German philosopher Martin Heidegger, and in *Being and Time* (1962) he defends the above-mentioned claim as the starting point for existential philosophical inquiry, and attends to our existence as finite and temporal. Since Heidegger is one of the first authors to be associated with the movement, his views make a suitable starting point. In addition, Heidegger’s views on death-related concerns and emotion converge with some of the modern perspectives, and this is why he receives much of my focus.

Heidegger argues that if we are to find the meaning of our existence, we first need to find the fundamental conditions thereof, which can only be achieved by studying being-there, what he termed Dasein. Dasein can generally be translated as existence and refers to a situated existence in the present moment. Dasein is also used to describe the characteristics of people that make them a distinctive kind of entity (Wheeler, 2018). Heidegger argues that the analysis of being-there is both different and opposed to the study of beings or things which philosophers have been pursuing ever since Aristotle. He believed that these forms of analysis were insufficient to capture what a human is, and argued that the only way we can begin to gain an understanding of ourselves is by studying the only mode open to us, our subjectivity. Thus, it is the subjective individual that marks the starting point for finding the conditions of human existence (Kaufmann, 1959: 76). Heidegger divides human reality into two categories, the first is what he terms the who (existence), and the second, the which (being-at-hand). These two categories

represent the conditions of the subject and determining characteristics such as body and circumstance respectively (Kaufmann, 1959: 76). Hence, Heidegger noted that people are both subjects and objects in the world. Similarly, Jean-Paul Sartre made the distinction between facticity and transcendence (Flynn, 2013). However, Heidegger's core motivation is toward the conditions of our subjectivity.

Heidegger's focus is on being-in-the-world, which means that humans are first and foremost imbedded in a web of relations with other people and objects. He argues that how we relate to and engage with the world is in a primordial pre-theoretical manner. These fixed conditions of our existence are what he aimed to identify and he believed that these conditions are united together to form how the world is disclosed to us as subjects (Elpidorou and Freeman, 2015: 3). Heidegger identifies several characteristics of Dasein which he presents in an ontological structure. Dasein is primarily understood in terms of disclosedness or care, which is characterized by mood or emotion. Emotions are fundamental states of attunement that disclose the world to the individual Dasein in a meaningful manner. For example, if one is feeling depressed the world is disclosed as a sad somber place. In the sense described by Heidegger moods are revealing of fundamental conditions of Dasein's existence. His focus on mood is further important because he seeks the authentic mood of human existence, which he claims is anxiety (Magrini, 2004: 78). Although I discuss Heidegger's views on anxiety in more detail in section (1.6), the general idea is that he believes anxiety to be the most rudimentary form of disclosure that attunes Dasein to his/her fundamental nature.

Next Heidegger asserts that temporality is a fixed condition of Dasein and argues that the three dimensions of time are unified in the subject. The past is characterized by thrownness or facticity. Humans are thrown into the world with fixed facts, this includes, bodily, social, political, cultural and historical circumstances, that we are forced into and did not choose. The future is characterized by projection or future-orientated thought, which are associated with freedom and the potential of the individual. Dasein cannot help but project the future possibilities of itself in the situations it is thrown into (Wheeler, 2018). The present is characterized by fallenness and fascination, This feature manifests itself in the need for meaning and an overall curiosity with the world. People seek

meaning and philosophical understanding of themselves. However, Heidegger argues that most people never truly understand themselves and hence fallenness also refers to a hiding or avoiding of the authentic potential self. According to Heidegger, fallenness is a factor within an individual's inauthentic existence where the person lives in the world of others. Some examples include as curiosity, gossip, religions and cultural tools such as science. This fallenness is to be understood as Dasein's everyday mode of existence and is often referred to as lost-in-the-they-self (Wheeler, 2018). In contrast, in an authentic existence, which I discuss in some detail in section (1.4), is not justified in comparison with the existence of others, but rather in freedom and awareness of one's thrownness (facts) and other limitations such as death.

All three dimensions of time and their associated characteristics are fundamental conditions of Dasein's existence. They form a unity in the subject and combine with the other primordial features Heidegger identifies, including freedom, mortality awareness, anxiety and the impossibility of enacting all possibilities (Magrini, 2004: 80). Mortality awareness in particular stands out because humans seem to be the only creatures aware of their finitude. Further to this Heidegger wants us to consider that being-there, the present moment, is all we have and can ever experience. He argues that the past and future need to be considered as functions of the present. The future is the present possibility, and it is in this sense that it belongs to the individual in the present. Similarly, the past should also be understood as part of the present because past experiences determine how we are thrown into the world and influence our decisions (Gray, 1951: 122-123). The focus on the present is a common theme in existential thought, with Sartre, Heidegger, Nietzsche and Camus among others emphasizing the here and now.

It is due to these characteristics and features of Dasein that Heidegger concludes that humanity's existence is different from the existence of other animals and things, namely a human is a being-on-its-own. Although Heidegger makes use of obscure coinages that make his work difficult, he provides interesting insights into the characteristics that make us unique. For one, our capacity for past and future orientated thought, what scientists today call autonoetic consciousness (Tulving, 1985), does appear to set us apart from other animals. Secondly, his views on emotions and their role in individual meaning-

making are certainly thought-provoking, and indicate another feature that seems to set us apart from other creatures. Thirdly, his ideas on mortality and anxiety are also relevant today.

Similarly, to Heidegger, other existentialists, such as Sartre and Camus, also believed that humans are different to other animals and things, and thus cannot be understood in the same manner. One major reason for this is that humans possess certain primordial characteristics that other animals don't. Another of which is freedom. Paraphrasing Heidegger, when humans recognize their separateness from other people and things they come face to face with the nothingness of existence. This mode of being, which is realized through anxiety, then acts to individualize and separate the person, revealing his or her unique individual possibilities which that person alone has the potential to enact as being-in-the-world (Heidegger, 1962: 232). What Heidegger means here is that our freedom is revealed when we recognize our individualization. Which brings our attention to that which we are most anxious about, our potential (Magrini, 2004: 77).

Emotion can be identified as a key theme, with particular emphasis placed on the emotion of anxiety by various authors, including Kierkegaard, Heidegger and Nietzsche. Emotion is linked to the idea of one's individual separate existence, in the sense that our feelings are an important part of our unique individual worlds. In recent years much data and theory has accumulated on emotion, and later on the reader will see that there are similarities between the existential and scientific views. From an existential perspective emotion was believed to be revealing of fundamental features of our subjectivity (Elpidorou and Freeman, 2015: 1). Accordingly, Heidegger argues that emotions are revealing of three key features; 1) Thrownness/Facticity, 2) Being in-the-world, and 3) what matters to us. How emotion reveals facticity is through what Heidegger calls turning away. Turning away is an evasive action, and how this fits in with moods is that humans have a tendency to turn away from the facts of their situation, i.e. political, socio-economic, personal and historical-cultural contexts. For example, in grief, after the loss of a loved one, people often drown themselves in social affairs and worldly projects. Heidegger argues that by busying oneself with such projects one can cover up and forget

one's facticity. Thus, through emotion Dasein flees in the face of itself by tuning away from its facticity (Heidegger, 1962: 390; Elpidorou and Freeman, 2015: 10).

Heidegger argues that emotions disclose Dasein's being-in-the-world. An emotion, arises not from outside nor inside the individual but out of being-in-the-world (Heidegger, 1962: 176). Humans are affected by the world which indicates both our ontological makeup and our prior embeddedness in it. Furthermore, he argues that emotions are only possible because Dasein is a worldly being (Elpidorou and Freeman, 2015: 8). In order for Dasein to encounter entities in the world, those entities must matter to it. This concern for worldly entities is grounded in emotion because what matters to us has the character of becoming effected in some way (Heidegger, 1962: 176). Accordingly, Heidegger argues that emotions reveal the context of situations and illuminate specific features. They disclose to us what is of value or significance in the world, in the form of an evaluative judgement. Emotions inform us about the type and significance of the situation we are in and direct us how to act and this makes the experience of emotions meaningful. Additionally, they motivate and convince us to pursue certain goals. He further argues that it is because we have moods that the world is disclosed to us and is the reason why we find ourselves among worldly projects and social situations that we deem personally important (Elpidorou and Freeman, 2015: 10).

Heidegger concludes that emotions are fundamental states that colour human awareness and our interactions with the world. He viewed emotion as inherent to our human experiences, affecting how we perceive, evaluate and create meaning in the world. In this sense, emotional experiences contain a certain force, influencing multiple aspects of our existence. Heidegger relates emotions to atmospheres, to describe how humans are always imbedded in them. This means that emotions are fixed in the primordial sense and function as a lens through which the world is disclosed (Elpidorou and Freeman, 2015: 6). Emotion can be described as a filter of sorts through which the value and meaning of world is interpreted.

I argue that some of the existential views on emotion are similar to those found in modern emotional theory. This I discuss in more detail in sections (2.5-2.8). However, one interesting point of convergence is Heidegger's view on emotion as a filter which discloses the world. This fits well with one well known modern view on emotion as an interface through which people evaluate the world (Rolls, 1999; 2000; 2018). Although Rolls argues for a variety of other evolutionary functions of emotion including that they are motivating, reinforcing and can result in long term goals being set, there are similarities between his ideas and those of Heidegger. More importantly Rolls is already dedicated to bridging science and existentialism, and his (2018) view is that emotions provide the basis for meaning and purpose, and this is why he gets primary focus in section (2.5).

Hence, based mostly on the views of Heidegger, the existential image of a person is that of a subjective emotional individual that seeks meaning in the world that it is thrown into. This individual makes use of its primordial abilities such as future-orientated thought and awareness of the past to face life issues, interpret them and create meaning. But this is not the end of the story for existentialists; they identify a number of other primordial conditions of our existence that are interesting and relevant today.

It is now starting to become clear why existential analysis differs from scientific enquiry. The focus is on the subjective individual, in the present, in his/her life, aiming to derive conditions and meaning from lived experiences. As mentioned, often it was extreme experiences that were focused on, such as death, suffering, and morality. For example, for Nietzsche it was morality, and for Heidegger and Camus it was death. Both whose views are discussed in sections (1.3 and 1.5). From these extreme experiences further deductions were made about the human condition. However, before these issues are discussed I want to turn the reader's attention briefly to the next theme and primordial condition: freedom.

1.2) FREEDOM

Freedom is a common theme in existentialism with existentialists, such as Heidegger and Sartre, arguing for freedom as a fundamental condition of human existence; and is another reason why people were believed to be different from the rest of the animal kingdom. Freedom can be defined as the ability to choose from multiple possible choices and to be responsible for those choices (Sartre, 1989). For Sartre freedom is existence. This means that freedom is absolute in the libertarian anti-determinist sense. Freedom, when taken together with human subjective individual existence, gives rise to the following. It is through individual action that we can understand people and it is through action that meaning is derived. Then when taken in conjunction with emotion, it is through action and emotion that individual meaning can be understood. However, humans although free to act are not free from being unable to act, and this was the proposed justification for freedom as a primordial condition.

Freedom was thought to allow people to transcend their circumstances. Many existentialists were anxious about how to face life issues, such as suffering and awareness of death, and freedom was claimed to facilitate transcendence of such problems because it allows people to take responsibly for the meaning in their lives. This means that through responsible choices people can overcome their circumstances and take ownership of the meaning in their lives. In this sense, as a liberating opportunity, meaning was argued to be subjective, grounded in free action, responsibility and emotion. The meaning in life was not some universal truth; rather it was thought to vary amongst individuals. Meaning thus conceived is what the individual chooses and is willing to take responsibility for.

Hence, unlike other animals and things whose properties are fixed, human beings are not fixed. Rather our nature is conceived as flexible because freedom allows us to shape our own identities. Jean-Paul Sartre (e.g. 1989) is one of the writers who advocated this view. Sartre was a French philosopher, novelist and literary critic and is another key figure associated with the existential movement. In a similar fashion to his predecessors Sartre

also sought the primordial conditions of human existence, with the focus on the present and the subjective experiences of individuals. Sartre argued that humans can transcend their situation through freedom. Accordingly, he claimed that people are capable of transcending their facticity. Meaning that although humans are fixed by body, name, and circumstance, our freedom allows us to transcend these facts (Crowell, 2017).

Sartre talks about three modes of human existence, the being-in-itself, being-for-itself and being-for-others. Being-in-itself and the being-for-itself represents facticity and transcendence respectively. He argues that this creates ambiguity surrounding humanity's existence. It involves both facticity and freedom and hence humans are both physical objects and self-aware free agents. However, he concludes that the fact of being for persons is always subjective, and hence he reaches Heidegger's conclusion that humans are a fundamentally different kind of entity, namely a being-on-its-own, separate from other animals and things (Crowell, 2017). The third mode of being, the being-for-others, becomes relevant when human beings encounter each other. This brings to the fore the concept of the other, in particular, the bridge from one mind to another. Other minds make us into objects; and in the mind of someone else, we are an object, with facts. This limits our freedom since our freedom entails the transcendence of such facts. However, he contends that our relationships with other people are the very essence of our humanity and must be treated differently to our relations with objects (Crowell, 2017).

For Sartre and other existentialists, freedom is important because of its role in transcendence. The writers were hopeful that humans could reach beyond their fixed facts and become something more. Importantly, although the existentialists placed emphasis on freedom in terms of transcendence, some of the authors including Heidegger, Nietzsche, Sartre and Camus, also focused on the limits of freedom. They preferred to understand people without isolating them from their personal circumstances. For one, Sartre believed other people limited our freedom because other people make us into objects. An additional example is that culture limits freedom, because people cannot control the culture they are born into, a view advocated by both Heidegger and Nietzsche. Another limit is of course mortality because death is inevitable, and thus cannot be transcended.

The idea of freedom: libertarian anti-determinist conceptions of free will have traditionally been incompatible with science. The free will versus determinism debate is entrenched in philosophy and without going into too much detail, if the universe is deterministic there is no place for a libertarian conception of free will. In support of this, recent neuroscientific research has suggested that libertarian free will does not exist (Carusso and Flanagan, 2018). It is only recently that more compatibilist evolutionary approaches such as that of Dennett (2003) and Levy (2018) have been presented, however, this has resulted in the definition of free will shifting. However, modern-day scientists do conceive of humans as flexible deliberate creatures; they just differ from the existentialists regarding the role and type of freedom. Furthermore, the focus on the limits of freedom in terms of personal circumstances is relevant in today's neuroscientific and philosophical enquiries into freedom and intentionality.

1.3) NIHILISM AND ABSURDISM

Next on the list is one of the most publicly famous themes in existential thought, Nihilism, strongly associated with Friedrich Nietzsche (e.g. 1968). Nietzsche was a German philosopher, poet and cultural critic whose work has had a prolific influence on modern ethics. His attack on traditional values, particularly morality, made his views all the more thought-provoking. Nihilism can be defined, as Alan Pratt (2019) shows, as the view that traditional values and beliefs are unsubstantiated and that existence is senseless or meaningless. The idea that there is no objective inherent meaning to life is a common view held by many existentialists, rather meaning is tied to the will of the individual person and that which he/she is willing to take responsibility for, and in this sense Nietzsche's view is no different.

In his writings, Nietzsche sought to draw the consequences of the death of God. As Crowell explains, Nietzsche saw a complicity between social values and theism, which he believed caused humans to be at odds with their natural instincts, creating a sick animal. He argued that once morality is removed from a theistic grounding, it cannot be clearly justified (Crowell, 2017).

In similar fashion to the other authors associated with the movement Nietzsche sought the fundamental features of human existence. He believed that behind moral norms lies nothing but the will to power, and that this undermined any authoritarian justification for morality. The will to power can be defined as the doctrine that everything that exists rests fundamentally on the principle of the expansion of power (Anderson, 2017).

Accordingly, he argued for the will to power as a primordial condition. In his famous book *On the Genealogy of Morals* (1969), Nietzsche presents an attack toward theistic institutions including the beliefs and values they embody due to their authoritarian complicity, and because they have been used by those in power to create conformity. Nietzsche uses the intentionally provoking expression, the herd, to refer to those who conform to the values forced upon them by society. Nietzsche argues that the herd animal has trained itself to docility and unfreedom by conforming to these moral standards.

However, for Nietzsche this is not the end of the story; he believed that although moral values were designed to create conformists, individuals still have the potential to become something else. The individual does not have to succumb to despair in the face of nihilism because nihilism presents a liberating opportunity to take responsibility for meaning. This type of strong individual Nietzsche imagined as the 'ubermensch' or overman. According to Nietzsche the overman marks the next phase for the evolution of humanity, where we put aside our herd mentalities of the past and recognize our true nature as free agents whose utmost potentiality is characterized by the will to power (Nietzsche, 1968; Crowell, 2017).

Is science at odds with the nihilistic image of persons? Modern-day scientists in particular biologists would likely agree with some of Nietzsche's views but not all. For one, his view on the will to power as a primordial condition is certainly contentious. However, many would agree that a justification for traditional values including the Christian morals needs to be grounded naturalistically. Most would treat any authoritarian justification with scepticism. Evolutionary theory has however provided us with an alternative to a theistic justification. Evolutionary biologists argue that morality has evolved and serves specific functions in aiding individuals in social species toward reproductive success (e.g. Krebs, 2015).

In a somewhat similar manner to Nietzsche, Albert Camus also presented an attack toward society. In his writings, he argued for a type of nihilistic stance known as absurdism. Absurdism can be defined as the belief that the universe is irrational and meaningless and that the search for order brings the individual into conflict with the universe (Aronson, 2017). As I have noted, existentialism as a whole seeks to establish the meaning of life out the primordial conditions of the subject, and in this sense, Camus's approach is no different.

In, *The Myth of Sisyphus* (1942), Camus presents a series of arguments that puts his philosophy at odds with science and even philosophy itself. Although he aims to derive the meaning of life he differs from the philosophers before him because he argues for a

sceptical stance. Camus is sceptical that human life has any inherent meaning yet in the essay he offers objectively valid solutions for how people should live. He denies that science, philosophy, metaphysics or any human-created means (cultural or religious) can assist us in answering the question as to the meaning of life, and as such argues that the human condition is absurd (Aronson, 2017).

Similarly, to Nietzsche, Camus's idea of the absurd is a consequence of the absence of God. He argues that humanity cannot escape suffering and the certainty of death, and that true knowledge of the self and the meaning of life are out of reach. He believes that life has nothing to do with fulfilment, and that the fulfilment people receive from religion, culture, or their ambitions is merely superficial. Without God there is a discrepancy between human ambitions and the world (Aronson, 2017).

Camus's view of absurdity is best captured by the image of Sisyphus struggling to push his boulder up the mountain only to watch it roll down over and over again in an endless cycle. People cannot help but ask the question as to the meaning of life, but like Sisyphus the answers we develop come tumbling back down.

The problem of mortality was of particular interest to Camus and is central to his views on the absurd. All humans die and he believed that people are not facing up to this fact of life. Camus was an atheist and thus rejected any religious conception of a self or soul that continues after death. Knowing we are going to die poses a problem to our rationality because we can't experience death, nor fully grasp its meaning. His focus like other existentialists was with the present. He believed that religions which offered promises of an afterlife hurt humanity by offering hope where there was none. His reason for this was that the hope of immortality causes humans to minimize the value of their lives, as this life is merely preparation for life beyond (Aronson, 2017). Camus rejects religious views, Camus would prefer for people to face death and accept it, however, he is unsure if we can achieve this. Perhaps one might think that facing death would render one fearful leading to despair, however for Camus facing death presents a liberating opportunity to take control of our lives in the present.

Can science help us solve these problems? Camus thinks not, he states that all the knowledge in the world cannot assure that this world is mine. “I realize that if through science I can seize phenomena and enumerate them, I cannot, for all that, apprehend the world” (Camus, 1942: 7). What he means here is that science nor philosophy cannot fully explain what/who we are, nor provide a logic to the point death, and thus does not fulfil our needs for meaning and rationality. However, it is noteworthy to mention that much has changed in science, in terms of methodology and technology since Camus was alive. The recent advances in evolutionary biology and neuroscience provide new insights into death-related concerns that were not available to Camus. The recent research shows that there are specific survival functions for fear, anxiety and future orientated death-related thoughts, that in general promote behavioural flexibility in novel and recurring threatening situations toward continued survival (e.g. Mobbs, 2018; LeDoux, 2018). This I discuss in detail in section (2.8).

Camus argued that although science provides numerous facts about the natural world these facts do little to assist us in understanding ourselves. It is life and awareness of death that gives rise to the absurd. It is absurd to hope for immortality when death is a natural fact and it is absurd to continually seek meaning where there is none (Aronson, 2017). Accordingly, Camus argues that this fate of absurdism is something the human mind cannot accept. Hence, in its defence humanity has created social structures, laws, rules, and standards which are all merely attempts to impose order in a world where there is none. In solving the problem of absurdity Camus offers three methods.

The first and most famous is suicide, in the first line of the Absurd Reasoning, he states “There is but one serious philosophical problem, and that is suicide,” (Camus, 1942: 1). Is life worth living or not? This he believed is up for debate. He sees suicide as both acceptance of the absurd, albeit extreme, as well as heroic defiance, and simply argues that it is a natural response to the premise that the human condition is absurd (Aronson, 2017). The second method proposed is to embrace a meaning framework through religion, like that of Christianity, although as I have shown he rejects this. Most religions

deal with problems of knowing the self, death, and suffering by claiming of a self or soul that continues to live after death. The third and final solution that he offers is acceptance. Here he argues that by accepting the absurd this allows us to open up to the indifference of the world and embrace both the positive and negative aspects of it. This directs humans to what matters most, the present. It is at this point the artistic side of Camus shines through, he imagines that for a person to be happy acceptance is necessary. It is not that finding the absurd leads to happiness, rather acknowledging and accepting the absurd, means also accepting the limitations of the human condition. These are all conditions of what it means to be a person which he depicts this with an image of Sisyphus straining, fully alive, and happy (Aronson, 2017).

Camus presents a thought-provoking attack upon society, science, and philosophy, and he believed the methods we have been using are insufficient to understand ourselves, and concludes that our condition is irrational. Camus thinks of the absurd as the limit of the human mind and thus a fixed condition of our existence.

1.4) AUTHENTICITY

As it currently stands the existential image of persons can summarily be described as finite, temporal, flexible, autonomous, emotional, meaning-seeking beings, whose needs for meaning and rationality the natural world falls short in meeting. The inevitability of death, uncontrollable personal and social circumstances, and the unsound justification for morals shows the limits of our freedom and rationality. But is it really plausible that our condition is irrational as Camus thinks? Can contemporary science not help us face death and the absurd? The latter of these questions is the core topic of interest. However, it is relevant to mention that the existentialists in many cases sought to find the correct way to approach life's problems, which brings me to the next theme, authenticity.

A good way to express this theme is in the form of a question, how are we to live or what is the authentic mode of human existence? To say that something is authentic is to say that it is what it professes to be, or what it is supposed to be (Crowell, 2017).

Existentialists conceived of humans as flexible autonomous beings and hence the authentic human would live in accordance with this flexible nature, namely through freedom and responsibility and would face life's problems in this sense. However, it is important to note that existentialists also focused on the constraints of freedom, and thus the authentic person is also lucidly aware of their limitations. Hence, authenticity can be described, as the correct mode of living, in contrast, if one lives inauthentically one is not living in unity with one's nature (Crowell, 2017). Furthermore, due to the unsound justification for morality and other human values, authenticity was for many existentialists the only value worth obtaining (Levy, 2018: 112).

Heidegger and Nietzsche argued that inauthenticity manifests when a person gives up their individualization. For example, if a person lives by following unjustified norms and standards set by their society, what has often been termed, the crowd, as described by Nietzsche, and Heidegger. Gray (1951) illuminates, that people prefer to avoid the problems they encounter in their lives for the reason that it is natural to seek security and comfort, a view that is reflected in modern evolutionary theory and TMT. However, the

existentialist doesn't want us to seek security, rather we should face life's issues head on. But does this make sense to a modern-day scientist? This is a tricky question, which I address in some detail later on in sections (2.7 and 2.8). In light of this, Gray notes that few people ever reach their authentic being (Gray, 1951: 121).

As mentioned under the theme of nihilism, Nietzsche uses the provoking expression, the herd, which portrays most of humanity not only as animals but as tame submissive animals. He believed that otherworldly authorities and culture were insufficient to justify morality and values, to do so would be inauthentic. However, Nietzsche takes the idea of authenticity further, he claims that the authentic mode for humans is the will to power. For Nietzsche, the world is the will to power because everything in existence relies fundamentally on the expansion of power, and thus by extension so do people (Anderson, 2017). The death of God marks a fundamental revolution, the moral foundation of Christianity collapses paving the way for new culture characterized by the will to power. It is at this point that Nietzsche introduces his concept of the overman.

Like Nietzsche, Heidegger too is concerned with establishing an authentic way to live. As Magrini (2004) explains, Heidegger argues that most people live in an inauthentic manner, what he terms the inauthentic mode or everydayness. The inauthentic person does not understand his or herself correctly, and thus exists superficially subdued by what seems a complete understanding of things, which is false; what he termed lost-in-the-they-self, and is associated with his concept of fallenness (Magrini, 2004: 77). Like Camus, Nietzsche, and Sartre, Heidegger was opposed to any justification for morality, meaning, and values that is grounded in religion. To do so is to live inauthentically. For Heidegger in an inauthentic existence, people refuse to take responsibility for their actions and hence authenticity involves freedom tied in with responsibility, a point which was also advocated by Sartre (Crowell, 2017). Hence, living in an authentic manner involves the capacity to choose among several possible ways of living together with being responsible for those choices.

Interestingly for Heidegger anxiety was believed to be the authentic emotion that attunes Dasein's awareness and illuminates his/her finitude, temporality and potentiality for being. Thus, anxiety is to be understood as humanities primordial means of disclosure (Magrini, 2004: 77-79). Although I discuss existential anxiety in section (1.6), its link with authenticity for Heidegger is noteworthy here. Heidegger believed emotions expose humans to their thrownness (facticity), being-in-the-world, and what matters to them. Emotions inform us about the type and significance of the situation we are in and direct us how to act making the experience of emotions meaningful. In light of this Heidegger claims that anxiety is the most rudimental form of disclosure that attunes people to their existence. In this sense anxiety is the original emotion from which other emotions spring (Heidegger, 1962: 230). Other emotions he argues often result in fallenness because people tend to avoid negative feelings and the circumstances that have caused them. For example, in grief, that results from the loss of a loved one, people often hide or turn away from their pain by distracting themselves and focusing on worldly projects. As mentioned in section (1.1), Heidegger argues that by occupying oneself with worldly affairs, one covers up and forgets one's facticity. This Heidegger viewed as inauthentic. In contrast however Heidegger also talks about another type of turning away, where people can turn away from their inauthenticity toward their authentic self, and it's here that anxiety fits in. Accordingly, anxiety functions by directing people to what matters most in their lives, which includes facing one's suffering and death, as opposed to avoiding it. Hence Heidegger concludes that anxiety is primordial because it is something that we encounter within our existence and thus is on a different level to other emotions. In this sense anxiety isn't tied to other objects and things rather anxiety is united with human reality (Elpidorou and Freeman, 2015: 9-11).

In summary, the envisioned existential image of a person hasn't changed much. Humans are conceived as finite, temporal, flexible, autonomous, emotional, meaning-seeking beings, the addition is simply that we often hide away from our true nature. The existentialists want people to consider that the way we have been living may be wrong. They want people to critically examine their lives and not simply accept the views forced upon them by others or society, nor do they want people to avoid life's inherent issues.

They want people to live reflectively and responsibly. It is easy for the modern person to confuse social convention with what is natural or fixed because deindividuation offers meaningful security. As appealing as many social conventions are, the existentialist wants the individual to look beyond their convention to their nature (Levy, 2018: 118-119). The idea of authenticity is relevant in today's world where conflicting beliefs often result in violence.

Could modern day science help us answer the question of authenticity? Perhaps it can, however, further research is required. Evolutionary biology conceives of humans as flexible and even as anxious beings. However, they differ to existentialists regarding the role of freedom in this regard. Perhaps the more we learn about our evolution and biology the clearer the idea of an authentic way to live will become.

It should now be clear why science and existentialism were traditionally opposed. However, I hope I have shown that the gap isn't as wide as was previously thought. There is convergence on emotion, freedom and morality that is relevant today. The next theme is my core topic of interest, mortality awareness, and here the reader will see that existentialism has many interesting insights, and that there are similarities with the contemporary evolutionary views. Furthermore, some of the ideas presented are of interest for additional analysis and experimentation.

1.5) MORTALITY AWARENESS

As briefly introduced in section (1.3), death, or more specifically mortality awareness was of particular interest to existentialists such as Camus, and there is a relationship with emotion and absurdism. This awareness is rooted in our capacity for future orientated thought and as Heidegger noted people cannot help but project the possibilities of themselves in the situations they are thrown into. In the face of death, this projection has resulted in creation of beliefs that are likely impossible, and the religious beliefs of fate and immortality stand out. As Camus showed death awareness results in several absurdities which the human mind struggles to accept and when taken in conjunction with future orientated thought provides reason for why people reach beyond what is possible.

Contemporary evolutionary theory and neuroscience have much to say about death-related concerns, yet the issue of mortality awareness hasn't received sufficient focus. However recently in psychology, the theory of Terror Management Theory (TMT) (Greenberg et al., 1986) (Appendix) has gained influence and support. TMT explores the effects of death awareness, its possible defences, and culminates in the claim that much of culture has been constructed in its defence. TMT posits that people make use of the same abilities that give rise to the awareness of death to defend against its potential to induce debilitating fear. People engage with cultural ideas, beliefs, values and concepts in attempt to regulate this fear. People construct and maintain cultural world views that embed them in a theory of reality that provides meaning, purpose, significance, value and the hope of immortality. A person can become a part of religion, nation or group that is larger and more powerful than themselves and will continue to exist after they are gone (Pyszczynski et al., 2015: 7-8). These cultural world views act as an anxiety buffer which suppresses and avoids mortality awareness by convincing them of either symbolic or literal immortality. To qualify for either form of immortality, individuals are required to maintain their belief in their cultural world view and live up to the values and norms that are apart of them. This provides a sense of value and being part of a meaningful universe; which is the core of self-esteem according to TMT. In this sense, self-esteem entrenches

people psychologically in a symbolic reality where physical death can be transcended. This then implies that any uncertainty regarding the truth or integrity of one's world view or one's value within its context undermines its effectiveness as a psychological defence mechanism. Thus, people are motivated to seek validation from others to bolster self-esteem and maintain belief in their cultural world view. This often requires eliminating competing world views, even at the cost of violence (Lifshin et al., 2017: 83- 84). TMT has its roots in existentialism; however, the theory focuses mostly on avoidance and suppression as the coping mechanisms for facing death awareness. In contrast most existentialists favoured acceptance as the best approach. They believed that the avoidance and suppression of mortality awareness is a cause for concern.

It is likely that questions pertaining to death have long plagued humanity. However, they gained increased attention with the rise of existentialism. Camus believed that mortality awareness is a uniquely human phenomenon that science is unable to explain. However, excluding the topic from scientific enquiry doesn't make as much sense as it previously did. Although my main focus is to explore the issue from a contemporary evolutionary perspective, the writers in the existential movement provide a thought-provoking account of the concept that I believe is both interesting and relevant today.

Knowing we are going to die poses some interesting and somewhat disturbing questions about our condition and the meaning of life. What meaning and significance, if any, should we attach to this fact? Is it all that important to acknowledge or should we perhaps just forget about it and pretend death is not real? However, if we are to face our mortality and it seems reasonable that we should, what is our best means of approach? What is clear is that knowing we are going to die poses philosophical problems whose effects have been argued have significant reach. It poses a threat to our rationality, ambitions, world-views, meaning-making capacity, and has been argued causes anxiety, fear, dread, and even terror. Kaufmann (1959) and Gray (1951) are two authors that have provided us with a comprehensive and critical analysis of the existential view on the topic.

Both Kaufman and Gray begin with a discussion of Heidegger, who was one of the first to focus on mortality awareness as a fixed condition of human existence. As Heidegger

puts it and Gray illuminates, to exist as a human being means being exposed to nothingness (Gray, 1951: 117). The concept of nothingness or non-being is how Heidegger initially describes death and he ties the concept in with anxiety, dread, and authenticity. In *Being and Time* (1962) he discusses the idea of being-toward-death and argues for the conclusion that "death does not reveal itself as a loss, but rather as loss experienced by the survivors" (Kaufman, 1959: 81). He explains that the suffering of this loss is different from the loss of being, which is suffered by the person who died. Accordingly, Heidegger claims that humans can only experience death as bystanders (Heidegger 1962: 282). Humans cannot truly experience death because death implies the end of consciousness, and is thus impossible to experience. This means that if a person lived to experience death, then they wouldn't be dead at all. Heidegger continues by showing that the public or cultural view of death is simply that one must inevitably die. Hence, he concludes that humans can only experience death as a loss (as in the loss of a loved one) and as a fact (Kaufman, 1959: 80).

Kaufmann explains that Heidegger's view on death is similar to Tolstoy's story, *The Death of Ivan Ilyitch* (2012). In the short novel, Tolstoy presents an attack on some of the cultural views on death and mortality. The story follows a man named Ivan whose life at first seems to be good and meaningful; at least according to his initial belief as to what a decent, happy life should be, in line with what his society has depicted. Over the course of his life Ivan's career grows, he gets married and has children and although there are some problems in his marriage he still feels as though his life has measured up to the standards of his society. He becomes a man of power and stature with friends in high places. Then rather suddenly Ivan gets sick and is forced to go see a doctor. After a few visits with a variety of doctors Ivan begins to realize that his illness is serious. However, when he discusses it with his wife, she simply dismisses the seriousness and tells him to just take his medication and all will be well. Even though the pain in his side does not go away, Ivan tells himself that he will get better. Ivan begins to deceive himself (Tolstoy, 2012: 63). However, as the story progresses, Ivan begins to realize that he is going die and this fills him with fear and despair, that he believes he alone understands, and everyone else around him seems to merely dismiss. Eventually, Ivan's awareness of his

impending death causes him to realize that his life has been pointless, empty and futile, but no more than all the other individuals in his society including his colleagues and wife. He realizes that they have all been pretending that they won't die.

“Death. Yes, death. And none of them knows, or wants to know, or feels pity. They're playing. It makes no difference to them, but they'll also die. Fools. For me sooner, for them later; but it will be the same for them. Yet they make merry” (Tolstoy, 2012: 69).

The attack by Tolstoy is clear, he feels that people although aware of the fact of death never truly confront that they must eventually die, and he depicts society as dictating that death and fear of death should be suppressed. As Ivan gets sicker, he realizes that his problem is not merely a disease, but leaving a meaningless life behind. Tolstoy illuminates that in the society Ivan finds himself it is considered cowardly to fear death. Hence when Ivan gets sick culture decrees that he should just pretend he will get better and suppress the fear and anxiety caused by his mortality awareness. Toward the end of the novel, Ivan finally becomes aware of the futility of his life and struggles to accept that he is going to die, which fills him with confusion and despair. His work which before his terminal illness gave him pride and happiness does not mitigate his suffering (Tolstoy, 2012: 71). However, he eventually overcomes his despair by ceasing to pretend. In the place of death was light, death had lost its terror and from that moment onwards Ivan was happy that he had not suddenly died, his awareness of his death had directed him to what mattered most to him in the present (Kaufman, 1959: 81).

Similarly, to Tolstoy, Heidegger also believes that humans need to have courage in the face of their mortality and not suppress it as Ivan did. It is noteworthy to mention that World War I greatly illuminated the topic of death as death was ever-present in the minds of those at war and at home. Additionally, the Influenza pandemic of 1918/1919, where 1/3 of world's population was infected and 50 million people lost their lives, also brought mortality to forefront of awareness. Kaufmann notes that Freud at the time also published on the topic and presents his ideas in a far shorter and clearer manner than Heidegger. Freud argued that humans behave as if they are not going to die, yet if you asked a person

about their mortality, they would present the cultural view as an unavoidable natural fact. However, he argued that in reality, people behave as if this were not true. He concluded that our relationship with death has not been sincere and hence it seems that society has historically pushed death aside (Kaufmann, 1959: 82). There are other examples of this suppression, such as keeping the old and sick separate from the rest of society, which is still evident today. However, Freud notes that events such as WWI brought death to the front of people's minds forcing them to face death and not suppress it. Similarly, the SARS-CoV-2 pandemic of 2019 to the present is another extreme event that brings death to front of our awareness and thought. More commonly known as Covid-19 the pandemic to date has infected millions and killed hundreds of thousands with the numbers growing daily. The threat has resulted in countries implementing measures such as social distancing and lockdowns to slow the spread of the virus.

For Heidegger, being-towards-death represents a running ahead in thought to one's death and accepting it. This forcibly reminds us that we have limited time, filling us with anxiety, which directs us to what matters most in our lives in the present. Heidegger also ties in the concept of being-towards death with authenticity. He argues that only once a person has accepted their mortality can they reach their authentic being (Heidegger, 1962: 308). What this acceptance entails is keeping the awareness of death at the forefront of our minds and not suppressing it. To actively focus and reflect on death and the physiological arousal, emotions, memories and future-orientated thoughts that it elicits. Although this results in anxiety, Heidegger construes this anxiety as functional because it directs people's attention to what is of most value in their lives, such as family and close relationships. For Heidegger death marks the limit of one's possibilities and he argues that to truly understand oneself, one has to face one's full range of possibilities. Does the acceptance of death necessarily require anxiety as Heidegger insists? Here Kaufmann is critical of Heidegger, he argues that Heidegger doesn't take into account sacrifice, namely that it is conceivable that a person can be proud to die. He criticizes Heidegger further by pointing out that he blows up the link between anxiety and death to a general truth about human existence without consideration of alternative observations (Kaufmann, 1959: 84).

Another existential writer for whom death awareness was important is Camus. As discussed in section (1.3) Camus was concerned with the absurdity of the human condition with mortality awareness at the centre of his view. Much of Camus's pursuit is toward a logic of this awareness. Is there such logic? This is difficult to say, and Camus thinks not, he sees mortality as beyond our understanding and as something that our minds cannot accept. In similar fashion to that of Heidegger, Freud, and Tolstoy, Camus notes that people behave as if it were not true that everyone dies. The reason he gives for this is that there is no experience of death, which matches Heidegger's view. He states "nothing has been experienced but what has been lived and made conscious. Here, it is barely possible to speak of the experience of others' deaths. It is a substitute, an illusion, and it never quite convinces us" (Camus, 1942: 5). As I explained Camus offers suicide as a solution to the absurd and he believed suicide to be acceptance at its extreme. He argues that by committing suicide one can settle the absurd, by engulfing it in the same fate that it forces upon us, that is to die unreconciled. Suicide is thus an act of defiance against an irrational world.; However, this is not the end of the story for Camus. He argues that to stay alive the absurd cannot be settled. He states "the absurd cannot be settled. It escapes suicide to the extent that it is simultaneously awareness and rejection of death" (Camus, 1942: 19). In contrast to suicide, humanity is condemned to death, which is why he sees suicide as an act of defiance. He concludes that this revolt against the absurd is what gives life meaning.

Although Camus argues for a sceptical stance, the solution of acceptance makes the most sense to him, especially when taken together with his idea of lucidity. A lucid person in his view is a person that is maximally aware of his/her individuality, freedom, limits, and the revolt against life's inherent issues. This is the authentic human that he conceives of (Kaufmann, 1959: 90).

The fact of death, and because it can come any moment, can be argued undermines religious and other world-views, on ideas of fate and a fulfilled life. There are many examples of these views, for one, let's consider that a known person has died. It could be

that one holds the view that the person who has died has accomplished what they needed to do in this life, in the sense that they have fulfilled their purpose and thus have now moved on to the life beyond. Although there are many examples of such views, there are also many examples of unexpected chance deaths that can be argued undermine such perspectives. Such as children who have unexpectedly died in car crashes, or sportspeople that have died before they have reached the peak of their careers, or a painter that dies before the completion of his masterpiece. On the other hand, it is conceivable that someone can waste their life without accomplishing much, or perhaps it could be that they simply just ran out of time. The fact that death can come at any moment is part of the reason why the existentialist wants us to face death and not suppress it. They want people to have the right attitude toward it, and they believed that we need to take the possibility of death into account in the present. This forcibly reminds us that we have limited time and thus helps us focus on what is most important in our lives.

The awareness of mortality is linked to emotion and can result in the experience of fear, anxiety, dread and even terror. For one, the term dread comes up a lot in existential writing and has often been used in conjunction with anxiety. Dread can be defined as a feeling of hopelessness or vulnerability. Gray explains that dread results when humans are confronted with the idea that there is no ultimate consolidation to the meaning of life and that at 'the end of all our ambitions is nothing but shipwreck' (Gray, 1951: 117). It is our defencelessness in the face of existence, due to the limited time that we have and because death can come at any moment, that characterizes this mood. This feeling is further compounded when we realize that our human needs for rationality and meaning fall short in the face of death, and that science and philosophy can do very little to mitigate this feeling. Yet, existential philosophers, such as Heidegger and Camus, viewed dread and mortality not as something that should be avoided but rather something that should be endured. It is only natural for people to seek safety and security and dread is in direct contrast to such feelings. Humans seek to avoid negative emotions and this explains why the problem of mortality awareness has historically been suppressed. However, as I have shown this was viewed as inauthentic.

Heidegger wants humans to consider that the present moment is all we have, and because death can come at any moment, this idea becomes all the more important. Hence one could conclude that we always live in the face of death, and it seems that we haven't been facing up to this fact of life. Heidegger want us to believe that all we can control and have responsibility over is the present. The focus on lucidly living in the moment, aware of freedom, responsibility, our limits, and facing life's absurdities and not suppressing them characterizes the authentic person (Gray, 1951: 122).

So how should we face death? The solution that Heidegger and Camus back is acceptance; however, I remain sceptical as to what our best defence might be. Perhaps believing in a meaning framework like those found in religions is the best defence we have. But what can science tell us about coping with mortality awareness? I believe that evolutionary biology and neuroscience can shed much light on the topic and they have plenty say about how humans and animals respond to threats. Evolutionary theory shows us the traits and mental abilities humans and animals have evolved and make use of when facing life threatening situations. In a sense, these evolved traits are the conditions of the subject, and depending on what traits the species in question have evolved, limits how those individuals respond.

Summarily, I believe science and existentialism working together could greatly inform on the problem of mortality and its associated effects and issues. The field of TMT is already dedicated to this bridge; however, I think that evolutionary theory and neuroscience could further illuminate the topic, and here there is a lack of research. Survival is after all a primary biological and existential goal, and death is a fact of life for all living things. Although evolutionary biology shows that survival is always in the service of reproduction, it is nevertheless imperative for long-lived social species including humans. If humans have evolved, and we have, then it stands to reason that much of our cognitive abilities have developed to aid in the avoidance of premature death. Without going into too much detail, as this will be done later on, evolutionary theory proposes that humans have an array of traits including various mental abilities that aid in the avoidance of

threats. This is an obvious position, however the existential views on the topic have shed light on how humans have historically dealt with the problem, namely via avoidance and suppression, and they have presented some of the unique characteristics we use to face it. The solution that was proposed was that humans should rather accept this fact because it focuses our attention on what is important in the present. The issues as Camus shows is that this awareness affects whether our ambitions and lives have any inherent meaning.

1.6) EXISTENTIAL ANXIETY

Emotion, in particular anxiety, is an important topic in existentialism and is the last of the overlapping themes I have identified with the movement. One of the reasons why emotions were of interest to writers like Heidegger and Kierkegaard, was due to their subjective nature. I mentioned in section (1.1) that Heidegger believed emotion to be inherent to human existence, forming an integral part of how the world is disclosed to us, affecting our perception and meaning-making capacity. Furthermore, emotions were understood to be revealing of certain features of our subjectivity. Although these ideas are interesting and relevant, the existentialists noted something a little more unorthodox and troublesome pertaining to anxiety in particular. Finally, there is a link between fear, anxiety and death-related concerns.

In existentialism, the term anxiety is often used in conjunction with the term dread, which I briefly discussed in section (1.5). Generally speaking, the existential authors believed that there was an unreasonable discrepancy between the human needs for meaning and rationality and the universe we are thrown into. As Camus describes, humans cannot help but ask the question as to the meaning of life, and we cannot help but notice that we are fated to eventually die. However, like Sisyphus, it appears our answers keep tumbling back down. The emotions of dread and anxiety have been used to capture this existential mood and are closely linked to one another and have sometimes been used interchangeably by the various writers.

Are the existential views on emotion irreconcilable with science? I believe this is not the case and I think there is much science and existentialism can do working together to further the contemporary research.

For the existentialists anxiety and dread stand out above all other emotions and they were important to many of the authors including Kierkegaard, Heidegger, and Nietzsche. In the sense described by these writer's anxiety is defined as an unfocussed fear, inherent to human existence (Korsnes, 2013: 1; Crowell, 2017; Kaufmann, 1959: 78). As Korsnes,

Crowell, Gray, and Kaufmann among others explain, the existentialists believed that anxiety differs from other fears because it has no object. It is not a fear of consequences in relation to objects that people encounter, such as the fear experienced regarding what to do when one has no money, or when one faces a life-threatening stimulus. Rather anxiety is a fear that is united with human existence. Hence it would appear that anxiety is on a different level to that of other fears, linked to a form of absurdity that forms part of our reality and exists outside the realm of rationality and justification (Korsnes, 2013; Crowell, 2017). This definition of anxiety as an objectless fear is certainly at odds with modern scientific and psychological definitions of anxiety, and as Korsnes points out, is rather contentious.

The American Psychological Association defines anxiety as “an emotion characterized by feelings of tension, worried thoughts and physical changes like increased blood pressure,” usually in response to a difficult situation or circumstance (Kazdin 2000). In this sense anxiety is always in relation to some object. We may feel anxiety before a job interview or an exam, or when we perceive a threat. How existentialists have justified their claim that anxiety is objectless has varied, but they seem to agree that a distinction must be made between anxiety and other fears. Kierkegaard devoted a major work to the topic where he compared life to standing on the edge of a tall cliff, a metaphor that has become common in many conceptions of existential anxiety. For Kierkegaard, this anxiety can be expressed as the feeling of wanting to throw oneself off the cliff. In the sense of Kierkegaard freedom is the source of existential anxiety tied in with one's responsibilities. For Kierkegaard freedom causes anxiety due to the weight of responsibility (Korsnes, 2013).

In a similar fashion to Kierkegaard, Heidegger describes the mood of anxiety in relation to freedom, however, he also links anxiety with individualism. Human existence as being-on-its-own is thus a further source of anxiety. However, it is important to note that this is only plausible to accept if we agree with the notion that humans are separate from the rest of nature. If we accept this claim, it is then possible to argue that when we

recognize that we are separate this leads us to the realization that we are alone in this world, which can cause anxiety (Korsnes, 2013).

Another major source of existential anxiety is of course mortality awareness. Unlike other animals, humans have the cognitive ability for future orientated thought which has resulted in us knowing that we will one day eventually die, and this can be a very anxious and even terrifying experience. At the very least the awareness of mortality poses an apparent distal threat to humans and its link to anxiety is another of the reasons why anxiety has been claimed to be a primordial condition.

The existentialists thought anxiety to be caused by the recognition of one's individuality, freedom, responsibility and mortality. They further argue that society acts to buffer this anxiety by providing structures and holistic philosophical doctrines to give us a complete understanding of things. Religion again is a great example as pointed out by Heidegger, Nietzsche, and Camus. Social structures and the meaning frameworks that they embody provide a sense of security protecting us from loneliness, the responsibility of freedom, mortality awareness and consequentially anxiety, a view that is reflected in Terror Management Theory. However, in contrast to TMT existentialists, such as Heidegger and Camus, entertained the possibility that there is no God and thus were not happy with any justification for meaning, morality, social norms or coping mechanisms for mortality awareness that were bound to theism or any other unjustified cultural structure. This anxiety is further compounded when we realize that there is uncertain justification for many of our values when we separate them from their social structures (Caruso and Flanagan, 2018). Religion stands out again when it comes to the justification for morality as Nietzsche prolifically pointed out. Furthermore, as I discussed in section (1.4) living in the buffer of religion or any other unjustified cultural structures was thought to be inauthentic since this limits freedom.

Sartre too was concerned with anxiety as a primordial condition of human existence and was also troubled with how to justify meaning, morals and social norms without a theistic foundation. Sartre defined anxiety in a similar way to his predecessors, as the loneliness

of individualism together with the responsibility of freedom. Sartre argues that anxiety is the result of freedom because freedom is linked to the absence of God. According to Sartre once we denounce God's existence, we are forced to realize that we only have ourselves to rely on and that this responsibility can be too much for us to bear. People know that each decision that they make has the potential to have huge, possibly catastrophic consequences. For Sartre, the idea that we have neither God nor anyone else to rely in making choices in the face of potentially bad consequences, is an anxiety-provoking experience (Korsnes, 2013: 6).

In a similar fashion to anxiety, the concept of dread was also thought to be tied to an objectless fear. In the experience of dread, humans are confronted by the helplessness of their situation particularly in the face of mortality (Gray, 1951: 176). This defencelessness shows itself when one realizes that death can come at any moment. This poses a threat to our ambitions and conceptions of the meaning of life. This dread is compounded further when humans realize that science, philosophy, and religion fall short in solving the problem. As already mentioned, the human need for safety and security makes an appearance, and it is certainly a natural response for humans to seek to avoid negative emotions and experiences. However, the existentialists believed that we need to face up and embrace this vulnerability rather than suppress it because this allows us to focus on what matters most in our lives.

However, as Korsnes points out the justification for the concept of anxiety as being without an object grounded in freedom and responsibility is contentious. If freedom tied with responsibility is the source of anxiety, and anxiety is defined as an objectless fear, the result is problematic. Korsnes shows that if we follow this chain of reasoning as advocated by Kierkegaard, Heidegger and Sartre, anxiety will be objectified because responsibility always entails some form of consequences. He contends that if anxiety were to be truly objectless then it cannot be tied to freedom. Korsnes concludes that it is the helplessness of the human condition rather than freedom that is the source of existential anxiety. Hence Korsnes presents an argument in line with that of Gray and the concept of dread. It is not freedom but the absence of freedom that is the source of angst.

The knowledge of humanity's vulnerability in the face of existence by the fact that it is human destiny to eventually cease to exist. Accordingly, it is this precariousness, helplessness, and limits to our freedom that characterizes true inconsequential objectless anxiety (Korsnes, 2013: 9).

It is interesting to mention that anxiety was argued by some of the writers to be the authentic state of human existence. As mentioned in section (1.4) Heidegger viewed anxiety as the authentic mood that discloses and colours our awareness, directing us to that which matters most in our lives, our potentiality. Our vulnerability in the face of existence was thought to be primordial, forming the base from which knowledge of the self and meaning must spring. As Gray puts it "nothingness proceeds, envelops and conditions all being" (Gray, 1951: 127).

1.7) CRITICISMS AND LIMITATIONS OF EXISTENTIALISM

There are various reasons why existentialism and science were traditionally thought to be incompatible. The crux of the argument is that science is insufficient to understand people. The existentialists claimed that when you apply science to humans, you won't be able to see the important existential concerns of freedom, responsibility, authenticity, mortality, nihilism, absurdity and anxiety. These were believed could only be understood through existential philosophical inquiry. However, as Burnham and Papandreopoulos (2002) explains, existentialism as a whole has had a relatively small direct influence within philosophy with many of its philosophers having fallen under criticism. For example, Heidegger was criticized for being obscure and far too abstract. Further to this Heidegger and Nietzsche were both criticized for paying insufficient attention to social and political structures and the values that they embody, the critics argued that they were too narrow in their views on these institutions with dangerous implications. Heidegger and Nietzsche were not the only existentialists that came under fire, in France Sartre was criticized by the philosophers who were newly under the influence of structuralism. They argued that he paid insufficient attention to the nature of language and impersonal structures of meaning (Burnham and Papandreopoulos, 2002).

The existential image of persons has recently come under fire by the findings in evolutionary biology and neuroscience. Caruso and Flanagan (2018) argue that as science reveals new truths about the human condition it causes further disenchantment. The theory of evolution by natural selection together with advances in the brain sciences seems to have removed the last hopes of an immaterial soul or self that truly knows itself and can know the nature of what is good and moral. The advances in science have changed the picture of what it means to be a human being. The first and perhaps the most important is that we are no longer viewed as separate to the rest of nature, humans are animals and our fate is the same bound by the same rules and laws. Furthermore, recent neuroscientific findings have even dwindled the hope that was found amongst the writers by showing that libertarian free will does not exist (Caruso and Flanagan, 2018: 6). With regards to mortality in particular, the existential approach is limited because the authors

didn't account for humans sharing traits with other animals nor the evolutionary conditions that give rise to defensive behaviours. In addition, the approach is limited because it does not account for all the underlying traits and neural mechanisms that drive human behaviour.

Although existentialism has been criticized, there are however some indirect influences that remain important today. For one the limits of freedom in relation to circumstance that many existentialists discussed are relevant in today's inquiries. Another contribution to modern thinking is the philosophical importance that the existentialists placed upon emotion, which has had a substantial impact on the field of psychology. Furthermore, existential thought impacted philosophy by insisting that it should deal more directly and practically with real-world issues such as death, anxiety, and morality, which had previously been analysed via abstract methods of inquiry (Burnham and Papandreopoulos, 2002).

Although a variety of reasons support the view that existentialism and science are opposed, it is fair to say that much has changed in both philosophy and science since this opposition first originated. The recent advances in technology and methodology have provided new means to access these previously inaccessible features of our condition. This in conjunction with the limits of the existentialism provides some support, even if only speculatively, for an interdisciplinary approach. Furthermore, traditional opposition shouldn't stand in the way of scientific enquires into existential concerns. Regarding possible compatibility, I argue that insights of existential theory on death-related concerns and emotion are not completely in conflict with contemporary science, and I believe there is scope for the fields to inform and influence one another.

PART 2: AN EVOLUTIONARY AND NEUROSCIENCE APPROACH TO DEATH-RELATED CONCERNS

The existentialists believed that science couldn't explain people for various reasons. However, both science and philosophy have changed a lot since this conflict first originated, and as I have shown the gap between them might not be as wide as was previously thought. My argument is that there is an interesting intersection between the existential and scientific views on mortality and emotion. The recent advances in science, particularly in evolutionary biology and neuroscience, provide new ways to investigate these previously inaccessible existential features of people. There are other authors dedicated to bridging science and existentialism, notably Caruso and Flanagan (2018), Levy (2018), Rolls (2018), among others. However, on reflection these authors have focused on other aspects of existential thought whereas I am interested in mortality and related emotions. I explained that the existentialists focused on finding the conditions of the subject and these conditions were supposed to show how we should deal with issues such as mortality awareness, anxiety and the meaning of life. The existentialists envisioned an image of persons as finite, flexible, temporal, emotional, autonomous, meaning-seeking beings whose needs the natural world falls short in meeting.

I argue that there is convergence between the contemporary scientific views and those of the existentialists on mortality and emotion, which provides support, even if just speculatively, for an Evo-existential approach. The views of the authors I present are not the sum of the topics. However, these scientists are at the top of their respective fields, are a good representation of the current consensus and directly address topics that are relevant to my argument.

How should we face the knowledge of our mortality, what is the correct attitude toward it, and what is the best strategy to cope with this threat? What can science tell us about our behaviour in response to such a threat? Can science help us figure out what the authentic approach to this issue should be? For humans, survival is a primary biological and existential goal and there is a link between anxiety, fear, survival and death-related

concerns. The existential view, in general, has been one of worry that we are not facing up to this fact of life, and they presented the problems associated with this awareness. They also provided possible solutions for how we might cope it. However, it is important to remember that they were not happy with the solutions they found. There is one solution however that stands out and that is acceptance, which seems to make the most sense to the authors. However, would the solution of acceptance make sense to a scientist?

To address the question about facing mortality from an evolutionary perspective, the logical starting point is with evolution by natural selection, followed by an analysis of the evolutionary conditions that affect survival and the defensive traits natural selection has favoured in animals and humans. One of the core goals at hand is to begin building a model to capture how people might respond to such an unusual threat. However, before this is possible it is necessary to first unpack the various factors involved, which include, but are not limited to, environmental circumstances, evolved defensive traits, intelligence, survival strategies and emotions. I first present a summary of the argument for evolution by natural selection. The focus will then shift to survival, to show the ecological and evolutionary factors that influence survival, together with identifying the traits and defensive responses humans and animals have evolved to deal with threats to life.

2.1) EVOLUTION BY NATURAL SELECTION

The theory of evolution by natural selection is the best explanation we have so far for the diversification of life on earth. What makes evolutionary theory so compelling is because it gives us a coherent and verifiable way to explain how the simplest things could change into more complex things over time. Evolution gives us a process to show how unordered particles could group together and change into ever more intricate and multifaceted patterns, until they ended up grouping together to form the complexity that is a human being. Evolution is defined as the process of change over time by which organisms develop from earlier forms. Today the theory of evolution by natural selection is about as much open to doubt as the theory that the earth revolves around the sun (Dawkins, 1976).

What is evolution by natural selection and how does it work? Charles Darwin's theory of evolution by natural selection shows how entities change over time becoming more adapted to their environment. In short form the argument can be expressed as follows; due to the limited resources in nature, organisms who have inherited traits that consequentially favour survival and reproduction would tend to leave more offspring than those without the favourable traits, causing the traits to increase in frequency over generations (Ridley, 2004: 6). Darwin defined evolution, as descent with modification, which is the idea that species change over time, gives rise to new species, and share a common ancestor. The process that Darwin proposed for evolution is natural selection.

The basic principles of Darwin's theory of natural selection are gracefully simple and can best be understood in the form of a logical argument. However, before we begin two preconditions need to be taken into account. The first is the excess fecundity in nature and the second is competition to survive in order to reproduce (Ridley, 2004: 74). In other words, the ability to produce an abundance of offspring than is sustainable, together with competition amongst species and individuals, forms the basis from which natural selection occurs.

The argument I will be presenting in this section is a version of Ridley's (2004). Mark Ridley is a Zoologist, author and one of the foremost authorities on evolutionary theory. In its most general form, the argument for evolution by natural selection requires four conditions to be met and whenever all are present, natural selection is the inevitable result, whether the population be organisms, viruses or words (Ridley, 2004: 4).

The Four Conditions of Natural Selection

- 1) *Reproduction*: Entities must reproduce to form a new generation.
- 2) *Heredity*: The characteristics of individuals are inherited from parents and thus tend to resemble their parents.
- 3) *Variation*: There is variation in individual characteristics among the members of the population such as size or colour and these variations in characteristics are considered heritable.
- 4) *Differential fitness of organisms*: Individuals with some characteristics must be more likely to reproduce than those without the characteristics. Hence there is variation in fitness amongst individuals in a given population. The different characteristics of individuals are connected to the differential capability to survive and reproduce. Hence causing differential rates of reproduction (for more detailed explanations see: Ridley, 2004).

If these conditions are met for any characteristic of a species natural selection is the inevitable result and if these conditions are not met then it does not. Planets, for example, do not reproduce and thus cannot evolve by natural selection. However, when the four conditions are met, the organisms with the characteristics that result in higher fitness will leave more offspring, causing the frequency of that type of organism with those characters to increase in the population (Ridley, 2004: 74).

2.2) SURVIVAL

Charles Darwin (1871) stated that organisms unable to adapt to the demands of their environment will fail to reproduce and fall as casualties in the war of nature.

To address the issue of mortality awareness from an evolutionary perspective, it makes sense to begin by looking at the evolutionary and environmental factors that influence survival. It is necessary to take these natural conditions into account because it is from these that survival behaviours are elicited (Mobbs, 2018: 2). This is followed by an investigation into the traits humans and animals have evolved which function to help them survive. How are animals and humans biologically predisposed to respond to death-related concerns? Or more specifically what traits do humans and animals have and make use of when responding to threats to life? The views presented here are in line with the contemporary consensus, as seen in Ridley (2004) and also draws from the recent findings in neuroscience.

Why is survival important? Survival is important because it is in the service of reproduction. What this means is that most organisms need to survive for a certain time period before they are capable of reproducing. It is interesting to note that natural selection can favour short-lived replicators such as the luna moth, which is born without a mouth and lives just long enough to reproduce. However, when it comes to long-lived species, whose young require nurturing, such as elephants, whales, apes, and of course humans, survival is imperative.

The struggle for individual survival in a given population takes place within a network of ecological relations. One way of illustrating this is in the form of levels (Ridley, 2004)

- 1) *Parasites and Predators*: For individual organisms in the ecological food chain there will be parasites and predators seeking to feed off them.
- 2) *Food resources*: At the same level in the food chain are competitors that may be competing for the same limited resources i.e. consuming the same food.

Furthermore, an organism competes most closely with other members of its species, this is due to them having the same ecological needs as its own.

- 3) *Other species*: In decreasing order of ecological similarity, organisms of other species also compete and impact on the organism's chance of survival by consuming the limited resources in its environment.
- 4) *Excess fecundity*: Organisms produce more offspring than can survive in the limited resource environment, and therefore are forced to compete for survival. The result is that only the successful competitors will reproduce.
- 5) *Climate change*: A sudden change in climate can affect the number of resources, such as a drought (Ridley, 2004: 74).

These evolutionary pressures have sculpted, over time, traits in individual organisms which enables them to become progressively more adapted to their environment. This includes physiological, cognitive, behavioural and neurological phenotypes that form systems in perception, attention and decision-making, which we find in more intelligent organisms (Mobbs et al., 2015). Multiple environmental factors interact to threaten the survival of individuals in a given population. It is necessary to understand these ecological conditions, because they give rise to survival behaviours and elicit emotions. Furthermore, they need to be taken into account if we are to understand why natural selection has favoured specific sets of traits and types of behaviour. These ecological circumstances created the need for the sophisticated physical traits and advanced forms of intelligence that we see in some species and is why they were selected for evolution. Speed is an obvious example and so is the ability to learn. If certain species hadn't evolved with these traits they may have been selected for extinction.

To address how humans respond to threats to life and eventually the issue of mortality awareness, it helps to first understand and acknowledge these environmental circumstances. Exposure to these types of threats over time has resulted in humans evolving specific survival traits and acquiring intelligent survival skills. These specific traits are the reason why humans are so adaptable and flexible in the face of novel and recurring threats. Later on, I will show that some of these traits are fixed and linked to

fixed behavioural responses. However, others I show result in more flexible responses. Both need to be taken into account if we are to see how humans might respond to threats and ultimately the knowledge of mortality.

In summary, a web containing five levels of possible ecological conditions interacts to affect the survival of organisms and the analysis varies depending on which organisms are being studied. These factors are common to most species that are trying to survive in a given habitat. In addition, survival is imperative for long-lived social species like great apes. In such species, predators are a major threat to survival. Thus natural selection has favoured characteristics in individuals, which aid in the avoidance of predators.

2.3) PREDATORS AND DEFENSIVE TRAITS

One of the most pervasive ecological demands is predator avoidance, particularly if the species is long-lived and a slow reproducer. What then are the traits animals and humans have evolved to survive the threat of predators? In addressing this question, I draw on the consensus and recent findings in evolutionary biology and neuroscience, the view I present is in line with a group of neuroscientists including Dean Mobbs, Joseph LeDoux and associates who are contemporary authorities investigating how humans and animals respond in life threatening situations. Using computational modelling, behavioural techniques and brain imaging (fMRI) these scientists are able to probe the neurological basis for fear and anxiety.

Humans have undergone the same evolutionary processes as other mammals and we share an array of traits, including neurological structures. Although we have more sophisticated and complex brains, these older structures are foundational and work in conjunction with our newer more flexible equipment, and both need to be taken into account if we are to grasp how humans respond to threats (Mobbs, 2018: 1; LeDoux, 2018: 1).

The prevalence of predators across species and evolutionary time has resulted in most nervous systems being equipped with fixed predatory defence mechanisms (LeDoux, 2018: 1). Fixed traits are developed gradually by evolutionary methods particular to the species, and are associated with fixed neural mechanisms, bodily arousal and behaviours specified by genes. These types of responses are rigid in nature, meaning there is no option for behavioural selection or modification, such as the examples of fight or flight and the startle reflex which have been studied extensively by neuroscientists (LeDoux, 2018: 5). However fixed reflex circuits and reaction patterns are by no means the end of the story. The need to adapt to the ever-changing environment at some point in evolutionary history produced plasticity: the ability of brains to mould and shape themselves. The result is a flexible nervous system that functions to assist the individual organism in adapting to ecological changes and novel survival threats. In contrast to fixed

traits, flexible or plastic traits are associated with learning and behavioural modification within the animal's lifetime and result in individuals being able to learn to avoid dangers (Mobbs et al., 2015: 1-2).

The relentless pressure to avoid dangers has resulted in the evolution of a nervous system that favours flexible survival actions. These actions provide the organism with survival intelligence, which results in an array of survival responses to the multitude of life-threatening circumstances. Different organisms exhibit differential survival intelligence, where survival intelligence means how powerful the organism is at adapting to environmental changes and responding to novel threats, with the overriding goal to avoid such encounters. Hence those species with the greater capacity to learn new skills that promote avoidance of threats are most likely to survive and pass on their genes and avoidance skills (Mobbs et al., 2015: 2).

Although nature favours flexible survival actions, the current research has demonstrated that the older fixed adaptations, which humans share with many other creatures, are foundational, strongly interconnected and even in competition with our newer more flexible plastic equipment, including forebrain structures such as the amygdala and prefrontal cortex (Mobbs et al., 2007; Mobbs et al., 2015). Most animals have a combination of both fixed and flexible traits and humans are no different. Although our brains are more advanced, the older neural circuits work together with the newer equipment and both need to be taken into account if we are to understand how humans respond to threats (LeDoux and Daw, 2018: 3).

In order to understand both the fixed and flexible responses animals and humans employ in the face of danger. We first need to take into account what type of danger organisms can find themselves in, as this directly affects which responses are selected. Research conducted on rodents by Blanchard et al. (1986) suggests that there are three levels of danger, potential threat, distal threat and proximal threat, that are associated with different behavioural responses and neural circuits (Mobbs et al., 2015: 4).

Mobbs and colleagues show that it is an optimal survival strategy for most individual organisms to facilitate behaviours that improve the avoidance of danger. Such as reducing surprise, detecting the predator first or reducing detection by the predator. These are distal defences associated with flexible responses. Fixed defensive responses, in contrast, are rigid and automatic and are not as effective in novel situations. However, if the threat is proximal and attacking, they are effective because they result in rapid reactions (Mobbs et al., 2015).

Three Levels of Danger

- 1) *Potential Threat*: Associated with flexible defensive responses, avoidance of the threat is the overriding goal. Examples include heightened alertness during foraging and the animal may have learned from past experiences to avoid certain areas that the predator frequents.
- 2) *Distal Threat*: Associated mostly with flexible defensive responses toward avoidance. Assumes the threat has been detected, in the case of a predator the prey would have detected the predator first and has not yet been detected so there is enough time to select between different behavioural responses. Freezing is a fixed defensive response that animals employ to deal with distal threats and functions to avoid detection.
- 3) *Proximal threat*: Associated with fixed defensive responses, as the threat is imminent i.e. attacking and there is insufficient time for behavioural selection.

Most animals are equipped with the fixed defensive reaction patterns of fight, flight and freeze (FFF), which are commonly evolved strategies and correlate to automatic defensive survival circuits in the older brain regions. Although organisms have other defensive traits including camouflage, poison, speed and armour; most of these traits coincide with FFF. But how do they work, and at what level of danger are they implemented?

Freezing is a sophisticated fixed defensive avoidance system that many animals employ when threats are distal (Mobbs et al., 2015: 4). For example, where an impala has detected a lion, but the lion has not yet detected the impala. Freezing is the stopping of motion: when an organism freezes; its muscles stiffen, it reduces motion, and thus visibility, hence increasing the possibility of avoiding the threat. Another example is the octopus which uses camouflage together with freezing to avoid predators. This avoidance strategy is used when the threat is distal and detected. The flight response, in contrast, works to increase the distance between the organism and the threat, and presumes the threat is proximal. The action of fleeing increases the chances the organism has of escaping the threat. Thirdly we have the fight response. This is sometimes the last resort when other strategies (flight and freeze) have failed. Fighting is staying and engaging the threat, which might discourage the predator (Mobbs et al., 2015: 4). An interesting example of fight is observed in the porcupine who uses its armoured quills as a weapon to discourage would-be predators.

The evolution of plasticity marks a fundamental revolution and has resulted in many animals evolving the ability to learn from past experiences. For example, some animals are capable of remembering past locations where they have encountered predators and seek to avoid those locations. Some other examples of flexible responses include increased alertness during foraging, environmental surveillance and prediction of threats. In support of these ideas, the current research proposes that human brains are specialised in improvisation. Paraphrasing Mobbs et al., (2015: 3) much of the cells in our brains are adaptively tuned to code current information that is relevant to the immediate environment. These cells are multi-specialised and can adapt and perform different functions, relative to the situation at hand. However, it is important to remember that most animals have a combination of both fixed and flexible neurological architecture and this will be unpacked in more detail in the next section on the evolution of survival intelligence.

Extending the ideas of Blanchard et al., the ‘Threat Imminence Continuum’ (Fanselow and Lester, 1988) shows that defensive behavioural responses and threat states of animals change depending on whether the threat is absent, detected or attacking. By studying the

ecological conditions of predator-prey encounters, researchers have been able to derive survival strategies (Mobbs, 2018: 2). Fanselow and Lester present four stages in the continuum, which are directly linked to the types of defensive responses individual organisms employ.

The Threat Imminence Continuum

- 1) *The preferred stage* is the time period where the animal is safe such as a home, nest or cave. A good example would be of a rodent that is in its burrow.
- 2) *The pre-encounter stage* is characterised by the time period where danger is present, but there is no detection of danger, such as when an animal is foraging for food.
- 3) *The post-encounter stage* comes into effect once a threat has been detected, but there is no direct interaction as yet between prey and predator.
- 4) *The circa-strike stage*, which is when the predator not only sees their prey but begins its attack with the intent of capturing and eating the prey (Fanselow and Lester, 1988: 187-203).

Fanselow and Lester demonstrated that these four stages of imminence induce typical defensive behaviours in rodents. From this, they derived that how individual animals respond varies depending on which stage on the continuum they find themselves. In the pre-encounter stage, animals typically respond with increased vigilance and arousal, as seen in foraging. In the pre-encounter phase, flexible defensive responses are the norm. It could be that the animal has encountered the predator before in the same context, and hence contextual fear conditioning may occur. In the post-encounter stage, both fixed and flexible defensive responses are observed. For example, freezing together with automatic physiological responses such as sweating and increased heart rates are typically seen. The animal will actively seek to avoid the threat. In the post-encounter stage, most animals usually respond by fleeing from any approaching threat, particularly when an escape route or possible refuge is available. Should post-encounter responses fail, the animal will be under imminent attack and pursued by the predator, this results in a switch to circa-

strike defensive responses. The typical responses are flight, and if flight is not possible, fight (Fanselow and Lester, 1988; Mobbs et al., 2015: 4).

Hence the threat context and distance to the threat determine which defence response will be invoked in the organism. For example, in the case of rat vs cat, if the distance between two is substantial then typical responses are fleeing and freezing. However, if the rat is in close proximity to the cat, the rat will panic displaying fight or flight. Another factor that needs to be taken into account is the type of predator. In the case of the rat, the predator could be a bird of prey or a snake, which influences the rat's responses. The key difference in this regard is how the different predators attack (Mobbs et al., 2015: 4-5).

In summary, the four stages of the continuum are directly linked to the defensive response's organisms employ and are associated with distinct patterns of neurological activity (Mobbs et al., 2007: 1). Thus, the threat context and distance to the threat determine which defensive response will be invoked in the organism (Mobbs et al., 2015: 5). I mentioned in section (2.2) that one of the best survival strategies for any individual organism is to facilitate behaviors that improve the avoidance of danger. Hence natural selection has favored traits that enhance avoidance; namely distal defenses which are associated with intelligent flexible responses. For long-lived species survival is imperative, and consequentially such animals possess traits that promote behavioral flexibility. The greater the flexibility the greater the survival intelligence of such creatures.

How then do humans respond to threats to life? The arguments just presented should already provide the reader with an idea. However, to answer this question thoroughly, it will help to go into a little more detail on the traits we have evolved, particularly our intelligence and this is the focus of the next section. Daniel Dennett (1996) presented the Tower of Generate and Test which provides a useful framework for understanding the evolution of intelligence. The tower shows the different types of brains and levels of agency organisms have evolved and how they work.

2.4) THE EVOLUTION OF SURVIVAL INTELLIGENCE

I have reviewed the common evolutionary factors that influence survival, together with the factors which affect how animals and humans respond to threats, and what responses are selected. The next topic is the evolution of survival intelligence. What is survival intelligence and what are the different types of brains that nature has selected for evolution, and what functions do they serve? To answer the overriding concern of how people might cope with mortality awareness, it will help to identify the traits and cognitive skills we use in the face of natural dangers. In order to do this, I begin by looking at the simplest creatures making my way up to the complexity that is a human being. I present a version of Daniel Dennett's Tower of Generate and Test (e.g. 1996). Daniel Dennett himself says that the tower is an oversimplification, however, it provides a useful framework for understanding different brains and how they function. The tower consists of four levels of agency which combine to form the brains and minds of a multitude of organisms.

Fixed Level

In the early stages of life on earth, organisms had only fixed traits, which means their responses to stimuli were automatic, unless genetic variation had occurred, causing a new trait, whose effect was a new form of behaviour. Dennett calls these early organisms Darwinian creatures. The process that produced Darwinian creatures went through millions of cycles, producing many wonderful designs both plant and animal, and it was only by random mutation and chance that some organism had better survival traits than others (Dennett, 2017).

The behaviours of Darwinian creatures are fixed. This means they cannot learn nor select their behaviour. Stimulus-response captures the sum of their behavioural ability. An array of different stimuli exist that can be external or internal, examples include, heat, light, gravity, predators or reproductive drives. All organisms exhibit automatic responses to stimuli. Plants for example automatically respond to light. Other more sophisticated

organisms with brains exhibit responses such as the startle reflex. In terms of the brain, these mechanisms have been described as modular and they combine together to form the brains and minds of an array of organisms. The current consensus in the brain sciences is that the brain and mind are modular. This means that each specific brain module or mechanism is dissociable, has a limited set of tasks which it can perform, and is only sensitive to specific kinds of information in the environment. This implies that damage to the modules will result in the information no longer being available. Furthermore, these modules can work together or they can compete with one another (Levy, 2018: 116).

Even the simplest creatures are subject to threats, such as predators. As I noted in the prior section, the prevalence of predators across species and evolutionary time has led to the presence of fixed defensive traits. After millions of cycles in light of predatory threats, nature has selected organisms with the defensive properties of Fight, Flight and Freeze (FFF). Other examples of fixed systems include reflexes such as sneezing and sensory systems of touch, taste, smell and pain that can all be elicited from various stimuli and are specified by genes. These implicit responses have further been described as gene-based goals for action (Rolls, 2018: 73). It is necessary to take this equipment into account because it is foundational and in humans has been coadapted to deal with the threats from our own species in the modern social world (LeDoux and Daw, 2018).

Learning Level

Evolution then continues with millions more cycles, until we find among the evolutionary designs organisms with phenotypic plasticity. This mouldability of the brain endows animals to learn and consequently adapt to ecological changes and novel survival threats. However, these organisms were not necessarily better off than the hard-wired Darwinian creatures, unless they were equipped with a wired-in reinforcement capacity. This capacity allows them to try out and favour what Dennett calls smart moves; the actions that are the better than the other available actions (Dennett, 1996: 85).

Dennett calls these organisms Skinnerian creatures after the psychologist B.F Skinner (e.g. 1984), who made famous the concept of reinforced behaviour. Skinnerian creatures can test out a variety of different actions until they find one that works, and they achieve this by detecting positive and negative reinforcement signals or rewards and punishers in the environment. These reinforcement signals are specified by genes and issue fixed goals for action, they are termed primary reinforcers (Rolls, 2018: 73). Primary reinforcers include taste, touch, pleasure and pain, which all work in the interest of genes and become associated with secondary reinforcers such as the sight of food or predators. Skinnerian creatures make up the realm of organisms that are capable of learning from their environment; some examples include insects, fish, amphibians, mammals and of course humans.

Creatures at this level have the most basic form of mind, characterised as a trial and error system, whereby they learn from their mistakes and successful moves (Dennett, 2017: 87). The organism brain moulds and reorganises itself based on experience and reinforcement. This helps the creature to be adaptive in its environment, because it can alter its behaviour based on past experiences. In terms of survival, the learning equipment combines with the fixed responses to provide a more flexible platform in the face of recurring threatening situations. Learned behaviours are elicited from the environment and habits are formed through stimulus reinforcement interaction that is repeatedly experienced. However, these creatures don't have the capacity for complex emitted goal-directed behaviours associated with more intelligent creatures such as primates and humans (LeDoux, 2018).

Neurological studies have shown that plasticity in the brain allows for the modification of neural connections through experience and reinforcement of those experiences within the organism's lifetime. Dennett calls this process ABC learning: associationism, behaviourism and connectionism. However, Dennett concludes ABC learning is only great as long as you don't get killed by one of your early errors (Dennett, 1996: 87).

How does a Skinnerian creature respond to threats, such as predators? Well, the answer here depends on where the creature finds itself in the 'The Threat Immanence Continuum'. The creature would of course still respond with fixed reaction patterns, but it might have learned how to avoid the predator through past experience. One example could be of an animal that has discovered that a predator tends to only be in one particular part of the environment, and hence could learn to avoid that area. Furthermore, conditioning studies have shown that FFF can come under the control of a conditioned stimulus that has been associated with negative outcomes. A process termed fear conditioning. Thus, in the presence of learned warning signals Skinnerian creatures can be induced to respond with FFF, and if successful, a habit can be formed (LeDoux and Daw, 2018: 3).

Pre-selective Level

Skinnerian creatures are more adaptable than hard-wired Darwinian creatures, however, there is an apparent limitation in the trial and error system they use. The limitation is that death may occur at any moment, which means that the organism has to be lucky, as the behaviours they attempt may kill them. Hence a better system evolved which is capable of pre-selection among the possible actions, so that the really stupid moves, that might get the organism killed, are removed before they become truly hazardous. Humans, of course, are creatures capable of this form of behaviour refinement, but we are not alone. Organisms who have evolved this design enhancement are capable of hypothesizing about possible outcomes of behaviours. Hence unlike merely Skinnerian creatures, which survive on lucky first moves, Popperian creatures survive because they make better than chance first moves (Dennett, 1996: 88). Popperian creatures, named after the famous philosopher Sir Karl Popper, are smart and for them to be smart they employ a pre-selective process. Thus, they must have some form of filter between them and the environment. This filter takes the form of an inner environment where behavioural hypotheses can be tried out and safely executed. Popperian creatures make up a large portion of the animal kingdom, including those studied by behaviourists such as Skinner

because they all have some form of inner environment, no matter how primitive, which allows them to pre-select options (Dennett 1996: 88).

This equipment combines with the learning and fixed equipment to make up the brains and minds of an array of species. These mechanisms can compete with one another, however, the competition between modules is limited because they share a common fate when they constitute an organism. In most animals it is useful to think of the brain and mind as a collective because it is the collection of mechanisms that give rise to behaviours, and together they produce only live behavioural possibilities that are attuned to the situation at hand. Thus, pre-selective minds are limited because they can only select among live options which are contingent on unconscious active modules (Levy, 2018: 117-118). For example, if the animal is in a proximally threatening situation the live behaviors are flight and fight.

The ability to internally deliberate and select appropriate behaviours relative to the situation at hand shows a level of foresight which improves the animals' survival prospects. Pre-selection is particularly useful in novel situations where experience and fixed responses are insufficient to account for environmental circumstances, such as novel threats. If you think of a dog for example, a dog is a Popperian, Skinnerian and Darwinian creature and exhibits correlating brains structures. You can train a dog to sit by giving her food, whilst using the command sit, after enough reinforcement the dog will associate the command with the action of sit, with or without food. At first, you may think that this is merely an example of a Skinnerian creature, but dogs take this learning further. When the dog is hungry, it may first jump on you and perhaps then you push it down, the dog may then try a different behaviour, and since it knows sitting implies food, it may then select sitting over jumping. Popperian creatures can figure out what the clever things they do are and how to use them. Unlike merely Skinnerian creatures which are habitual learners, Popperian creatures emit goal-directed or action-outcome learned behaviours. These behaviours are based upon learned/conditioned action-outcome based contingencies where the outcome is a valued goal. These types of behaviours are emitted from within the organism as opposed to being elicited from environmental triggers. For

example, avoidance behaviours based on a history of harm (LeDoux and Daw, 2018: 3-4). It is important to remember that this pre-selective process is limited because the decisions Popperian creatures make are guided by underlying brain mechanism whose goals are not available to the creature's awareness (Levy, 2018). Furthermore, although these animals are very smart, they do not understand the grounds of their intelligence (Dennett 1996: 90).

So, what other creatures are Popperian? Many other creatures have been shown to exhibit some form of pre-selection. The octopus, for example, is a very intelligent Popperian creature. The list goes on, birds, reptiles, amphibians and fish make up the realm of Popperian creatures. How then does a Popperian creature respond to a survival threat? This would once again depend on the environmental circumstances, namely on which stage of the 'Threat Imminence Continuum' the creature finds itself. What is clear is that the animal would be more reliant on flexible defensive responses towards avoidance. Since Popperian creatures have the cognitive ability to pre-select behaviours they wouldn't just merely respond with FFF, emitted avoidance behaviours are a good example. Other examples include environmental surveillance, heightened alertness and contextual fear conditioning.

Cultural Level

As we have seen Popperian creatures are very smart and talented at surviving, humans no doubt are Popperian creatures but the definition doesn't fully encapsulate our intelligence. The next creatures in the tower are dubbed Gregorian creatures, named after the British psychologist Richard Gregory (e.g. 1997). Dennett explains that Gregory's research focused on the role of information in making smart moves the first-time round (Dennett, 2017: 88). Gregory uses the example of a pair of scissors and notes that this is not just a result of intelligence, but marks the potential for intelligence. This means that a person with a pair of scissors is more likely to finish the task of cutting up a piece of paper swiftly and safely than a person without scissors (Dennett, 1996: 99). The use of tools in the animal kingdom has always been considered a mark of high intelligence. A

good example is that of chimpanzees, who use sticks as crude tools to remove termites from mounds. In addition, chimpanzees also exhibit the ability to learn from other chimpanzees. Gregorian creatures have the capacity to import tools from their cultural environment to their inner environment. Their inner environments are informed by designed portions of the outer environment which permits them to create even better interactions with the world (Dennett, 1996: 99).

Understanding Gregorian creatures takes a huge step to understanding the cognitive abilities in humans. As humans, we make use of these capacities all the time, by benefiting from the experience and wisdom of others and exploiting that knowledge with all the tools and inventions that it encompasses. However, it is noteworthy to mention that humans don't just use tools; they keep them for future use. This applies not only to physical tools but mind tools as well, which includes, learned methods and techniques, as well as belief structures and meaning frameworks. Language is the medium through which we engage with mind tools and we import those tools to our inner environments, where we think about them and retain them in our memories for future use. The better the tool, the more information there is in its fabrication; and thus, the greater potential intelligence it can confer on the user (Dennett, 1996: 100). People talk to each other; we share experiences and convey emotions. We tell stories and sometimes we write those stories down, where they become a part of the cultural environment with which we engage. The ability to interact with the culture and learn how better to act and think, followed by how better to think about what one should think about next, generates a further tower of internal reflections with no fixed or apparent limit (Dennett, 1996: 101). This final level of the tower Dennett argues is best characterized by science, science is thus defined as a system of generate and test, that we have created using Gregorian methods of foresight and earlier methods of trial-and-error, resulting in the much better system we call science. The idea of hypotheses is important because it allows situations to be fed into the singular system of science, and accurate results can be generated without having to encounter the situation firsthand (Dennett, 1996: 2017).

What then are humans? Humans are Gregorian creatures that exhibit characteristics of all four levels of the tower, we have hard wired fixed traits, yet we also exhibit neural plasticity so we can modify our behaviours during the course of our lifetimes. We are capable of learning from our environment in the sense of operative conditioning, yet we also have an inner environment of which we are aware, and thus we can engage in the pre-selection and emit goal-directed behaviours. Furthermore, we have evolved with the ability for potential intelligence because we can engage with our historical-cultural environment to further enhance our pre-selective skills. All these levels of the tower are interconnected in a myriad of ways and together they make up much of what we are.

Humans, however, have a few additional traits that the other great apes don't possess. The first is that humans are not merely self-aware, we also have the capacity for meta-awareness, meaning we are aware that we are aware. Secondly, as Heidegger pointed out, humans have the capacity for past and future thought or mental time travel, what today is called autonoetic consciousness (Tulving, 1985). Humans make use of this skill all the time, we remember past experiences and project our minds into the future. This helps us plan and predict the future to capture rewards and avoid dangers and punishments. Humans are conscious creatures and we impose a unity on ourselves in the form of a self (Levy, 2018). People can think, rationalize, engage with culture and set goals for themselves that are in personal self-interest. However, the self and consciousness are not some central executive with unlimited causal powers (Dennett, 1991). Past conceptions of the self, have viewed the self in this sense. However modern conceptions of the modular mind undermine these views because the mind and self arise from the multiplicity of brain mechanisms and are thus limited by those mechanisms. Furthermore, the goals of those mechanisms are often obscure and inaccessible to consciousness. Hence there is no room for a central executive (Levy, 2018: 116-117).

This image of the mind appears to dissolve the self into nothing because it appears that's the self has very little causal power, and has been viewed by some in the general public with contempt (Caruso and Flanagan, 2018). Yet, there are reasons to believe the self can influence the modules in a causal manner and in the face of novel situations the self and

consciousness play an important role in decision making by providing information to the modules and vice versa. In this sense consciousness informs and modulates the brain mechanisms which drive behaviour (Levy, 2018: 117-118). Although there is an open debate between nonreductive and reductive accounts of the mind-brain relationship, the general consensus is towards some causal role for mind. The mind is necessarily interconnected with the brain and there is evidence to support a reciprocal causal relationship. Some examples where this is evident is in novel threatening situations, addiction and confabulation. In the confabulation observed in stereotypes, people's conscious personal values conflict with their learned and fixed responses (Levy, 2018). In novel threatening situations our minds intervene because our implicit mechanisms are insufficient to account for the situation a hand. However, the causal role of the mind is limited by the unconscious mechanisms that drive behaviour as well as the environmental context (Glannon, 2018: 153-159).

Humans are deliberate conscious creatures capable of intentionally acting to obtain personal goals that may not be in the interest of genes, for example in recreational drug use, the individual seeks immediate reward despite the negative consequences on health. Usually such an explicit system is adaptive because it can intervene or modulate the implicit systems when they are insufficient to account for environmental circumstances (Rolls, 2018: 75). In terms of survival, novel threats stand out, and there is very little doubt that consciousness plays an important role in decision making in such situations. The existentialists conceived of humans as flexible autonomous beings. Although modern-day scientists do not agree with libertarian conceptions of free will because the will does not have unlimited causal powers, they do conceive of humans as flexible and intentional. I mentioned that although the existentialists often focused on free will in terms of transcendence, they also noted the limits of freedom and preferred not to isolate people from their personal, social and historical circumstances; which applies in modern-day enquires into freedom and intentionality. Furthermore, the will is limited by the unconscious brain modules that often guide choice for reasons that are opaque to us. This is again evident in examples of confabulation and in brain injuries where the modules are no longer available to consciousness (Levy, 2018: 118-121). Finally, humans subjectively

experience and appraise emotions, whether other animals experience emotions in the sense humans do is an open date, however, there are similarities in brain activation and behaviour (LeDoux and Daw, 2018). Emotion is the focus of the next section, and there is a link between emotion, survival and death-related concerns. For existentialists, such as Heidegger, emotion was of importance and there is very little doubt that emotion is a significant feature of human existence.

The existentialists believed that humans are different and separate to other animals and things. However evolutionary theory has shown that we do share certain abilities with other animals, a view that they did not take into account. Furthermore, these other abilities, which we share, are foundational and strongly interconnected with our advanced conscious, cognitive and linguistic abilities, and need to be taken into account if we are to understand concerns such as mortality awareness. However, it is noteworthy to mention that only humans can experience existential problems such as anxiety, absurdism and mortality awareness. Humans communicate their fears and concerns, they tell stories about them and it is only through interaction with others and culture that one can have such existential experiences. Furthermore, without culture we wouldn't have complex beliefs and values, many of which the existentialists were critical about. Other animals don't have values and they can't experience anxiety through stories, because they are unable to comprehend their behaviours and they cannot import mind tools to their inner environment.

With these ideas in minds, how are humans biologically predisposed to respond to mortality awareness? It would seem that humans should make use of their Gregorian skills obtained through cultural interaction in an attempt to avoid this knowledge. This would likely involve belief structures and meaning frameworks; a view that is reflected in TMT (Appendix). However, this was a position the existentialists were concerned about. In contrast to this the existentialists favored acceptance as the best way to face our mortality, but they were skeptical humans could truly achieve this. Would the strategy of acceptance make sense to scientist? This is difficult to say and I address this question in some detail in section (2.7).

Dennett says the tower is an oversimplification (Dennett, 2018: 146). However, it nevertheless provides a useful way to think about the evolution of the human brain and how it works. In humans, all the levels in the tower are interconnected and together they form a network that accounts for much of our brains and behaviour. Finally, it provides a good framework within which to begin to build a model to capture how we might respond to death-related concerns and ultimately mortality awareness.

The below model summarises the ideas of Dennett and extends it by including some of the other advanced abilities, which are required to understand how we respond to mortality awareness⁴

- 1) *Fixed level*: Foundational equipment, which humans share with an array of species and correlates to fixed physiological arousal, responses and behaviours.
- 2) *Learning level*: Flexible learning equipment which we also share with numerous species and works through Skinnerian reinforcement.
- 3) *Pre-selective level*: Consistent with an internal capacity and the ability pre-sort actions before acting and emit goal-directed behaviours. This level is found in Popperian and Gregorian creatures.
- 4) *Meta-level*: Humans are conscious creatures aware of themselves their actions, can mentally time travel, internally think, hypothesise, subjectively experience emotions and intentionally act.
- 5) *Cultural level*: The final level is captured by the ability to engage with other people and culture importing its tools to further enhance our pre-selective skills.

⁴ Dennett would include these abilities under the cultural/Gregorian level. However, for understanding human behaviours in response to threats, a separate level is useful. This I discuss in detail in section 2.8.

2.5) HOW EMOTION FITS INTO THE PICTURE

The evolutionary cognitive arms race has resulted in Gregorian creatures and ultimately humans, who possess an array of sophisticated traits and skills that aid in survival. We are capable of projecting ourselves into the future, hypothesising and predicting the possible outcomes of situations, interacting and learning from the cultural environment, internally pre-sorting actions, deliberately acting and being aware of doing so. In this section, the topic is emotion. At the beginning of this dissertation, I explained that emotion was of significance to the existentialists due to its subjective nature. Heidegger claimed that emotion discloses the world to us, motivates specific behaviours and plays a role in the creation of personal meaning. Recall also that anxiety stood out above all other emotions, and existentialists believed anxiety should be distinguished from other fears. Anxiety was argued to be a fixed feature of human existence tied to our exposedness in face of death, and the unfulfillment of our needs for meaning and rationality. The existentialists believed that science was insufficient to account for human emotional experiences, meaning and mortality awareness. However, it is becoming apparent that evolution and the brain sciences have a lot more to say than the existentialists envisioned, and emotion and mortality awareness are just two topics that illustrate this.

In section (1.1) I claimed that there are similarities and points of convergence between the existential and current scientific views on emotion and defend this claim here. For one there is an obvious relationship between emotion, survival, and death-related concerns. Secondly Heidegger's view of emotion as disclosing the world in a meaningful manner, I believe is similar to one popular modern view. However, whether anxiety has such a fixed role as the existentialists claimed, requires further investigation. Emotion is important to survival and it is necessary to take emotion into account if we are to grasp human behaviour in response to life-threatening situations. Furthermore, emotion would need to be included in the model I am attempting to build.

What then is emotion and why would nature select such a thing for evolution? As discussed in section (2.2), individuals who have evolved the traits that enable them to

better recognize and adapt to the challenges of survival tended to live longer and reproduce more than other individuals, resulting in those traits increasing in frequency over generations. Evolution has favoured the traits that promote the greatest behavioural flexibility resulting in intelligent Gregorian creatures. If emotion is such a trait, what evolutionary functions does emotion serve? What are the rules by which emotions operate and how are they managed? To answer these questions, I present Edmund Rolls version of the contemporary Neo-Darwinian position. Rolls is a neuroscientist and psychologist and one of the foremost authorities on emotion. In addition, Rolls is already dedicated to bridging science and existentialism. In conjunction with Rolls, I draw on some of the other recent findings in neuroscience. These views are by no means exhaustive; some of the other noteworthy theories on emotion include James-Lange theory, Cannon-Bard theory and Cognitive appraisal theory.

The experience of emotion can be defined as a conscious feeling of appraisal over physiological sensations invoked by specific circumstances. The emotion enters your conscious mind and has the potential to grip you, focusing your attention to the stimulus and motivates you how to act. There are many different emotions at varying intensity ranging from pleasure to ecstasy, anxiety to terror, frustration to rage, shock to relief and love to hate. However, due to the subjective nature of emotion in humans, it is difficult to determine the exact intensity of emotional experiences. This difficulty in conjunction with the inability to probe emotion as a subjective feeling in animals has resulted in researchers looking for alternative measures to account for emotions (Mobbs, 2018: 33). Hence the majority of Neo-Darwinian approaches to emotion have been functional, and this seems to make sense due to the reasons just stated and helps correlate the human experience with that of other animals. One way to capture the modern evolutionary view is through the following two core claims.

- 1) *Emotions have evolved bodily and neurological components* that have been inherited by individuals from their ancestors via the process of natural selection.
- 2) *Emotions serve specific functions that have adaptive value.* Generally speaking, these functions promote behavioural flexibility and include but are not limited to,

interfacing environmental stimuli, elicit automatic responses, provide evaluative judgements, motivate specific behaviours and set long term goals (Rolls, 1999, 2000).

The evolved bodily and neurological component is evident in numerous species including primates, dogs, rodents, bees and even crayfish. In primates, for example, this includes fixed physiological arousals, such as sweating, increased heart rate and the release of adrenaline in the face of a threat. Such automatic responses prepare the body for action. Emotions serve specific adaptive functions. Perhaps the most important function is that emotion interfaces environmental stimuli as either positive or negative. This can best be understood through an example. In the case of fear, fear directs behaviour towards avoidance of the threat, and this is flexible because the animal in question can select their behaviour toward the goal of avoidance, interfaced by the emotion of fear. Hence fear acts as a filter of sorts, directing and aiding in behaviour selection (Rolls, 2000: 177).

The mechanisms of learning are integrated with emotion which gives animals and humans greater flexibility and this is an adaptive advantage. The learning systems in the brain work in conjunction with modularity systems to effectively manage emotions and behaviour. How humans and animals appraise emotions and select behavioural responses needs to be controlled and hence many animals possess systems which function by regulating and flexibility assigning responses to specific circumstances. Modularity systems include but are not limited to cognitive appraisal, suppression, interoception, motivation, metabolic drives, and memories of past encounters. Although I discuss some of these systems in more detail in section (2.7), the general idea is that these systems are integrated with emotional regulation and the behavioural strategies animals and humans employ, and actively manage them in a top-down manner. Learning further promotes flexibility by altering behavioural strategies and modulatory systems through reinforcement signals (Mobbs et al., 2015: 30)

However, it is important to note that not all research on emotion is strictly functional. In psychology, many of the approaches and theories of emotion have focussed on what has

been termed the process of appraisal (e.g. Lazarus, 1991). The concept of appraisal can be defined as the process of developing a judgement as to the value of something. Emotions then are extracted from our appraisal or evaluations of events. Hence as it stands emotion can be divided into two core components:

- 1) *Evolutionary biological component*: Evolved bodily and neurological mechanisms which serve specific functions in aiding the fitness of individuals.
- 2) *Cognitive evaluative component*: Emotions form a part of the process of appraisal in characterising the value of environmental stimuli.

Rolls argues that the brain mechanisms of both emotion and motivation need to be considered together. The reason for this is because both motivation and emotion involve rewards and punishments as the solution of the brain for interfacing sensory systems to action, selection and execution (Rolls, 2000: 177). In other words, they characterise sensory environmental stimuli by calculating the reward or punishment value, then the organism can select its behaviour toward obtaining the reward or avoiding the punishment. Accordingly, Rolls argues that emotions can usefully be defined as states elicited by rewards and punishers (Rolls, 2018: 69). Appraisal, as I have explained, involves evaluations of stimuli, and hence one can assume that this involves assessing whether something is either rewarding or punishing (Rolls, 2000: 177).

As mentioned in section (2.4) some stimuli are unlearned primary biological reinforcers such as the taste of food when an organism is hungry or pain when an organism is physically hurt, while others become reinforcing via learning. A reinforcer becomes learned when they are associated with a primary biological reinforcer such as pain, thereby becoming a secondary reinforcer. This type of learning is the process of conditioning as seen in Skinnerian creatures. Once again, a good example is the emotional state of fear, that might be produced by a sound (the conditioned stimulus) that has previously been associated with a painful electrical shock (the primary reinforcer).

It is important to note that rewarding stimuli such as the taste of food are not usually described as producing emotional states. Hence further differentiation is required between rewards related to internal need states such as hunger and those not related to internal need states. However, these internal need states can have a modularity effect on the appraisal of situations and emotions (Mobbs et al., 2015: 32). Again, fear is a great example for illustrating this, such as the fear that is produced by the sight of a stimulus that is associated with pain. The key point here is that fear is the emotion, not pain, because unlearned primary reinforcers do not produce emotions. Rather it is secondary reinforcers, namely stimuli associated with the primary reinforcer that produce the emotion, in this case, pain associated with a stimulus such as an electric shock (Rolls, 2000: 179). Thus, it is useful to categorise stimuli into whether they are instrumentally reinforcing (secondary reinforcers) or not, as this effectively shows whether the stimuli produce emotions.

Emotions can be described as states elicited by goals for action (Rolls, 2018). Primary reinforcers are fixed by genes and once they have been paired with an instrumental reinforcer, they become goals for action. The design of brains to avoid punishers and seek rewards is highly adaptive and Rolls argues that this provides the basis for a neurological approach to purpose. These goals are gene-based and because emotion helps obtain these goals, this makes emotion useful. Emotional states act as a filter between sensory inputs and action systems which facilitates flexible responses to reinforcing stimuli (Rolls 2018: 71-72). Hence emotion is motivating, the motivation is to obtain rewards or avoid punishments.

There are two core processes involved in emotional behaviour. The first is Skinnerian reinforcement learning because emotions are produced as a result. The second is instrumental learning or goal directed learning. Rolls believes that this is the solution natural selection has found for how genes can influence behaviour. Rewards and punishment systems are attuned to fitness dimensions of the environment and they motivate specific behaviours. It's important to note that this process can take place unconsciously (implicit) or consciously (explicit). There are many different brain

processes involved in evaluating the world, including those mentioned in the ‘Tower of Generate and Test’ and they are interconnected in a myriad of ways. They can be implicit and involve fixed behaviour patterns or flexible involving learning and explicit deliberate actions. All need to be taken into account if one is grasp human behaviour (Rolls, 2018: 71-73).

Rolls has developed a foundation of six core factors that account for an array of emotions at variant degrees of intensity.

Six Core Factors of Emotion

- 1) *The reinforcement contingency*, such as when punishments or rewards are given or withheld.
- 2) *The intensity of the reinforcer*. Reinforcer intensity often correlates to emotional intensity on a gradient from low to high. Such as anxiety to terror or pleasure to ecstasy, i.e. sight of a nearby predator would result in high intensity fear that prompts the body to react quickly.
- 3) *Stimuli can have several different reinforcement associations*. For example, a stimulus can be associated with both a reward and a punisher. This accounts for emotional states such as conflict and guilt.
- 4) *Different primary reinforcers* associated with stimuli will elicit different emotions.
- 5) *Different secondary reinforcers* will elicit different emotions. This applies even if the primary reinforcer is similar.
- 6) *Active or passive behaviour*; the elicited emotion can depend on whether active or passive behaviour is possible. For example, in the presence of a positive punisher, if an active response can occur then anger can result. In contrast, if only passive behavioural responses are possible then depression or sadness may result (Rolls, 2018: 70-71).

If these six factors are combined it is possible to account for an array of different emotions. However, it is important to note that emotions are not only produced by external reinforcing stimuli, they can also be produced internally by recalling memories of reinforcing events (Rolls, 2018: 71).

Rolls proposes nine possible functions of emotion (for more detailed explanations see Rolls, 1999; 2000).

Nine Functions of Emotion

- 1) *Emotions function as an interface.* Emotions interface environmental stimuli as either positive or negative which helps organisms be flexible. Goals for behaviour are specified by reward and punishment evaluation. This means that once an organism has decoded environmental stimuli as either rewarding or punishing via emotion, it then becomes a goal for action. The organism can then perform any action to obtain the reward or avoid the punishment.
- 2) *Emotions elicit automatic responses.* For example, fear prepares the body for action in the face of imminent threats and can elicit reflexes and fixed behaviour patterns such as FFF. This includes changes in heart rate and the release of adrenaline.
- 3) *Emotion is motivating.* The motivation is to obtain certain rewards and avoid punishments. For this to work this motivation must be built into the organism; meaning the primary or unlearned rewards and punishers are specified by its genes and in turn effectively specify the goals for action. This processing can take place unconsciously or explicitly.
- 4) *Current moods affect the cognitive evaluations of events and memories.* Current moods facilitate the continuity in the interpretation of the reinforcing value of events in the environment.
- 5) *Emotion can help to produce persistent motivation.* If an emotion is endured for a prolonged time after a reinforcing stimulus has occurred it may produce continued

motivation to either seek the reward or avoid the punishment, resulting in long term goals being set.

- 6) *Emotion plays a role in the storage of memories.* Long-term subjective recollections of past events are facilitated by the emotional states within which these events occurred. This is advantageous because storing these events in conjunction with their reinforcer is useful should similar situations arise in the future.
- 7) *Emotions may trigger the recall of memories.* Emotions may trigger neocortical representations in episodic memory if the memory is formed in conjunction with the emotion that is being experienced in the immediate moment.
- 8) *Emotions help communication.* In primates, for example, emotional states are communicated to others via facial expression. Humans communicate emotions both non-verbally and verbally.
- 9) *Emotions are involved in social bonding.* This is evident in the emotions associated with attachment between parents and young (Roll, 2000: 179-180).

A surprising convergence between Rolls and Heidegger

In section (1.1) I claimed that there is an intersection between the existential and scientific views on emotion. In particular, I believe there is an interesting and unexpected convergence between views of Rolls and Heidegger. It is unexpected because Heidegger and Rolls come from two very different backgrounds and fields, and using different methods of enquiry and very different language have reached similar conclusions.

The first and perhaps the most interesting point of convergence is Rolls core function for emotion as an evaluative interface. Rolls argues that emotions function as a filter between the individual and the world because they decode stimuli as either rewarding or punishing. This fits well with Heidegger's view on emotion as disclosing the world to humans in a meaningful manner. Heidegger argued that emotions reveal the context of situations and illuminate specific features, this includes our facticity and what matters to us (Elpidorou and Freeman, 2015). Secondly, Heidegger believed that emotions are

motivating, because they inform people about the type and significance of the situation they are in. Here again there are similarities with Rolls who emphasises emotion as motivating. The motivation is to obtain rewards and avoid punishments, where both are informative about fitness dimensions of the environment. Thirdly Heidegger's requirement for emotion as needing worldly embeddedness (being in the world) I think is also alike to Rolls. Rolls argues that emotion operates via the mechanisms of rewards and punishments and in order for emotion to achieve this it has to be imbedded in the world (in the presence of instrumental reinforcer).

For Heidegger anxiety stands out above all other emotions and he argues that anxiety is inherent to human existence linked to our finitude, freedom and individuality. He further argues that anxiety is the most rudimentary form or disclosure that attunes humans to their existence. In terms of fear, he believes people can only experience fear because fear is already grounded in anxiety. Accordingly, Heidegger argues that anxiety is the base emotion from which all other emotions stem (Elpidorou and Freeman, 2015: 12). In the sense described by Heidegger emotion is a uniquely human phenomenon. Whether or not other animals experience emotions the way humans do is an open debate in neuroscience, however there are similarities in brain activation, physiological arousal and behaviour. Some contemporary neuroscientists such as LeDoux (2012) argue that emotion arises out the subjective conscious appraisal of the circuit activation. Heidegger makes an array of interesting claims pertaining to anxiety. However, whether his claims can be verified from a modern-day scientific perspective is tricky to assess, but what is clear is that humans experience the emotions of fear and anxiety when facing death-related concerns.

Rolls (2018) argues that emotion serves another important function in humans. Humans have evolved as goal-seeking creatures and this is in the interest of our genes. These genes specify what we determine as rewarding or punishing and this is an efficient way to guide goal orientated or purposeful behaviours toward survival and reproductive success. However, Rolls argues that in addition to the gene-based goal-directed system, humans have evolved a separate rational system (consciousness) that can work toward different goals to those of genes. These can be in the interest of the individual or phenotype as

opposed to the genotype (Rolls, 2018: 74). Humans can predict, simulate and plan for the future setting long term self-interested goals. As mentioned, an explicit system is highly adaptive because it can modulate the implicit systems when they are insufficient to account for circumstances, such as novel threats. In light of these ideas, Rolls explains that it is interesting and thought-provoking to assess what impact our rational system has on emotions or how emotions might impact this system. For example, emotions like grief and sadness can be interpreted as having a long-standing effect. In the case of the loss of a loved one, this occurs within a system that can plan for the future, and thus as having a long-term detrimental effect on the individual. In addition, Rolls notes that our flexible higher-order systems are often in conflict and competition with our implicit systems. Once again, a good example is habitual drug use where people obtain an immediate reward despite the negative consequences to health (Rolls, 2018: 74-75). Furthermore, because emotions affect the evaluation of experiences, memories and produce persistent motivation. This makes it possible to argue that emotion plays a role in how people assign personal meaning to experiences; a view that coincides with the existential.

Hence it is plausible that emotion serves two more important functions in humans that apply to the needs of our personal explicit conscious systems.

- 1) *Emotions may facilitate how humans assign meaning to experiences.* Due to the effect of current moods on cognitive evaluations of events and memories, and because emotions help produce persistent motivation. They likely play a role in what humans deem personally meaningful and important. In contrast, persistent negative feelings like that of anxiety would have a detrimental effect.
- 2) *Emotions may facilitate individual purpose.* Emotions facilitate implicit goal-directed behaviours toward obtaining rewards and avoiding punishments. When taken in conjunction with our higher-order rational system which pursues self-interested goals, this may provide the basis for individual purposeful action that is in the interest of the phenotype (Rolls, 2018).

With these ideas from Rolls in mind, what emotional effects might mortality awareness exert on the individual? Initially and speculatively it makes sense to assume that morality awareness could result in anxiety because it poses a distal threat to humans. This anxiety can be interpreted as having a long-standing effect and would possibly motivate behaviours that mitigate this feeling. In addition, due to the link between emotion and personal meaning this longstanding effect could culminate in a nihilistic or absurdist stance. Also, the intensity of the reinforcer and proximity would affect the intensity of emotional experience (anxiety, dread, fear or terror), and might result in more automatic responses being invoked such as fight or flight. Due to the longstanding effects of mortality awareness it is further plausible that long term goals and deliberate plans may result. These could involve avoidance and suppression or aim toward continued survival, and would likely involve Gregorian interaction. Moreover, it is possible that a person's conscious explicit plans could conflict with their implicit responses because they may be in the interest of phenotype not the genotype (Rolls, 2018).

Heidegger and Camus sought the authentic approach to mortality. They were not happy with the avoidance and suppression of death awareness, rejecting religious and other cultural views that mitigate it. In support of this one can argue that religious ideas of immortality are in the interest of the phenotype because they protect the self from potential dread/anxiety of mortality awareness. In contrast the existentialists believed this anxiety serves important functions in humans and that it shouldn't be suppressed. This is because it directs humans to what is of greatest value in their lives in the present, such as close relationships. As Camus noted, the avoidance of death-related concerns could result in unrealistic ambitions. In the next section anxiety and fear take centre stage and the reader will see that they serve important functions in humans when it comes survival. This is because they motivate specific behaviours that avoid premature death (Mobbs, 2015; 2018). However, whether the anxiety caused by mortality awareness is as functional as the existentialist would have us believe requires additional research.

In summary, emotions are an important part of human existence; they serve a variety of useful functions and they make our lives meaningful and purposeful by directing us to

what is rewarding and important in our lives. Emotions are biological functions that reinforce and characterize environmental stimuli resulting in the appraisal of situations and directing the selection of responses. This is highly useful, as it helps facilitate the flexibility of behaviour in organisms who have inherited them as a trait. Furthermore, emotions operate via the mechanism of evaluation (rewards and punishments) resulting in clear goals for action and selection of behaviour. When taken in conjunction with memory they may even facilitate long-term goal-directed behaviour. This process involves modularity systems and learning systems which manage the behavioural strategies and regulate emotions. In humans, due to the effects of current moods on cognitive evaluations, memories and motivation, emotions might play a substantial role in how we assign personal meaning to experiences. In conjunction with our higher-order cognitive system they may even facilitate individual purposeful action. Hence one can conclude that there are similarities between the views of Rolls and those of Heidegger. Furthermore, it certainly appears that modern day science has a lot more to say about human emotional experiences than the existentialists thought possible. However, whether anxiety has such a fixed role as Heidegger and the other existentialists envisioned requires further research.

2.6) THE ROLE OF EMOTION IN SURVIVAL

Rolls offers a compelling account of the adaptive value and functions of emotions. He also provides interesting insights into the role emotion plays in individual meaning and purpose. I explained that emotions are motivating, reinforcing, meaningful, require appraisal, elicit automatic responses and result in physiological arousal that prepares the body for action. I also mentioned that emotional responses are managed by modulatory and learning systems. These components of emotion form a unified process in individuals that unfolds in the face of challenges, dangers and opportunities (LeDoux, 2012: 654). How then do emotions function in the face of threats to life? If the circumstances are life-threatening, it is clear that emotions of anxiety and fear stand out. I explained in section (2.3) that it is a major goal of the nervous system to facilitate behaviours that promote the avoidance of threats and it is a major function of emotion to assist in this. I further noted that the distance and the type of threat affect which responses are invoked. The focus now is on the functions of emotion in survival.

The general neuroscientific consensus is that many of the aforementioned components of emotion have evolved, are innate, and are shared with many other animals. Accordingly, McNaughton and Corr (2004) proposed that two sets of neural circuits exist that are associated with two defensive systems.

- 1) *Defensive approach system*, which has been allied with anxiety, presumes the threat is distal, and has often been observed in foraging. The animal that is engaged in foraging will use this approach system to check its surroundings and determine if a particular stimulus is a threat or food, and anxiety functions by interfacing that there could be possible threats. Typically, animals employing this system are very alert, have heightened visual awareness, increased heart rate and exhibit sweating.
- 2) *Defensive avoidance system*, which has been associated with panic and fear. This system is activated when the threat is moving, is nearby, or is attacking. The

physiological arousal includes very rapid heart rate, intense sweating and alertness associated with a large release of noradrenaline. The typical responses are flight and fight (McNaughton and Corr, 2004: 292-295).

Although human brains are more sophisticated, the presence of these two neural circuits, allied with anxiety and fear, has been supported by neuroscientific research using fMRI employing an avoidance model where the goal was to actively evade an artificial predator, and the results supported the views of McNaughton and Corr (Mobbs et al., 2015: 6). These evolved neurological components and their corresponding physiological arousal, have commonly been associated with emotion, and are found in a variety of species including dogs, rodents, primates and humans. These mechanisms prepare the body for action. The cognitive evaluative component, which is also evident in many of the aforementioned species, provides the organism with a method for interpreting the value of environmental stimuli as positive or negative. This is reinforcing and provides the animal with clear goals for action (Rolls, 2018). In this sense, anxiety and fear help determine whether the animal is in a threatening situation and how threatening the situation is. Blanchard et al. (1986) showed that the distance to the threat affects which response is evoked in the organism. Thus, many of the past researchers have proposed that proximity is likely to result in an explosive attack, panic and fear. In comparison, large distances result in freezing and non-defensive behaviours. In general, the idea is that distal threats are more likely to result in anxiety, and imminent threats are most likely to result in fear.

However, some recent theorists like LeDoux and Mobbs argue that we need to rethink our views on human emotions in comparison to that of other animals. They argue that it is unclear whether animals experience emotions in the sense that humans do. LeDoux argues that the subjective emotional experience or the consciously appraised feeling is the essence of an emotion and that the bodily and brain physiology are merely indirect indicators of these inner experiences (LeDoux and Hoffman, 2018: 1). Although we share these older neurological structures, they are not causally related to emotional feelings. However they do contribute to these emotional states. Rather the function of survival

circuits is to direct behaviour in situations that may be dangerous or opportunistic (LeDoux, 2012: 655). Even though many animals possess these innate survival circuits, it is not clear whether they subjectively experience anxiety and fear in the sense that humans do. However, the physiological arousal associated with these circuits is connected to the human appraised feelings. LeDoux's solution is to focus on threat-induced defensive reactions to distinguish feelings from brain/bodily responses. He claims that survival circuits, although associated with emotions, occur independently of them. Thus, the human feelings of fear and anxiety only occur when individuals consciously appraise the circuit activation. In support of this he argues that certain types of defensive behaviours also correlate with different brain circuits including those associated with appraisal and deliberate cognition (LeDoux and Daw 2018: 2).

LeDoux argues that fear is a cognitive process that is often associated with higher-order feelings of terror and despair, and thus fear arises out of consciously appraised experiences, rationality and deliberation, and emerges not merely from fixed circuits, but also from brain structures involved in cognition. However, these primitive circuits play a foundational role and influence the higher order circuits. Hence the conscious feelings humans experience work in conjunction with the defensive survival circuits (LeDoux, 2012: 665). This theory proposed by LeDoux leaves open the possibility that some conscious animals may experience emotions, albeit differently to humans. He concludes that fear and anxiety in humans cannot be merely understood in terms of defensive survival circuits. However, these circuits are interconnected and even in competition with our higher-order cognitive systems.

Mobbs (2018) shows that many of LeDoux ideas are mirrored in Fanselow and Lester's 'Threat Imminence Continuum'. In light of this, Mobbs explains that fear and anxiety are often not clearly defined in neuroscience and that better definitions are required. He argues that fear takes many forms, ranging from the sudden reactions to proximal danger, to the slow dread associated with an abstract distal threat. When fear is defined this way, it is clear that it can arise from different neural circuits, thus supporting of the view of

LeDoux. Therefore, he divides fear and anxiety into four core categories (Mobbs, 2018: 34).

- 1) *Reactive fear*: Associated with proximal imminent threats and fixed defensive survival circuits, fight and flight are the norm. The goal of this type of fear is to make fast effective survival decisions.
- 2) *Cognitive fear*: This occurs when an organism is under direct threat but has time to comprehend and subjectively appraise the situation. This type of fear is associated with fixed defensive survival circuits of FFF and may even proceed or cause reactive fear. However, this fear implies cognitive appraisal and is often defined as a conscious feeling of panic and terror. The key point is that there is sufficient time to organize and strategize escape. This mostly occurs during post-encounter circumstances.
- 3) *Anticipatory anxiety*: Associated with distal potential threats in safe or pre-encounter conditions. Anticipatory anxiety is an apprehension of danger with the absence of direct threat but includes the possibility of encountering the threat in the future. Often results in avoidance and precautionary behaviors and is associated with flexible intelligent defensive behaviors.
- 4) *Encounter anxiety*: Assumes the threat has been encountered and is distal, but is not attacking. However, this implies that there is a possibility that the threat will direct its attention toward the organism and attack, often resulting in amplified urgency to avoid the situation (Mobbs, 2018: 34-36).

Mobbs differentiates anxiety from fear by the properties, perceived intentions and distance to the threat as captured in the 'Threat Imminence Continuum'. Many of these ideas are also reflected in Davis et al. (2010) whose study found that fear is prompted by imminent danger, resulting in automatic defensive responses. In comparison, anxiety is often elicited by less predictable or distant threats. Davis and colleagues argue that anxiety is a future-oriented mood state that is long lasting and triggered by potential and distal threats (Davis, 2010: 24). However, these future-orientated fears facilitate cognitive avoidance strategies that provide long term protection from dangers. Humans are lucky

enough to possess an explicit cognitive system that allows us to remember the adverse situations experienced and simulate and predict future encounters (Mobbs, 2018: 34). These skills allow us to develop strategies to avoid and even prevent future dangers.

Mobbs and associates propose that the overriding goal of the nervous system is to minimize surprise, predict and even prevent dangers (Mobbs et al., 2015: 1). In humans, the threat type needs to be modelled from abstract to imminent to properly grasp how we respond. For example, in the preferred stage and pre-encounter stages, humans can prepare for and flexibly focus on potential dangers. The prediction and simulation of threats are associated with increased alertness, vigilance and environmental surveillance. These pre-encounter avoidance behaviours are allied mostly with anxiety. In many cases, predictions occur through Skinnerian reinforcement learning which is noticeable in both animals and humans (Mobbs et al., 2015: 8). However, some of our more complex predictions and avoidance behaviours are likely to be associated with Gregorian skills obtained through cultural interaction. Our advanced avoidance behaviours are aimed at minimizing proximal threats that are most likely to cause death, which are aligned with panic and fear, and thus also aims to regulate these emotions.

To summarize fear and anxiety are mostly associated with threats to life. These threats can be distal, imminent and even abstract. The type of threat and distance affects whether anxiety or fear are appraised at variant intensities. These emotions function by interfacing the environmental stimuli in the form of a cognitive evaluation. This motivates specific behaviors toward avoidance, and, if sustained for long period of time, may even result in long term individual goals being set. These emotions further function by reinforcing memory so that one can learn to reduce encounters with a particular threat. Humans make use of their Gregorian abilities to avoid, predict, simulate and even prevent dangers by engaging with tools and using them to protect themselves. Finally, these emotions are managed by modulatory and learning systems that help regulate them and influence the survival strategies.

With these additional ideas of Mobbs and LeDoux in mind, what emotional effects could we expect to result from mortality awareness? As already mentioned, it's likely that this awareness results in anxiety because mortality poses a distal threat to humans. This would motivate flexible avoidance behaviours that would likely involve Gregorian tools such as belief structures and meaning frameworks. Humans make use of skills such as prediction, planning and learning to avoid and prevent future dangers. In light of this it seems humans are biologically predisposed to try to avoid or even suppress this awareness, which is supported by the findings of TMT (Appendix). However, this was a position the existentialists were worried about. The focus of the next section is emotional regulation, and, as the reader will see, how humans appraise emotional responses needs to be regulated, because a response that is out of proportion to the stimulus would have a negative effect on the individual. Rolls has shown that some emotions can have a long-standing effect because they exist within an explicit conscious system that can predict and plan for the future. In this sense the anxiety or fear caused by mortality awareness could potentially result in a nihilistic or absurdist stance. In an attempt to mitigate mortality awareness, it is further plausible that long term goals and deliberate plans may result. These plans could involve avoidance and suppression or aim toward continued survival. Due to the negative emotions and longstanding effects of mortality awareness it is reasonable that it needs to be managed.

2.7) WHY EMOTIONAL REGULATION IS IMPORTANT

Owing to the overwhelming diversity of threats humans and animals have encountered in their evolutionary history, the need for a flexible system that manages emotions and behaviour is clear. Such a system would flexibly assign responses to specific circumstances. Emotions need to be regulated because an emotional response that is out of proportion to the stimulus can have a negative effect on health. In humans the ability to consciously control emotions and behaviours that inhibit adaptive functioning is critical to mental health and survival (Smoski et al., 2015: 1187). In humans, cases of dysregulated emotion are characteristic of an array of mental disorders including anxiety, depression, and post-traumatic-stress-disorder. In such disorders, biological, cognitive and behavioural responses to stimuli are dysregulated and dysfunctional (Smoski et al., 2015: 1187). In contrast, regulated emotion is attuned to relevant situations and this is an adaptive advantage because this optimizes the functionality of behaviour relative to the circumstances at hand (Price and Hooven, 2018: 1). In humans, regulated emotion helps us function better in our environment and adapt our behaviour in line with our goals and the situations we encounter.

How then are emotions regulated? The short answer is that emotions are regulated actively or passively by modulatory and learning systems. As Rolls, Levy, Glannon LeDoux, and Mobbs among others show, human behaviour needs to be understood through both implicit (fixed) and explicit (conscious) systems, both of which modulate behaviour. Modulatory systems include, but are not limited to, cognitive appraisal, reappraisal, regulation, suppression, interoception, motivation, metabolic drives, and memories of past encounters (Mobbs et al., 2015: 12). Concerning survival, these systems function by managing the survival circuits in a top-down manner and influence the survival strategies humans and animals employ. To date most of the neuroscientific research has focused on cognitive reappraisal and suppression as active regulation strategies. (Smoski et al., 2015: 1187).

In terms of survival, cognitive reappraisal and suppression are two clear ways of consciously controlling emotions and behaviour (Mobbs et al., 2015: 13). Suppression is defined as the action of keeping the information about the threat and the threat itself out of mind. This would regulate emotions associated with the threat. In contrast, reappraisal functions by altering the way we think about threats. Cognitive reappraisal is defined as a type of cognitive change that involves the reinterpreting of an emotion-eliciting situation to alter its emotional impact (Gross, 1998). For example, in the treatment of PTSD the patient is trained to reframe the way they perceive and think about the traumatic event, which alters the emotional response. In humans, the Gregorian ability to learn and interact with culture by using its tools can assist in both cognitive reappraisal and suppression of threats. Suppression and cognitive reappraisal are most likely to occur during threat assessment and prediction when threats are distal. As threats move closer and become imminent then fixed defensive responses of fight and flight are likely to be implemented, however, these fall outside of conscious control. (Mobbs et al., 2015: 13-14).

Another modulatory process that is worthy of mention is interoception, which relates to stimuli produced within the organism. Mobbs et al. (2015) show that internal signals from physiological and hormonal systems function as important contexts that influence decision making. In light of this, one can argue that any changes in mental states, including representations of the self, can exert a profound contextual effect on emotional processing and behaviour. This means that the self, which includes internal feelings of self-esteem, values and personal goals, can influence and modulate the brain mechanisms that drive behaviour, including those involved in emotional processing. Furthermore, hormonal levels and metabolic drives also affect how individuals interpret and appraise the emotions they experience. For example, research in neuroscience has shown that hunger can influence survival strategies and emotions (Mobbs et al., 2015: 13-14). Hence one can conclude that an interoceptive awareness of one's physical and mental states can help regulate emotions and there is evidence to support this. For one, the tool of mindfulness is a good example that is used in psychotherapy and shows how interoceptive awareness can help regulate emotions. In contrast, there is evidence that

shows links between poor awareness of sensory information, or interoceptive awareness, and problems with emotional regulation (Price and Hooven, 2018).

Although the majority of studies have focused on cognitive reappraisal and suppression, a few recent studies show that the strategy of acceptance is also effective for downregulating negative emotions in people (e.g. Smoski et al., 2015; Troy et al., 2018). Smoski et al. (2015) show that acceptance can modulate anxiety in persons suffering from PTSD. Although the study found that reappraisal to be the most effective strategy, both showed similar patterns of prefrontal cortex activation associated with downregulation (Smoski et al., 2015: 1192). During reappraisal the meaning of the emotional stimulus is reinterpreted. In contrast, acceptance has mostly been used within the concept of mindfulness and the broader concept of meditation, which have recently been popularised within psychology. Within mindfulness, emotional acceptance requires actively focusing attention on one's current mood, physiological arousal, associated stimuli, memories of past experiences and future-orientated thoughts and goals, while maintaining a non-judgemental stance. In individuals who have undergone mindfulness training, the neural circuits associated with regulation were activated and a downregulated effect was observed. According to the study reappraisal and acceptance both reduce physiological arousal associated with heightened anxiety. However, reappraisal was found to be better than acceptance in downgrading negative effects (Smoski et al., 2015: 1187-1194).

In humans, our innate neural equipment prepares us to react to the diverse ecological dangers we may encounter. However, it is our experiences that are responsible for shaping how we use this neural equipment. Reinforcement learning allows us to continually update our responses and prepare even better adaptive interactions with the world. In terms of survival, our learning systems modulate both our fixed and flexible defensive systems, including FFF and higher-order conscious systems such as prediction and planning. This helps us prepare and flexibly adjust our survival strategies. Skinnerian trial and error encounters with threats that do not result in death provide valuable information that results in the increased ability to avoid future encounters with the same

threat. Learning manages the survival strategies that animals and humans employ and promotes adaptability (Mobbs et al., 2015: 14-16).

What about mortality awareness? Heidegger and Camus argued for acceptance as the best strategy to face our mortality. However, they were sceptical that humans could truly achieve this. They further believed that the suppression and/or avoidance of mortality awareness is a cause for concern and they presented valid reasons to support this.

Tolstoy's story illuminated one cultural view on its suppression. In addition, Camus argued that avoidance of mortality awareness via religious conceptions of immortality resulted in unrealistic ambitions and removed value from the present (Camus, 1941). The existentialists believed that the cognitive reappraisal or suppression of death-related concerns hurt humanity. However, as I have shown there is evidence that supports the strategy of acceptance for downregulating negative emotional states, a view I believe existentialists such as Heidegger and Camus may have been interested in. However additional research is required to confirm whether acceptance is an effective coping mechanism. Although the existentialists (with the exception of Kierkegaard) rejected religious cognitive reappraisal, the research shows that reappraisal is more effective than acceptance for downregulating fear and anxiety. This is a position that they did not take into account. Hence, based on the current research, cognitive reappraisal may be the best defence we have. A view that is reflected in TMT. However, I remain sceptical as to what our best defence maybe, and due to the inevitable and unavoidable nature of mortality I believe a case for acceptance as a coping mechanism can be made, and this I discuss in section (3.2).

2.8) HOW HUMANS FACE THREATS TO LIFE

So how do humans respond in life threatening situations? The literature shows that humans make use of a combination of fixed and flexible traits that interact and compete with one another, and our responses are similar to other mammals. Emotion is a trait that improves our flexibility by filtering our interaction with the world in terms of an evaluative judgement. This is useful, meaningful, reinforcing, motivates behavior and even facilitates long term purposeful goals. In the face of threats to life humans feel the emotions of fear and anxiety at variant intensities and this is beneficial because they motivate particular behaviors toward avoidance and continued survival. In contrast a dysregulated emotional response would have an aversive effect. I explained how the threat context and type of threat affect which responses are invoked. Accordingly, the threat type needs to be measured from abstract to imminent as this affects the emotions and behaviors elicited or emitted. Predators are a pervasive environmental threat which has resulted in the evolution of the fixed defensive traits. Although modern humans rarely encounter predators, these fixed neural mechanisms have been co-adapted to deal with threats from our own species, including social and abstract threats. These defensive mechanisms are foundational; however, they are insufficient to account for human defensive behaviors and emotional states. Humans and other intelligent mammals make use of higher order cognitive systems in conjunction with these older brain structures when interpreting emotions and threatening situations. This includes learned, goal directed, deliberate and future orientated actions, which require a level of foresight and cognition bound to flexible portions of the brain. How the human brain responds to threats needs to be understood in terms of both fixed and flexible defensive mechanisms and both need to be taken into account if we are to understand psychological disorders and overall well-being. Although these brain mechanisms work in conjunction and even competition with one another, our fixed innate responses to natural dangers form the basis from which we address our more complex social problems.

Human brains have undergone some of the same gradual evolutionary processes as other mammals and this is why we possess some of the same neural structures. Just like other

mammals we possess the startle reflex and FFF. Yet, most agree that the human neural circuits are in fact quite unique. Paraphrasing Mobbs (2018), this uniqueness arises from our large expanded cortex, which includes plastic biological equipment that enables our minds to project, plan and simulate near and distant futures, experience emotions, and even cognitively regulate them. The current consensus is that these older neural structures combine with the newer ones to form the more complex neural circuitry that is evident in us. In terms of survival, the view is that this circuitry evolved to maximize fitness by providing a more flexible platform for reacting to and anticipating, predatory, social and environmental threats, with the general aim to avoid such encounters and reduce the negative emotions associated with them (Mobbs, 2018: 1-2).

As proposed at the end of section (2.4) a useful way to think of the human brain is in terms of five levels similar to that of the ‘Tower of Generate and Test’ that are interconnected in various of ways. It is useful because it provides a simple and coherent way to show the various levels of agency and neural mechanisms humans employ.

- 1) *Fixed level*: Fixed innate foundational equipment and correlates to fixed physiological arousal, responses and behaviours i.e. FFF and the startle reflex.
- 2) *Learning level*: Flexible learning equipment which works through Skinnerian reinforcement.
- 3) *Pre-selective level*: Consistent with an internal capacity and the ability pre-sort actions before acting and emit goal-directed behaviours. The goals are associated with primary reinforcers. Humans and animals behave to obtain rewards or avoid the punishers. One example is behaviours toward the avoidance of pain.
- 4) *Meta-level*: Humans are aware of themselves their actions, can project themselves into the future, internally think, hypothesise, appraise, intentionally act, create meaning, exhibit emotions and cognitively regulate them. Individual humans are capable of explicit deliberate actions that benefit themselves and not necessarily their genes.
- 5) *Cultural level*: The final level is captured by the ability to engage with other people, language and culture. Humans interact with others and culture, importing

mind tools to further enhance their pre-selective skills. However, this can be in the interest of the individual person (phenotype) and not the genotype. Such as personal desires for meaning and fulfilment.

All five levels are interconnected and even in competition with one another, and together they form a network that accounts for much of our brain mechanisms and behaviours. Other creatures only exhibit portions of this network and this correlates with their behaviour patterns. In terms of survival these levels combine to provide behavioural flexibility in the face of novel and recurring threats. In terms of this model, consciousness functions by informing and modulating the other levels. In humans, emotions interact and are interconnected with these levels because they are motivating, reinforcing, and can result in fixed mechanism being invoked such as fight and flight. This is meaningful and useful because they filter the significance of environmental stimuli in the form of an evaluative judgement and reinforce the positive or negative outcomes.

In a similar fashion to the model I have described, LeDoux and Daw (2018) propose a hierarchical taxonomy of six dimensions of defensive behavior that are associated with different neural circuit activation. This taxonomy includes both learned and unlearned behaviors together with conscious and nonconscious deliberate actions. This model includes and extends many of the views of Dennett, Mobbs and Rolls mentioned from sections (2.2-2.7).

A Defensive Taxonomy

- 1) *Innate species-typical reflexes*: The response of startle is a good example, which is implicit and elicited by specific threatening circumstances.
- 2) *Fixed reaction patterns*: FFF are the norm, similarly to reflexes these are implicit, and are elicited by threat context and imminence. These defensive reactions although innate can be modulated by learning.
- 3) *Defensive habits*: Habits are formed when an association is created between a conditioned stimulus and an aversive outcome. In conditioning studies FFF can

come under the control of a conditioned stimulus and avoidance behaviors may persist despite lack of evidence that harm will come.

- 4) *Action-outcome behaviors*: These defensive behaviors are goal directed and based upon learned/conditioned action-outcome based contingencies where the outcome is a valued goal. These types of behaviors are emitted from within the organism as opposes to being elicited from triggers. For example, avoidance behaviors based on a history of harm.
- 5) *Implicit deliberate actions*: These types of defensive behaviors are goal-directed and consist of unconscious deliberation toward specific valued outcomes. For example, avoidance behaviors that result from implicitly anticipating a potentially dangerous event.
- 6) *Explicit deliberate actions*: These behaviors are goal-directed, yet imply conscious deliberate prediction and planning toward valued outcomes. For example, a conscious feeling of anxiety that motivates an intentional plan to escape, and to mitigate or avoid present and future harm. The need to reason/think about the possible consequences of actions is evident in numerous circumstances pertaining to humans. This is particularly evident in novel situations where past experiences fall short in providing useful information (LeDoux and Daw, 2018: 2-5).

The defensive behaviors in these categories occur in varying degrees in different organisms. All these behaviors can be mediated by learning and modularity systems; in humans this includes the conscious cognitive control systems of appraisal, reappraisal, suppression and acceptance. These behaviors are implemented depending on the type and imminence of the threat and their corresponding neural mechanisms are layered on top of one another often combining together, with innate reflexes and fixed reaction patterns forming the foundation of this taxonomy. Hence, these systems are interconnected and overlap with one another, and over evolutionary time have formed the complex neural system present in us. Crucially, emotion under LeDoux view involves consciousness and cognition, which implies conscious appraisal of the survival circuit activation (LeDoux, 2012; 2018). In the case of anxiety, anxiety motivates intentional plans to avoid present

and future harm. Furthermore, humans continually update their behavioral responses via Skinnerian learning and can potentially control aversive associations via active regulation processes such as cognitive reappraisal, suppression and acceptance.

We make use of our Gregorian abilities to flexibly avoid, predict and prevent future dangers, as well as suppress and reappraise negative emotional states. Although we have a combination of fixed and flexible neurological architecture. It is clear that we rely more on flexible defensive skills towards avoidance of danger. Importantly humans have autonoetic consciousness which allows us to project ourselves into the future and facilitates many of our other advanced skills including predicting, planning, simulating and hypothesizing. We employ these skills mostly in the preferred and pre-encounter stages where threats are distal. Proximal and imminent threats are the most likely to result in death and thus are to be avoided, and this is an optimal survival strategy. Humans learn from the sensory environment including culture. Interaction with culture works in conjunction with our other skills to develop sophisticated defensive behaviors, and helps us regulate the associated emotions. In today's world we make use of technologies such as alarms, motion sensor cameras and even belief structures to avoid the various environmental and social threats we encounter.

Mobbs et al. argue that it is the goal of the nervous system to reduce surprise and optimise actions by predicting the sensory environment. Such as simulating possible encounters and creating prevention strategies to avoid threats. Hence, Mobbs et al. (2015) propose a Survival Optimization System (SOS) composed of five defensive strategies that are central to human survival and are implemented in the face of threats at varying distances coinciding with the 'Threat Imminence Continuum' (Mobbs, 2015: 6).

Survival Optimization System

- 1) *Prediction-* Associated with preferred and pre-encounter stages toward avoidance and minimising surprise, and is mostly associated with anxiety. This allows

- humans to flexibility prepare for potential dangers. Past memories of experienced threats are used to simulate the future in order to avoid future encounters.
- 2) *Prevention*- If threats can be predicted it is then possible to prevent them. Prevention is associated with preferred and pre-encounter stages toward avoidance. Prevention strategies include, altering the environment, as in the use of tools and technology, including alarms, walls and belief structures.
 - 3) *Threat orientating*- If a potential threat has been detected, the post-encounter stage will be initiated and a set of predictable defensive strategies will be instigated that typically coincide with freezing toward avoidance. Heightened vigilance is typically observed in both animals and humans and is linked to early detection which aids in avoidance.
 - 4) *Threat assessment*- Coincides with freezing and presumes the threat is distal and detected. Humans have the ability to evaluate the context in which the threat is encountered and thus can appraise the level of danger, this also affects whether anxiety, fear or stronger higher order emotions such as terror or despair are invoked. This allows us to select our response based on what level of danger we are in.
 - 5) *Rapid Reaction*- If humans find themselves in the circa-strike stage then the threat cannot be avoided. Fight or flight are likely to be evoked and are mostly associated with panic and fear. However, the faster we react the better because this increases the probability of escape. For example, if a person is aware of safe haven that they can flee to, then this will increase the chance of escape and the speed of response. Predicting the actions of the threat also aids in rapid response (Mobbs et al., 2015).

Once again, it important to note that these five strategies are influenced and managed by modulatory and learning systems, which are integrated with emotional regulation and the survival strategies, and are actively involved in the reconfiguration of survival circuits in a top-down manner (Mobbs et al., 2015: 13). Humans can actively modulate their defensive behaviours and can potentially control adverse emotions through appraisal and reappraisal of the threatening stimuli. As mentioned in section (2.4) such an explicit

system is adaptive because it can inform our implicit mechanisms in situations where they are insufficient. In terms of the possible conflict between the explicit and implicit systems, this is evident in instances of confabulation where one's values and implicit/learned responses do not correlate. One example is that of stereotypes, another is the denial associated with addiction and mental disorders (Levy 2018: 118-121).

In synthesis, I propose an integrative defensive behavioural model. The model includes features from Mobbs, LeDoux, Rolls, Dennett, Fanselow and Lester, and the other work reviewed thus far; and extends it in an attempt to provide a more comprehensive framework for understanding how humans respond in life threatening situations and shows the role emotion has to play. This model should allow for the prediction of human behaviours in various threatening situations. The focus of the next section is mortality awareness where I attempt to apply this model.

Integrative Defensive Model

- 1) *Fixed defensive behaviours*- Are foundational and elicited from proximal imminent threats where there is insufficient time to think and prepare avoidance behaviours. Reflexes and rapid reactions are the norm i.e. startle, fight and flight. High intensity reactive fear is the appraised emotion that prompts the body to quickly react. These defensive behaviours although innate can be modulated by learning.
- 2) *Learned defensive behaviours*- These include habits that have been formed. Learned defensive actions are linked together with fixed reaction patterns and can come under the control a conditioned stimulus. These behaviours are elicited from direct recurring threats in post-encounter situations and often proceed fixed defensive behaviours. Cognitive fear is the appraised emotion but often results in reactive fear that has been reinforced by past experiences.
- 3) *Elicited outcome based defensive behaviours*- These behaviours coincide with freezing and are elicited from potentially threatening pre-encounter and post-encounter situations where danger is present but there is sufficient time to assess

the threat context and deliberate. Humans have the ability to appraise the level of danger and assess possible outcomes and this modulates whether anxiety, fear or higher order emotions such as terror are invoked. Usually this results in precautionary avoidance behaviours but may proceed reinforced or fixed behaviours and associated emotions.

- 4) *Emitted outcome based defensive behaviors*- These types of behaviors are goal directed but are emitted from within as oppose to being elicited from environmental triggers. Consist of unconscious deliberation toward specific valued outcomes. These include goals that are set by internal need states, such as hunger and even self-esteem. A good example is avoidance behaviors based on a history of harm. These behaviors are associated mostly with anticipatory anxiety and often result in precautionary behaviors. These occur in preferred situations where threats are distal or potential.
- 5) *Deliberate defensive behaviours*- Humans perform intentional actions toward goals such as avoidance, prevention and long term continued survival. Imply conscious constructive deliberation, planning, simulation and prediction and are associated mostly with a conscious feeling of anxiety and active modulation and emotional regulation processes. This applies to distal threats where there is adequate time to think and strategize about possible defensive behaviours. This also applies to situations where there is an apprehension of danger without direct threat. The need to think and deliberate is particularly evident in novel or abstract threatening circumstances where past experiences and implicit reactions are insufficient to direct behaviour.
- 6) *Defensive behaviours using tools*- Use of tools and technologies toward avoidance and prevention. Humans make use of technologies to prepare for and prevent dangers. These tools are also used to defend against abstract threats and help regulate emotions, for example religions. The interaction with culture presumes threats are distal or absent but the tools are used when threats become imminent. These types of defensive behaviours are associated with anticipatory anxiety.

All six levels of the model are mediated by learning and modulatory processes and are integrated with emotional regulation and the behavioral strategies we employ. In terms of this model emotion functions as a filter that interfaces the value of stimuli, motivates and reinforces specific behavior, and is involved in the setting of long-term individual purposeful goals. The emotions of fear and anxiety move on a gradient from low to high intensity which correlates to reinforcer intensity, the different stages of imminence and threat type. Importantly, the appraised intensity of the emotion or the imminence of the situation affects whether fixed reaction patterns or combination of the above behaviours are implemented. For example, if the appraised emotional intensity increases this will result in a top-down mediation of behaviors and associated brain mechanisms. Humans have the ability to consciously regulate emotions and are capable of actively modulating the brain mechanisms which drive behaviour. Our minds intervene to inform the other levels so we can flexibly respond to the new context. Learning systems work conjunction with our conscious control systems to continually update our behavioral responses. However, there are examples where one's consciousness and representations of the self-conflict with one's implicit mechanisms and this can have a negative effect on health.

I now have a model where the type of threat can be fed into and likely behaviors can be predicted. Let's look take a look at the example of the distal threat of potential illness that humans commonly face and would usually be reinforced by past experiences of illness and a conscious feeling of anxiety. This threat type could be elicited from an environmental cue causing the memory of past experiences to flood the individual's mind with resulting anxiety. The person in question would likely initially respond with freezing and associated physiological arousal such as increased heart rate and sweating coinciding with a distal threat. The threat would then be filtered through learned behaviours, habits and implicit goals. Followed by threat assessment and orientating involving our conscious cognitive system (simulating, planning and predicting) because there is sufficient time to strategize a defense. The likely result is outcome-based intentional precautionary avoidance or preventive behaviors that involve deliberation and engagement with cultural tools such as preventative medicines. This would mitigate the

threat and regulate anxiety. From this example it is clear that the different levels are interconnected and this can be shown in a myriad of ways.

In the 2019/20 Covid-19 pandemic a variation in defensive responses has been observed amongst people. Behaviours have been seen that correlate to both a distal and proximal threat. A virus is different to other threats because it is invisible to the naked eye. This makes the assessment of the threat rather difficult. Individuals have to rely on the information from others to identify whether the threat is proximal or distal. For example, panic buying has been observed in some individuals even though there is little or no infections in the person's region. Such behaviour is likely associated with cognitive fear and fixed reaction patterns that correlate to an imminent threat. However, in some individuals the threat of the virus has been perceived as far more distal or even absent, some even believe that virus is a government conspiracy. These variations in behaviours can be explained because how people appraise their circumstances affects how they respond. If the appraised emotional intensity increases this will result in top down mediation of responses. From these examples the modularity effect of the mind on behaviour can be observed as well as the influence of proximity and emotional intensity. This also includes instances of confabulation where individuals' personal interests, values or convictions are conflicting with the interests of survival and genes.

It makes sense for humans to rely more on their flexible defensive systems for survival because they help us avoid and prevent dangers. How then would a scientist expect a human to respond to a more abstract threat like that of mortality awareness under the views just presented? Can mortality awareness be classed as a threat and if so what level of danger according to Blanchard's view would mortality awareness fall under? Is it possible to place mortality on the 'Threat Imminence Continuum'? Would we respond with fixed or flexible systems or would it be a combination of both? Which of the five survival strategies as seen in Mobbs would we make use of? What defensive behaviors under LeDoux and Daw's view would be elicited or emitted? If I was to feed mortality awareness as a threat into my integrative model what would the result be?

In section (1.5), I explained that Heidegger and Camus, believed that mortality awareness does not merely affect humans in the distal future but also in the present, because death can come at any moment and for any number of reasons. They also believed that humans weren't facing up to this fact of life. These authors presented an attack on the cultural views of death and mortality, and it seems that historically humans have been pushing death aside. If you were to ask someone about death, most would simply present the cultural view as a fact of life, but the existentialists believed that most people never truly confront that they themselves must eventually die. In addition, the fact that death can come any moment can be argued undermines religious or other views on fate or a fulfilled life, because there are many examples of unexpected chance deaths. The existentialists argued that humans have dealt with mortality awareness by avoiding, suppressing and even denying its reality, which is a cause for concern. It is a natural human need to seek safety and security, which makes avoidance and suppression seem like logical responses. However, it is important to remember that the existentialists were not happy with these types of responses, and believed humans were only facing their mortality in a superficial sense. The solution that was backed was acceptance, but they were skeptical that people could achieve this. However, as I have shown in the previous section a case can be made for acceptance as a coping mechanism, but additional research is required to confirm or reject this.

2.9) AN EVOLUTIONARY AND BRAIN SCIENCES APPROACH TO MORTALITY AWARENESS

Section (2.8) culminated in an integrative defensive behavioural model that accounts for much of our behaviours in the face of threats to life. I have presented a fairly comprehensive image of what an evolved human is and I now have a solid framework from which to begin assessing how we are biologically predisposed to respond to mortality awareness. I have shown the defensive traits we have evolved and make use of in life-threatening situations, and in a sense, I now have the conditions of the human subject, albeit biological. Avoidance of danger is a primary goal for most, if not all, animals and they have evolved traits and in some cases intelligence that aid in this regard (Mobbs, 2015; Dennett, 1996). I have explained how the distance and threat context effect what responses are invoked (Blanchard et al., 1986; Fanselow and Lester, 1988). In the face of threats to life humans feel the emotions of fear and anxiety at various intensities and this is beneficial because they motivate specific behaviours toward continued survival. In contrast a dysregulated emotional response has been shown to have an aversive effect (Price and Hooven, 2018). Humans and other intelligent mammals make use of flexible higher-order cognitive and conscious systems in conjunction with their fixed brain structures when interpreting emotions and responding to threatening situations (LeDoux and Daw, 2018). This includes reflexes and fixed reaction patterns together with learned, goal-directed, deliberate and future-orientated actions. The latter flexible platform provides the means for the sophisticated avoidance behaviours that humans make use of, and influences and modulates the brain mechanisms which drive behaviour (Levy, 2018; Mobbs, 2015). Both our implicit and explicit systems need to be taken into account if we are to understand the effects of mortality awareness on people.

Death awareness exerts motivational force on human behaviour due to the emotions of fear, anxiety, dread and terror that are associated with it. This is supported by the current scientific findings which show that anxiety and fear motivate behaviours toward avoidance and continued survival (Mobbs, 2015; 2018). This claim is further supported by the findings of Terror Management Theory (Appendix). Generally speaking, it seems

likely that people will seek to avoid this awareness and stimuli that may result in it. People engage in intentional precautionary avoidance or preventive behaviours that involve deliberation, threat assessment and engagement with cultural tools in an attempt to mitigate the threat and regulate the associated emotions. Persons may actively engage in emotional regulation strategies such as cognitive reappraisal, suppression and acceptance to downregulate its emotional effects (Smoski et al., 2015).

In general, the literature suggests that humans would use their intelligent abilities including learning, prediction, planning, simulation and the use of cultural tools to successfully avoid, mitigate or prevent its awareness. This would include tools such as belief structures and meaning frameworks. The effects of mortality awareness and its possible defences need to be understood within our conscious explicit system that can plan for and predict the future. When understood in terms of our explicit system the threat of mortality can be interpreted as having a long-standing effect (Rolls, 2018). On the other hand, prediction, simulation and planning are useful for avoiding and preventing future dangers and this may mitigate mortality awareness and mortality related thoughts (Mobbs, 2015).

I argue that awareness of mortality can result in a multitude of defensive behaviours. This includes implicit fixed reactions, learned behaviours as well as explicit deliberate actions. This is plausible because the appraised emotional intensity in relation to the intensity of the reinforcer and the proximity affect what responses are invoked (Rolls, 2018; Fanselow and Lester, 1988). Also, there may be conflict between them (Levy, 2018). Although I argue for the above, I want the reader to note that our evolutionary understanding of mortality awareness and its associated effects on the human psyche and behaviour is limited. Even though evolutionary theory and the brain sciences have much to say about how humans and animals respond in life-threatening situations it is not clear how we should behave in the face of such an abstract threat.

Several factors need to be taken into account if we are to understand how the awareness of death affects people. The first is that circumstances can vary amongst individuals. This

includes bodily, personal, social, political, cultural and historical circumstances. For example, if a person has recently lost a loved one or has been diagnosed with cancer or is exposed to a pandemic, this will likely influence the appraisal of the stimulus and the emotional intensity experienced, and thus the response when primed to think about mortality. In addition, a person may have a dysregulated response. Furthermore, brain damage to regions such as the amygdala can result in dysregulated threat processing (LeDoux and Hoffman, 2018). The second is the intensity of the reinforcer. Reinforcer intensity often correlates to emotional intensity on a gradient from low to high (Rolls, 2018). Thirdly, the perceived proximity of mortality will affect the appraised emotional intensity and result in different defensive responses (Fanselow and Lester. 1988; Mobbs et al. 2015). Finally, emotions and behaviours are continually managed and updated by modulatory and learning systems including metabolic and reproductive drives, representations of the self (self-esteem and values), memories of past encounters, cognitive reappraisal, suppression and acceptance.

Can mortality be classed as a threat and if so on which level of danger under Blanchard et al.'s (1986) view would mortality awareness be? I think most would initially agree that mortality poses a distal threat to humans. However, as the existentialists point out there are reasons to believe that mortality awareness could also be classed as proximal. However, mortality awareness is both qualitatively and quantitatively different from other threats because it can affect humans in scenarios of a direct threat as well as in the absence of threat (Burke et al., 2010). Hence the threat of mortality needs to be classed as an extension of both direct proximal and distal threats as well as the absence of direct threat. In addition, the emotional intensity will affect whether mortality is appraised as distal or imminent. Fanselow and Lester's 'Threat Imminence Continuum' (1988) shows that the threat context and distance result in different defensive responses. Thus, I want the reader to consider that the threat of mortality could be placed on multiple stages of the continuum, and at each level of danger under Blanchard's view. This can best be explained through an example.

Let's consider the mortality awareness caused by a diagnosis of stage one cancer; mortality awareness would likely fall under the post-encounter stage, as a distal detected threat because there is sufficient time to appraise, deliberate and prepare a defensive strategy. The original response would perhaps be a startle together with freezing and associated physiological arousals such as increased heart rate and sweating. This might be followed by orientating and assessing the threat so a suitable defensive strategy can be developed that would involve explicit conscious deliberation and the use of cultural tools. The associated emotion would likely be anxiety but may proceed cognitive fear depending on appraised intensity. Hence if mortality awareness is treated in this sense, outcome-based defensive behaviours will likely be elicited such as precautionary behaviours. This includes deliberate defensive behaviours using tools such as medicines but may also include meaning frameworks. The individual's conscious cognitions would work together with learning to manage the defensive strategies, update them and regulate anxiety. However, in the example of a person who has recently lost a loved one due to a pandemic, mortality awareness may be perceived as more proximal in the subject causing an increased emotional intensity even though the threat may be distal. Thus, in the second example, a switch to circa-strike defensive responses may result. From these examples, it is clear that personal circumstances, threat context, reinforcer intensity and appraised emotional intensity play a role in how individuals will respond when primed to think about mortality.

At the end of the previous section, I introduced an integrative defensive behavioural model comprised of six levels of defensive behaviours. I explained that all six levels of the model are mediated by learning and modulatory systems in a top-down manner and are integrated with emotional regulation and the behavioural strategies we employ. In terms of this model, the emotions of fear and anxiety move on a gradient from low to high intensity which correlates to reinforcer intensity, the different stages of imminence and threat type. In humans, these six levels are interconnected, with fixed reaction patterns forming the foundation of this model. Importantly the appraised intensity of the emotion or the imminence of the situation affects whether fixed reaction patterns or a

combination of the behaviours are implemented. Although mortality awareness is an abstract threat, I argue that it interacts and is interconnected to all six levels.

- 1) *Fixed defensive behaviours*- Elicited from proximal imminent threats and there is insufficient time to prepare avoidance behaviours. Rapid reactions such as fight and flight are the norm. High-intensity reactive fear is the appraised emotion. If mortality is perceived as imminent or the appraised emotional intensity is high or dysregulated, fixed defensive responses may result. E.g. sudden terminal illness diagnosis or the recent loss of a close relative could cause someone to react more implicitly when primed to think about mortality i.e. fight response.
- 2) *Learned defensive behaviours*- These defensive behaviours are linked together with fixed reaction patterns and can come under the control of a conditioned stimulus. These behaviours are elicited from direct recurring threats in post-encounter situations and often proceed fixed defensive behaviours. Cognitive fear is the appraised emotion but often results in reactive fear that has been reinforced by past experiences. For example, a person can be exposed to a greater number of mortality related reinforcers or those of higher intensity, such as witnessing a multitude of people die in a battle or killed by a virus in a pandemic. Thus, a habitual fixed response to mortality awareness may have been learned which might coincide with fight or flight. Also, the habitual response could involve learned suppression or avoidance behaviours which may include beliefs. However, the appraised intensity of the emotional experience will affect what response is invoked.
- 3) *Elicited outcome-based defensive behaviours*- These behaviours are elicited from potentially threatening pre-encounter and post-encounter situations where danger is present but there is sufficient time to assess the threat context and deliberate. Humans can appraise the level of danger and assess possible outcomes and this modulates whether anxiety, fear or higher-order emotions such as terror are invoked. This usually results in precautionary avoidance behaviours but may proceed reinforced or fixed behaviours and associated emotions. In the example of mortality awareness caused by the threat of a virus, outcome defensive

behaviours that mitigate the threat will likely be elicited. For example, sanitization and social distancing.

- 4) *Emitted outcome-based defensive behaviours*- These behaviours are goal-directed but are emitted from within as oppose to being elicited from environmental triggers. They consist of unconscious deliberation toward specific valued outcomes. These include goals that are set by internal need states. These behaviours are associated mostly with anticipatory anxiety and often result in precautionary behaviours. These occur in preferred situations where threats are distal or potential. Applies to the distal threat of mortality without the presence of a direct threat. For example, preventative behaviours due to a history of illness, harm or experienced dangers, or avoidance behaviours due to implicitly anticipating a dangerous event.
- 5) *Deliberate defensive behaviours*- These are intentional actions toward goals such as avoidance, prevention and long term continued survival. These behaviours consist of conscious constructive deliberation, planning, simulation and prediction and are associated with a conscious feeling of anxiety or fear and active emotional regulation strategies. These occur mostly in preferred and pre-encounter situations where apprehension danger but sufficient time to think and strategize about possible defensive behaviours. They are applied to the distal threat of mortality where there is satisfactory time to plan mitigation strategies. This applies to distal threats as well as the absence of direct threat and are associated with intentional avoidance and preventive behaviours as well as the active emotional regulation strategies of cognitive reappraisal, suppression or acceptance. Furthermore, if representations of the self (self-esteem, beliefs and values) mitigate the fear or anxiety caused by mortality awareness, conscious deliberate actions to bolster those representations could result.
- 6) *Defensive behaviours using tools*- The use of tools and technologies toward avoidance and prevention. These types of defensive behaviours are associated with anticipatory anxiety. In terms of mortality awareness mind tools such as belief structures and meaning frameworks, including religions, can be used to suppress or avoid the awareness of death and may help regulate emotions. The

interaction with culture presumes threats are distal or absent but the tools are used when threats become imminent, such as examples where mortality is made more salient. Other examples of cultural tools include scientific knowledge, preventative medicines and defensive technologies such as walls and alarms that can be used to mitigate danger and may reduce mortality awareness's detrimental effects.

Perhaps the most predominant factor to take into account is appraised emotional intensity because the difference in intensity results in different responses. In addition, persons may have a dysregulated emotional response when primed to think about mortality. If we look again at the example of the recent loss of a loved one, mortality may be perceived as more proximal due to the intensity of the reinforcer and may result in reactive fear and fixed defensive behaviours. Similarly, in the example of a soldier suffering from PTSD, if primed to think about mortality might also react more implicitly and experience heightened emotional intensity. In contrast, it is also conceivable that a person may have little or no association to death. In such a person mortality would be far more distal compared to the person who recently lost a loved one. Also, it is possible that mortality awareness may result in a combination of the above behaviours depending on context and imminence.

How mortality awareness affects people is complex- numerous factors need to be taken into account and these factors influence how people respond. Some people may react more implicitly where others may react more explicitly. That being said, the literature suggests, that humans are biologically predisposed to avoid or suppress this awareness due to the negative emotions associated with it that can have a longstanding effect. It seems that our biology would have us make use of our flexible defensive traits, namely our intelligence, in an attempt to avoid this knowledge. However, evolutionary theory also shows us that anxiety and fear serve important adaptive functions in humans. Fear and anxiety at the variant degrees of intensity are attuned to specialized adaptive challenges that a person might face. In this sense, mortality awareness and its associated fear/anxiety may be construed as functional because they direct attention toward

avoidance of danger and continued survival. Thus, one can argue that death awareness and anxiety are not to be avoided. It is threats and dangers that need to be avoided because they may result in premature death. Furthermore, death is a fact of life so it can only be avoided to an extent.

However, the historical and current literature suggests that humans have been behaving to avoid and suppress this awareness. So how have humans been avoiding the awareness of mortality? One of the most obvious ways humans have been avoiding the problem is by subscribing to meaning frameworks, such as those found in religions. In general, religions deal with mortality by denying that humans ever truly die. Promises of immortality are the norm, and most religions speak of a self or soul that lives on for all eternity. If you subscribe to such a framework then death shouldn't be a concern of yours. Suppression also seems to be an effective avoidance strategy, such as keeping the old and sick separate from the rest of society, to keep the thoughts of death and mortality out of people minds. But what is the best approach to the problem of death awareness? Is suppression and avoidance really the best coping mechanisms we have? The next chapter introduces an integrative evo-existential approach to the problem. This is worth trying, because there is enough convergence between the two fields. Together they provide a useful way to address the problem of mortality.

PART 3: EVO-EXISTENTIALISM

In Part 1, we saw that science and existentialism are at odds with one another. However, the reasons for this are not as convincing as was previously thought. The existentialists believed that science was insufficient for understanding people. They claimed that when you apply science to humans, you won't be able to see the important existential concerns of freedom, responsibility, authenticity, mortality, nihilism, absurdity and anxiety. However, it has become apparent that science, specifically evolution and neuroscience, have much more say about these topics than the existentialists envisioned. In the previous chapter I tried to give a survey of some of the ways that this happens, specifically in relation to anxiety about death. A bridge has presented itself between science and existentialism that isn't merely superficial.

The recent advances in evolutionary biology and neuroscience have paved the way for a more comprehensive understanding of human beings that differs significantly from past perspectives. Imaging techniques such fMRI together with various behavioural techniques have provided the means to explore our uniquely human features in ways the existentialists could only have imagined. However, the thinkers in the movement have provided us with interesting insights into the peculiarities of our condition that are still relevant today. I believe I have provided evidence to show that evolutionary neuroscience and existentialism could work together. There is enough common ground between their goals and conclusions to justify an interdisciplinary approach, that may pave the way for future research and experimentation on the topics. I hope that the reader has reached some of my conclusions already. In this chapter I draw out these points of convergence showing the justifications behind the relationships between them.

3.1) WHY SCIENCE AND EXISTENTIALISM SHOULD TALK

Scientific discoveries often improve our lives for the better. However, not all of the findings scientists make are taken by the bulk of humanity as hopeful and helpful. As Caruso and Flanagan (2018) show, recent scientific discoveries have changed the way we conceive the self, free will, and morality in ways that look negative to some people. The picture of what it means to be a person has changed, and this has had a negative existential effect. For one, the image of people as free agents, an idea that existential philosophers deemed so important, has come under fire due to recent findings in evolutionary biology and neuroscience. Hence, even though there is common ground, there are still opposing views. The new clash between these fields seems to further our existential angst because our preconceived ideas of what a person is are being challenged (Caruso and Flanagan, 2018). However, as I hope my comparative analysis so far has shown, this is not the end of the story, and that the reader has realised that there is much science can do to help us understand the issues raised by the existentialists.

The list below covers the important converging features between the two fields and some of their interesting implications for a contemporary theory of existentialism. This list is not exhaustive; it merely sheds light on the link between evolution and existentialism that may pave the way for future experimentation and theorising.

- 1) *Emotion is of both biological and existential significance.* Emotion was particularly important to existentialists because of its subjective nature and was thought to be revealing of basic features of human existence (Section 1.1). Many existentialists, including Heidegger, believed emotion to be a fixed feature of human existence. Heidegger argued that emotions disclosed the world to us and that it is through our emotions that we make sense of the meaningfulness of individual and social lives. The existential analysis of emotion is grounded in experience with the focus on the subjective experiences of individuals in real-life situations. Emotions are also understood to be the base of our cognitive evaluations and are crucial in understanding human meaning-making capacity.

(Elpidorou and Freeman, 2015). In evolutionary biology, emotions are understood through the analysis of evolved neurological and cognitive mechanisms, which can be detached from the experience of emotions. The focus is on the functions of emotions in aiding the fitness of individuals (Section 2.5). They adjust multiple response parameters in ways that increase fitness in challenging situations. Emotions reinforce and characterise environmental stimuli resulting in the appraisal of situations and motivate the selection of particular responses (Rolls, 2018). Although evolutionary theory mostly takes an impersonal approach to emotion it does not exclude the subjective experiential approach. Recently neuroscientists such as LeDoux and Mobbs argue that emotions require subjective appraisal. The experience of emotion has a cognitive evaluative component as well as evolved bodily and neurological mechanisms which are all important to its understanding. The main source of the conflict between science and existentialism on emotion is grounded in the idea that there is a dichotomy, namely that emotion is both cognitive and bodily (Elpidorou and Freeman, 2015). However recent theorists such as Rolls, Mobbs, LeDoux, Elpidorou and Freeman show that this dichotomy is merely superficial. Emotions are ways of making sense of our surroundings and they are necessarily connected to our bodies in a fixed manner. Emotions permeate from our bodily biology all the way through to our cognitive evaluations, including our senses and meaning-making capacities, and as such are existentially fixed in disclosing the world to us.

- 2) *Survival is a primary biological and existential goal.* Human beings like other long-lived animals have the primary goal of survival to reproduce. The avoidance of death in the name of reproduction is one of the core drivers of the evolution of intelligence (Sections 2.2-2.4). Unlike other animals, however, humans have a meta-awareness of this obligation and when combined with autonoetic consciousness has resulted in the awareness of mortality. The link between survival and emotion for existentialists such as Heidegger differs to that of biologist as it is thought of as purely cognitive because humans are aware of the need to survive yet they also have the awareness and intelligence to deduce that

they will eventually die resulting in anxiety, fear and even terror that is not directly linked to any immediate object or stimuli (Section 1.6). From an evolutionary perspective, survival in the service of reproduction is a primary goal for most individuals. The role of emotion here is to aid these individuals in survival. Emotions function to characterise, reinforce and select behavioural responses in light of life-threatening stimuli. Hence in the face of danger and the threat of death, our nervous system is engaged and our brains and bodies are flooded with neurotransmitters and hormones that force us to respond with defensive behaviours depending on the proximity and type of threat (Fanselow and Lester, 1988) (Section 2.3). These defensive behaviours are facilitated by genes and form the foundation through which we face contemporary social threats (LeDoux and Daw, 2018). The overriding goal is that of avoidance of all the forms of threat that an individual may encounter in their lifetime. For example, an individual could find itself in the immediate moment, with the environmental stimuli of a predator in close proximity, the subjective experience in such a scenario is usually reactive fear which prompts the body to respond rapidly. It is clear that our biology is fixed in this regard forcing us to respond with haste to life-threatening stimuli (Mobbs, 2018).

- 3) *Mortality awareness is a primary source of anxiety.* The awareness of the possibility of death caused by the experience of threat whether due to proximal, distal or potential results in fear and anxiety (Mobbs et al. 2015; 2018) (Section 2.6). The bodily and neurological activity associated with fear and anxiety can be witnessed in animals, such as during foraging when the animal is on the lookout for potential threats or when a predator attacks. Biologically speaking both fear and anxiety at their variant intensities can be linked to the threat of death. In existentialism, death awareness is thought to be a primary source of anxiety. Anxiety is defined as the awareness of non-being, hence anxiety results from the biological certainty of death and the psychological experience of threat. TMT further supports this by showing that threats to self and the threats to sources of

meaning and value which result in anxiety, fear and even terror are all grounded in the ultimate threat of death (Pyszczynski et al., 2015).

- 4) *Biology and existentialism converge on anxiety and fear.* Biologically speaking emotions such as fear and anxiety evolved and function to aid surviving recurring and novel threats. These underlying mechanisms are connected to the subjective experiences of individuals in threatening circumstances. The current biological literature shows that it is through emotion that the world is disclosed to us and through which we make sense of the meaningfulness of our existence. Then these biological principals should be included in the existential understanding. Similarly, biological experimentation should take into account the subjective experience of emotion and the influence it has on perception and cognition and some authors already advocate this view (Mobbs 2018; LeDoux, 2018). The core idea is that evolved neurological and bodily mechanisms which result in fear and anxiety in the face of threats permeate from our bodies to our perception, personal cognitive evaluations and meaning-making. For example, in Terror Management Theory anxiety is specifically linked to death awareness and the meaning structures humans employ to cope with this anxiety.
- 5) *Emotions disclose the world in a meaningful manner and may facilitate individual purpose.* Rolls argues that emotion functions as an interface between us and the world which fits, at least very approximately, with Heidegger's view on emotion as a filter through which the world is disclosed (Section 2.5). One of the main existential topics is that there is no clear justification for meaning. However, recent research on emotion provides us with a new way to understand meaning. Due to the effect of current moods on cognitive evaluations of events and memories, and because emotions help produce persistent motivation. They likely play a role in what humans deem personally meaningful and important. In contrast, persistent negative feelings like that of anxiety would have a detrimental effect. Emotions facilitate implicit goal-directed behaviours toward obtaining rewards and avoiding punishments. When taken in conjunction with our higher-

order rational system which pursues self-interested goals, this may provide the basis for individual purposeful action (Rolls, 2018) (Section 2.5).

- 6) *There is some convergence between the existential and scientific views on human behaviour in response to death-related concerns.* TMT has shown that humans avoid and suppress death-related concerns (Appendix), a view that is reflected in both evolutionary biology and existentialism (Sections 1.5 and 2.8-2.9). However, existentialists, such as Heidegger and Camus, were not happy with the avoidance and suppression of death related concerns. They argued that avoidance and suppression resulted in unrealistic expectations and removed value from the present (inauthenticity) (Heidegger, 1962; Camus, 1942). Furthermore, death is inevitable and thus it cannot be fully avoided.
- 7) *Acceptance may be the most viable strategy to cope with mortality awareness.* Recent studies comparing emotional regulation strategies show that acceptance can down-regulate negative emotional states, however cognitive reappraisal has been shown to be the most effective (Smoski et al., 2015; Troy et al., 2018) (Section 2.7). However, mortality awareness cannot be fully avoided and there are issues with cognitive reappraisal and suppression as coping mechanisms. Thus, it would be of interest to test whether acceptance is a valid coping mechanism.
- 8) *An evo-existential approach to mortality makes sense.* The limitations of existentialism and TMT provide support for a new interdisciplinary approach. By combining the views from both evolutionary biology and existentialism concerning mortality awareness it is possible that the limitations I have mentioned will be overcome, however further research and testing is required to confirm this. Furthermore, since mortality awareness evolved as a by-product of our intelligence, it makes sense to investigate the phenomenon for an evolutionary perspective. Finally, the possibility of acceptance as a viable coping mechanism is a result of this interdisciplinary approach. Yet again, further experimentation is required to confirm this.

- 9) *It may be of interest to investigate anxiety as the base emotion due to its link with mortality awareness.* Heidegger argued that anxiety is the base emotion from which all other emotions spring (Heidegger, 1962). His reasons for this are because anxiety is as an unfocussed objectless fear that is inherent to human existence due to its link with mortality awareness (Elpidorou and Freeman, 2015). Whether or not this claim by Heidegger can be verified is difficult to assess: however it would be interesting to explore this idea from a neuroscientific perspective because it may further the research and treatment of anxiety disorders.

3.2) CONCLUSION: AN EVO-EXISTENTIAL APPROACH TO MORTALITY AWARENESS

How mortality awareness affects people is complex. There are numerous factors that need to be taken into account and although existentialism, evolutionary biology, neuroscience and psychology have much to say about the topic, it is not quite clear how we should behave toward death. Should we attempt to avoid or suppress this awareness or should we attempt to face it? A major goal of this dissertation was to discover what the best approach to the problem of mortality might be. I have presented two approaches: the existential and evolutionary. Although I believe a solely existential approach to persons no longer makes sense, the movement has provided pertinent insights into the problem of death that are still of value today. In conjunction with these two approaches I have discussed the psychological theory of TMT. Although I am critical of the theory, it has illuminated the bridge between science and existentialism and the experimental results have confirmed some of the initial existential views.

I now propose an integrated evo-existential approach to the problem of mortality awareness. As shown in the prior section, there is common ground and overlaps between the questions and conclusions of existentialism and evolutionary neuroscience to provide some justification for such an approach. In addition, the limitations of existentialism and TMT provide further support. Perhaps once combined these fields may correct one another. Moreover, I believe I have sufficiently shown that it is of interest to investigate existential concerns from an evolutionary perspective. Although there are differences between these fields, they both provide valid insights into the problem of mortality awareness.

Death awareness motivates people due to the emotions of fear, anxiety, dread and terror that are associated with it which can have a longstanding effect. The consensus is that anxiety and fear motivate specific behaviours toward avoidance and continued survival. This claim is further supported by the findings of TMT. But is avoidance really the best coping mechanism we have to face death? It makes sense that mortality awareness should

be managed because of the negative emotions associated with it. But it is less clear how we are supposed to do this. The concerns raised by the existentialists still seem to hold: mortality awareness is different to other threats and even though avoidance is our natural response it doesn't seem to mitigate the problem as well as we might have hoped. Maybe we can do better, however this remains to be seen.

In section (1.5) I noted that Heidegger, Camus, Becker, Tolstoy and Freud all found that people behave as if it were not true that everyone dies. The main reason they provided for this is that there is no experience of death. They argued that humans can only experience death as bystanders, as in suffering the loss of loved one, and as fact. Furthermore, it is the exposedness or helplessness of people in the face of death and because it is suffered by those left behind that are the likely causes of its suppression. Tolstoy's story *The Death of Ivan Ilyich* (2012) illuminated one cultural view on the suppression of death and Becker devoted a major work to the topic, *The Denial of Death* (1973). In sum these authors all came to the realisation that humans were only facing their mortality in a superficial sense, preferring to avoid or suppress it, as opposed to facing it.

In further support of the above, the experiments conducted in TMT and evolutionary biology show that humans prefer to avoid and suppress death-related concerns. TMT is at least consistent with evolutionary biology because most animals including humans behave to avoid threats. The general consensus amongst the authorities I have discussed is that people will seek to avoid death awareness and stimuli that may result in it. Humans use their flexible intelligent abilities including learning, prediction, planning, simulation and the use of cultural tools to successfully avoid, suppress or prevent its awareness. The findings of TMT show that people attempt to mitigate the detrimental effects associated with mortality awareness by adhering to cultural world views, such as religions. These experiments confirmed that people mostly behave to avoid or suppress the awareness of death. How this is achieved is via cultural structures and self-esteem which reappraise mortality in the form of immortality (see Appendix for an overview of the experimental results).

At first glance, these seem like natural defences however these were the kind of defences that the existentialists were worried about. For Heidegger and Camus avoidance and suppression are not viable defences because mortality is inevitable and cannot be truly avoided. Secondly, they believed that religion's hope of immortality diminished the value of our lives in the present. Thirdly death can come any moment, which is why we need to face it so as to be prepared for future dangers. Finally, they argued that mortality awareness is useful because it focuses one's attention to what matters most in the present. I noted that TMT does not consider the alternative strategy of acceptance which the existentialists favoured. Rather TMT has shown that people favour what the existentialists thought were inauthentic defences.

In section (2.8) I developed a defensive behavioural model comprised of six levels which in section (2.9) I applied to the problem of mortality. I argued that death awareness can result in a multitude of defensive behaviours corresponding to these six levels. This includes implicit fixed reactions, learned behaviours as well as explicit deliberate actions. This makes sense because the appraised emotional intensity in relation to the intensity of the reinforcer and the proximity affect what responses are invoked in people (Fanselow and Lester, 1988; Mobbs, 2015; LeDoux and Daw, 2018; Rolls, 2018). The appraised emotional intensity and proximity in particular have been shown to influence and limit defensive behaviours in humans. For example, if the emotional intensity increases this may result in fixed defensive behaviours such as fight and flight being invoked. Regarding proximity, if a threat is nearby or attacking this also results in fixed reaction patterns. In humans, threats to life have many forms, ranging from invisible viruses to war and even those of delusion. Some threats may be perceived as distal in some where others perceive them as more proximal. This is largely dependent on the subjective reinforcer intensity and will result in different emotions and behaviours. How the conscious mind functions in the event of a threat is to upregulate or downregulate the various defensive responses based on perceived urgency in correlation with learning.

In section (2.7) I introduced the idea that acceptance may be a viable strategy for managing death awareness, a view I believe Heidegger and Camus may have been

excited about. Although the recent studies show that cognitive reappraisal is a better strategy than acceptance for downregulating negative emotional states associated with disorders such as PTSD (Smoski et al. 2015). However, due to the complexities surrounding mortality, I think acceptance may be the more viable strategy for coping with it than cognitive reappraisal and the recent research in emotional regulation supports this (Smoski et al., 2015). However, it will require additional research to confirm or reject this claim.

In section (1.5) I discussed in some detail the views of two predominant existential authors Heidegger and Camus who presented the issues surrounding mortality awareness. Both authors rejected the suppression and avoidance of death and they presented valid reasons to support this. They believed mortality awareness is something that could be accepted and endured.

Existentialism has its limitations. The first and perhaps the most important is that humans share a variety of traits and abilities with other animals and we make use of these traits when facing life threatening situations. This was a position that the existentialists did not take into account; they treated humans as separate from other animals and things, yet contemporary evolutionary biology shows this to be incorrect. Humans are animals bound by the same rules and laws and is why we share certain traits with them. If we are to understand our behaviours in light of such an abstract threat, then these traits and abilities would need to be included with the existential understanding.

Humans have the ability to consciously upregulate or down regulate emotions as well as modulate the brain mechanism which drive behaviour. This is particularly useful in novel situations (Levy, 2018). Our minds intervene to inform the other levels so we can flexibly respond to the new context. People are capable of actively regulating emotions via the strategies of cognitive reappraisal, suppression and acceptance, and this has been shown in variety of neurological studies focusing on mental disorders (e.g. Smoski et al., 2015). The experimental results in TMT show that cultural world views and self-esteem successfully reappraise mortality awareness. Although these defences seem efficient, I

think, as the existentialists did, that acceptance may be the best defence we have. At the very least I think a case can be made for it that beckons further research.

APPENDIX: TERROR MANAGEMENT THEORY

Terror Management Theory (Greenberg et al., 1986) is based on the writings of Ernest Becker (e.g. 1973). Becker was a cultural anthropologist whose research was greatly influenced by psychoanalysis and existential philosophy, including the work of Freud, Nietzsche, Heidegger and Kierkegaard. Ernest Becker argued that human beings are haunted by the fear of death like no other animal. He explains that humans are self-aware, yet we also have the cognitive ability to mentally travel in time. Which results in people realizing that they will someday cease to exist. Drawing on existential philosophy, Becker argued that the knowledge of our mortality has the potential to cause anxiety, fear and even terror, that may culminate in a nihilistic or absurdist stance. To cope with this existential fear, Becker claims that humans have created a symbolic representation of reality called culture that ultimately convinces us that we will continue to exist after death. Humans subscribe to beliefs and associate themselves with cultural structures that convince them of either literal or symbolic immortality, what Becker called the cultural *causa-sui* project or immortality project (Becker, 1973: 41). For example, a person can become a part of something that supersedes their mortality such as a nation, religion or group that is larger and more powerful than themselves and will continue to exist even after they are gone. Humans adhere to what Becker called cultural worldviews that give people a sense of meaning and value which helps them feel as though they can transcend their limited mortal selves (Becker, 1973).

Becker points out that humans are fully reliant on their parents at birth. As babies we are helpless and dependent needing our parents in order to survive, this includes feeding, soothing and psychologically protecting us. As children begin to grow up, they learn that to get this psychological protection from their parents, they need to behave in a manner that matches their parent's expectations. This Greenberg and associates argue is the source of self-esteem according to Becker (Lifshin et al., 2017: 80). High self-esteem Becker explains is attained when humans have a sense of invulnerability which can be achieved through three basic ways, 1) through the protection of parents, 2) safety of the body and 3) the cultural *causa-sui* project (Becker, 1973: 229-230). Once children's

cognitive skills develop, they become aware that they and their parents will at some point eventually die. This primordial fact of our existence creates the need for something greater than parents for psychological protection. Something that is not subjected to the fate of death, like deities or nations. However, Becker argues that to be protected from these cultural structures, humans need to live up to the standards that are a part of them. As Becker's describes, people need to feel like the heroes in the drama of their lives, and thus they require self-esteem. On the other hand, low self-esteem is caused when this heroic transcendence of one's fate is most in doubt. Namely when a person doubts their immortality, the abiding value of their life, and if they come to believe that their life makes no cosmic difference (Becker, 1973: 209-210). It is noteworthy to mention that at the time Becker was arguing against Sigmund Freud, who claimed that the development of the superego and the socialization process are due to the resolution of the Oedipus complex (Becker, 1973: 86). In opposition to this Becker claims that socialization and the development of a superego are responses to the awareness of threats and death. Paraphrasing Lifshin et al., humans learn that by living up to internalized standards of value, they are loved and protected, and it is in this sense that self-esteem functions as a buffer against anxiety (Lifshin et al., 2017: 80).

Terror Management Theory extends these insights from Becker and claims that human awareness of mortality exerts a profound influence on diverse aspects of human thought, emotion, motivation, and behaviour (Pyszczynski et al., 2015: 2). TMT posits that fear of death underlies the human needs for personal transcendent meaning and value and that this pursuit influences much of human behaviour (Pyszczynski et al., 2015: 6).

TMT was originally developed by Greenberg et al. (1986) to address three questions about the source of human motivation and behaviour. (1) Why do humans need self-esteem? (2) Why do people feel the need to believe that out of the multitude of ways of understanding the universe, their view happens to be correct? (3) Why do persons who are different from one another have such a difficult time peacefully coexisting? (Pyszczynski et al., 2015: 2). These three questions are of importance and relevance in modern times where divisive politics and conflicting belief structures are major sources

of violence. Greenberg and colleagues believe that Becker's analysis provides a persuasive explanation for why people need self-esteem and for why people from different cultures have a hard time coexisting peacefully. Accordingly, TMT defines self-esteem as the extent to which individuals believe they are living up to the standards of value associated with their cultural worldview, and argue that self-esteem functions to buffer the fear and anxiety that results from mortality awareness (Pyszczynski et al., 2015: 6).

As I have shown humanity shares many evolutionary adaptations with other species, this includes various bodily and cognitive systems that function to keep us alive long enough to reproduce. Most living organisms are biologically predisposed to survive by avoiding for as long as possible that which could kill them and have evolved traits and in some cases intelligence that assists greatly in this regard. Humans are intelligent creatures who possess additional capacities not found in other animals, including meta-awareness, consciousness, autonoetic awareness, the capacity for symbolic and abstract thought, and engage with cultural tools. Such sophisticated intelligence is adaptive because it increases behavioural flexibility and helps us solve a variety of novel and diverse environmental challenges including those we face in the modern social world. It is a good strategy for any organism to facilitate behaviours that improve the avoidance of danger, namely distal defences which are associated with intelligence and flexible defensive responses.

Unfortunately, in humans, this sophisticated intelligence has resulted in us realizing that they we will someday eventually cease to exist. TMT posits that awareness of death in evolved animals' functions for them to avoid an early death, yet it also creates the potential for intense primal fear or terror. The potential for terror in response to the awareness of death could seriously impede successful goal-directed behaviour and perhaps even survival itself unless successfully managed (Pyszczynski et al., 2015: 7).

TMT argues that people use the same intellectual abilities that give rise to their mortality awareness to manage their potential for terror. People engage with cultural ideas, beliefs, values, and concepts in an attempt to regulate this fear. People invent, absorb, and cling to cultural worldviews. Greenberg et al. define cultural world views as:

- 1) Sets of ideas that provide a theory of reality that provides purpose, meaning and significance.
- 2) As standards of value by which human behaviour can be evaluated.
- 3) Provide hope of literal or symbolic immortality to those who believe in and live up to the standards of that world view (Pyszczynski et al., 2015: 7-8).

Literal immortality can be defined as the belief that one will continue to exist after death, in a manner that transcends the limitations of the physical. It typically reflects the religious aspects of cultural worldviews, which often conceive of a soul or self that continues to live for all eternity. In contrast to literal immortality, symbolic immortality is acquired by leaving something behind or creating something that will outlast your existence, such as families, fortunes, monuments, books, music and so on (Lifshin et al., 2017: 83). TMT claims that to qualify for either form of immortality, individuals are required to maintain their belief in their cultural world view and live up to the values and norms that are apart of them. In doing so this provides persons with a sense that they have value and are part of a meaningful universe, which is the very essence of self-esteem. In this sense, self-esteem entrenches people psychologically in a symbolic reality where physical death can be transcended. This then implies that any uncertainty regarding the truth or integrity of one's world view or one's value within its context undermines its effectiveness as a psychological defence mechanism. These beliefs serve as anxiety buffers and thus it is of utmost importance that individuals believe they are valid. This results in each individual being highly motivated to defend their own cultural beliefs. Often this validation of one's world view requires eliminating competing world views, even at the cost of violence. Experimental studies by various TMT theorists have directly supported this analysis (e.g. McGregor et al., 1998; Lifshin et al., 2017: 83-84).

According to TMT, there are many possible ways of understanding reality (many different world views, e.g. religions and cultures) and because it is very difficult to measure how well a person is meeting cultural standards; people require validation of their worldviews and self-esteem from others to buffer fear and anxiety. To secure this

protective buffer, humans are motivated to preserve close relationships with other people because they help maintain their symbolic (and genetic) legacy. Accordingly, this allows persons to deny their animal nature, making them feel special, separate and superior to the other mortal animals (Lifshin et al., 2017: 79). Hence people are motivated to seek validation of their worldviews from others and avoid or dismiss any that may conflict. Accordingly, people exaggerate the value of their worldview and those who provide positive self-evaluations and reject or belittle the value of those with diverging worldviews or who provide negative self-evaluations (Pyszczynski et al., 2015: 8).

In summary, to avoid the potentially threatening awareness of mortality, people construct and maintain cultural worldviews, which buffer against fear and anxiety by providing standards of value that are derived from that meaningful conception of reality, and by promising protection and immortality to those who meet those standards of value. Self-esteem is the degree to which one lives up to the standards of one's cultural worldview and is therefore worthy of the literal or symbolic sense of immortality that the worldview offers. For this to be achieved people require validation from others to effectively confirm their sense of value and the validity of their world view. Thus, having a valid world view, self-esteem and close relationships allow persons to gain a feeling of death of transcendence. Although there are other elements of the theory these are the core propositions as to how the anxiety-buffering system develops and functions (Pyszczynski et al., 2015).

1) AN OVERVIEW OF TMT'S EXPERIMENTAL RESULTS

Mortality Salience Hypothesis

In the last few decades, a large amount of empirical evidence has accumulated that supports the claims proposed by TMT, for a meta-analysis see Burke et al. (2010). In these studies, TMT has been applied to a broad range of psychological and social phenomenon, including aggression, altruism, mental-illness, desire for fame, conflict, war, terrorism and more (Pyszczynski et al., 2015: 6-7). The first test of TMT is the mortality salience (MS) hypothesis which was created by Greenberg et al., and can be expressed as follows. If a psychological structure provides defence or protection against the potential for terror caused by the awareness of death, then reminding people of their mortality should increase the need for protection provided by that structure (Greenberg et al., 1997: 72). Rosenblatt et al. (1989) were the first to test the hypothesis, in the studies conducted they reminded participants of their mortality or not, and then measured the extent to which they upheld their cultural world views. For example, in one study, judges who were reminded of their mortality set a much higher bail to a worldview violating target a prostitute. This effect was replicated in another study only among those who found prostitution to be immoral. The mortality salience hypothesis was further supported and its effects replicated in hundreds of experiments in many countries across the globe (for a review, see Pyszczynski et al., 2015). These studies claim that after mortality is made salient participants are more likely to defend and uphold their cultural worldviews and reject, often aggressively, towards those with conflicting worldviews (e.g. Pyszczynski et al., 2006). Interestingly many of the studies produced an effect on participants of causing the need to enhance their self-esteem, such as donating money to charity; or causing them to directly attempt to establish symbolic immortality by attaining fame or having offspring (e.g. Greenberg et al., 2010).

Anxiety Buffer Hypothesis

The second hypothesis which tested TMT and its formulation of self-esteem is called the anxiety buffer hypothesis (Greenberg et al., 1992). The hypothesis can be formulated as follows: if a psychological structure provides individuals with protection against anxiety, then enhancing that particular structure should reduce anxiety in response to a subsequent threat. This means that if self-esteem acts as a buffer against death awareness then people with high self-esteem should be protected from mortality salience responses. Several studies have been produced that support this hypothesis (e.g. Dechesne et al., 2003). Initially, Greenberg et al. (1992) in their experiments found that by enhancing the participant's sense of self-esteem through giving positive personality feedback compared to neutral, reduced subsequent self-reported anxiety as well as physiological arousal in response to viewing disturbing death-related media or to anticipating painful electric shocks. Hence this showed and further studies replicated, that enhancing participants self-esteem or validating their cultural worldviews can reduce mortality salience related defensiveness (Lifshin et al., 2017).

The Death Thought Accessibility Hypothesis

The third hypothesis testing TMT is the death thought accessibility hypothesis (DTA). If psychological structures, namely self-esteem and cultural worldviews, provide protection from death-related thoughts, then undermining them should increase the accessibility of death-related thoughts in consciousness. The (DTA) hypothesis is the reverse of the (MS) hypothesis. Various studies have been produced in support of this hypothesis (e.g. Florian et al., 2002; Hayes et al., 2008). These studies found that by threatening individuals' sense of self-esteem or undermining the validity of their cultural worldviews increased death-related thoughts in the participants (Lifshin et al., 2017). For example, Florian and colleagues found that by having participants think about problems in their current romantic relationships or being separated from their romantic partner increased DTA in consciousness. This is because romantic relationships are one way of achieving immortality, i.e. through reproduction, and when threatened death-related thoughts were shown to increase (Florian et al., 2002). Other studies found that by priming people to think about cancer (Arndt et al., 2007), or exposing them to disabilities (Hirschberger et

al., 2005), or reminding them of their animal nature increased thoughts about death (Cox et al., 2006). According to TMT one's cultural-world view and self-esteem, function to buffer anxiety and thus further studies have shown that threats to cultural world-views or self-esteem also increased DTA (Schimmel et al., 2007; Hayes et al., 2008: 602-603).

In sum, a lot of empirical support has accumulated that supports the claims made by TMT. The focus is on the avoidance and suppression of death and death-related concerns. A view that is at least consistent with evolutionary biology. However, this was the position that the existentialists were concerned about. They believed the suppression of death hurt humanity. For the existentialists death is something that needs to be faced and accepted, if we are to lead truly meaningful lives.

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