

What is the Best Available Evidence for the Survival of Human Consciousness After Permanent Bodily Death? By Sam Parnia MD, PhD and Tara Keshavarz Shirazi BS. New York University School of Medicine

Part One: Introduction:

While the question of what happens after death has intrigued humans throughout time, for centuries scientific exploration of this field had generally seemed inconceivable. However, modern scientific exploration into the question of death and what happens when we die, inadvertently became a possibility after efforts in the 20th century led to the development of modern intensive care units (ICU's), and especially after the discovery of cardiopulmonary resuscitation (CPR) in 1960. This latter discovery was revolutionary, as it enabled the heart to be restarted in people who would otherwise have been permanently dead.¹ One of the major consequences of scientific advancements during the past few decades has been the recognition that hundreds of millions of people globally have either come close to, or even crossed beyond the biological threshold of death before being successfully resuscitated back to life. Interestingly, many of these survivors have consistently described an apparently universal, transcendent and unique cognitive state with paradoxical lucidity, external visual awareness and a meaningful educational review encompassing the entirety of a person's life. These episodes of lucidity and consciousness in relation to death have raised the inevitable question: does consciousness continue beyond death and is life purposeful?

2-5

Although reports of experiences that seem to transcend ordinary reality (transcendent experiences) close to death have been described anecdotally for centuries, it was not until after the discovery of CPR and the birth of resuscitation science that widespread knowledge of their existence entered the public domain². This occurred in 1975, after Raymond Moody, an American medical student and former professor of philosophy, collected and published the recalled experiences of 150 people who he had interviewed after being involved in seemingly life-threatening (near-death) events. These people's experiences included a consistent set of features with transcendent

qualities, which he called *near-death experiences* (NDE).² Moody identified 15 overall themes [Summarized in Table 1]. Of these, 11 were related to the experience of coming close to death, while the other four were related to the longer-term aftereffects of surviving the experience. The themes that Moody described in relation to being near to death were: 1) a sense of ineffability. People consistently stated that they could not find adequate words to describe what they had experienced, which had felt like entering a different dimension. 2) hearing the news, people had described hearing themselves being pronounced dead, as well as 3) feelings of peace, and of 4) hearing unusual noises. They had also experienced 5) going through a dark tunnel, and 6) meeting others, as well as 7) encountering a being of light; a highly luminous entity who was described as all powerful, yet compassionate and benevolent and who helped people through what is perhaps one of the most intriguing aspects of the NDE, which is 8) experiencing a life review. This took the form of a reappraisal and judgment of all of one's actions in

life in a meaningful and purposeful way. Specifically, it focused on how the person had treated others and what

Table 1: The Classical NDE Themes in Relation to Proximity to Death
Ineffability: <ul style="list-style-type: none"> • "There are just no words to express what I am trying to say."
Hearing The News: <ul style="list-style-type: none"> • [Doctor explains]. "I told the other doctor ... 'Let's try one more time'. Later... [the patient] said she didn't remember [anything] except that she did hear me say, 'Let's try one more time and then we'll give up'."
Feeling Peace and Quiet <ul style="list-style-type: none"> • "I just had a nice, great feeling of solitude and peace."
The Noise: <ul style="list-style-type: none"> • "I began to hear music of some sort."
The Dark Tunnel: <ul style="list-style-type: none"> • "I found myself in a tunnel."
Out of The Body: <ul style="list-style-type: none"> • "I started rising upward ... floating right below the ceiling ... As I saw them below beating on my chest ... I thought, "Why are they going to so much trouble? I'm just fine now."
Meeting Others: <ul style="list-style-type: none"> • "I recognized my grandmother and a girl I had known when I was in school... it seems that I mainly saw their faces and felt their presence."
The Being of Light: <ul style="list-style-type: none"> • "I could see this light. It was a very, very brilliant light ... I was trying to get to that light."
The Review: <ul style="list-style-type: none"> • "My whole entire life was there It was ... more in the form of thought ... I thought ... about things that I had done wrong. After I [saw] the mean little things I did ... I wished I could go back and undo them."
The Border or Limit: <ul style="list-style-type: none"> • "On the distant ... I could see all my loved ones who had died ... they seemed to be beckoning me to come on over and all the while I was saying '... I'm not ready to go'."
Coming Back <ul style="list-style-type: none"> • "I was concerned about my children, about who would take care of them. So, I was not ready to go."
Telling Others: <ul style="list-style-type: none"> • "[I tried to tell my mother]. But, I was just a little boy and she didn't pay any attention to me. So I never told it to anybody else."
Effects on Lives: <ul style="list-style-type: none"> • "Since [my experience], it has been on my mind constantly what I have done with my life, and what I will do with my life."
New Views of Death: <ul style="list-style-type: none"> • "Since the experience, I don't fear death. Those feelings vanished."
Corroboration: <ul style="list-style-type: none"> • "I told [my doctor] the whole story...He was really shocked to know that I knew everything that had happened."

he/she had come to learn about themselves and their real worth as a human being – in essence it stood as a gauge of their humanity. Some had further described 9) sensing [they have reached] a border or limit, such that if they were to cross further beyond that point during their experience, then they could never come back to life again. Another intriguing aspect of the experience was that people described a sense of external visual awareness. This involved a perception of separating from the body and observing events typically from a point of being 10) out of the body. Specifically, people described that their consciousness - their true self - had separated from the body, yet, was able to observe and hear events occurring to them, including attempts at being revived back to life by doctors and nurses. These aspects of the experience were followed by a sense of 11) returning to the body, whereby the individual was told that they would have to return back to their ordinary life, even though they usually did not want to come back again. After recovering from their life-threatening or *near-death* event, many people had come to realize that their experience had provided a very profound and long-lasting positive impact on their lives. They became less materialistic, less self-centered, more altruistic and less afraid of death. Yet, when they tried to tell others, they found that most people would not understand or believe them. Moody further summarized these aftereffects of the experience into the following themes: 12) telling others (of the experience), 13) [positive longer term] effects on the person's life, 14) [the emergence of] new views on death, and 15) [finding] corroboration (of the details of the experience)².

A closer examination of Moody's cases, demonstrated that people who had been in a life threatening situation with a recalled experience of death, described an experience that contained a very specific narrative arc [summarized in Figure 1] involving: a) paradoxical lucidity and external visual awareness with perceived separation from the body, b) a sense of travel to a different dimension that is permeated by benevolence, c) encountering and communicating with a luminous being and/or deceased relatives, a d) reappraisal and judgment of all of one's thoughts, intentions and actions in life in the form of a highly meaningful and purposeful life review, as well as e) a decision to return to the body. Finally, aside from this specific and meaningful narrative arc, the experiences seemed to transcend ordinary reality, were ineffable and culminated into a positive long-term

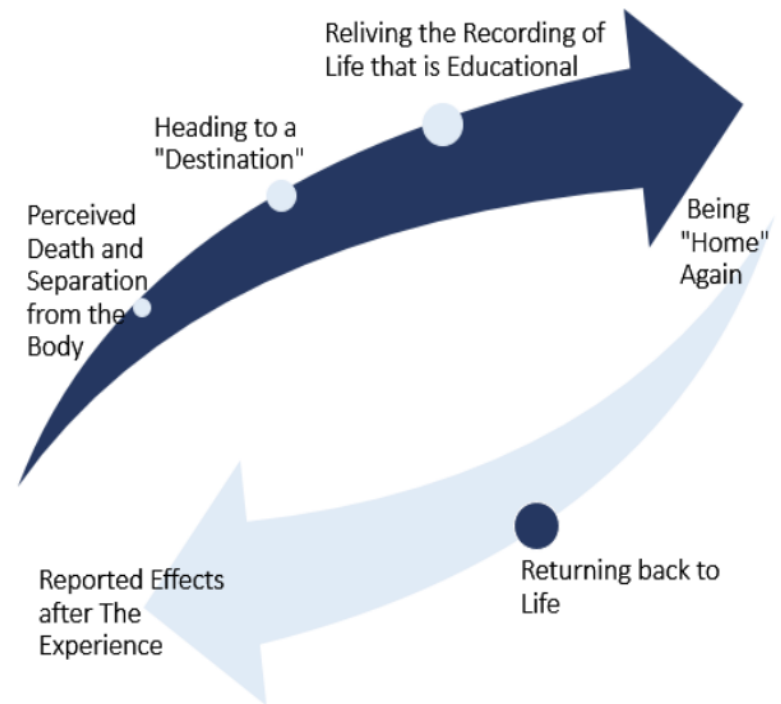
transformative change, as evidenced by greater altruism, seeking greater meaning and purpose in life beyond ordinary social parameters of success.²

For most people who had undergone these experiences and many who came to learn of them, the specificity of the recalled features and in particular paradoxical lucidity with separation from the body, combined with a meaningful life-review, and the overall narrative arc, supported the age-old philosophical argument for the continuation of consciousness and a so called “afterlife”. However, others claimed these experiences

were possibly fabrications or hallucinations, delusions or illusions occurring in response to a disordered and dysfunctional brain in severely ill people who were at risk of death. They further argued that since death represents an absolute end, the experience of death is not amenable to scientific study. Consequently, any recalled experience must reflect what happens “close to death” in a disordered brain, rather than an actual vision of what happens in relation to death itself.

The purpose of this essay is to delve into what is currently known about this subject and examine the evidence for the possibility of the continuation of consciousness beyond death (rather than states that are close to death). After providing a detailed description of the features and themes related to the recalled experience of death, we will provide a critical examination of the arguments put forth that have attempted to categorize the recalled experiences of death as hallucinations, delusions or illusions, before examining whether they may be considered “real”. We will then provide relevant background to enable the reader to understand the science of death and how

Figure 1. Proposed Narrative of the Recalled Experience of Death (RED)



contrary to popular perception, scientific progress has enabled not only the study of experiences that occur close to or in the peri-death period, but also the actual human experience of death (including consciousness). We will then review scientific studies that examine whether human consciousness is not annihilated with death. Finally, we will set out the future path for research that could provide humankind with the ability to address the age-old question regarding the nature of consciousness (psyche, self or “soul”) and whether it survives death.

Part Two: The Recalled Experience of Death: What Has Been Discovered in the 21st Century?

2.1 The Prevalence of the Recalled Experience of Death

Over the 45 years since Moody’s original descriptions of what he termed a NDE, much more has come to be understood regarding the experience of death for humans. While Moody’s descriptions were critical, it is now quite evident that they represent the tip of a much larger iceberg of recalled experiences that are universal, as evidenced by the fact that they have been described from all over the world, and by diverse groups of people, irrespective of culture, religion or race.^{6, 7-8} Subsequent studies have indicated that although the central features of the experience appear universal, the interpretation of the experience appears to be influenced by personal, religious, philosophical, and cultural views.^{6, 7-8} A U.S. survey by Gallup in 1980-1981 reported that approximately 4% of the general population have had an experience consistent with Moody’s NDE.⁹ In a later Australian survey, 9% of the general population reported a “close brush with death,” with recalled experiences that were suggestive of a NDE¹⁰. In 2020, researchers at New York University commissioned the most comprehensive international poll of the general population to date. This was carried out by Opinion Research Business (ORB) among 6,019 people from diverse religious and cultural backgrounds in the United Kingdom, United States, France, China, Thailand, Brazil and Syria. This poll indicated that the overall prevalence of a recalled experience of death is 11%, while 10% reported external visual awareness with perceived separation from the body. Based on these estimates and assuming a global population of 7.8 billion, today around 850 million

people globally may have had a recalled experience of death and 780 million may have had an experience of external visual awareness with perceived separation from the body.

These data indicate that the recalled experience of death is common, universal, and certainly not an isolated anecdotal occurrence. However, these experiences are now increasingly amenable to scientific study due to the impact of advances in medicine, which have enabled people who would otherwise have died after a life-threatening illness (that had taken them to the brink of death) to remain alive and subsequently recall their experiences.

Table 2: Children’s Recalled Experience of Death (Authentic Near-Death Experiences)	
	Experience Reported by Parents
Cardiac Arrest in a Two-Year-Old Child	<p>[After John had been discharged from hospital] one day, he said, “Grandma, when I died, I saw a lady.” He was not yet three years old. I asked my daughter if anyone had mentioned anything to John about him dying and she said, No, absolutely not. But over the course of the next few months, he continued to talk about his experience. It was all during the course of play and in a child's vocabulary.</p> <p>He said, When I was in the doctor's car the belt came undone and I was looking down from above. He also said, “when you die, it is not the end...a lady came to take me.... There were also many others, who were getting new clothes, but not me, because I wasn't really dead. I was going to come back.” He also said, “When you die you see a bright lamp and ...are connected by a cord.”</p>

As a result, one of the main sources of evidence for understanding what happens to human consciousness in relation to death are the roughly 850 million people alive today who can provide eye-witness testimonies of what it is like to reach and in many cases even cross over the biological threshold of death. This experience is not limited to adults and children have also described similar recalled experiences, often using children's terminology over many months and during the course of play.¹¹⁻¹⁵ In some cases, the experiences occurred at ages (e.g., when the child had been less than 3 years old) in which children would not have been expected to have cultural insights into concepts related to death or an afterlife and thus unlikely to have imagined their experiences through the influence of cultural and religious traditions.¹⁶ One illustrative child’s experience is presented in Table 2. Because children’s experiences have not been studied in depth, and the data in the published literature are largely limited to case reports and case series,¹¹⁻¹⁵ more systematic studies are needed. Nonetheless, these data combined with testimonies from adults highlight the wide prevalence and universality of the experience of death.

2.2 The Features of the Recalled Experience of Death: Thematic Studies Derived from Qualitative Studies

Today, research carried out into the testimonies obtained from thousands of survivors of “near-death” encounters, has indicated that the original narrative arc derived from Moody’s cases in 1975, remains consistent and provides the backbone for the overall themes that people describe in relation to death [Figure 1]. What is understood is that more than 50 overall broad recalled themes related to the recalled experience of death have been identified [Table 3], which far surpasses the original 15 themes identified by Moody. These themes were derived using samples containing 200-500 survivors of life-threatening disorders using quantitative and qualitative methods and were verified using a survey of over 6000 people from an international poll carried out across seven different countries, with diverse cultural and religious backgrounds [Section 2.1] by researchers at New York University School of Medicine. Some of the data from these specific studies which are being presented in this essay have already been peer-reviewed, presented and subsequently published in the proceedings of major international medical meetings, including the American Heart Association, the Society for Critical Care Medicine, the European Resuscitation Council and the American Clinical Neurophysiology Society, while other sets of data are undergoing the publication process in peer reviewed journals, but are being presented here for the first time. These datasets have provided far greater insights regarding the experience of death than what was initially described by Moody in 1975 and what has commonly been referred to as a “NDE” over the past few decades. Furthermore, even among the themes that Moody had described—for example, a life review or experiencing a light—many additional subthemes and far greater knowledge and insights have now been gleaned.

In order to provide a greater understating of the recalled experience of death, but also be succinct, we have summarized the main features related to each of the major categories of more than 50 themes in Table 3. This table contains illustrative quotes that are meant to provide the reader with a clearer understanding and context regarding what is currently known about each of the main themes. As this dataset is very large, and in order to

complement this heavily condensed summary table, we have provided more detailed exemplar testimonies for some of the main themes in the body of the essay.

2.2.1. External Visual Awareness (EVA) with Perceived Separation from the Body

As people approach death, they transition into a coma and become unconscious from the perspective of others - physicians or otherwise – who may be observing them from the outside. However, during this period of deep unconsciousness, a fascinating transcendent experience emerges. This section will focus on the first dimension of this experience, namely a perception of a sensation of separation from the body and a realization of having died. As will be discussed and examined later, this is one of the major recalled themes that provides tremendous support for the continuation of consciousness in relation to death and runs contrary to the notion that these experiences are “unreal” (i.e., hallucinations, delusions or illusions).

One woman who was bleeding profusely after a gynecological emergency described that she suddenly found herself surrounded by a strong light and felt happy, peaceful and not the least bit frightened. She

Table 3.A. Separation

<p>1.Separating from the Body “I remember leaving my body and rising up to the ceiling of the room.”</p> <p>2.Paradoxical Lucidity “I still was completely lucid and aware of what was going on.”</p> <p>3.Initial Confusion “I didn't know why I was there....”</p> <p>4.Realization of Having Died “I knew that I had died and would be leaving behind a 5-6 month old infant and my husband.”</p> <p>5.A Sense of Liberation and Weightlessness •“I felt wonderful and light where I was. I had no pain and no problems.”</p> <p>6.External Visual Awareness: Observing the Body or Events • “I saw the whole room and everyone working on me from the ceiling of the room. I was watching the heart monitor machine and saw that my heart had flat-lined. I saw that the hospital staff were trying to get my heart to start again.”</p> <p>7.A Birds Eye View: I Felt like I Could “See” in All Directions (360 degrees) •“I could see from the top of the room in 360-degrees.”</p> <p>8.Becoming Detached from Events Below •“I didn't identify, in any way, with the body or the people in the room. I was instead, a detached observer.”</p> <p>9.“I”, Myself Remains •“I was still alive but I didn't have my body. I know for a fact that I am, that I exist. I sensed that I had left my body ... I have died and left my body, yet I still exist.”</p> <p>10.Shedding the Body •“I had shed the sense of my body very quickly.”</p> <p>11.Connected by a “Cord” •“I did see a silver cord attached to my body which had a luminescence to it.”</p> <p>12.Hovering in the Space •“I was floating up towards the ceiling of the operating room and toward the light.”</p>
<p>Heading to a “Destination”</p> <p>13.Being Drawn towards a “Destination” •“I began rising... I continued [moving] for some time before I became aware of a small bright light in the distance in the direction I was headed.”</p> <p>14.Seeing of Travelling Through a Tunnel •“I traveled through a kind of tunnel.”</p>

recalled that she was “high on the ceiling of the ward looking down upon the bed (which seemed to be a long way down) and saw the doctors and nurses around the bed working on the person lying there.”

This example illustrates how people who have come close to death describe a perception that the real self—one’s consciousness—separates from the body yet maintains lucidity and the ability to process visual and auditory information that relate to actual ongoing events, which have at times been verified and corroborated^{2,17-18}. This reflects a lucid state of visual awareness and external view of one’s own body and its surroundings, which is paradoxically perceived as separation from the body. We consider that an appropriate and accurate term to describe this experience is External Visual Awareness (EVA). This phenomenon can occur under multiple circumstances, one of which is a life-threatening illness and proximity to death^{6,17-27}. To help

better understand this aspect of the experience of death, we have selected a number of testimonies, which highlight its main features.

Table 3.B. Reliving the Recording of My Life: Actions and Intentions Matter
<p>15. Review of the Recording of My Life: All my Thoughts, Intentions and Actions Matter</p> <ul style="list-style-type: none"> • “I saw myself on the wrong side... I was not as good as I thought I was... I was also shown the good things I had done.” <p>16. The Indescribable: A Compassionate, Loving, “Perfect” and Luminous Being</p> <ul style="list-style-type: none"> • “I was not alone; I could sense a presence with me... I felt a presence, and also felt complete trust in this company.” <p>17. Not as Good as I Thought: Judging my True Worth As a Human Being</p> <ul style="list-style-type: none"> • “My whole life was viewed, analyzed and judged.” <p>18. Reliving Life Events: I Re-experienced Each Moment</p> <ul style="list-style-type: none"> • “[In my life review] I was able to re-experience myself in all events in my life.” <p>19. Being in Others’ Shoes: Experiencing the Perspective of Others</p> <ul style="list-style-type: none"> • “I could examine [my experiences] from multiple perspectives, such as the people they affected.” <p>20. A Glance at my Past and Prior Past</p> <ul style="list-style-type: none"> • “My understanding is that we live numerous lives, each with a different ‘purpose’.” <p>21. The Domino Effect: Impact and Consequences of Actions</p> <ul style="list-style-type: none"> • “[I saw] how big an impact my seemingly small actions had on a large scale.” <p>22. Human Dignity: Importance of Living with Morals and Ethics</p> <ul style="list-style-type: none"> • “I received such an applaud and joy for a simple [selfless] act, that is unbelievable.” <p>23. There is a Reason Underlying it All: Cause and Effect Rules</p> <ul style="list-style-type: none"> • “[My life review] was like watching a mathematical equation, or sum, that makes perfect sense. Such event and such event create this kind of result. It was a simple portrayal of natural cause and effect, with a gentle understanding.” <p>24. Embarrassment and Shame: I Could Have Done Better</p> <ul style="list-style-type: none"> • “I had done so little with my life! I had been selfish and cruel in so many ways! I was truly sorry I had done so little.” <p>25. The Education: Need to Evolve into a Better Human Being</p> <ul style="list-style-type: none"> • “I found out that... I had to improve as a human being.” <p>26. A Higher Purpose: I Wish I had Known</p> <ul style="list-style-type: none"> • “I saw that I alone am in charge of my destiny.”

One person explained, *“I remember ‘me’ being pulled away, out of the bed, but my physical body was lying limp. At this stage, I could still hear everything but could not acknowledge or move. I can see the nurse pushing the alarm but not with my eyes. It was as if I was looking at her from somewhere else ... I could see so many people around me frantically doing things to me ... they started resuscitation. They punched my chest with an injection. I kept thinking that this should hurt but it didn’t ... I could see everything but not from my body. I can’t explain where I was, but I was not in the body.”* Another person described his experience: *“the first thing I experienced was that I could suddenly see my body from above. I saw that the doctors were incredibly busy treating me ... I felt wonderful and light where I was. I had no pain and no problems ... I clearly remember that I hovered over the doctor who conducted the treatment.”*

Table 3.C. “Home” Again

27.Returning “Home”: A Place I Had Been Before

- “I knew I was home.”

28.Time is Not as it Would Seem

- “Time had lost its meaning.”

29.The Atmosphere: Permeated by Benevolence, Kindness, Knowledge and Truth

- “I was in a place of love, kindness, compassion, contentment, acceptance and joy - a place of 'knowing'.”

30.Being Assisted

- “I was surrounded by my deceased relatives. I was feeling so much joy and lightness from seeing them. I felt they were there to help me.”

31.Experiencing Others: An Image or a Light (with Differing Intensity)

- “I felt very comfortable and I was being approached by a being – a being of light. As he came to me, I recognized that it was my grandfather. He had passed away about five years prior to that.”

32.Communication: Thought is Everything

- “No words were spoken and everything was communicated by thought.”

33.Becoming Detached

- “As strange as it may seem, the more away I was ... the more the existence of my family ceased to matter to me. I didn’t think of my son and that was very strange.”

34.I Suddenly Knew So Much

- “I understood things that I couldn't possibly have known.”

35.Life is Like a Dream by Comparison: Much More Real than Anything Else

- “Everything was hyper-realistic, perhaps more real than I have ever known reality to be.”

36.A Hierarchy Exists: Layers of Comprehension

- “I felt sure that the person made of love was much, much, much more superior to me.”

37.My Position in the Hierarchy: A Matter of Comprehension and Wisdom

- “My own awareness of this new dimension seemed much more limited than their awareness.”

38.An Origin: A Source

- “[I was going] back to my origin and the origin of everything.”

The Return

39.Reaching a Point of no Return

- “At one point, [I was] 'told' I wasn't allowed to pass yet and had to 'go back'.”

40.Really Want to Stay

- “I felt more joy and contentment than even the brightest moments in this life ever provided, and I didn’t want to return.”

41.Must Return

- “Hard as it was to leave this place of overwhelming unconditional love and indescribable peace, I knew I had to return.”

42.Sensations during Return

- “I was being sucked back into my body like it was a vacuum.”

43.My Mission

- “That it was not my time and that I needed to return to my body, to complete my life's mission.”

Interestingly, during this phase of the experience many people have gone on to describe the ability to gain information regarding their relatives and loved ones, even if those people had been in a different room as illustrated by this case:

“As [the medical team] worked on me, I left my body and was watching from above. I could see and hear everything, but could not feel what they were doing to the body below ... while watching the doctors and nurses working on the body below, I also remember being able to watch what was

happening at the same time in the room they had taken my mom. I could feel my mother's hysteria and distraught, as if her emotions were my own.”

Paradoxical Lucidity:

One of the intriguing aspects of this experience is that people who are in this state paradoxically report having lucid thought processes, which would not be expected when the brain is severely disordered. This can be better understood when examining the following testimonies: *“I was totally alert - more alert than I had been in my life - more alert than life. I was totally free of worry and doubts and bothersome physical sensations and limitations.”*

Another person explained: *“I felt myself to be very awake and aware the whole time. I was immensely curious and observing, and my awareness was ... much larger than when I am here in life.”*

“I”, myself remains:

While experiencing this state of external visual awareness people consistently describe that their real self – their consciousness – remains in a separated state from the body and can collect information regarding events occurring

Table 3.D, Reported Effects after The Experience

44.Ineffability

- “There are no words to explain some of the things I saw, felt, experienced ... There are no words for the feelings I felt.”

45.Forgetting So Much

- “All I can say is I knew so much then that I don’t now.”

46.The Challenge of Personal Interpretation

- “I believe this place was heaven.”

47.Overall Positive Experience Despite Errors

- “It was the most positive feeling I have ever felt.”

48.Seeking Purpose and Meaning in Life

- “I do not know what my work ... is. But, I am sure that I must do something. I believe that it is something important.”

49.Loss of Fear of Death

- “Since [my experience], I have not been afraid of death.”

50.Reappraising the Role of Hardships

- “All of life's challenges have been chosen for a reason and each event teaches us something we need to learn in order to evolve to the next lesson.”

51.Long-Term Positive Effects

- “I have been much more mindful of others. It's easier for me to put myself in other people's shoes. It's easier for me to act out of love and compassion. However, it's still something I put work in.

around their own body. One person explained, *“I had left my body and began to return home. I suddenly saw myself as a light ... I was still me, Adriana. I was not my body, but I was my essence”*. Another said: *“I was still alive but I didn’t have my body. I know for a fact that I am, that I exist. I sensed that I had left my body ... I have died and left my body, yet I still exist.”*

Hovering or Floating in the Space:

During this period of external visual awareness, people often describe a perception of hovering above or around their own body and observing events. One person explained: *“I was out of my body but not seeing with my eyes. I knew something had happened during surgery that was life-threatening... I remember floating toward a light.”* Another explained: *“I was no longer in my body. I floated without weight or physicality. I was above my body and directly below the ceiling of the intensive therapy room.”*

A Birds Eye View: I Felt like I Could “See” in All Directions (360 degrees)

Furthermore, as people hover above or around their own body, they describe a perception of being able to gather visual information from all around. The following example highlights how in this state, people often describe experiencing a 360-degree vision of their entire surroundings, which is not limited only to the conventional visual fields that we are ordinarily accustomed to: *“During surgery, I popped out of my body...surgery appeared more brutal and bloody than I imagined it would look, especially from a 360-degree vantage point. I could see the doctors and the entire room all at once without blinking or relying on eyes. There, in the room with the doctors, nurses, surgical technicians, anesthesiologist, and others, I felt incredible joy and shock as I realized all does not die with the body.”*

Realization of Having Died:

During the period of external visual awareness, there is a mental realization of having died, but ironically this doesn’t seem to cause alarm. People describe being indifferent to their body, while undergoing a very peaceful and comforting transition through death and a sense of being on their way “home”.

One person described this as: *“I was outside my body, floating ... and just looking around. I saw a body lying in the middle of the street next to a car... It took me a little while to recognize that it was my own body that I am looking at. I had no feelings for it; I was just an indifferent observer. I thought to myself that I must have died, but I was not sad at all.”* Another person explained: *“I came out into the light and was in an upper corner of the emergency room looking down at my body on the gurney. I was not disturbed by being dead or by seeing my body on the gurney. I was in a state of euphoria and a sense of perfect peace and being. I had no pain, wants, or needs of any kind. I had a sense of being home...”* Another person said: *“I saw the team enter and surround a person lying next to me; at least that was what I thought at the time. It never dawned on me that the other person was I. I was very, very calm. But I felt bad for the lady (me) as the code blue team [cardiac arrest emergency team] struggled to get her heart to start again. I saw 'me' being intubated with chest compressions and the rotation of the team to revive me.”*

A Sense of Liberation and Weightlessness

While having a sense of external visual awareness, people feel like they have been liberated from their body. One person explained: *“Suddenly, I was above my body, which lay on a stretcher, wearing a white hospital gown, I looked at my body and knew it wasn't the real me, it was the thing I had been caught inside [the body], and now I was free! Oh, and how I felt such happiness!”* Another person said: *“I simply felt like an armor had been unlocked and my real body had been released. I felt warm, love, peace and pure joy ... I looked at myself for only a moment, and at my husband frantically driving to the hospital. At that same moment, I began to multi-locate and was with my mother [and the doctor]... I could tell the doctor everything he did during my arrival. I could tell him down to the minute details”. Another explained: “I felt totally liberated, I saw myself in a hospital gown, with the doctors around my body trying to resuscitate me.”*

A Sense of Becoming Detached from Events Below

As people continue to observe details of events involving their own body unfolding below them, they remain quite detached. One person said: *“The next thing I remember is coming out of my body. I was floating up towards the ceiling of the operating room and toward the light ... I looked down and saw my body with many people around it. I did not feel any attachment to my body or regret upon leaving it. I felt so light and free: free of the pain of the past several weeks and free of the pain of my life up to that point.”* Another person explained: *“[I] was now floating above my body. The distance between my conscious self and my body below seemed to be stretched out ... There was no sound, no pain, and no fear ... I could see someone lying on a bed ... As I lingered above, I didn't identify, in any way, with the body or the people in the room. I was instead, a detached observer, although still 'Krista' within the fine static of my consciousness. I ... felt more alive than ever.”*

Connected by a “Cord”

While being aware of but remaining disinterested in their own body during this state of external visual awareness, some people go on to describe a sense of feeling a connection to their own body through a type of a “cord”. One person described: *“I suddenly 'woke up' floating on the ceiling and was looking down. It wasn't dream-like because everything was in clear detail. ... There were several people in green gowns, who were working around my body on the operating table. I distinctly remember marveling at the thin, glowing, silver 'cord' leading ... down to the body on the table.”*

Perception of Being Drawn towards a Destination and Traveling Back “Home”

Many people describe that after their sense of separation from their own body and observing events around themselves, while maintaining lucidity and consciousness, they then find themselves progressing on a very rapid journey. People describe a sensation of being pulled, almost as if by a very powerful magnetic force and find themselves moving away from their body and the room in which they had been observing events. During this period, they experience their senses becoming heightened and much sharper as they go on to experience the presence of multiple new senses that they had not experienced before, and which seem to transcend their five-

ordinary day to day senses. One person explained: *"I found myself pulled up through the light at an accelerated rate of speed. It was like I was being sucked through the air by a powerful, yet gentle and loving force... At that moment I looked up and saw my destination."* Another person explained: *"As I hovered, I felt a wonderful force beckoning from above. I was going home. All I had to do was will it and follow the force, or, rather, let it draw me up."* Another said, *"I died and floated slowly and calmly out of my body, as though it was the most natural thing in the world. After floating under the ceiling, I left the room, leaving behind my body, the hospital ward, and the hospital where I lied down with my newborn son."*

Travelling through a Tunnel Toward a Personified, and Loving "Light"

The sense of travel away from the body is often accompanied with a sensation of traversing through a perceived tunnel towards a warm and welcoming light. One person explained: *"I continued to float up and a tunnel appeared. There was a beautiful tunnel with a bright light at the end of it."* Another said: *"I briefly hovered over my newborn baby ... then I was travelling ... It felt like I was shooting through a tunnel, but I couldn't see any sides to it ... I was tumbling, forward/upward at an unfathomable speed... I saw a pinpoint of light in the distance. When I saw it, it was like a remembering. I knew where I was headed, and I wanted to get there, fast. I can't recall if I was moving myself towards it or if I was being 'drawn' to it somehow, but it was a 'need/desire' within me".* Another person said: *"I remember rushing into a dark, cave-like area where I continued at high speed for some time before I became aware of a small bright light in the distance in the direction that I was headed."* Another person explained: *"All of a sudden, I started floating out of my body. I felt free, peaceful, no pain. I looked down and they were doing compressions on me. I continued to float up and a tunnel appeared. There was a beautiful tunnel with a bright light at the end of it."* One other person recalled: *"I felt very relaxed and peaceful. Everything was black and I had the feeling of being in a tunnel. Way off, in the distance at the end of the tunnel, I could see a bright light."* Other examples that illustrate this part of the experience include the following: *"I found myself well above the operating theater (operating room) where I should have been on a floor above that room or outside looking on a roof, but I wasn't. Instead, I was floating in the entrance to a tunnel,"* or *"I found myself floating*

down a long tunnel. I looked all around and was aware of a soft and mesmerizing light at the end... All awareness of my body on the bed left me as I tried for some time to reach the light. I knew absolutely that wonderful things were awaiting, if I could only get to the end of the tunnel” and “I began to look upward towards the direction we were travelling. This was very difficult because of the speed which we were travelling ... it appeared as though we were going through a tunnel of light.”

During this phase of the experience many people go on to describe the features that characterize the warm, compassionate and loving personified “light”. One person explained: *“I remember a great light appearing before us, like the sun but smoother and cleaner in its light. It did not hurt to look at and regardless we did not have physical eyes. There was the greatest feeling emanating from it. It was the greatest form of love I have ever felt. Greatly beyond that of any parent, lover or child. It was like every expression of love combined. I remember being drawn towards it.”* This phase of the experience typically progresses into a review of one’s life in the presence of this highly benevolent, yet perfect luminous being.

2.2.2. “I Should Have Done Better”: Reliving an Educational and Meaningful Recording of Life

In this section, we will examine what may arguably be considered to be the most remarkable and important aspect of the experience of death. This relates to what has traditionally been referred to as a “Life Review” (as first proposed by Moody in 1975). However, this term and the way it is often presented as a sort of “flashing of your life past you”, doesn’t do the highly meaningful dimension of this feature of the experience justice. A more appropriate description based on our studies would be to refer to this as a “reliving of a recording of life”. This is because it reflects a meaningful evaluation of every detail in each person’s life; people describe that all their actions, thoughts and intentions towards others are recorded in their own self (or consciousness) and become apparent to the individual. The person then relives every moment of his/her life from his/her own perspective, but also the perspective of others (who had been involved in the events), as well as from what is described as a higher perspective – what one person termed “the truth of the matter”. Interestingly, during this phase of the

experience, the focus is not so much on major life events, as one would ordinarily expect, such as graduations, weddings and so on. Instead, the focus is on each and every minute detail of how the individual had interacted with others, including minute events that the person would ordinarily not have even been expected to recall. This includes opportunities taken where one acted in a higher and more dignified or humanistic manner, but also opportunities where one could have acted in a higher and more dignified or humanistic manner, but had failed to do so. This leads the person to evaluate, assess and judge the correctness or otherwise of their own thoughts, actions and intentions based on a review of their entire lifetime. During this review, there is usually a perception of the presence of the compassionate and benevolent entity or personality – the “light” - who guides the person through this detailed review and judgement of their entire life. This presence exhibits a sense of magnitude and power and helps educate the person through each moment of their life. Researchers at New York University have identified highly meaningful and purposeful themes, which include reliving the impact of self-justification to relieve dissonance, the long-lasting impact of one’s actions on other people’s lives and learning the importance of making amends for infringements toward others. The quotes below can help better understand this aspect of the experience .

Review of the Recording of My Life: All My Thoughts, Intentions and Actions Matter

One person explained: *“I started watching my whole life being reviewed in front of me. The emphasis seemed to be on good and bad events...”* Another said: *“I was shown my life from birth to unconsciousness ... I saw not only the actions I had done, but also the thoughts I had sent out. And the thoughts meant more than the actions. That surprised me. I hadn't thought it would be like that. It was scary.”* One other person said: *“I saw and experienced every single detail of my present life up to [the moment of undergoing a cardiac arrest], like watching a movie, yet starring as the main character simultaneously... I was my own judge.”*

This experience progresses further, as described by another person: *“I was watching millions of the pictures of my life’s event ... All the little deeds, thoughts and moments upon moments, even the ones I forgot ever happened,*

they were all there. ... I could see how the last moment of my life was a result of everything that had ever happened to me, before. I could see my life was a perfect manifestation of just what it was, who I was. There was complete acceptance, even of those moments that I remembered as less pleasant."

During this phase, people also describe the personified, compassionate, loving and perfect "light". One person explained: *"I met a glowingly beautiful, very loving being. It was as if I knew him (it was apparently a he)... His loving presence completely surrounded me and together we went through my life and all that I had experienced ... It was observed, and all the feelings involved during the life were examined... All situations were examined, and all the good was emphasized and shown."* Another said: *"I felt a huge presence all around me just pouring love out onto me. I felt such joy and all I could do was stand there in awe at the beauty and the love that was all around me... then... I was given my life review. I was shown my life; everything I had ever said and done was shown to me. It was like watching a black and white movie on a reel."* Another person said: *"I found there was a being beside me...It was a comforting presence, a reassuring presence, but was also a presence of magnitude and power... then I began a review of my life, the key moments of my life. "[I saw a] ... very strong and powerful [being], but yet it was gentle and filled with love. I remember having the thought that I could linger here forever, and just experience this joy, this beauty, and this love."* Another person said: *"I was not alone; I could sense a presence with me... I felt a presence, and also felt complete trust in this company."* Another person explained: *"I did not know [the benevolent personality] is aware of everyone and everything every minute of each day, that each act, word, intention is duly noted"*, while another person explained: *"I do remember a being of light ... standing near me. It was looming over me like a great tower of strength, yet, radiating only warmth and love. I caught glimpses of my life and felt pride, love, joy, and sadness, all pouring into me. Each image was of me, but from the standpoint of a being standing with me or looking on...."*

Not as Good as I Thought: Judging My True Worth as a Human Being

During this phase of the experience, people then go on to report a sense of judgment and re-evaluation of their life, but this is all done by themselves and not an outside agency. One person said: *"I saw myself on the wrong*

side. I was not as good as I thought I was and was ashamed of myself. But the Being of love didn't judge me. He just supported me and gave me love. I saw not only the actions I had done, but also the thoughts I had sent out. And the thoughts meant more than the actions. That surprised me. I hadn't thought it would be like that. It was scary."

Another person further acknowledged the judgment came from himself and not an outside source, explaining: *"It was humiliating. I felt really awful, and it was completely humbling (the individual felt that he had not acted in the best way possible). The judgment came all from myself. It was not from an outside source, but then this being was with me, was also sending me comforting messages.... I felt I had a chance now to change things so that the next time I get back to the life review, it wouldn't be the same, or at least they would say he tried (in relation to being a better human being)."*

People then go on to realize that they were often not as good as they had thought and judge their own true worth as a human being – in essence their humanity towards others - in an impartial manner. One person explained: *"I went through a life review... It was all about my relationships with others in this review. During this, I felt what they felt in my relationship with them. I felt their love or their pain or their hurt, by things I had done or said to them. Their hurt or pain made me cringe and I found myself thinking, 'Oooh, I could have done better there.'"* Another explained: *"I felt like I was a failure as a person, and I wasn't the person I had thought I was,"* while another said: *"I was shown my life in review from the perspective [of] the truth. I was shown every time I had been selfish, choosing for my own interests. I was shown every time I had been divisive or manipulative for selfish gains. I then felt that pain several folds over."* This case and many others illustrate how people come to recognize and judge the reality of their actions, intentions and thoughts, not only from their own perspective, but also the perspective of others and ultimately from the perspective of the real truth of the matter.

Reliving and Experiencing Life Events from their own Perspective and the Perspective of Others

One person explained: *“Not only was I viewing moments [of my life], I was feeling them happen again as if I were there.”* Another explained: *“[A being of light who] told me he was there to help me ... started to show me my life like a movie... The first image I saw was something bad that I did. I could feel the pain that I caused because of my actions... This movie was showing, second by second, my entire life; everything I saw I could feel the results of it. Everything I did had a life of its own... He didn't show me just the bad things I did; he showed me the things I did out of love too [good things].”*

People relive and then evaluate all of their own actions, intentions, and thoughts towards others. One person explained: *“I started to recall significant moments of my... life. It was like traveling to the past to be the main character of the story and an observer at the same time. I learned so many things about myself that I did not know.”* Another said: *“I was able to re-experience myself in all events in my life.”*

There is a sense of being in other peoples' shoes and experiencing their perspective of events. One person explained:

“I could examine [my experiences] from multiple perspectives, such as the people they affected.” One other person said: *“I was re-experiencing [my life] from the other people's points of view and that was a stunner, because you feel their pain, you feel the sting, you feel the hurt.”*

The point of re-experiencing things from the perspective of others is very prominent in the recollections that people have of this phase of their experience. One other person stated: *“Many events in my life I experienced, but not from how I remembered it, but from the point of view, I experienced it from how [others] experienced it around me... It was very apparent that every single thought, word and action affects everything ... In the life review we judge ourselves... with no ego left and no lies, we can't hide from what we have done and feel remorse and shame, especially in the presence of this love and light.”*

One other person explained: *“[I was shown] everything good and bad that had taken place in my life. In your life review, you switch places with the people you hurt. You feel the emotional pain you've caused them. It was painful to watch how I had hurt people...”*

Learning about the Impact and Consequences of One's Actions

Although, this component of the experience can be broken down into multiple distinct themes (summarized in Table 3), overall, people come to recognize and learn that all their thoughts, intentions and actions in life had mattered and that they all had meaning and consequences. They also explain experiencing a sense of embarrassment and shame from their negative actions. One person explained: *“I was shown the consequences of my life, thousands of people that I'd interacted with and felt what they felt about me, saw their life and how I had impacted them. Next, I saw the consequences of my life and the influence of my actions.”* Another person explained: *“I was watch[ing] my life ... I was able to re-experience myself in all these events in my life, but just as importantly, I was able to experience the impact of my actions and words on those other people with whom I had interacted. [No one] condemned me for those painful things I had done or not done, but I felt so very sorry and sad about them within my own heart...”*

One other person recalled: *“[I saw] how big an impact my seemingly small actions had on a large scale... While watching/re-experiencing each moment, I found I was now able to experience each event through the emotions present at each time. I watched my own poor mistakes and learnt from every re-living ... I had learnt so much. How big an impact my seemingly small actions had on a large scale. How my choices and behavior rippled through the lives of countless others. How the love I showed spread like wildfire. How the way I mistreated others, deeply hurt and affected them and also how that pain, fear and confusion would then impact the lives of others too.”*

One other person went on to explain: *“So, what I saw was my own life and my own self-deception to myself, which I had used to convince me that doing certain things was okay because people had deserved it. Then I was now*

experiencing the emotional impact it has had on other people. I felt their pain. I felt the shock on them.” Another person explained: “[I had a] feeling that there is a presence that was following me all the time... he showed me... scenes from my own life. The scenes were in chronological order from the very beginning of my life... I saw that whenever I had done something good to anyone or anything, that I had done it to myself. And whenever I had hurt someone, I had done it to myself.”

Finally, during this phase of the experience people come to realize that there had been a higher overall purpose to their lives, which focuses on developing higher human qualities and virtues and to actively practice ethics and morality, with one person summarizing it as: “*I [learnt I] had to improve as a human being.*”

Part Three: Recalled Experience of Death: Visions of Reality, or Distorted Visions of a Dying Brain?

The testimonials provided by people who have survived a glimpse of death are extraordinarily powerful; not least because of how common they are and the remarkable consistency and universality of the experiences. As will be explained in this section, unfortunately many other diverse experiences have been mislabeled as so called “near-death” experiences. However, what stands out when examining the authentic recalled experiences of death is that they center around a specific narrative arc as illustrated in Figure 1 and expanded upon in Table 3. One of the most prominent features is the ability to maintain visual and auditory awareness and lucid consciousness, as depicted by the capacity to recall, understand, and reason about actual *real and verifiable* events that had happened while they were in a deep coma and on the brink of death with a highly disordered or non-functional brain [Section 7.1]. This contrasts to the altered states of consciousness and hallucinatory experiences reported by people after taking psychedelic drugs. Such psychedelic experiences are characterized by multiple highly diverse and unrelated themes [Section 4] that do not follow the specific narrative arc of death [Figure 1] and occur in a state of *wakefulness*, rather than in a coma and have no relation to real and verifiable events [Section 4]. One of the other features that stand out in particular with the recalled experience of death is the deeply purposeful and meaningful review of one’s intentions, actions and thoughts towards others [Section 2.2.2]. Neither the ability to

verify real events, nor the ability to review one's own life can be considered consistent with an "unreal" experience. It should also be noted that based on population surveys these experiences are estimated to be recalled by around 850 million people today. Yet, some people continue to dismiss these recalled experiences of death as being "unreal" – in part because they have been inexplicable using current models of understanding. Consequently, they have categorized them as "tricks of the mind" or "visions of a dying brain" – in essence unreal experiences that feel real to the person, but are occurring as either hallucinations, delusions or illusions. In this section, we will review the major limitations of this line of thought and what has facilitated the mischaracterization of these experiences as being "unreal".

By way of a recap, we will first breakdown the different types of "unreal" experiences. Hallucinations are sensory experiences (that may arise from any of the five senses) during periods of wakefulness, with content that feels real to the individual, but is experienced without any corresponding sensory stimulus being present. For example, someone may hear a voice talking to them (auditory hallucinations) or may see another person in the room (visual hallucinations) when nobody else is in the room. Illusions are distortions or misinterpretations of real sensory stimuli that had been present (e.g., someone's hand is touched, but in response the person believes his/her hand is shrinking). Delusions are strongly held beliefs that are false and inconsistent with the person's own cultural or religious background and are categorized based on whether they are implausible (e.g., believing that family members have been replaced by body-doubles) or plausible (e.g., believing a spouse is having an affair). Frequently encountered types of delusions include a) Persecutory or paranoid delusions (e.g., falsely believing one is being harassed by others, b) Grandiose delusions (e.g., falsely believing one is a billionaire who owns businesses around the world), c) Erotomaniac delusions (e.g., falsely believing a famous person is in love with them), d) Delusions of control (e.g., falsely believing one's actions are controlled by other persons or objects)

Those who continue to attempt to categorize recalled experiences of death as “unreal” experiences base their arguments around the fact that hospitalized patients in the intensive care unit (ICU) with a disordered brain can exhibit a state of acute confusion (also referred to as delirium). This leads to delusional, hallucinatory and illusory beliefs in response to chemical changes in a dysfunctional brain. Consequently, they believe that the recalled experience of death should also be categorized this way. They have proposed that a variety of mechanisms, such as a lack of brain oxygen, increased carbon dioxide, the release of endorphins (the body’s own morphine-like substance), a specific type of seizure known as temporal lobe epilepsy (which is like an electrical storm in the brain) may be causing these experiences in this manner. In addition, they have also proposed that since a multitude of drugs, including LSD, DMT, and Ketamine can induce hallucinations in a wakeful state, then the recalled experiences of death that are occurring during a deep coma must also be the same. This line of thinking has been aided by ambiguous and/or subjective definitions, as well as a misuse of research scales [See 3.1-3.4] for the so called “NDE” and has led to the problem of comparing “apples” and “oranges” - two things that are fundamentally different and unable to be compared together scientifically (i.e., the recalled experience of death and the variety of hallucinatory, delusional and illusory experiences), but, are nonetheless labeled the same. Here we will examine this “labeling issue” and the circumstances that have facilitated this mindset, before examining the evidence around how “reality” is determined and whether the experiences of death may be considered “real” and consequently indicative of the continuation of human consciousness beyond death.

3.1 Mislabeling Diverse Human Experiences as “Near-Death”: Comparing “Apples and Oranges”

3.1.1 Lack of a Scientific Definition: Misunderstanding and Mislabeling a “Near-Death” Experience.

Starting in the 1970’s and 1980’s and following on from Moody’s original description of what he called a NDE, one of the biggest challenges, (which has plagued the field for decades) has been the lack of a proper scientific definition. Moody did not establish a clear or precise definition of what constitutes a “NDE” in his book and his

notion of being *near-death* was ambiguous. He loosely defined being *near-death* as any medical condition or disease in which a person would likely die without medical intervention². However, he did not specify by what criteria a person should be considered at risk of dying, nor how to define *likely to die* objectively. He considered being “near-death” (i.e., biologically at risk of death), based on the name of the disease or disorder that had been recounted to him, without consideration for any objective biological markers of the severity of those illnesses and actual proximity to death (such as the blood pressure or other vital signs).² Although, some of the conditions that Moody described in his book (such as cardiac arrest) are always truly life-threatening, many other potentially life-threatening conditions (such as a heart attack, severe pneumonia and stroke), can lead to death if untreated, but, will not necessarily place someone at risk of death when less severe. Furthermore, doctors often intervene medically to limit the risk of death (e.g., through the insertion of a breathing tube). Therefore, defining “near-death” based on the name of a potentially life-threatening disorder, while a useful start, is scientifically imprecise. This lack of a precise reference allowed people to progressively mislabel different experiences as “near-death” experiences.

3.1.2 Gradual Omission of the Need to Be “Near to Death”: A Contradiction in Terms

While Moody’s definition of being near-death had not been precise, nonetheless, his description of a NDE, had been based on experiences relayed to him by people who had described being in seemingly life-threatening situations and hence “*near-death*”. Interestingly though, in the years that followed, others, arbitrarily chose to ignore the requirement for proximity to death when labeling experiences as “NDE”, even though the phrase *near-death* clearly specified a relationship to death. Thus, by omitting the need for the presence of life-threatening conditions and proximity to death, many other diverse experiences were subjectively mislabeled as “NDE”. This caused the term NDE to drift away from its origin and to be used much more broadly to describe diverse unrelated experiences, which at times have little or nothing in common with Moody’s original themes, the overall narrative arc that he had described [Figure 1], each another, or death.^{3, 28} Consequently, what one person labels “NDE”, is

different to what someone else is labeling “NDE” in publications. In reality, people are describing different phenomena, but mistakenly labelling them all as “NDE” and understandably disagreeing with each other when discussing their view of a so called “NDE”.

In 2000, Greyson and colleagues attempted to come up with a definition to encompass the different situations in which the term NDE was used by different people.²⁹ They defined NDE as “profound psychological events with transcendental and mystical elements, typically occurring to individuals close to death or in situations of intense physical or emotional danger. These elements include ineffability, as well as a sense that the experience transcends personal ego, and an experience of union with a divine or higher principle.”²⁹ As with Moody’s original observations, this definition included the presence of transcendence, ineffability and long-term positive transformative changes. However, even though being “near-death” was *the* major unifying aspect of Moody’s original cases and is encapsulated in the term NDE,⁶ Greyson did not explicitly mandate the need for an objective relationship with death, such as critical illness, or life-threatening conditions²⁸⁻³⁶.

The lack of a standardized reference and definition, as well as the lack of an explicit requirement to ensure experiences that are labelled “NDE” have a relationship with death, has enabled almost any type of hallucinatory, delusional or illusory human experience, as well as other diverse experiences, including dreams, and meditation related memories to be arbitrarily labelled as “NDE” in publications based on perceived similarities and the author’s own subjective opinions.²⁸⁻³⁶ These include, but are not limited to, experiences that occur in relation to simple fainting episodes³⁴, disorders of sleep³¹, simple dreams, meditation³², and the use of hallucination inducing drugs such as DMT and Ketamine.^{33,35}

Some of the diverse experiences that have been mislabeled as “NDE” by different people are summarized in [Table 4]. The experiences described in these studies, neither fulfill the conditions proposed by Moody, nor those proposed by Greyson, including a sense of transcendence, ineffability, and long-term positive transformative changes, and importantly they fail to relay experiences related to death. A detailed examination of these experiences clearly illustrates that they are fundamentally quite different to the experience that Moody originally described and the overall narrative arc [Section 1 and Figure 1]. Yet, these mislabeled experiences have led to confusion for the public, the media and scientific bodies, due to the continued problem of comparing of “apples” and “oranges”. This has enabled people to consciously or unconsciously “confirm” or “refute” their own subjective suppositions and beliefs, in line with the well described principles of confirmation bias and the Dunning-Kruger effect. For instance, without a clear reference, when, someone believes the recalled experience of death is hallucinatory, delusional or illusory, they can simply label and categorize other delusional, illusory, or hallucinatory experiences as an “OBE”, or “NDE” (e.g., someone who imagines flying after taking a hallucinogenic drug). Alternatively, if someone believes these experiences are “spiritual”, they can label what they perceive to be spiritual experiences (e.g., meditation related experiences) as “NDE”. As will be discussed in section 3.3, this subjective mislabeling of diverse experiences has also impacted the perception of external visual awareness (so called out of body experience).

Table 4. Experiences Labelled as “NDE” During Events Unrelated to Death or Life-Threatening Illness	
Experience Type	Summary of Reported Themes and Description of the phenomenological Features of Experience being Labelled as “NDE”
Syncope	Themes described were colors and lights, landscape, familiar people, out of body, sounds, and emotions , however, no actual qualitative descriptions were provided to enable a more detailed analysis of the phenomenology and themes.
REM Sleep Intrusion	“Sometimes I wake at night, and I can’t move. I see strange things, like spirits or demons at my door, and after a while, I see them coming beside me. I can’t move or talk, and they sit on my chest. It scares the hell out of me! I think that it is a dream, count to 3 and close my eyes. Sometimes this helps.”
Meditation	Some of the themes described were as follows: Feeling of drowning, being stuck/unable to move, ceasing to be aware of time and space, worlds where beings “hang from ropes”, recently deceased beings, demonic beings, emptiness, non-self, and remaining aware of body”
Meditation	The Greyson NDE Scale was used to measure depth of a so-called NDE. However, no actual qualitative descriptions were provided to enable a more detailed analysis of the phenomenology and themes.
DMT	
Ketamine	

3.2.3 Problem of Symbols: Subjective Interpretations of Religious, Non-Religious and Alien Symbols

People sometimes mention ‘religious’ and ‘spiritual’ features or symbols, or use ill-defined terms like “spirits,” when reporting dreams,³⁷ or during experiences induced by hallucinogenic drugs. Words, symbols and phrases have meaning depending on how language is used and in relation to the circumstances and overall context that they are being used. Thus, rigorous analyses using linguistic approaches and reliance on the science of language are needed to evaluate the meaning of experiences. Nonetheless, for some when a religious symbol, figure, or phrase (e.g., cross, Jesus, God, or spirit) is mentioned during neurological or psychiatric events (such as schizophrenia), simple dreams,³⁷ drug induced or other hallucinatory experiences³⁵ has been considered sufficient to label and superficially categorize those as “religious” and “Near-Death” experiences. This reflects the fact that a universally accepted definition of what constitutes or defines a “religious” or ‘spiritual’ experience does not exist. As a result, some have labeled “religious” experiences in 1.3% of epilepsy and 2.2% of people suffering with temporal lobe epilepsy (TLE).³⁸ However, in these studies, the label “religious” has been applied loosely based on the simple use of religious symbols or phrases by individuals during seizures, rather than a deeper analysis of what constitutes a religious or spiritual experience, including their features, phenomenon and meaning.³⁸ Specifically, patients with TLE have been observed to report vivid dream-like states, déjà vu experiences, and repeated automatisms in which they may repeat phrases, such as “God, God, God,” as well as depersonalization, fearful, and anxiety-eliciting experiences.³⁸

Some have used this observation to propose that experiences in relation to death and religious experiences in general may occur as a result of abnormal brain functioning similar to that seen during seizures.³⁹ However, without any supporting studies to demonstrate how seizures cause verifiable religious or spiritual experiences, or even studies to show any relationship between the two may exist; this is at best speculation. Furthermore, studies have shown that the features, phenomena and characteristics described by people with a recalled experience of

death [Table's 1-3] are not consistent with the automatisms with or without religious terminology that occur with TLE and in fact have completely dissimilar features.⁴⁹

By way of further illustration, in 1997, Whinnery, an engineer, claimed similarities between NDE and acceleration (+Gz)-induced loss of consciousness (G-LOC), which causes transient episodes of loss of consciousness due to a transient reduction in blood flow to the brain (cerebral blood flow) in fighter pilots.⁴¹ This phenomenon occurs when extreme acceleration during flight leads to the pooling of blood in the limbs due to the effects of gravity, with a significant reduction in brain blood flow.⁴¹ This report was largely a description of the author's own personal views laced with a limited number of anecdotes and largely did not contain any scientific data. Despite this lack of scientific rigor by today's standards, on closer examination, it is worth noting that the experiences Whinnery reported and labeled as "NDE" were quite dissimilar to the classical NDE and were consistent with conventional dreams.⁴¹ For example, one 20-year-old fighter pilot stated that during his unconscious state he had a dream, which he described as follows: "... I can't remember what we were doing, but when I came back [return of consciousness] I thought I shouldn't be here. We were outdoors; it was wild!" Other anecdotes related to dreams during G-LOC included watching a "sunset" or people dreaming that they were "floating in a blue ocean."⁴¹ Whinnery also claimed that some individuals after experiencing G-LOC reported an OBE, but, provided no detailed descriptions. It is possible that what those individuals described may not have been phenomenologically consistent with the classical OBE descriptions. Unlike the classical NDE descriptions, these G-LOC reports did not include a life review, a transcendent experience, or any long-lasting transformational effects⁴¹ – further evidence that these were likely dissimilar experiences (e.g., conventional dreams labeled as NDE due to lack of definition).

3.3 The Story of Illusions: Distortions of Bodily Image Labeled as External Visual Awareness

People who have come close to death describe a perception that the self—one’s consciousness—separates from the body, yet maintains lucidity and the ability to process visual and auditory information that relate to actual ongoing events, which have at times been verified and corroborated^{2,17-18}. This reflects a lucid state of visual and auditory awareness and consciousness of one’s own body and its surroundings, which is paradoxically perceived as an external view of oneself. Although, a more appropriate and accurate term to describe this experience may be External Visual Awareness (EVA), Moody referred to these episodes using an older term of out of body experience (OBE) (which was originally coined in the 1940’s), in the context of being “near” to death.² This phenomenon can occur under multiple circumstances, one of which is a life-threatening illness or being in proximity to death^{6,17-27}. Over the last 45 years, despite the growing use of this term, a definition regarding what constitutes an EVA (or authentic OBE) has never been set forth. For this reason, much like the broader NDE term, wide discrepancies exist in the ways the term has been used to refer to a diverse group of experiences that are often quite different to the original descriptions, using an overall umbrella term of “OBE”. These include the phenomenon of autoscopy and visual and perceptual illusions created through virtual reality goggles,⁴²⁻⁴³ as well as a broad range of bodily illusions created through brain stimulation.⁴⁴

3.3.1 Autoscopy: Seeing a Duplicate of Yourself

Autoscopy is a phenomenon in which people experience seeing a physical double—a literal replica of themselves—often at a distance acting independently and separately. For example, the replica/double of the individual may be seen standing across the room and cooking, reading, or performing other activities.⁴⁵ This is different from the classical description of zexternal visual awareness and the phenomenon that Moody had labelled as an OBE [See Section 2.2.1 and Table 6]. In particular, during autoscopy people do not describe that their self—their consciousness—had separated from the body and is able to perceive visual and auditory awareness of events from a point outside of the body. They describe seeing a physical double who resembles

themselves at a distance and they recognize as being unreal and imaginary, yet is conducting various activities independently and in a manner that is unrelated to what the individual is actually doing.⁴⁶

3.3.2 Tricking the Mind Through Virtual Reality Goggles: Looking at Yourself from Behind

Another category of experiences, which lack the features of external visual awareness (or an authentic OBE), but have been labeled “OBE”, are optical illusions created through virtual reality goggles⁴²⁻⁴³. For instance, in one study, participants were asked to wear goggles that obscured their vision of the outside world and as a result they could only see what they were shown through the screen of the goggles. They were then video recorded from behind using a camera and the image of their own back was transmitted through to the screen of the goggles that they were wearing. Consequently, over time, the individuals got used to seeing themselves from behind and started to perceive this as their new reality. Then afterwards, they became startled when the camera was attacked with an object (because they believed that they were being attacked from behind).⁴²⁻⁴³ Although, this shares nothing with the sense of external visual awareness, nonetheless, it was arbitrarily labelled as an “OBE” and the researchers claimed that they had been able to reproduce an “OBE” in the laboratory.

3.3.2 Bodily Distortions and a Feeling of Floating: Optical Illusions Created Through Brain Stimulation

Almost 20 years ago, a group of researchers led by Olaf Blanke proposed that OBE are complex illusions.⁴⁴ This was based on a case report published in 2002 of a 43-year-old woman who was receiving brain electrical stimulation for the treatment of epilepsy⁴⁴. When one part of her brain (right angular gyrus) was stimulated with electricity, she reported a feeling of “sinking into the bed” followed by a feeling of “*falling from a height*” and said: “*I only see my legs and lower trunk*” and then reported seeing her legs “*becoming shorter,*” followed by a perception that “*her legs appeared to be moving quickly towards her face*”—something that had felt real enough to make her take evasive action⁴⁴. The investigators stated that when the woman was asked to look at her outstretched arms during electrical stimulation of the brain, she “*felt as though her left arm was shortened*” and

“that her left lower arm and hand were moving towards her face.” Furthermore, *“when her eyes were shut, she felt that her upper body was moving towards her legs...”* Based on these descriptions of illusory alterations in the length of her limbs, and because no reference or definition existed, her experience was labeled as an

‘OBE.’⁴⁴ Following this case, other case reports were published that claimed similar observations and they too followed this lead and labelled their cases as ‘OBE’^{20, 21, 23, 27}. However, these reports of illusory experiences (e.g. alterations in the shape of the body or the feeling of floating) were not consistent with the descriptions that people had provided of external visual awareness – i.e., the sense that the real self or consciousness, while outside the body maintains visual and auditory awareness of their own body and its surroundings (rather than just the feeling of floating). Others have also proposed other theories, which includes a hypothesis that this experience is an illusion related to middle ear disorders.²²

However, none of these reports, while claiming to be describing an “OBE”, have provided a detailed narrative of an experience that resembles and reflects the descriptions of external visual awareness.

Table 5: Case Reports of Diverse Experiences Labelled as “Out of Body Experiences”
Illusory Experience during Focal Electrical Stimulation of the Brain: She was "sinking into the bed", "falling from a height" and felt her legs "becoming shorter".
17 year old female with epilepsy during intracranial electrode stimulation: She felt the “virtual body” was real herself and she saw her own body ... being electrode stimulated by the doctor
15 year old male with epilepsy who experienced observing his body from the ceiling Told his mother he had been projected out of his physical body to an elevated position under the ceiling
Patient Experiencing floating during an awake craniotomy for resection of low-grade glioma Feeling as if she was floating just below the ceiling and saw her own body lying on the operating table
Illusory experience during stimulation of temporoparietal junction on the right side Feeling of disembodiment without an alteration in the patient’s level of consciousness.
A sixty year old man with history of bifrontal throbbing headache who had an altered experience of autoscopy Patient stated seeing the double once while brushing his teeth and while sitting on his bed where the image turned around and walked away
A 21 year old man with seizures who had an experience Patient reported turning around to see himself lying in bed, he tried to wake the body in the bed by shouting at it, shaking it and jumping on his alter ego in the bed
A patient who was hospitalized due to stroke and experienced visual hallucinations seven weeks after admission. Patient reported seeing image of himself, which was exactly “like looking in a mirror”. While seeing image of himself all his movements were reciprocated by the image.

Today, the use of the label ‘OBE’ to describe multiple different experiences has continued, and appropriate and specific terminology is needed to distinguish among these experiences in the future. Furthermore, it is challenging to compare all the different case reports and studies that purport to be reporting on so-called OBE, because 1) there is no specific definition of an “OBE” or reference being used; 2) in most instances, the researchers have not provided any detailed descriptions of the experiences they are labeling as OBE; and 3) researchers have not offered criteria by which an experience was deemed to be an OBE. To illustrate the breadth of experiences with different features that have been labeled ‘OBEs,’ yet are inconsistent with the original concept of external visual awareness, we have summarized the reported features from different published studies in [Table 5].

An ongoing qualitative study underway among survivors of life-threatening illnesses has identified multiple characteristic themes, which are consistent

with external visual awareness and the original (authentic) description of an OBE are also presented for the first time for illustrative purposes [Table 6]. A comparison of these cases with many other reported so-called “OBE” in [Table 5], illustrates some of the fundamental differences. Future studies are needed to better characterize the features and phenomena that relate to external visual awareness (authentic OBEs), as well as other experiences

Table 6: Themes Related to External Visual Awareness in the Context of Life-Threatening Illness
Separating from the body <ul style="list-style-type: none"> • “I found myself very near the ceiling in the corner of the room. I was so high that I was within inches of the ceiling tiles.”
Paradoxical Lucidity <ul style="list-style-type: none"> • “I still was completely lucid and aware of what was going on.”
Initial Confusion <ul style="list-style-type: none"> • “I was wandering around ... found others who were similarly confused as to ... what was going on.”
Realization of Having Died <ul style="list-style-type: none"> • “I was sure I had died.”
A Sense of Liberation and Weightlessness <ul style="list-style-type: none"> • “I looked at my body and knew it wasn't the real me, it was the thing I had been caught inside, and now I was free!”
Visual Awareness: Observing the Body or Events from Above <ul style="list-style-type: none"> • “I was looking down at myself from above! At first, I did not even recognize that it was me.”
A Birds Eye View: I Felt like I Could “See” in All Directions (360 degrees) <ul style="list-style-type: none"> • “I perceived and saw everything around me, like in 360 degrees.”
Becoming Detached from Events Below <ul style="list-style-type: none"> • “I also noticed that I was no longer concerned about my body, [or] how it looked.”
“I”, Myself Remains <ul style="list-style-type: none"> • “My consciousness had separated from my body and I seemed to be next to it [the body]. I was watching like an observer or a bystander.”
Shedding the body like a piece of clothing <ul style="list-style-type: none"> • “I was amazed... that body there was just a coat I had been wearing. It felt good to be out of it.”
Connected by a “Cord” <ul style="list-style-type: none"> • “It felt like I was attached to a cord.”
Hovering or floating in the space <ul style="list-style-type: none"> • “I floated without weight ... I was above my body and directly below the ceiling of the intensive therapy room.”
Moving to a destination <ul style="list-style-type: none"> • “At that moment, I had left my body and began to return home.”

that have been categorized as “OBEs” but where the features are inconsistent with the original descriptions. These include autoscopy, bodily illusions, as well as illusions created through virtual reality goggles. Such an endeavor would aid with the creation of a unified definition and measurement scale.

Systematic mechanistic studies are also needed to determine whether stimulation of a focal point or multiple points in the brain may actually trigger the occurrence of external visual awareness (an authentic OBE), as might occur during life-threatening illnesses, or whether this approach can only induce the types of bodily illusions that have been reported so far. Nonetheless, it should be pointed out that the identification of a brain region that could be involved in the occurrence of external visual awareness or any other experience cannot establish whether the experience is real or illusory, just as the identification of brain modulators underlying other human experiences, such as love, cannot determine whether they are “real” or “unreal” [Section 5.3]. In particular, the occurrence of the perceived separation of the self—consciousness—from the body, with continued lucidity and visual and auditory consciousness, as well as awareness and recall of actual verifiable events, is inexplicable through current neuroscientific models. Even more peculiar is the ability to maintain paradoxical lucidity with visual and auditory consciousness by individuals undergoing cardiac arrest,¹⁷⁻¹⁸ because during cardiac arrest, the brain—and cortical activity, in particular—is either severely disordered or non-functional. This provides support for the potential continuation of consciousness in relation to death [Section 7].

3.4 Almost Any Experience Labeled “Near Death”: Non-Context Specific Use of Research Scales

Another important feature that has continued to facilitate the mislabeling of numerous hallucinatory, delusional and illusional experiences as NDE, has been the lack of specific and sensitive research scales that can distinguish between the NDE that Moody described and other diverse human experiences, when used outside of the context for which they were created - i.e., experiences occurring during a life-threatening situation and proximity to death.

In 1980, Kenneth Ring created the “weighted core experience index” (WCEI) by taking specific components of what he considered to be a NDE, such as the sense of being dead, feelings of peace, or separating from the body.⁵ Each feature was scored based on whether or not it was present, and the overall total score (based on the features that were present) were added together to give a total score that ranged between 0 and 29. A score of zero was considered inconsistent with a NDE, while scores between 1 and 5 were classified as a “superficial NDE” and those over 6 were classified as a “core NDE”.⁵ Furthermore, the core NDE was further classified as moderately deep (WCEI 6-9), deep (WCEI 10-14) and very deep (WCEI 15-19). Although, this was a promising attempt to measure and calculate the depth of the NDE, however, one major problem was that many of the features that were included in the scale were not specific to a classical NDE and so could be misused in other circumstances. For instance, a sense of being peaceful is a very non-specific and widely encountered experience that may be described in relation to a variety of circumstances, such as walking in an idyllic location, or while in nature. As a result, if the scale were to be used outside of the context of a life-threatening illness and proximity to death - then a whole host of simple day to day experiences, like feeling peaceful could also be misclassified as a “NDE”.⁵

In 1983, Bruce Greyson developed a more robust scale, which has been used commonly since. The scale contains 16 features of a NDE that are classified based on whether or not people had recalled them. A score is given for each of the 16 items (0 = absent, 1 = mildly present, 2 = definitely present) and using this scale, a NDE is defined as any experience that includes four or more NDE features (i.e., a NDE Scale score ≥ 7).⁴⁷ Although, this improved on the WCEI (since at least four features were needed to define a NDE as opposed to only one feature), however, this scale too remained prone to many of the same limitations as the WCEI, as many of the features were highly non-specific.

While not obvious at the time of the development of these scales almost 40 years ago, many of the terms and prompts used by Ring and Greyson, were taken in a literal sense from the phrases that the members of the public

had used. However, these terms (such as feeling peace) were not sensitive or specific enough to distinguish features that occur during a NDE from other diverse and different human experiences and contained enormous ambiguities. Examples in Greyson's NDE scale that are ambiguous and open to misinterpretation⁴⁷ include asking people whether they had experienced: "strange bodily sensations," an "unearthly" [place], "mystical" [feelings], "joy," "harmony," "pleasantness," and "spirits." These terms can be used by people non-specifically to refer to multiple diverse human experiences.⁴⁷ For instance, the term, "unearthly"⁴⁷ is very broad and used in common language to refer to any experience that is considered out of the ordinary. This could range from experiencing a beautiful and idyllic vacation spot to feelings after psychoactive drug use. To illustrate the problem, consider a person who travels to an idyllic, beautiful, and peaceful vacation spot that seems out of the ordinary and then starts to think back on his/her life. This simple common vacation related memory would be mislabeled as a "NDE" if the Greyson NDE scale is applied in a literal and non-context specific manner (i.e., to people returning from vacation), because the vacation related memory would include the following four themes that are included in the NDE scale to "define" a NDE (i.e., score \geq 7): a) feelings of peace, b) harmony, c) being in an unearthly place and d) memories of one's past.

Even though the WCEI and Greyson NDE scales were meant to be used in the context of memories reported after life-threatening (near-death) events, however, by applying them in non-context specific circumstances, many people have erroneously labeled a broad range of other human experiences, with completely different features, including dreams and drug induced hallucinations as "NDE". Today, the continued mislabeling of a variety of experiences as 'NDE'.³⁵ reflects the lack of a precise definition, together with the misuse of research scales that were developed 40 years ago specifically for experiences occurring in life-threatening circumstances; rather than actual similarities between the features that people recall during the different experiences.^{5, 33, 47, 48}

Putting aside the gross mislabeling of diverse experiences as *near-death*, a review of the published studies that have examined the reports provided by people after taking hallucinogenic drugs (including those which have labelled these as "NDE" or "NDE-like"), clearly demonstrate that they are completely dissimilar. This is also the

same for the results of published studies that have reported on the features of delusions, dreams and illusions in the ICU. A review of these studies demonstrates clearly the differences between the recalled experience of death and hallucinations, delusions, illusions, and other delirium related experiences and dreams that are being labelled as “NDE”.

Part Four: Experiences of a Disordered Brain: Drug Induced and ICU Hallucinations, Delusions and

Illusions.

4.1 Characteristics of Drug Induced Experiences:

Psychedelic induced experiences and altered states of consciousness occur in people in a wakeful state after the use of hallucinogenic and dissociative compounds such as N,N-Dimethyltryptamine (DMT), Lysergic Acid Diethylamide (LSD), ketamine, and psilocybin. In recent years, the subjective effects of different types of psychedelics have attracted the attention of researchers⁵⁰⁻⁵⁸. Some have compared the psychedelic induced experiences to the recalled experiences of death and have proposed similarities between the two. However, a detailed review of the literature and analysis of first-

Table 7. Experiences Recalled in Relation to the Use of N,N-Dimethyltryptamine (DMT) and Ketamine	
•Intensive Body Misperceptions and Deformations Deformation of body parts Sensations as if one’s arm did not belong to oneself Losing control of body movements Impossible to stand up Limbs being stuck to the chair Midget hands Very big legs Elongated pipe cleaner legs and arms Spindly E.T.-like fingers	•Visual Hallucinations Ballroom with crystal chandeliers Birds Huge fly eye bouncing in front of the face Stairway Duct Tunnel DNA double helices Pulsating diaphragm The inside of a computer’s boards Moving persons and body parts on the computer screen
•Voices Whispering voices Music Telephone rings Crinkling noise Crunching noise Whining Whirring	•Egotistical Themes “I was God” “I was Isis the goddess” “I felt God-like”
•Geometric Patterns Complex geometric patterns on the walls Kaleidoscopic geometric patterns: “beautiful, colorful pink cobwebs; an elongation of light”, “tremendously intricate tiny geometric colors, like being 1 inch from a color TV.”	•Emotions and Sensations Giggles and Bliss Sense of Vibration Feeling uncomfortable with the emotional alterations Emotionally unresponsive Feeling that emotions are not being “real” but made by the drug
•Seeing “Other Beings” “Elves” “Alien beings” “Higher Intelligence” “Little round creature with one big eye and one small eye”	•Time Time had stopped Everything takes a long time

person narratives indicates that these experiences are quite dissimilar and any assumed “similarities” again reflects

the lack of a precise definition for the recalled experience of death, which has enabled such experiences to be subjectively mislabeled as a so-called NDE.

Studies exploring the psychedelic induced experiences often include healthy volunteers or individuals who have had no proximity to death, which contrasts to the biological changes in patients who have been in a life-threatening circumstance and close proximity to death. Importantly, an analysis of published studies indicates that the recalled themes by people after the use of psychedelic drugs are very broad and inconsistent [Table 7] and do not follow the narrative arc of an authentic NDE or the recalled experience of death as summarized in Figure 1. On the contrary, the features described in the literature in relation to psychedelic experiences include deformation of body parts, enlarged or shrunken body parts, presence of aliens, and geometric shapes and patterns. Additionally, auditory hallucinations, include whispering voices, telephone rings, crinkling and crunching noises, comical and chattering sounds. In order to allow readers to better understand the main recalled themes after the use of psychedelic drugs, we have provided summaries of these in Table 7, as well as some exemplary quotes from the published literature in the main text.⁵⁰⁻⁵⁸

4.1.1 Intensive Bodily Misperceptions:

One of the main themes after the use of hallucinogenic drugs is misperceptions regarding one's own body. For instance, one person had stated that *"Each limb seems separate, detached from each other."* Another said: *"My body image was distorted beyond recognition—fantastically elongated pipe cleaner legs and arms, spindly E.T.-like fingers, and morphing alien-insect head in the mirror..."*, while another said: *"My hands look small, but the fingers are really long."* Other examples of this include: *"My hand looks like a midget hand ... like a funhouse mirror effect,"* and *"I feel like I'm shrunken inside."* *"My legs look very big and funny shaped, like another person's"* and [I am] *"Not in control of my body, can't move"* and *"I don't feel in control of my muscles anymore"*

- like a zombie is a very good description of it. There is something making me just stay here. Something in my head is telling me I can't move.”

Some people also describe the inability to move their limbs, as well as heaviness in their limbs. One person said: *“The will is there but difficult to get my legs to do what I want them to do.”* Other recollections include: *“I feel myself slipping away. I can no longer remember my name. I search my memories for clues to my identity. I do not know where I am”* and [I] *“Feel like it would be impossible to stand up, body feels like a ten-ton weight... noticeable delay between thinking about moving and it happening.”* Another person explained: *“My limbs feel like they've got a magnet and they're stuck to the arm of the chair like lead weights”,* while another said: *“I looked up and saw how mechanical and essentially soul-less you were. Your movements were not your own, they were no longer smooth and coordinated.”*

The experience of bodily misperception includes a feeling of other bodily distortions. One person explained how he had been split into three different people: *“I talked to my selves as a group. I would say: ‘O.K. guys, how do we feel about this?’ Once I actually saw myself split up into 3 different people, not in my mind either. I mean that I actually saw one of me to the right, and one of me on the left.”* Another explained: *“I was sitting on the floor – but I was also sitting on the ceiling and on the walls, looking down and up and sideways at everything. Multiple perspectives – then suddenly more and more – I was sitting, standing, walking, flying, falling and totally still.”* Another person explained that *“K [ketamine] can split you into several personalities—different selves in one room—without anything to unify all the subroutines into a single whole. You realize that the real miracle is that there is ever a unifying self.”*

4.1.2 Seeing “Other Beings”

One of the other main recalled themes after the use of hallucinogenic drugs involves seeing other entities. This includes, elves, aliens, even a ‘ketamine creature’. However, these are very different to the personified luminous being that is consistently described by people during a recalled experience of death. After taking a hallucinogenic

substance, one person explained: *"It felt like there were more people in the room than two, presence of four people. I could see shapes of people moving but I couldn't keep track and they were all talking. I could hear people talking but I couldn't tell who was doing the talking - so it could have been something inside my head, I don't know. But I was definitely hearing things that I couldn't just place to any specific person or thing."* Another person said: *"[There was] a large space with strange textures and geometrical shapes. Two of these shapes were eventually perceived as intelligent beings",* while another explained that *"I became aware of a 'ketamine creature' (Kreature) who was simultaneously some kind of spaceship, and it told me that the person I usually was in everyday life was also something like a four-dimensional 'badge' that was worn by some larger multi-dimensional entity."* Another person said: *"One of the elves made it impossible for me to move. There was no issue of control; they were totally in control. They wanted me to look here and there. That was all I could do."* He continued to explain: *"The 'elves' were prankish and ornery in their nature. There were four of them by the highway, they totally commanded the scene- it was their territory. They were about my height and held up placards."*

4.1.3 Egotistical Features:

During psychedelic induced experiences, references to religious symbols may be made. However, unlike during the recalled experience of death, where survivors recognize the presence of a highly luminous, kind, benevolent, and all-powerful entity who is imbued with humility and guides them through a review of their life; during drug induced experiences, the 'religious' symbolism is completely different. Furthermore, the religious terms are symbols are often used in the context of giving the person a deluded sense of grandeur, which is completely different to the sense of humility that people are left with after a recalled experience of death. For example, after a drug induced experience, one person said: *"I was essentially told that I was God"* while another said: *"I felt God-like. I would love myself; it was great"* and another said: *"I was actually God. I distinctly felt the universe watching for my signal to see if it should cycle through itself once again, as it had an infinite number of times, or*

should it simply conclude” and another explained: “*I was Isis herself, the virgin mother-goddess brooding lovingly over this world that I had created and was enfolding with arms like wings.*”

There are many other broad themes related to the use of psychedelic substances, which have been summarized in Table 7, this includes misperceptions about time, seeing multiple geometric shapes and other diverse emotional states and visual recollections which are quite different to that of a recalled experience of death.

4.2 Characteristics of Intensive Care Unit

Dreams, Delirium, and Delusions:

Another category of experiences described by people who have experienced a life-threatening illness is related to the time of hospitalization in the intensive care unit (ICU). These include dreams, nightmares, delusions, illusions and hallucinations.

Some studies exploring ICU related memories

and recollections have suggested that acute confusional states after a brain disorder – delirium - lead to disturbed memories and “unreal” experiences, with an incidence as high as 70-80%⁶³. Interestingly, unlike people with a Recalled Experience of Death who associate their experience to a long-term positive transformative outcome,

Table 8. Themes Related to the Experience of ICU Delirium, Delusion and Dreams	
•Bodily themes and feelings related to self: Being out of it Falling or sinking Distorted perception of body and bodily sensations Feeling of floating	•Eating and drinking Giving the doctor a beer Ice-cream on the ceiling Drinking water Feeling thirsty
•Misperception of places Prison Restaurant Waiting in a queue to go to a burial On a cloud walking a dog Car Pipe Farm Hole Wedding	•Sleep and time Disrupted time perception Shift of day and night Disrupted sleep pattern Fear to fall asleep
•Persecuting others and being persecuted Attempting murder Being poisoned Attempted murder by staff Buried alive in a glass sided coffin Nurse trying to steal tablets	•Religious themes Conversations with God Face of Jesus Christ in the wall and ceiling Being in a temple
•Alien Creatures Lady with a wing Other creatures	•Nature Flower River Landscape
•Animals Horse Dog	•Sounds Strange noises Clicking noises like horses
•Strong emotional feelings Anger Fear Frustration Guilt Incomprehension Joy during and after delirium No fear	•Others Rubber Commercial Temperature Looking through a glass window Vision of glass window all around

many other ICU survivors have reported psychological distress, including post-traumatic stress disorder, anxiety and depression after delirium during their stay at the ICU. A review of the literature on memories (aside from recalled experiences of death) reported by ICU survivors suggested that while some reported memories are common among ICU survivors, often times there is no consistency among experience features and they vary from one person to another⁵⁹⁻⁶⁶. One common feature reported by ICU patients are auditory and visual memories, which have a persecutory nature such as impending death, being buried alive, being poisoned or attempted murder by staff. Another common feature of such experiences reflects the misperception of the place, e.g., feeling that they have been in a temple, prison hospital or café. Other examples of ICU memories in the literature that are not consistent among patients are, hearing clicking noises, seeing frills and laces, sensation of being in a different world, feeling a void, presence of two men with a plastic bag and a name tag you put on a toe, car/horse racing (Table 8)⁵⁹⁻⁶⁶. These experiences are different from the recalled experience of death, which has a consistent set of features and follows a very specific narrative arc [Figure 1] and has a positive outcome.

Part Five: Examining the Reality of Recalled Experiences of Death:

Although, due to imprecise definitions and the misuse of research scales, it has been possible for some people to mislabel diverse “unreal” experiences as ‘near-death’ experiences. However, a review of the recalled experience of death and other diverse experiences so far, clearly demonstrates the fundamental differences. In this section, we will examine issues related to the determination of reality in relation to human experiences, including that of the recalled experience of death.

5.1 “Unreal” Experiences in a “Dying Brain”? Multiple Proposed Theories Without Supporting Scientific Data.

A variety of potential brain-based intermediaries have been proposed to account for the occurrence of recalled experiences in relation to death as either hallucinations, delusions, or illusions in response to a disordered brain.

These include oxygen deprivation (hypoxia),^{34,67-69} high carbon dioxide levels (hypercarbia);⁷⁸ changes in hormones and brain-based chemicals (neurotransmitters) including endorphins⁷¹⁻⁷² or serotonin;⁷³ *N*-methyl-D-aspartic acid (NMDA) receptor activation;⁷⁴ or activation of the parts of the brain involved in memory, hearing and the interpretation of what has been seen (temporal lobes) through seizures⁷⁵ or activation of the parts of the brain involved in emotions (limbic lobe).⁷⁶ The proposed intermediary-based theories which are summarized below can be classified into three broad categories: (1) speculative theories put forward without any supporting research data (e.g., the oxygen deprivation [hypoxia/anoxia] ^{34,67-69}, and brain based intermediary [NMDA, serotonin, and endorphin theories]) ⁷¹⁻⁷⁴, (2) theories based on very weak association data (e.g., high carbon dioxide⁷⁸ and dreams arising from sleep disorders (REM-intrusion theories), and (3) theories that reflect the lack of precise definitions, as well as measurement scales used incorrectly in non-context specific circumstances.

More than 20 years ago, oxygen deprivation was proposed to lead to the illusion of seeing a tunnel⁶⁷⁻⁶⁸. To explain how changes in the brain at the time of death may cause hallucinations, Susan Blackmore, a British psychologist, proposed what became known as the “dying brain” hypothesis. This theory held that a lack of brain oxygen, which is inevitable during the dying process, might cause uncontrolled activity in the brain areas responsible for vision. This activity could trigger the illusion of seeing a light and a tunnel. This was stated without consideration for the fact that the “light” reflects a luminous personified entity with compassion, and benevolence, rather than simply a characterless “light”, which may be expected if this theory was correct. Although, oxygen deprivation has been extensively researched as part of a wide range of medical disorders, such as asthma, emphysema, acute respiratory distress syndrome and pneumonia (including in COVID-19), no relationship between so-called “NDE” (or the illusion of seeing a tunnel and light) and oxygen deprivation has been reported in any of thousands of studies of oxygen deprivation. Instead, oxygen deprivation leads to an acute confusional state (delirium) with clouding of consciousness [as detailed in section 4.2], which contrasts to the structured episodes of paradoxical lucidity, thought processes, reasoning and memories with transcendent features that reflect the original description of an NDE.⁴⁰ Furthermore, at least one study has demonstrated no difference between oxygen levels in people who

report a NDE after suffering cardiac arrest and those without,⁷⁰ while another study demonstrated a possible inverse relationship.⁷⁷ Other brain-based theories, that propose NMDA receptor activation causes hallucinations, or that the release of serotonin, and endorphin cause the sense of peace and comfort in so called NDE are also unsupported by scientific studies to date.⁷²⁻⁷⁴

Another category of theories are those advanced based on very weak association data (a relationship where two factors may be observed to change together, but it is unclear whether one causes the other). One small study reported a possible association between so called “NDE” and high carbon dioxide levels (hypercarbia).⁷⁰ Much like oxygen deprivation (hypoxia), high carbon dioxide levels in the blood has also been extensively studied as part of a diverse group of lung diseases, without any indication of any authentic NDE features occurring in such people [Table 1]. In reality, higher carbon dioxide levels measured during emergency treatments when the heart is stopped (cardiac arrest) reflect a marker of higher quality treatment.⁷⁸ This might suggest less brain injury and hence impact the ability for people to later recall their memories (including so-called NDE). Having said that, an earlier study of NDE after cardiac arrest found no association with carbon dioxide levels and it is unclear whether the reported relation is even valid.⁷⁷

Another proposed theory suggests that the so called NDE that Moody originally described is actually a type of a dream that is occurring during the phase of rapid eye movement (REM) sleep. It is hypothesized that a specific type of disorder of sleep called REM intrusion, which represents the continuation of features that occur during the REM phase of sleep (such as transient paralysis) into states of wakefulness, may cause the recalled experience of death as a dream-like, but unreal state.³¹ This theory was proposed based on an association between reports of so-called ‘NDE’ and reports of symptoms of REM intrusion (e.g., a transient feeling of paralysis) in a very small study with significant design limitations, including concerns for bias.⁷⁹ In 2019, Kondziella and colleagues, attempted to replicate this study with 1,034 young people who were identified through an internet-based crowd-sourcing platform.³⁷ These researchers concluded that features of REM intrusion were more likely to be reported

by people who they categorized as having a “NDE” and that this suggests they are dreams³⁷ However, not only was this study unable to show this, but it too had very significant design flaws, including the way they had classified people as having a “NDE”. In particular, the researchers failed to distinguish individuals with experiences that were consistent with a classical NDE from those describing many other experiences that did not meet the criteria for a NDE. This included experiences based on the measurement scale that they had used themselves to define a NDE (i.e., Greyson NDE scale score above 7) and experiences that were clearly not consistent with a NDE, but were nonetheless arbitrarily and unilaterally labeled as “NDE” by the researchers (e.g., a variety of distressing experiences, frightening dreams, drug induced experiences, and other experiences in non-life threatening circumstances).³⁷ One illustrative case that demonstrates the misuse of the term NDE in this study involves the case of a 28-year-old woman who reported her dreams to the study authors, who then labeled her dream a “NDE”. She stated: “Sometimes I wake at night, and I can’t move. I see strange things, like spirits or demons at my door, and after a while I see them coming beside me. I can’t move or talk, and they sit on my chest. It scares the hell out of me! I think that it is a dream, count to 3 and close my eyes. Sometimes this helps.”³⁷ The authors arbitrarily labeled this a “NDE”, likely because of the reference to spirits and demons, despite the fact that the measurement scale they used was used in a non-context specific manner and is not designed for use in relation to dreams and other diverse human experiences [section 3 and 4]. Not only did this study demonstrate major errors determining so-called “NDE” cases, but it also revealed problems related to the questions (which were not specific or sensitive) in the measurement scale/survey used to determine a predilection for symptoms of REM intrusion. For example, the following question was used to identify REM intrusion: “Have you ever had abrupt muscle weakness in your legs or knee buckling or felt sudden muscle weakness in your face or head drop?”³⁷ This question is so nonspecific that a “yes” response could characterize any individual with any broad range of orthopedic or neurological disorders at any time in their lives, ranging from knee arthritis and meniscus tears, to multiple sclerosis and muscular palsy. Thus, this study was not able to determine whether a true association exists between REM intrusion (e.g., feeling transiently paralyzed after waking up) and the

classical NDE. Notably, REM intrusion is very common in the general population and has been described in association with many conditions, including post-traumatic stress disorder (PTSD).⁸⁰ In the same way that any association between REM intrusion and PTSD cannot be considered to be causative; should such an association ever be identified with classical NDE, it cannot be assumed to be causing the so called “NDE” as a dream.^{79, 80} Furthermore, the examination of the features of recalled experiences of death, including external visual awareness with correct recall of verifiable real information and a detailed purposeful life review, cannot be considered the same as dreams.

5.2 Brain Electrical Discharges in Relation to Death: Marker of “Unreal” Experiences or Cell Death Processes?

A number of limited studies have indicated that at the time of death, electrical changes, including surges on the surface of the brain can be detected.⁸¹⁻⁸² This has led some to speculate that these brain electrical changes may be causing the so called “NDE” and the reports of lucidity in relation to death as a possible hallucination, delusion or illusion. In one animal, and one human study, reports of a brief surge of electrical activity was noted within 30 seconds after the heart had stopped with death.⁸¹⁻⁸² Observing brain electrical changes around the time of death, is not unusual as there are many changes in brain cell calcium, sodium and potassium levels, which cause electrical changes. Thus, it is much more likely that these observations are simply tracking biological changes related to the process of “excitotoxicity”, which is the first step in brain cell death. This is characterized by the entry of calcium inside brain cells at around 30 seconds after oxygen deprivation.⁸³ The observed changes in brain electricity, are much more likely occur due to this well-known biological change, rather than any speculative cognitive experiences (whether NDE, lucidity or otherwise). It will never be known whether any of the human or animal subjects in these studies had a NDE, or any other mental experience or lucidity, because no humans survived to recall their experiences. Therefore, to make a claim for a relationship between two factors when one

is not even known to have been present, is speculation at best. Furthermore, animals are not known to have “NDE” or transcendental experiences and none of the animals survived in these studies either.

5.3: How Is Reality Determined? Limitations of Proposed “Dying Brain” Based Theories at Determining Reality

As discussed, for decades, attempts have been made to categorize the recalled experiences of death as delusional, illusory, or hallucinatory, brought about as a by-product of brain dysfunction and altered brain-based intermediaries (e.g. oxygen deprivation) in relation to death. Aside from the lack of scientific data to support these theories as outlined above, this line of thought—and the subsequent theories associated with it—suffer from multiple major conceptual limitations.

The most important major limitation related to the brain-based theories is that the identification of a relationship between any brain based intermediary and any human experience (whether in relation to death or otherwise) cannot determine whether that experience is real, hallucinatory, delusional, or illusory. This is because all human experiences, whether triggered in response to what may be considered a real event, artificially induced, or occurring in response to an imaginary event are mediated by the same underlying brain-based intermediaries (neurotransmitters hormones and neuropeptides) across multiple brain regions.⁸⁴ Thus, monitoring brain-based changes can’t determine the reality of an experience. In other words, it’s not as if activation of one area of the brain can be used to determine whether an experience is a hallucination, a delusion or an illusion, while activation in another area means an experience is “real”. Thus, the discovery of a link between any intermediary and a given human experience cannot prove or disprove the reality of that experience. For example, alterations in brain chemical levels (neurotransmitters) are associated with the feeling of love⁸⁴, which is also a prominent component of diverse human experiences, including romantic relationships, the recalled experience of death, as well as authentic mystical experiences.² Feeling love is mediated by specific changes in the brain – including changes in

dopamine and oxytocin levels, whenever “love” is experienced. This is regardless of whether someone experiences love after a drug induced hallucination, or experiences love in the context of a deluded belief (e.g., an imaginary romantic relationship), or whether that person was really experiencing love in a loving relationship. The same is true of someone who sees a light. Whether, that person is actually seeing a light, or is imagining seeing a light, or experiences seeing a light as part of a hallucination; the same brain areas (occipital regions) become involved. Therefore, identifying changes in levels of dopamine, oxytocin, or other brain intermediaries in relation to the study of any experience, including love cannot determine whether someone’s experience, love or otherwise, is real, hallucinatory, delusional, or illusory. Indeed, there are no specific neuromodulators that distinguish between experiences arising in response to a ‘real’ or ‘non-real’ event and there are no neurological or brain-based intermediaries that can be used to determine the “reality” or “non-reality” of human experiences.

In fact, the reality of human experiences and the meanings ascribed to them are established through social consensus (not brain based biological changes). Humans determine and ascribe meaning to phenomena and experiences within any given culture or society (including scientific groups). When sufficient members of a society or social group, particularly those with influence, assign “reality” to a given experience or belief, it becomes accepted as being “real.” This is in part, why there are so many different perceptions of “reality” at any one time as regards any given subject among different groups and societies across the world, whether today or in the past (including scientific and medical bodies). As regards the experience of death, a relative minority of individuals have come close to death and returned to describe their experiences. Therefore, in some social circles and scientific groups, their experiences may be considered real, while in others they may not⁸⁵. Yet, as with many other personal experiences (including love), which are real to the individuals who have experienced them, it is impossible for others to reliably reject or determine the reality of someone else’s experiences.

5.4 Scientific Studies Suggest the Recalled Experience of Death May Be Consistent with Reality.

Despite the limitations with the study of reality, nonetheless, two separate methods have been used to try to address this issue scientifically in an indirect manner. The first, a small study of coma survivors, attempted to explore this question based on the principle that memories of imagined events are distinguishable from memories of real events, because memories of imagined events have fewer phenomenological characteristics. In particular, they contain fewer perceptual (i.e., visual, auditory, gustatory, and olfactory sensations), temporal, and spatial details, as well as less emotional information.⁸⁶ Thus, to test the hypothesis that NDEs are imagined experiences brought about by abnormal brain mechanisms, *Thonard et al.*⁸⁶ analyzed the characteristics of real and imagined memories in 21 patients who had recovered from coma. The results showed that people with “NDE” memories had more characteristics associated with real memories than with memories of imagined or even actual real events ($p < 0.02$). For example, NDE memories contained more self-referential and emotional information and had better clarity.⁸⁶ The investigators concluded that NDE memories are not consistent with imagined memories. The second study, AWAreness during REsuscitation (AWARE), aimed to test and verify the timing of awareness and consciousness during cardiac arrest¹⁸. Although, only 2% of 101 cardiac arrest survivors who could be interviewed showed explicit recall and awareness compatible with external visual awareness (so-called authentic OBE), in at least one case, the recalled experience relating to actual events occurring in the resuscitation room was verified as being accurate, correct, and consistent with real events that had occurred some 3-5 minutes after the heart had stopped and when the brain was expected to be either severely disordered or not functioning.¹⁸ This supports a similar observation by Van Lommel et al in 2001, in which a patient had described external visual awareness and had correctly recalled watching his dentures being removed and knew where they had been placed during his own cardiac arrest¹⁷. The investigators concluded that, while a larger study is needed, paradoxical lucidity with visual awareness compatible with so-called authentic OBE may correspond with actual real events and cannot be considered a hallucinatory, illusory, or delusional experience.¹⁸

Thus, in summary, little evidence supports the notion that the recalled experiences of death, including paradoxical episodes of lucidity with conscious visual and auditory awareness can be categorized as hallucinatory, illusory,

or delusional. The bigger question is how can humans scientifically study death and is there any evidence to suggest human consciousness (the mind, psyche or soul) may not be annihilated with death?

Part Six: How is it Possible to Study Death?

6.1 Understanding Permanent Death – The Scientific Foundations for Exploring What Happens When We Die

From a societal perspective, “death” has always been viewed as an absolute end and thus scientific exploration of what lies beyond this end point has been conceived by many to be conceptually impossible. This reflects long-held beliefs which are largely rooted in historical and philosophical notions regarding death, rather than the underlying scientific and biological processes that accompany death and the post-mortem period. Nonetheless, these beliefs have permeated society and established somewhat arbitrary conceptual models that have led to cognitive barriers to systematic research into what happens when people die. Despite this, an increasing body of scientific studies have challenged these age-old philosophical assumptions and established an unprecedented window of understanding into what happens to the human brain, mind and consciousness in relation to death and the immediate period after death. In this section, we will review the evidence for how the study of what happens when we die is now scientifically possible.

While, historically debated, today, the loss of vital signs of life, albeit more precisely, the cessation of the heartbeat, breathing, and brain function—after any severe illness, or accident — continues to remain the standard by which physicians declare permanent death, and this is how almost everyone dies.⁸⁷⁻⁸⁸ Interestingly, though for the first time in history, six decades ago, after the birth of CPR, it became possible to systematically bring people who would otherwise be declared permanently dead, back to life again after their hearts had stopped. Although, this discovery led to some ambiguities with the medical declaration of death, however, these ambiguities did not greatly impact societal notions of death. This was because medically speaking, the brain was thought to die within

a few minutes of the cessation of the heartbeat and blood flow due to oxygen deprivation. Nonetheless, to clarify any medical ambiguities, from the mid 20th century onwards, doctors have referred to the cessation of the heartbeat as “cardiac arrest” when making attempts to revive someone back to life, and permanent “death” when attempts at reviving someone are not made (for example if an elderly or terminally ill person had requested not to be resuscitated back to life after his/her heart had stopped), or when attempts at CPR were deemed to have been unsuccessful. This semantic distinction is unrelated to the biology of death; but has remained crucial at avoiding widespread medical, public and social confusion regarding the fundamental issue of distinguishing life from death. After all, based on social conventions, we couldn’t possibly tell people they could die and then come back to life again, since that would go against the whole fabric of our society and historical and philosophical notions of the permanency of death. In addition, in order to cope with the implications of the discovery of CPR and resuscitation science, some people, particularly in the media started to use the term “clinical death” when referring to people who had biologically reached the point of death and suffered a cardiac arrest but who had then been brought back to life. Nonetheless, as “clinical death” is not a standard, well defined, or scientifically precise term that adds ambiguities to the understanding of death, it shall not be referred to further in this discussion. Instead, we will discuss the actual science around death and what happens after death.

It should be clear that the terms “cardiac arrest” and “death” reflect the same underlying biological processes (albeit occurring at different time points) that occur after the heart stops beating and a person dies. As a result, the cells and organs, including the brain are subjected to progressive damage arising from oxygen deprivation (anoxia). Despite the way it is sometimes conceived, a cardiac arrest is not a heart attack, nor is it necessarily limited to a primary heart problem, even though it may sometimes be presented in a simplified manner for the public by organizations, such as the American Heart Association, or the British Heart Foundation. Quite literally, cardiac arrest means the heart stopping after any illness (heart attack, stroke, infection, poisoning, cancer, in fact any illness that can cause a person to die) or accident (leading to massive blood loss and exsanguination) becomes

so severe that it causes insufficient oxygen to reach the heart, or if there is a primary problem with the electrical conductance of the heart muscle (this is sometimes referred to as “sudden cardiac arrest”) and this is how people die. Almost immediately after this happens, there is no blood flowing around the body and the brain anymore; the person stops breathing, becomes lifeless, motionless and his or her brain stops functioning. There is loss of all vital signs of life, which signifies permanent death. Doctors usually shine a light on the pupils of the eye (which become fixed and dilated) to confirm that the brain has stopped functioning and they then formally declare a person dead based on the presence of the following three criteria: no heartbeat, no respirations, and no brain activity. Aside from the very rare instances of “auto-resuscitation”, (when the heart may spontaneously restart again usually within five minutes of stopping), without interventions such as CPR, this represents the irreversible and permanent end of life and hence permanent death. This is medically termed death by cardiopulmonary criteria, and it is how 98% of the population are declared dead today.⁸⁹

Although, throughout history, permanent death had been declared after “cardiac arrest” using “cardiopulmonary criteria”, however, due to the advent of modern ICU’s, in the 1950’s and 1960’s, it was increasingly recognized that an exception to this universal mode of declaring death was needed. Normally, the brain controls breathing and the heartbeat and so any devastating brain injury that causes the brain to stop functioning will lead to the cessation of breathing and the heartbeat (cardiac arrest) and hence death. However, from the middle of the 20th century onwards, for the first time in history breathing and the heartbeat were able to be artificially maintained even without a functioning brain using modern ventilators and other ICU life-support measures in people whose hearts would have otherwise stopped. As a result, people with catastrophic brain injuries (such as massive stroke from brain bleeds following trauma or gunshot wounds), no longer suffered a cardiac arrest automatically after their brains had stopped functioning. Consequently, death (by cardiopulmonary criteria) no longer automatically followed the cessation of brain function after catastrophic brain injuries. This was because the cessation of the heartbeat, was delayed for days or even weeks after the injured brain had lost all function and had even progressed to irreversible damage and hence permanent “brain death” over hours to days after the initial injury.⁹⁰ Since the

seat of consciousness relates to the brain, since the late 1960's, it was deemed unethical to wait for the heart to stop for people whose brain had "died", but whose heartbeat and breathing were artificially maintained using ICU life support measures. Thus, such people, are legally declared dead using brain-death or neurological criteria (which test for the absence of a functioning brain), without waiting for cardiopulmonary criteria (the inevitable cessation of respiration and heartbeat) to be reached. This is how death is declared for a very small minority of ~2% of people.⁹⁰

6.2 Examining for Brain Death Involves Testing for the Absence of Brain Function.

It is important to highlight that the cessation of the heartbeat leads to brain oxygen deprivation and death by cardiopulmonary criteria, while severe traumatic brain injury such as bleeding, typically leads to death by brain death criteria. After both of these potentially catastrophic brain injuries, the brain first loses function before transitioning to permanent cell damage and "death" over many hours to days of time. The key is to recognize that loss of brain function precedes permanent brain cell damage and hence death by many hours to days. Therefore, all protocols established for the determination of death by "brain death" criteria mandate a period of observation (hours to days) after the onset of the injury process before "brain death" testing and declaration of "brain death". This period of waiting is required to account for the brain transitioning from a non-functional, but potentially recoverable injury state to one that is non-functional and irreversibly damaged.

However, tests of "brain death" typically do not rely on objective markers of irreversible brain cell death, but rather rely on tests that examine for the absence of brain function (brain reflexes)⁹⁰. Because time is the critical determinant in the process of cell death after injury, sometimes, people declared dead using brain death criteria - i.e., who have lost all brain function after a catastrophic brain injury - may not have evidence of brain cell death at a cellular level when the brain is examined on autopsy.⁹¹ This is because while the brain may have been non-functional and the underlying devastating brain injury/disorder untreatable, and hence the permanency of "brain death" certain; nonetheless, at the time of the clinical declaration of brain death, the point of permanent and

irreversible biological (cellular) damage and “brain cell death” had not yet been reached. Nonetheless, from a practical perspective people were correctly deemed to be irreversibly and permanently dead using “brain death” criteria based on the absence of brain function in the context of a devastating brain injury, *without any known treatments to reverse the injury process*.

The key for understanding the permanency of death is that although, there may be a lack of treatments and/or medical advancements that could restore brain function and revive people who are declared dead today; as future treatments are discovered and refined, many of those considered irreversibly and permanently dead today – whether by brain death or cardiopulmonary criteria - but who have not yet reached true cellular irreversible damage and “death” in the post-mortem period maintain the potential to be revived. This represents a very exciting prospect, as treatments could be discovered to modulate and halt the process of cell death post-mortem and allow people to be brought back after crossing beyond the threshold of death.

6.3 - The Grey Zone of Permanent Death: The Transition from Reversible to Irreversible Cell Damage Post-Mortem

Today, the concept of an irreversible and hence permanent loss of vital organ function remains the hallmark of definitions of death all over the world. In the United States, the Uniform Determination of Death Act defines death as either the “irreversible cessation of circulatory and respiratory functions” (death by cardiopulmonary criteria) or the “irreversible cessation of all functions of the entire brain, including the brain stem” (death by brain-death criteria).⁹² Thus, the key feature in the determination of death, whether from the perspective of the public or the medical profession, remains the issue of an irreversible and permanent end of function and hence life (i.e., irreversible loss of vital organ functions).

However, one of the consequences of scientific advancements in the 21st century, has been the accumulation of evidence that suggests the irreversibility of organ function in relation to death and consequently, our

understanding of death—whether through cardiopulmonary or brain death criteria—needs to be profoundly reconsidered.⁹³⁻⁹⁵ One of the most significant discoveries to revolutionize our understanding of death and challenge widespread social notions regarding death in the 21st century has been the realization that cadaveric human brain cells do not become irreversibly damaged or “die” quickly (typically thought to be 4-10 minutes) after total oxygen deprivation in the post-mortem period. While irreversible cell damage and death occurs at differing times in different organs in cadavers, brain cells in a cadaver, if left alone after death and not intervened with through re-oxygenation with CPR or other resuscitative measures, have been shown to be much more resilient to the effects of post-mortem oxygen deprivation than had been assumed for decades.⁹⁴⁻⁹⁶ Although, brain cells do become damaged after oxygen deprivation and death, however, this occurs very slowly if a cadaver is left alone after death. Ironically, brain cell death becomes rapidly accelerated after doctors attempt to restart the heart through CPR or using other measures that introduce oxygen back into the brain. Ever since the 1970’s it has become increasingly clear that this is due to secondary reperfusion injury, which is a complication of oxygen flowing back into the brain (after the brain has been deprived of oxygen with death). The oxygen reacts with chemicals that had built up during oxygen deprivation to produce highly toxic substances and it is these substances that predominantly cause brain damage.⁹³⁻⁹⁵

In a landmark study published in 2001 in the prestigious scientific journal *Nature*, Palmer and colleagues⁴⁶ demonstrated that human brain biopsies obtained 7 hours or longer post-mortem from cadavers in a mortuary could be used to grow healthy brain cells in the laboratory. This finding has also been replicated in many other studies, with some showing that it may be possible to take brain biopsies from cadaveric animals up to 140 hours post-mortem and grow healthy brain cells in the laboratory from these biopsies.⁹⁶ These data indicate that the brain cells had not been dead, even though the humans and animals had died, and their brains weren’t working (the humans were actually in a mortuary). However, the most remarkable discovery to support these extraordinary findings came in 2019, when a group of researchers led by Nenad Sestan at Yale University made an astonishing breakthrough by showing the possibility of restoring multiple aspects of global whole brain

function again 10-14 hours after death in 32 cadaveric pig brains taken from a slaughterhouse four hours after the death of the animals⁹⁷. This is one of the most extraordinary discoveries in scientific history, because even though prior studies had shown that brain cells obtained from cadavers could be grown in the laboratory to function as “mini brains” (brain organoids), however, nobody had ever proven the ability to restore multiple areas of whole brain function again in a large mammalian brain many hours after death. Of course, this now means that it is a matter of time before this can be replicated in human post-mortem brains and indicates that death remains potentially reversible for many hours after it has taken place permanently.

These findings have led to the recognition that functionally speaking, irreversibility and permanency of death transitions through two distinct phases: a) relative or medical irreversibility and b) absolute or biological irreversibility. Relative (or medical) irreversibility of death starts after the heart stops and a person is declared dead and may last many hours to days (in the case of death by cardiopulmonary criteria). This reflects the post-mortem period during which the underlying cells in the body have not yet become irreversibly damaged and thus could potentially support life again. However, the organs in the body, including the brain do not function and an individual remains irreversibly and permanently dead. *At this stage, death is indeed permanent because the medical means to reverse this process and resume life again may not be available at a given time or place (e.g., due to disparities in medical care, availability of limited levels of expertise, different perceptions about what may be medically possible, resources, and so on), or may simply not have yet been discovered scientifically in a given era.* For instance, before the discovery of CPR in 1960, it was generally considered impossible to restart the heart and a person would have been irreversibly and permanently dead immediately after their hearts had stopped. However, many people who would otherwise have been dead throughout history, are now routinely able to be brought back to life again today. As science progresses, further discoveries will be made to augment this process in the coming decades.

It should also be noted that for the ~2% of people with devastating brain injuries that have led to “brain death”, the period of relative or medical irreversibility starts after the injurious insult has led to loss of global brain function, but before the cells in the brain have become irreversibly damaged and “died” and could never support life again, now or in the future.

The in-between period after someone dies, but before the cells in his/her body have reached their true absolute or biological point of irreversibility, represents an intriguing grey zone of permanent death. This is when people are correctly considered to be irreversibly and permanently dead, yet, at the same time maintain the potential to be brought back to life from a scientific and biological perspective, today or in the future. The discovery of a prolonged grey zone before true biological and cellular irreversibility is established during the post-mortem period provides an exciting opportunity for novel treatments directed at slowing down the rate by which brain cells die and saving millions of “lives and brains” in the future.⁹⁸⁻¹⁰¹ Importantly, the discovery of this grey zone of potential reversibility after death also provides the opportunity to scientifically explore what happens to the human mind and consciousness when people actually die. This is because science is making it possible for people to traverse beyond the biological threshold of death in a physiological sense and yet, still be brought back to life many minutes or even hours later. What they experience reflects what all humankind will likely experience with death.

Part Seven: Examining the Evidence: Does Human Consciousness Become Annihilated After Death?

7.1 Cardiac Arrest: A Model to Study Consciousness in Relation to Death

As discussed, cardiac arrest and death by cardiopulmonary criteria are biologically synonymous. After the heart stops and a person dies, blood flow to the brain ceases within 2-20 seconds and brain function ceases almost immediately.¹⁰²⁻¹⁰³ The initiation of treatments, including CPR typically only provide 10-15% of normal brain blood flow, which is insufficient for the brain to resume function.¹⁰⁴⁻¹⁰⁵ The loss of brain function is evidenced

clinically by the rapid loss of brain stem reflexes (evidenced as loss of the gag reflex and fixed dilated pupils).¹⁰⁴⁻
¹⁰⁵ Brain electricity monitoring using electrical encephalography (EEG) also demonstrates loss of function on the surface of the brain (i.e., the brain cortex), which under ordinary circumstances is vital for higher order thinking and consciousness.¹⁰⁶⁻¹¹² This flat line (isoelectric) state typically remains despite treatment attempts using CPR, until after the resumption of the heartbeat has been achieved.¹⁰⁹ In a recent study, it was shown that although some patterns of brain electrical activity may transiently reappear during CPR (suggesting the heartbeat may have been transiently restored), the majority of the time, no measurable brain electrical activity is observed.¹¹³ This is very significant as biologically cardiac arrest and “death” are synonymous, despite the terminology used. During this period, as expected clinical and EEG markers, indicate absence of overall brain function. Yet, growing reports by millions of people of conscious external visual awareness and, in particular, paradoxical lucidity, with well-structured cognitive processes, including attention and memory recall of specific events at a time when brain function is at best severely impaired or absent, raise perplexing questions about the relationship between the mind, consciousness and the brain. Specifically, these observations if able to be demonstrated and confirmed in independent studies suggest that the entity that makes humans who they are and i.e., consciousness or the self (what the ancients called the psyche or soul), may not become annihilated even after the brain stops functioning and people have crossed beyond the threshold of death.

In recent years, there have been large scale medical studies that have confirmed the reported experiences of death by many millions of cardiac arrest survivors. The largest of these, AWAreness during RESuscitation (AWARE), examined the timing of awareness and consciousness in 2060 people undergoing cardiac arrest over a four-year period across 15 hospitals in the United States, United Kingdom and Austria. Although only 101 survived and could be interviewed; nonetheless, this study was the first to confirm the occurrence of paradoxical lucidity with external visual awareness and accurate recall of real and verifiable events during a 3-5 minute period after the heart had stopped and when the brain was expected to be severely disordered or non -functioning.¹⁸ More specifically, this was the first time that the timing of external visual awareness had been demonstrated to occur in

a scientific study at a time when the heart had actually stopped (rather than before or after). This supported the claims by Van Lommel and colleagues in 2001, during their study of 344 cardiac arrest patients, which was published in the prestigious medical journal *The Lancet*. One of their patients described external visual awareness and the ability to see his dentures being removed and could later verify where they had been placed during his cardiac arrest¹⁷. However, they had not been able to accurately time this occurrence.

The findings of the AWARE study support the claims of consciousness, as evidenced by paradoxical lucidity with external visual awareness of actual and real events after the heart and brain stop functioning in the early phase of death by millions of people to date.¹⁸ How can these findings be explained?

In some exceptional cases, deeper brain electrical activity may be found despite the absence of electrical activity on the surface of the brain.¹¹⁴ However, this only occurs as an exception when there is localized damage to the brain surface which has not involved the deeper brain structures. During cardiac arrest and the early period of death, there is loss of blood flow to the whole brain (rather than selective areas of the brain) and the loss of brain electrical activity on the surface of the brain, corresponds not only with the loss of brainstem reflexes (that arise from deeper brain structures and keep a person alive including breathing and heartbeat), but also with the loss of activity in other deeper brain structures when measured using in-dwelling electrodes.¹¹⁵ Notably, brain localization studies have indicated that cognitive processes are mediated through the concerted activity of multiple regions of the brain cortex (surface of the brain), and evidence of this activity is used by scientists to assume the presence of consciousness.⁹⁷ Based on this, a globally disordered brain, including a nonfunctioning brain cortex, should not support lucid thought processes, memory recall, and consciousness. Furthermore, even relatively minor reductions in brain blood flow lead to confusional states (acute confusional state/delirium) and impaired attention, followed by loss of consciousness, rather than lucid thought processes, attention, and memory formation that are ordinarily reserved for consciousness in a normally functioning brain with levels of blood flow that support normal levels of brain cell activity.¹¹⁶ However, paradoxically the recalled experiences of death are not

confusional; furthermore, they are reported from a time when consciousness and memory formation should not be possible in light of the underlying levels of brain activity and markedly reduced brain blood flow.¹⁰² Alternatively, some have suggested these experiences may occur either before the brain shuts down completely or just after recovery from cardiac arrest, after brain function resumes. However, the AWARE study confirmed for the first time that cognitive experiences and consciousness can occur during the period when the heart is not beating and when brain activity is not expected rather than before or after.¹⁸ This study further indicated that the memories and conscious experiences consistent with a recalled experience of death or external visual awareness (authentic OBE) are quite different from the very rare phenomenon of CPR-induced consciousness (CPRIC), which has an incidence of 0.3% during CPR attempts.¹²⁵ During CPRIC, patients demonstrate visible external signs of consciousness.¹¹⁷ The most common sign of CPRIC is combativeness/agitation, groaning, and eye opening/rolling.^{117, 118} Although more studies are needed, episodes of CPRIC likely represent a subset of patients who have regained a heartbeat and are emerging out of coma, but whose pulse remains undetectable when clinicians examine for it by hand^a.

7.2 Recalled Experience of Death: Implications for the Mind Body Problem and the Problem of Consciousness

Today, science has largely come to grips with the mechanisms that lead to various signals and messages being transmitted in the brain and the connections between the brain and the rest of the body. But the question that remains unanswered and fuels scientific debate is how in the midst of all the electrical activity and chemical processes that take place in the brain do thoughts and consciousness arise? How does the passage of electricity across a cell or many cells lead to feelings, emotions, thoughts and all the specificities of human consciousness?

^a The absence of a palpable pulse does not necessarily mean the heartbeat is absent. The accurate determination of the restoration of the heartbeat would require an ultrasound study in the midst of CPR, which is not often practical.

In science, this is referred to as the problem of consciousness. According to David Chalmers, an Australian philosopher: “Consciousness poses the most baffling problems in the science of the mind. There is nothing that we know more intimately than conscious experience, but there is nothing that is harder to explain.” In his books, Chalmers has called this the “hard problem” of consciousness. This is in contrast to the “easy problems,” which essentially involve understanding the underlying mechanisms that change when someone is having a conscious experience; in essence the “neural correlates of consciousness” (NCC).

Modern medicine has helped identify the specific areas of the brain that are involved with certain feelings, emotions and thoughts, but not the question of whether or not thoughts and consciousness are actually produced from brain cells. Methods of analysing thought processes and identification of the underlying neural or brain based intermediary pathways of consciousness involve special brain scanners called functional MRI (magnetic resonance imaging) and PET (positron emission tomography) scanners. These work on the principle that brain cells have a constant need for blood, which carries with it all the vital nutritional substances that they need to be active, including oxygen and glucose. So, the scanners essentially detect and follow the movement of blood to various parts of the brain when they are activated, including when people are having conscious experiences. In addition to tracking changes to blood flow, these specialized scanners can also detect the areas of the brain that have increased their consumption of oxygen and glucose. So, by following the changes in flow of blood and the consumption of oxygen and glucose to various parts of the brain, scientists can understand which areas of the brain become active when people are having certain thought processes. This is called “mapping” the brain. However, identifying blood flow changes or increased metabolism in certain parts of the brain, during an experience doesn’t explain how a physical collection of cells could give rise to conscious experience?

This discussion of course traces its roots back to the mind-body problem and has been debated by some of the greatest thinkers going back at least to the time of the great Greek philosophers, including Aristotle, Plato,

Socrates and Democritus, as well as later thinkers such as Avicenna and Descartes. While some such as Democritus believed that consciousness, i.e., the self, psyche, or soul, is a by-product of the body and dies with the body; others such as Plato, Socrates and Avicenna, argued that the body and mind or consciousness are separate entities. Today, the problem of consciousness in modern science reflects the same ancient debate and discussion. In the scientific literature, a number of theories have been proposed to account for how human consciousness or as the ancients called it, the psyche or soul comes to exist from the brain. The most commonly held view is that it is simply a by-product of brain activity, just as, for example, light arises from the action of electricity passing through a light bulb or heat arises from the burning of coal.

It is important to point out that experimental scientific evidence or even a plausible biological theory demonstrating how consciousness can arise is lacking. A number of theories have been proposed to account for it. Overall, two broad mechanisms have been proposed to account for the emergence of the phenomenon of consciousness. Consciousness is thought to be the product of either a “bottom-up” or a “top-down” phenomenon. That is, consciousness or psyche (self) is a by-product of brain cell activity—an epiphenomenon—arising from the coordinated activities of cerebral regions, or consciousness is a separate entity that, while undiscovered by science today, is not produced by conventional brain cell activities and can itself independently modulate brain activity.¹⁰² Although further studies are needed, the finding that the human mind, consciousness, or psyche (self) may continue to function when brain function is severely disordered or has ceased after people cross the biological threshold of death supports the possibility that the latter mechanism may be correct and that human consciousness is not annihilated after death, even if it may seem to be non-existent to an outside observer.^{102, 119}

Part Eight: Conclusions and Future Directions:

Scientific advances have increasingly challenged societal views regarding death. While understanding what happens when we die remains a mystery, however, it is now amenable to objective scientific scrutiny. Based on

the balance of probabilities and the evidence to date, it is proposed that the entity referred to as “consciousness”, “psyche” or the “self”, does not become annihilated; but instead continues after permanent death. As demonstrated in this essay, evidence to support this comes from several sources. Firstly, recalled experiences of death are incompatible with “unreal” experiences. Instead, indirect scientific studies indicate they share consistent features with “real” experiences. Second, are the weight of testimonies and paradoxical claims of consciousness and external visual awareness by an estimated 800-850 million people in relation to death, that have been confirmed by at least one large scale cardiac arrest study. This is when the brain is at best severely disordered, or non-functional. Third, although the time taken for brain cells to become irreversibly damaged and “permanently die” in a cadaver during the post-mortem period can last hours to days, however, the brain as an organ loses function within seconds of the heart stopping. Thus, if vital aspects of consciousness continue fully in this early phase of death, then it is unlikely that they will become annihilated later since the brain itself remains non-functional. Overall, these results favor the notion that human consciousness may be a separate, undiscovered scientific entity to the underlying brain processes and can survive beyond death. While, more future studies are needed, clearly, the recalled experience surrounding death now merits further genuine empirical investigation without prejudice.

References

- 1) Kouwenhoven WB, Jude Jr, Knickerbocker GG. Closed-chest cardiac massage. JAMA. 1960; 173:1064-7.
- 2) Moody RA: *Life After Life*. Bantam Press 1975
- 3) Fenwick P, Fenwick E. The Truth in the Light, Hodder Headline, London 1995.
- 4) Sabom M, Recollections of Death: A Medical Investigation, Harper & Row, New York 1983.
- 5) Ring, K. Life at Death. Coward Mc Cann 1980 New York
- Khoshab H, Seyedbagheri S, Iranmanesh S, Shahrbabaki PM et al. Near-death experience among muslim cardiopulmonary resuscitation survivors. Iran J Nurs Midwifery Res. 2020; 25: 414-418
- 7) Pascricha S, Stevenson I Near Death Experiences in India. Journal of Nervous Mental Disease 1986; 55: 542 - 9
- 8) Feng Z A research on near death experiences of survivors in big earthquake of Tangshan 1976 Zhonghua Shen Jing Jing Shen Ke Za Zhi (Chinese Journal of Neurology and Psychiatry) 1992: 25; 222 - 5, 253 – 4
- 9) Gallup G, Proctor W. Adventures in immortality: A look beyond the threshold of death. New York, NY: McGraw-Hill. 1982
- 10) Perera M, Padmasekara G, Belanti J. Prevalence of near-death experiences in Australia. Journal of Near Death Studies. 2005; 24: 109-116
- 11) Morse M L Near death experiences of children: Journal of pediatric oncological nursing 1994; 11:139-144
- 12) Serdahely WJ. Pediatric Near-death experiences. Journal of Near Death Studies 1990; 9: 33-39
- 13) Herzog D B, Herrin J T, Near-death experiences in the very young: Critical Care Medicine 1985; 13: 1074 -1075
- 14) Morse M, Castillo P, Venecia D, Milstein J, Tyler DC. Childhood near death experiences Am J Dis Child 1986, 140, 1110-14
- 15) Shears D, Elison S, Garralda ME, Nadel S. Near-Death Experiences with Meningococcal Disease. Journal of the American Academy of Child and Adolescent Psychiatry 2005; 7: 630-631
- 16) Blanke O, Out of body experiences and their neural basis. British Medical Journal. 2004; 329:1414-5

- 17) Van Lommel P, Wees Van R, Meyers V, Elfferich I, Near-death experience in survivors of cardiac arrest: a prospective study in the Netherlands. *Lancet*. 2001;358:2039-45.
- 18) Parnia S, Fenwick P, Spearpoint K, Devos G et al. AWAreness during REsuscitation (AWARE) Resuscitation 2014; 85:1799-1805
- 19) Cardeña, E, Alvarado, C. S. "Anomalous self and identity experiences," in *Varieties of Anomalous Experience: Examining the Scientific Evidence, 2nd Edn.*, eds E. Cardeña, S. J. Lynn, and S. Krippner (Washington, DC: American Psychological Association), 175–212.
- 20) Yu K, Liu C, Yu T, Wang X et al. Out-of-body experience in the anterior insular cortex during the intracranial electrodes stimulation in an epileptic child. *Journal of Clinical Neuroscience*. 2018; 54: 122-125
- 21) Kantaro H, Shinoura N, Ryoji Y, Midorikawa A. Dissociation of the subjective and objective bodies: Out-of-body experiences following the development of a posterior cingulate lesion. *J Neuropsychol*. 2020; 14: 183-192.
- 22) Lopez C, Elziere M. Out-of-body experience in vestibular disorders - A prospective study of 210 patients with dizziness. *Cortex* 2018; 104: 193-206.
- 23) Bos EM, Spoor JKH, Smits M, Schouten JW et al. Out-of-Body Experience During Awake Craniotomy. *World Neurosurgery*. 2016; 92: 586.e9-586.e13.
- 24) Devinsky O, Feldmann E, Burrowes K, & Bromfield E: Autoscopy phenomena with seizures. *Arch Neurol* 1989; 46:1080–1088
- 25) Fang T, Yan R, Fang F. Spontaneous out-of-body experience in a child with refractory right temporoparietal epilepsy. *J Neurosurg Pediatr*. 2014; 14: 396-9
- 26) Greyson B, Fountain NB, Derr LL, Broshek DK. Out-of-body experiences associated with seizures. *Front. Hum. Neurosci*. 2014; 8:65
- 27) Bateman L, Jones C, Jomeen J. A narrative synthesis of women's out-of-body experiences during childbirth. *Journal of Midwifery Womens Health*. 2017; 62: 442–451
- 28) French C. Near-death experiences in cardiac arrest survivors. *Progress in Brain Research*. 2005; 150: 351-367.

- 29) Cardena E, Lynn SJ, Krippner. Varieties of anomalous experiences: Examining the scientific evidence. American Psychological Association, 2000; 315-352
- 30) Greyson B, Near-death encounters with and without near-death experiences: Comparative NDE Scale profiles. Journal of Near-Death Studies. 1990; 8: 151-16
- 31) Nelson KR, Mattingly M, Lee SA, Schmitt FA. Does the arousal system contribute to near-death experiences? Neurology. 2006;66:1003-9.
- 32) Beauregard M, Courtemanche J, V. Paquette V. Brain activity in near-death experiencers during a meditative state. Resuscitation. 2009; 80: 1006-1010.
- 33) V. Charland-Verville, J.-P. Jourdan, M. Thonnard, D. Ledoux, A.-F. Donneau, E. Questermont, *et al.* Near-death experiences in non-life-threatening events and coma of different etiologies. Frontiers in Human Neuroscience. 2014; 8: 203
- 34) Lempert T, Syncope and near death experience. Lancet 1994; 344: 829–830.
- 35) Timmerman C, Roseman L, Williams D et al. DMT models the near-death experience. Frontiers in Psychology. 2018; 9: 1424
- 36) Owens J E, Cook E W, Stevenson I, Features of “near death experience” in relation to whether or not patients were near death: Lancet 1990; 336: 1175 – 77
- 37) Kondziella D, Dreier J, Olsen MH. Prevalence of near-death experiences in people with and without REM sleep intrusion. Peer J. 2019; 7:e7585.
- 38) Devinsky O, Lai G. Spirituality and religion in epilepsy. *Epilepsy and Behavior*. 2008; 12: 636-643.
- 39) Britton WB, Bootzin RR. Near-death experiences and the temporal lobe 2004. Psychol. Sci; 15: 254–25
- 40) MacLulich AMJ, Ferguson KJ, Miller T, de Rooji S et al. Unravelling the pathophysiology of delirium: a focus on the role of aberrant stress responses. J Psychosom Res. 2008; 65: 229-238
- 41) Whinnery JE, Psychophysiologic correlates of unconsciousness and near-death experiences J. Near Death Stud. 1997; 15: 231-258
- 42) Yong E. Out-of-body experience: Master of illusion. Nature. 2011; 480: 168-170

- 43) Ehrsson H. The experimental induction of out-of-body-experiences. *Science*; 2007; 317: 1048
- 44) Blanke O, Ortigue S, Landis T, Seeck M. Stimulating illusory own-body perceptions. *Nature*. 2002;419:269-70
- 45) Denning TR, Berrios GE. Autoscopy Phenomena. *British Journal of Psychiatry*. 1994; 165: 808-817
- 46) Palmer TD, Schwartz PH, Taupin P, Stein SA, Gage FH. Cell culture. Progenitor cells from human brain after death. *Nature* 2001; 411: 42-43
- 47) Greyson B. The near-death experience scale: Construction, reliability, and validity. *J. Nerv. Ment. Dis.*, 1983; 171: 369-375
- 48) Martial C, Simon J, Puttaert N, Gosseries O et al. The Near-Death Experience Content (NDE-C) scale: Development and psychometric validation. *Consciousness and Cognition*. 2020; 86: 103049
- 49) Martial C, Cassol H, Charland-Verville V, Pallavicini C, Sanz C, Zamberlan F. Neurochemical models of near-death experiences: a large-scale study based on the semantic similarity of written reports. *Consciousness and Cognition*. 2019; 69: 52–69.
- 50) Newcombe R. Ketamine Case Study: The Phenomenology of a Ketamine Experience, *Addiction Research & Theory*. 2008;16: 209-215
- 51) Simon E. Ketamine: Safe Until It's Not - A Terrifying Trip to the K-Hole. *J Emerg Med*. 2019;57:587-588.
- 52) Pomarol-Clotet E, Honey GD, Murray GK, et al. Psychological effects of ketamine in healthy volunteers. Phenomenological study. *Br J Psychiatry*. 2006;189:173-179.
- 53) Strassman RJ, Qualls CR, Uhlenhuth EH, Kellner R. Dose-response study of N,N-dimethyltryptamine in humans. II. Subjective effects and preliminary results of a new rating scale. *Arch Gen Psychiatry*. 1994;51:98-108.
- 54) Rock A, Cott C. Phenomenology of N,N-Dimethyltryptamine Use: A Thematic analysis. *Journal of Scientific Exploration*, 2008;22:359-370
- 55) Jansen K. Ketamine: Dreams and Realities. *Multidisciplinary Association for Psychedelic Studies*, 2004

- 56) Davis AK, Clifton JM, Weaver EG, Hurwitz ES, Johnson MW, Griffiths RR. Survey of entity encounter experiences occasioned by inhaled N,N-dimethyltryptamine: Phenomenology, interpretation, and enduring effects. *Journal of Psychopharmacology*. 2020;34:1008-1020.
- 57) Newcomer JW, Farber NB, Jevtovic-Todorovic V, et al. Ketamine-induced NMDA receptor hypofunction as a model of memory impairment and psychosis. *Neuropsychopharmacology*. 1999;20:106-118.
- 58) Gouzoulis-Mayfrank E, Heekeren K, Neukirch A, et al. Psychological effects of (S)-ketamine and N,N-dimethyltryptamine (DMT): a double-blind, cross-over study in healthy volunteers. *Pharmacopsychiatry*. 2005;38:301-311.
- 59) Doig L, Solverson K. Wanting to Forget: Intrusive and Delusional Memories from Critical Illness. *Case Rep Crit Care*. 2020;2020:7324185.
- 60) Roberts B, Chaboyer W. Patients' dreams and unreal experiences following intensive care unit admission. *Nurs Crit Care*. 2004; 9:173-80.
- 61) Roberts BL, Rickard CM, Rajbhandari D, Reynolds P. Patients' dreams in ICU: recall at two years post discharge and comparison to delirium status during ICU admission. A multicentre cohort study. *Intensive Crit Care Nurs*. 2006;22:264-273.
- 62) Papathanassoglou ED, Patiraki EI. Transformations of self: a phenomenological investigation into the lived experience of survivors of critical illness. *Nurs Crit Care*. 2003;8:13-21.
- 63) Duppils GS, Wikblad K. Patients' experiences of being delirious. *J Clin Nurs*. 2007;16:810-818.
- 64) Van Rompaey B, Van Hoof A, van Bogaert P, Timmermans O, Dilles T. The patient's perception of a delirium: A qualitative research in a Belgian intensive care unit. *Intensive Crit Care Nurs*. 2016;32:66-74.
- 65) Magarey JM, McCutcheon HH. 'Fishing with the dead'--recall of memories from the ICU. *Intensive Crit Care Nurs*. 2005;21(6):344-354.
- 66) Löf L, Berggren L, Ahlström G. Severely ill ICU patients recall of factual events and unreal experiences of hospital admission and ICU stay--3 and 12 months after discharge. *Intensive Crit Care Nurs*. 2006;22(3):154-166.

- 67) Blackmore SJ, Troscianko T, The physiology of the tunnel. *Journal of Near Death Studies*. 1988; 8: 15–28.
- 68) Blackmore SJ, Near-Death Experiences. *Journal of the Royal Society of Medicine*. 1996; **89**: 73–76.
- 69) Whinnery JE, Psychophysiologic correlates of unconsciousness and near-death experiences J. *Near Death Stud*. 1997; 15: 231-258
- 70) Klemenc-Ketis Z, Grmec S, Kersnik J. The effect of carbon dioxide on near-death experiences in out-of-hospital cardiac arrest survivors: A prospective observational study. *Critical Care*. 2010;14:R56.
- 71) Carr DB. Endorphins at the approach of death. *Lancet* 1981;1: 390.
- 72) Sotelo J, Perez R, Guevara and Fernandez A, Changes in brain, plasma and cerebrospinal fluid contents of B-endorphin in dogs at the moment of death. *Neurol. Res*. 1995; 17: 223-5.
- 73) Morse M, Venecia D, Milstein J. Near-death experiences: A Neurophysiologic Explanatory Model *Journal of Near Death Studies* 1989; 8:45 - 53
- 74) Jansen K. Near death experience and the NMDA receptor. *British Medical Journal* 1989; **298**:1708.
- 75) Appleton R.E. Appleton. Reflex anoxic seizures. *British Medical Journal*. 1993; **307**: 214–215.
- 76) Carr D. Pathophysiology of stress induced limbic lobe dysfunction: a hypothesis for NDEs. *Journal of Near Death Studies*. 1982; **2**: 75–89.
- 77) Parnia S, Waller D, Yeates R, Fenwick P. A qualitative and quantitative study of the incidence, features and aetiology of near death experiences in cardiac arrest survivors. *Resuscitation* 2001; 48: 149 - 156
- 78) Sheak KR, Wiebe DJ, Leary M, Babaeizadeh et al. Quantitative relationship between end-tidal carbon dioxide and CPR quality during both in-hospital and out-of-hospital cardiac arrest. *Resuscitation*. 2015; 89: 149-154
- 79) Greyson B, Long JP. Does the arousal system contribute to near death experience? *Neurology*. 2006;67:2265
- 80) Husain AM, Miller PP, Carwile ST. REM sleep behavior disorder: potential relationships to post-traumatic stress disorder. *J Clin Neurophysiol* 2001;18:148–157.
- 81) Chawla LS, Akst S, Junker C, Jacobs, Seneff MG. Surges of electroencephalogram activity at the time of death: a case series. *Journal of Palliative Medicine* 2009; 12: 1095-1100.

- 82) Borjigin J, Lee U, Liu T, Pal D, Huff S, Klarr D, Sloboda J, Hernandez J, Wang MM, Mashour GA. Surge of neurophysiological coherence and connectivity in the dying brain. *Proceedings of the National Academy of Sciences*. 2013;110:14432-7
- 83) Uematsu D, Greenberg JH, Reivich M, Kobayashi S, Karp A. In Vivo Fluorometric Measurement of Changes in Cytosolic Free Calcium from the Cat Cortex during Anoxia. *Journal of Cerebral Blood Flow and Metabolism* 1988; 8: 367-374
- 84) Zeki S, The neurobiology of love. *FEBS Letters* 2007; 581: 2575–2579.
- 85) Henslin J.M. *Down to Earth Sociology: Introductory Readings* 2005 New York: Free Press 13th edition: 259-269.
- 86) Characteristics of near-death experiences memories as compared to real and imagined events memories. Thonnard M, Charland-Verville V, Brédart S, Dehon H, Ledoux D, Laureys S, Vanhaudenhuyse A. *PLoS One*. 2013;8:e57620
- 87) Paradis N, Halperin HR, Kern KB, Wenzel V, Chamberlain DA. Preface. *Cardiac Arrest: The Science and Practice of Resuscitation Medicine* 2007; xxxiii
- 88) Seifi A, Lacci JV, Godoy DA. Incidence of brain death in the United States. *Clinical Neurology and Neurosurgery* 2020; 195: 105885
- 89) Hornby K, Hornby L, Shemie SD. A systematic review of autoresuscitation after cardiac arrest. *Critical Care Medicine* 2010; 38: 1246-1253.
- 90) Wijdicks E.F.M., *Brain Death*, 2nd edition. New York: Oxford University Press 2011
- 91) Wijdicks E.F.M, Pfeifer E. Neuropathology of brain death in the modern transplant era. *Neurology* 2008; 70: 1234-1237.
- 92) Burkle CM, Schipper Am, Wijdicks EF. Brain death and the courts. *Neurology*. 2011; 76: 837-841
- 93) Rubenstein A, Cohen E, Jackson E. The Definition of Death and the Ethics of Organ Procurement from the Deceased. *President's Council on Bioethics* 2006.

- 94) Marfia GL, Madaschi F, Marra et al. Adult neural precursors isolated from post mortem brain yield mostly neurons: an erythropoietin dependent process. *Neurobiol Dis.* 43: 86-98
- 95) Youngner S, Hyun I. Pig experiment challenges assumptions around brain damage in people. *Nature.* 2019; 568: 302-4
- 96) Taoufik E, Probert L, Ischemic Neuronal Damage. *Current Pharmaceutical Design* 2008; 14; 3565-3573.
- 97) Vrselja Z, Daniele SG, Silbereis J et al. Restoration of brain circulation and cellular functions hours post mortem. *Nature* 2019; 568: 336-343,
- 98) Tishman S, Emergency Preservation and Resuscitation for Cardiac Arrest from Trauma.
<http://clinicaltrials.gov/show/NCT01042015>
- 99) Bevers, M. B., Ingleton, L. P., Che, D., Cole, J. T., Li, L., Da, T et al. RNAi targeting micro-calpain increases neuron survival and preserves hippocampal function after global brain ischemia. *Exp Neurol*, 2010. 224, 170-177.
- 100) Bevers, MB, Lawrence E, Maronski M, Starr N, Amesquita M, and Neumar RW, Knockdown of m-calpain increases survival of primary hippocampal neurons following NMDA excitotoxicity. *J Neurochem*, 2009; 108: 1237-1250.
- 101) Bevers, MB., Neumar RW. Mechanistic role of calpains in postischemic neurodegeneration. *Journal of Cerebral Blood Flow and Metabolism.* 2008; 28: 655-673
- 102) Parnia S, Fenwick P. Near death experiences in cardiac arrest: visions of a dying brain or visions of a new science of consciousness. *Resuscitation* 2002; 52: 5-11.
- 103) Buunk G, Van der Hoeven JG, Meinders AE. Cerebral blood flow after cardiac arrest. *The Netherlands Journals of Medicine* 2000; 57: 106-112
- 104) Eleff SM, Kim H, Shaffner DH, Traystman RJ, Koehler RC. Effect of cerebral blood flow generated during cardiopulmonary resuscitation in dogs on maintenance versus recovery of ATP and pH. *Stroke* 1993; 24:2066-73.
- 105) Shaffner DH, Eleff SM, Brambrink AM, Sugimoto H, Izuta M, Koehler RC, Traystman RJ. Effect of arrest time and cerebral perfusion pressure during cardiopulmonary resuscitation on cerebral blood flow, metabolism, adenosine triphosphate recovery, and pH in dogs. *Critical Care Medicine* 1999; 27: 1335-1342

- 106) Levin P, Kinnell J. Successful Cardiac Resuscitation Despite Prolonged Silence of EEG. *Archives Internal Medicine*; 1966; 117: 557-560.
- 107) Rossen R, Kabat H, Anderson JP. Acute Arrest of Cerebral Circulation in Man. *Archives of Neurology and Psychiatry* 1943; 50: 510-528.
- 108) Kano T, Hashiguchi A, Sadanaga M. Cardiopulmonary-cerebral resuscitation by using cardiopulmonary bypass through the femoral vein and artery in dogs. *Resuscitation* 1993; 25: 265-281.
- 109) Angelos M, Safar P, Reich H, A comparison of cardiopulmonary resuscitation with cardiopulmonary bypass after prolonged cardiac arrest in dogs. Reperfusion pressures and neurologic recovery. *Resuscitation* 1991; 21: 121-135
- 110) Lavy S, Stern S. Electroencephalographic Changes Following Sudden cessation of artificial pacing in patients with heart block. *Confin Neurol.* 1967; 29: 47-54
- 111) Hossman KA, Ophoff GB. Recovery of Monkey Brain After Prolonged Ischemia. I. Electrophysiology and Brain Electrolytes. *Journal of Cerebral Blood Flow and Metabolism*, 1986; 6: 15-21
- 112) Gonzalez ER, Ornato JP, Garnett AR. Dose dependent vasopressor response to epinephrine during CPR in human beings. *Ann Emerg Med* 1991; 18; 920-6
- 113) Reagan EM, Nguyen R, Ravishankar S, Chabra V, et al. Monitoring the Relationship Between Changes in Cerebral Oxygenation and Electroencephalography Patterns During Cardiopulmonary Resuscitation: A Feasibility Study. *Crit Care Medicine* 2018; 46:757-763
- 114) Kroeger D, Florea B, Amzica F. Human brain activity patterns beyond the isoelectric line of extreme deep coma. *PLoS One.* 2013;8: e75257
- 115) Mayer J, Marx T, The pathogenesis of EEG changes during cerebral anoxia In: *Cardiac and vascular diseases handbook of electroencephalography and clinical neurophysiology.* edited by J Van Der Drift 1972;14: 5-11 (Amsterdam)
- 116) Marshall RS, Lazar RM, Spellman JP. Recovery of brain function during induced cerebral hypoperfusion *Brain* 2001; 124: 1208-1217.

- 117) Olausen A, Nehme Z, Shepherd M, Jennings PA et al. Consciousness induced cardiopulmonary resuscitation: An observational study. *Resuscitation* 2017; 113: 44-50

- 118) Doan TN, Adams L, Schultz BV, Bunting D. Insights into the epidemiology of cardiopulmonary resuscitation-induced consciousness in out-of-hospital cardiac arrest. *Emergency Medicine Australasia*. 2020;32:769-776

- 119) Parnia S. Do reports of consciousness during cardiac arrest hold the key to discovering the nature of consciousness? *Medical Hypothesis* 2007; 69:933-7.