

The Science of Zen

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I have titled this talk "The Science of Zen".

In this talk, I am going to explore the intersections between certain aspects of Buddha Dharma and what neuroscience has learned about our nervous systems.

Scope

There are three areas where, at least in my opinion, Science has something interesting to say about Buddhism:

1. How and why the brain creates a sense of self
2. Why that sense of self makes us suffer
3. How practice can lead to the cessation of that suffering.

Unfortunately, I don't have time to really dive into the entire picture, so in this talk I am mostly going to focus on how a sense of self is created and then touch upon why having a sense of self can make us suffer.

Overview

Before I dive into the details, I want to give a high-level summary of what I am going to cover in this talk.

We humans experience various levels of discontentment with life because we encounter an unending stream of unmet expectations.

Unmet expectations are the source of suffering.

Our expectations of how we expect life to go are largely predicated on our beliefs around who we are and how we think the world should work in order to allow us to experience comfort and safety.

The totality of these beliefs can be called our self-identity.

This conceptual construct of our self-identity is a necessary part of our species-specific survival strategy.

All animals have a unique survival strategy that ultimately revolves around perceiving the world and then deciding how to interact with it.

The central component of our decision-making survival strategy is centered around cooperation and competition with other people.

To work or compete with other people we need to have a narrative sense of who we are and then be able to communicate it.

The Buddha long ago realized that our self-identity based survival strategy could be broken up into discrete and interrelated components called the five aggregates.

These components are:

- Our physical body
- Our ability to have a felt sense of self and other
- Our ability to experience pleasure and discomfort

- Our ability to perceive and recognize objects in the world
- Our ability to conceptualize the world and then make decisions about how to interact with it
 - o These conceptualizations are largely filtered by our sense of identity and it's relationship to other people.

Underpinning this whole process is our craving for pleasure and then our grasping for that pleasure.

Discontentment with life results because expectations to feel good are doomed to frequently fail due to the unpredictable and ever-changing nature of world we find ourselves in.

We are also uniquely designed to constantly worry about this.

The neurobiological underpinnings of these processes are:

- The brain's default mode network is the basis of our ability to have dualistic conceptualizations and a sense of self identity.
- A class of neurotransmitters called endorphins signal pleasant and unpleasant sensations in our brains.
- A neurotransmitter called dopamine signals craving and motivation in our brains.

Dukkha- "Dissatisfaction"

To begin our exploration of Buddhism and Science, lets touch base with the core purpose of Buddhism:

The cessation of Dukkha – the cessation of Dissatisfaction.

Translation of Dukkha

The typical translation of Dukkha is "Suffering", but I prefer Dissatisfaction because it better includes some of the more subtle aspects of Dukkha that is lost in the word "suffering".

Suffering is such a strong word, it tends to leave out the more subtle aspects of dukkha such as boredom, annoyance or yearning. Dissatisfaction has a broader scope.

The Zen teacher Jeff Shore translates dukkha as "Dis-Ease" which I also think a pretty good translation.

The First Noble Truth

The Buddha has this to say about Dissatisfaction in the First Noble Truth:

Now this, Monks, is the noble truth of Dissatisfaction: birth is Dissatisfaction, aging is Dissatisfaction, illness is Dissatisfaction, death is Dissatisfaction; union with what is displeasing is Dissatisfaction; separation from what is pleasing is Dissatisfaction; not to get what one wants is Dissatisfaction; in brief, the five aggregates of grasping are Dissatisfaction.

Key Points on The First Noble Truth

Let's highlight the last two points of this passage:

1. not to get what one wants is Dissatisfaction
2. the five aggregates subject to grasping are Dissatisfaction

These two points are central to our discussion today and we will explore them in detail.

Let's start with the five aggregates.

The Five Aggregates

It would not be an exaggeration to say that the core teaching of the Buddha is the idea and implications of the Five Aggregates.

The Five Aggregates which are also known as "Namarupa" or "Name and Form" are the physical and mental elements that create the illusion of Self Identity.

Using the terms as they are commonly translated as, the five aggregates are:

- Form
- Sensations
- Perceptions
- Formations
- Consciousness

Whenever you hear the Buddha talking about "Name and Form" or the these "Five Aggregates", you can substitute "The Illusion of Self Identity".

He often makes this connection explicit. For example, In the Sama nupas sanā sutta (or The Ways of Regarding sutra) he makes the point that a core human illusion is the equivalency of self-identity and the five aggregates.

A quote from the sutra:

A person who has not Awakened regards body as the self, the self as having body, body as being in the self, or the self as

being in the body. [He goes on makes the same point similarly for all the other aggregates such as 'feelings,' 'perceptions,' 'formations,' 'consciousness.']

Then he says:

So this way of regarding arises: it occurs a non-awakened person to think 'I am.'

We can see here that the five aggregates are the constituent parts of an illusory self-identity.

The Heart Sutra

The main thesis of Zen Buddhism is the Heart Sutra and it is safe to say that the main thesis of the Heart Sutra are its first few lines:

Avalokiteshvara Bodhisattva, when deeply practicing prajña paramita, clearly saw that all five aggregates are empty and thus relieved all suffering. Shariputra, form does not differ from emptiness, emptiness does not differ from form. Form itself is emptiness, emptiness itself form. Sensations, perceptions, formations, and consciousness are also like this.

The basic idea here is that our experience of a seamless sense of self identity is an illusion and seeing through the illusion is how we transcend dissatisfaction.

Why the five aggregates?

The reason that these five aggregates exist, is that they work together to create our Self-identity in a way that allows us to survive in the world as social individuals.

The Buddha explores this idea of survival in the "**Atthi Raga Sutta**" which can be translated as the "**Where There is Passion Sutra**".

In this Sutta, The Buddha is discussing what is required to be born into this world and survive. These requirements are the "nutrients" needed by existence.

One of these nutrients is food. Here is what the Buddha says about the relationship between food and self-identity:

- *If there is desire, relishing, and craving for solid food, vijnana (or dualistic consciousness) becomes established there and grows.*
- *Where vijnana is established and grows, name and form (self identity) are conceived.*

In other words, this physical need for survival is met through craving, dualistic consciousness and the illusion of self-identity.

More specifically, these five aggregates exist in order to allow us to perceive phenomena in the world and then decide how to interact with this phenomena in order to survive.

Let's now look at each of these five aggregates (aka the self-identity illusion) in detail.

Rupa – Form

The first aggregate is Rupa or Form

In this context, "form" is our biological body and brain.

From the perspective of science, there are really three points that are important to bring up here:

1. Every living creature has a survival strategy that has been selected for during evolution.
2. Creatures that have brains have them because they need to move around in the world and interact with objects and phenomena.
3. All creatures with brains have core drives to survive and procreate.

Brains are Expensive

Brains are extremely biologically expensive. If an organism does not move around and make decisions, it does not need a brain.

A brain exists to make decisions.

If you don't need to move around and make decisions, you do not need a brain.

Two Lifecycle Worm

There is a type of aquatic worm that really illustrates this point.

This worm has a two-phase lifecycle.

In the first phase of its life, it must swim around and decide how to interact with the world.

In its second phase, it anchors itself to a rock and stays there for the rest of its life.

Since it no longer moves around, it actually digests its own brain since it no longer needs such a biologically expensive organ.

Vedana

Now lets look at second of the Aggregate: Vedana – Pleasant and Unpleasant Feeling Tones

In many translations (including SFZC's Heart Sutra) Vedana is translated as "Sensations".

Scientists typically use the term "Feeling tones" to describe this idea and I like that as a translation. I think it best explains the concept.

Vedana feeling tones are either pleasant, unpleasant or neutral.

Feeling tones evolved so that organisms can receive real-time positive or negative feedback on their actions as they move around the world.

Do this / Don't do this Signaling

At a very core level, this is the "Keep doing this" or "don't do this" signaling in the brain.

It can also manifest as the "let this happen" or "don't let this happen" signaling in the brain.

Endorphins

These reward and punishment experiences are mediated by chemicals called endorphins and they act on what scientists call "hedonic hotspots" in the brain.

While endorphins are commonly known as "pleasure chemicals" there are also opioid receptors in the brain that create aversive or "dysphoria" experiences as well.

In short, we can think of Vedana as "liking" and "disliking".

Tanha / Craving

Now Let's take a quick detour from going through the five aggregates and look at Tanha – Craving

If Vedana is "liking" and "disliking" then Tanha, or Craving, is "wanting" and "not wanting".

It is not always obvious to people, but "liking" is very different than "wanting".

"Disliking" is very different than "Not Wanting".

If we pay attention, we can see that liking and wanting are experientially distinct.

In fact, these experiences are driven by different brain regions and different neurotransmitters.

Dopamine

While "liking" and "not liking" are driven by endorphins, "Wanting" and "Not Wanting" is mediated by the neurotransmitter Dopamine.

We can see that dopamine as the "wanting" and "not wanting" chemical.

Despite what scientists used to think and what the general public still largely believes, dopamine has nothing to do with pleasure or liking.

It has everything to do with wanting or craving.

Again, just to really bring it home, a key point here is that wanting and liking are different experiential phenomena.

Surprise

The Dopamine system generally fires when things are a surprise.

When something is a surprise and has a noticeable pleasant or unpleasant feeling tone, dopamine marks it as important and will drive us to either want to or not want to experience that again.

Seeking and Motivation

This craving through dopamine is what causes us to act. It motivates us to interact with the world in a way that increases pleasant feeling tones and avoids unpleasant feeling tones.

It alerts us to the possibility of action and creates a sense of tension that needs to be released through that action.

In order to interact with the world in this way, we need to be able to perceive and recognize it, so let's talk about that next.

Samjna – Perceiving, Recognizing and Categorizing the World

Samjna, which is the next of the "five aggregates" is often translated as simply "perception" but this can be misleading.

Samjna is not just perceiving but it is also recognizing and categorizing the world.

In the interest of time, I am not going to dive deeply into this aggregate, but it's worth mentioning that a lot of our perception and recognition is accomplished by just noticing a few details about an object and then inferring what it is based on previous experience.

Samskara – Motivated Intention

Let's now look at the fourth of the five aggregates: Samskara.

We now come to the crux of this five aggregate system.

Remember, this five aggregate system of Self Identity exists in order to help us move around and decide how to interact with the world in order to increase pleasure and decrease unpleasantness.

Samskara is the deciding part of this system.

Translation

Samskara is translated with varying terms such as:

- Formations
- Volitional Formations
- Dispositions
- Conditioned Things
- Determinations
- Fabrications

These are correct translations from a linguistic perspective, but don't quite get at what the word means in its five-aggregate context.

At least in my opinion.

If you look at its usage in the context of the five aggregates in the suttas, you will find phrases such as:

- Directed thought and evaluation
- Intention
- And tendency towards

The basic idea involves intention or volition, so of the traditional translations, "Volitional Formations" is probably the best.

Its clunky though, so I prefer "Motivated Intention".

What is the underlying motivation of the intention?

To experience pleasant feeling tones and to avoid unpleasant feeling tones. These are fundamental dictates of survival that nature gives us.

Chain of Action

Let's review how all this fits together:

Going down through the chain of what causes us to decide to act:

- **First**, we have the ability to experience pleasant and unpleasant feeling tones. This is Vedana.
- **Second**, we have the ability to "want" and "not want" based on this pleasure or lack of pleasure. This is Tanha or Craving.
- **Third**, we have the ability to perceive and recognize objects and phenomena of the world. This is Samjna.
- **And finally**, we have the ability to have motivated intention to interact with (or avoid) these objects and phenomena. This is Samskara.

This is how these capabilities work together to allow us to make decisions and interact with the world.

The Central Executive Network- The Decider

A key brain region that is involved with this intentional decision making is called the "Central Executive Network". It is the network that analyzes situations and makes intentional decisions.

It allows us to look analytically and dispassionately at our options and then decide what to do.

If you are familiar with Star Trek, we can think about it as the "Spock" part of our brains.

This coldly logical aspect of decision making is not the only part of our brain that makes decisions however.

In order for our brains to control our behavior and thinking, it needs to be able to make use of what we have learned about the world and then conceptualize how the world works.

It is also needs to take feeling implications into account.

Papañca – Dualistic Conceptualization

In order to decide on how to interact with the objects and phenomena in the world around us, we need to create an elaborate conceptual model of it.

Scientists call this model a "Schema".

Papanca

The best traditional Buddhist term I think that encapsulates this idea is "Papanca". It is almost always translated as "conceptualization" or "conceptual proliferation".

The Default Mode Network

The brain systems that create and process our models of the world is The Default Mode Network.

The default mode network engages in many cognitive tasks including this ability to conceptually model our world and ourselves.

To help us understand this idea, lets look at some examples of conceptual models that we might have:

- The United States uses the electoral system when voting for president.
- Blue and yellow make green
- If I am helpful, people will like me.

This last conceptualization is an example of the type of conceptualization that is most relevant to Buddhism: ones that involve dualistic self-referential ideas.

We will explore the relationship between this type of conceptualization and a sense of self later in this talk, but first let's look at how the default mode network can run simulations of the future.

Simulating the Future

A big part of the Default Mode Networks ability to conceptualize is its amazing ability to understand the concept of time.

Much of its conceptualization involves simulations of possible future scenarios.

This ability is used widely when we are in Samskara or "Motivated Intention" decision-making mode.

In order to decide what to do, we need to be able to project our imagination into the future and simulate potential outcomes and then imagine how they would feel like.

The imagined Vedana Feeling tones of potential future scenarios are the primary variables in deciding what to do.

Predicted potential future feeling tones are largely what motivate us how to behave.

Feeling Tone Database

How does the Default Mode Network predict possible future potential feeling tones?

It accesses what can be called the "feeling tone database" in our brains.

You could also call it the "Reward Value Database".

If you're interested, the brain region involved is called the Orbitofrontal Cortex, but we call it the feeling tone database to make it easier to remember.

Vijnana – Dualistic Consciousness

Let's now look at the last of the five aggregates: vijnana.

It is often translated as simply "consciousness" but "dualistic consciousness" or "dualistic self-awareness" is much more accurate.

"vi" means "split" or "separate".

"jnana" means knowledge, awareness or consciousness.

Vi-Jnana

Dualistic Consciousness.

Exists in the context of Senses

Dualistic consciousness, by definition, can only exist in the context of one of the six sense bases such as hearing, seeing, tasting, etc.

It is when our mind meets phenomena or objects through the senses that dualistic consciousness will come into being.

It is inherently dualistic.

Why does it exist?

Why does this type of dualistic consciousness exist?

Evolutionarily, it exists because, by definition, we require the ability to have a felt sense of subject and object to interact with objects in the world.

It is a precondition to perceiving and recognizing objects.

It allows us to decide how to interact with them.

Brain Networks for Vijnana

The neural substrate of a sense of dualistic conscious awareness is a combination of the Default Mode Network and a brain region called the Salience Network.

The Five Aggregates and Self

Having looked at the five aggregates, we now have a sense of how they all fit together so far.

We have not quite gotten to how an emergent sense of self fits into the picture, but let's review what we have covered:

- **First**, we have a body and brain that exists in order to allow us to make decisions and move around in a world of objects and phenomena. This is Rupa or Body.
- **Second**, we have the ability to experience pleasure and displeasure. This is Vedana or Feeling Tones.
- **Third**, we have the ability to "want" and "not want" based on this pleasure. This is Tanha or Craving.
- **Fourth**, we have the ability to perceive and recognize the objects and phenomena of the world. This is Samjna.
- **Fifth**, We have the ability to have motivated intention to interact with (or avoid) these objects and phenomena. This is Samskara.
- **Sixth**, We have the capacity to conceptualize the world into complex models of reality.
- **Seventh** – Making all this possible is the innate, precognitive ability to have a felt sense of subject and object. This is Vijnana.

A Sense of Self?

Remembering that according to the Buddha, the five aggregates are essentially synonymous with a sense of self, it makes sense to stop here and ask:

Are all these elements that we have explored so far enough in themselves to add up to a sense of self?

From one point of view, yes.

Most, or perhaps all, animals manifest craving and the five aggregates in a way that includes some sort of self-cognizance.

Even a lobster, for example, would experience all these processes of craving and the five aggregates within the context of some sort of object and subject dualism.

But would a lobster have an actual sense self similar to how we do?

This is a complex and nuanced topic, but it is fairly safe to say that a lobster does not have a sense of self in the way a human does.

A human-like sense of self is multi-layered, but one defining characteristic of it is that must include a "continuous sense of self".

That is, a felt sense that we have existed in the past, that we exist now and that we will exist in the future.

A Sense of Continuous Self

A continuous sense of self is possible due to the memory centers of the brain.

Brain regions such as the hippocampus and parahippocampus interact with the default mode network to produce this continuous sense of self.

It is very much a "felt sense" that is in many ways precognitive. It comes before thinking.

Not a Full Sense of Self

While this Sense of Continuous Self is a big part of what makes a human feel like a self, it isn't the whole picture.

The next layer on this stack of mind processes would be what we call a narrative sense of self.

The Narrative Sense of Self

A narrative sense of self is similar to the continuous sense of self but it includes a cognitive or thinking element to it.

This narrative sense of self is where we begin to have a sense of self identity.

Autobiographical Memory

This narrative sense of self is built upon something called "autobiographical memory".

Autobiographical memory is a combination of episodic memory and declarative memory.

Episodic Memory

Episodic memory is our ability to envision particular scenarios that we were part of.

It is almost like video or image capture of key moments in our life.

Declarative Memory

Declarative memory is essentially a huge data structure of facts that we think are true. Examples might be:

- I am pretty
- Getting older is hard
- Hard work pays off
- Life is not fair

- I like rocky road ice cream
- I am going to die
- McDonald's food makes me feel physically uncomfortable,

We saw earlier how the default mode network conceptually models reality into what scientists call schema.

The default mode network works with our autobiographical memories to create a sense of self-identity within this schema.

Our self-identity is the story of what we tell ourselves and the world about who we are and how the world works.

Our sense of narrative self-identity becomes the contextual filter through which we view the world and make decisions.

Name and Form

As mentioned at the beginning of the talk, our species' specific survival strategy in making decisions about how to interact with the world, largely revolves around competing and cooperating with other people.

It is our core survival strategy.

It turns out that this social context of our existence is why we have a sense of self-identity in the first place.

That is a perhaps a bold statement, so I will spend some time discussing it.

Social Self-Identity

It would be fair to ask:

If other animals get by with just a simple sense of object-and-subject as the "self" component of their five aggregate system, why does our five-aggregate system have to include such a complex sense of self identity?

How does a sense of self-identity help?

If other animals get by without a complex sense of self-identity, why did we develop one?

Humans – The Social Animal

Every life form has a specific strategy for survival.

Our species' strategy is extremely reliant on individual humans coming together into various types of social groups to work together for survival.

We are extremely social animals and our social structures are very hierarchical and complex.

What scientists are increasingly realizing is that a sophisticated sense of identity and even self-recognition is only needed when a creature is very social in this manner.

When social animals such as us need to make decisions for survival, these decisions frequently involve interactions with other individuals.

As a result, a very large percentage of our five-aggregate decision-making tends to revolve around our self-referential beliefs about who we are and how social dynamics will affect us.

Tribal Identity

Our sense of narrative identity allows us to figure out:

- what tribe we belong to,
- how we fit into it as a helpful member,
- what our status is within the group.
- Also, very importantly, it lets us figure out who is not in our tribe and might be a competitor or threat.

For example, if we despise a political party that we are not in, its likely because of our self-identity has labeled them as not "one of us".

Our Self-identity allows also allows us to communicate this narrative story to other people in both implicit and explicit ways.

Our Survival Strategy

To sum up this point:

Our five aggregate decision-making system includes such a powerful sense of social narrative identity because it has to. This is the world in which we live.

At a risk of being repetitive, let's review again how this all fits together and include what we just learned:

- **First**, we have a body and brain that exists in order to allow us to make decisions and move around in a world of objects and phenomena. This is Rupa or Body.
- **Second**, we have the ability to experience pleasure and displeasure. This is Vedana or Feeling Tones.

- **Third**, we have the ability to "want" and "not want" based on this pleasure. This is Tanha or Craving.
- **Forth**, we have the ability to perceive and recognize the objects and phenomena of the world. This is Samjna.
- **Fifth**, We have the ability to have motivated intention to interact with (or avoid) these objects and phenomena. This is Samskara.
- **Sixth**, We have the capacity to conceptualize the world into complex models of reality. This is papanca.
- **Seventh** – Making all this possible is the innate, precognitive ability to have a felt sense of being a subject or a world of objects. This is Vijnana.
- **Eighth** – Our brains construct a sense of self out of our ability to perceive a "continuous self" and uses autobiographical memory to construct a sense of self-identity. This self-identity is the filter in which we view the world and ourselves and we use these beliefs in our decision making.
- **Ninth** – Our self-identity is largely needed because humans have a complex social survival strategy. To work with and against other people, we have to know who we are. When we are in "motivated intention" samskara mode, the implications of other people are key variables in decision making.

Underneath all of this are the core survival drives of the need to experience pleasant feeling tones and avoid unpleasant ones.

Default Mode Network

What are the neurological underpinnings of social and self-identity cognition?

Its one we have seen before: It is the Default Mode Network.

It creates a felt sense of continuous self and uses its ability to dualistically conceptualize reality in order to build a sense of narrative self-identity on top of it.

Upadana

We have talked about craving a few times but have not yet formally defined upadana or grasping or clinging

This is a very rich topic to dive into but in the interest of time I will just make two quick points:

- Grasping happens when we add a self-referential layer of expectations over craving.
- It is the expectation that we can continue to hold onto the sources of our dopamine driven craving.
- The grasping process is driven, again, by the default mode network.

Pervasive Dissatisfaction

Let's now look at how a grasping sense of narrative Self-identity causes dukkha or dissatisfaction.

The default mode network is very sophisticated in its ability to model the world in a complex manner.

As a result, we have equally sophisticated and complex narrative expectations of what think we need or want in order to be happy and safe.

If we peel back the layers of our grasping, narrative, self-referential expectations, we will always eventually get down to the core layer of feeling-tone vedana.

We get down to the need to experience pleasant hedonic tones and the need to avoid unpleasant hedonic tones.

And this is what it always comes down to. Five-Aggregate, self-referential narrative thinking always has the root goal of optimizing feelings in the manner. We want to feel good and avoid feeling bad.

We become unwitting slaves to these feeling drives and constantly grasp at the need to fulfill them. Often with significant cost.

Remembering the first noble truth, we experience dissatisfaction when we don't get what we want or expect.

We experience dissatisfaction when our feeling-driven sense of self-identity has its expectations dashed.

Five Categories of Potential Dissatisfaction

To help structure our understanding of this idea, let's look at five categories of not getting what we want that may lead to dissatisfaction.

The categories are:

- **The hedonic treadmill** – Dopamine keeps us subtly dissatisfied unless we are experiencing new and exciting things. We layer narrative expectations over the tension and set expectations that can fail.
- **Physical Pain** – We transform pain into suffering by adding the "I wish this would stop hurting expectation".
- **Overly rigid conceptualization** – Our complex conceptualizations invent expectations that are hard or impossible to fulfill.
- **Rumination** – Where we worry uncontrollably about the future.
- **Poor decision making** – Where our needs to feel pleasure and avoid discomfort overrule the Central Executive Networks logical analysis.

Those are all driven by the default mode network layering self-referential conceptual narratives over reality.

Hedonic Treadmill

Even when things seem to be going well on paper, people often feel a bit uneasy and restless anyway.

This is due to dopamine. Since dopamine is always focused on what is next and moving to new pleasures, it causes us to be restless and seek new experiences and new objects.

This drive is a big part of why humans are so successful as a species but it has the negative side effect of making us never quite satisfied.

Experientially this can be a feeling like boredom or a general sense of subtle unease and disquiet.

Scientists call this the hedonic treadmill. It is a subtle baseline dukkha that can permeate all our lives.

We will often notice the tension of dopamine restlessness and to try to solve the situation with our Sense of Narrative Self to create stories of expectation such as:

- "This sucks, why do I have to wait so long in line. Darn it, it looks like I chose the slowest line."
- "I am tired of this boring job. I wish my work was more interesting."
- "Why is this dharma talk droning on and on?"

With these types of self-referential narrative stories, we have made the tension from craving our own.

Said another way, we have picked up and grasped at it with expectations.

We have set up conditions under which we can be further dissatisfied.

Overly Rigid Conceptualization

We saw earlier how the default mode network creates dualistic conceptual models of the world.

This is essential for our species' approach to survival, but it often creates unrealistic expectations that are unlikely or maybe even impossible to meet.

For example, we might make the conceptual determination regarding our self-identity that having a nice car is key to the approval of our peers.

We can get caught up in a self-referential narrative such as:

"I am successful and having this car will this make it clear to other people".

These types of grasped narrative expectations can cause problems in two ways:

- For one, the cost of meeting the expectation might be hardship in and of itself. For example, the huge debt of obtaining a car might make life very difficult down the road.
- Secondly, just do the impermanence of the world, we might never get that car or we might lose it after getting it. Expectations will be unmet and we will likely experience intense dissatisfaction.

Our grasped-at expectations that were manufactured by default mode network driven self-identity then go unmet and we experience emotional afflictions and dissatisfaction with life.

Since one of the core human strategies for survival revolves around social cooperation and competition, a very large percentage of our overly rigid conceptual expectations are social in nature.

We are constantly analyzing our social status and the social implications of what we encounter in life.

Physical Pain

Physical Pain all by itself can be surprisingly neutral.

The idea that pain and suffering are two separate experiences often sounds completely incomprehensible to non-practitioners.

What serious practitioners can come to experience is that when we feel pain, there is actually only suffering and dissatisfaction when we add a default mode network generated self-referential narrative layer on top of it.

When we grasp at a narrative expectation that we want the pain to stop, then the suffering and dissatisfaction comes into play.

This dynamic has actually been quantified in scientific experiments.

Long-term meditators show significantly less evidence of suffering from pain in brain scans than non-meditators do.

When a "I wish this would stop" type of narrative expectation is added to pain, that is when it becomes suffering.

Rumination

The default mode network's ability to create abstract simulations of the future is so powerful, that this can be a source of emotional pain itself.

When we imagine scenarios in the future that seem painful, the mere prospect of something happening can upset us.

Humans spend much their time being upset or stressed about future possible future scenarios.

The default mode network got its name because it is always active unless there is a real-time task grabbing our attention.

Since real-time tasks grabbing our attention are not constant, we have a significant amount of free time to worry about the future.

If the future perceived consequences are significant enough, the fear involved will be so intense that the default mode network will often ruminate uncontrollably despite our need to be present and focus on tasks.

When this is severe enough, it can be labeled as a mental illness such as an anxiety disorder or depression.

But even if the severity falls short of a diagnosable mental illness, as it does for most of us, this is still no way to live.

Poor decision Making

We saw earlier that in the five-aggregate process, a brain network called the Central Executive Network is in charge of analyzing novel situations and logically coming to the best possible decision.

In a perfect world, logic would reign supreme in these decisions, but Central Executive Network does not work alone in the real-time decision-making.

The default mode network and its dualistic conceptual view of the world also is involved. Its ability to run simulations of future possibilities is an incredibly important part of decision-making.

This becomes a problem when our conceptual models of reality are overly delusive (which is not infrequent) or when our model of reality is too rigid to offer the cognitive flexibility that would be helpful.

Additionally, the default mode network's contribution to decision making is heavily influenced by the feeling tone database that we all have.

When the default mode network runs simulations of the future, its will almost always pick an option based on how it thinks things will feel based on the values in this database.

Feeling tones and the resultant craving is a powerful and fundamental drive that influences our decision making process. The pull of these forces are so strong that we often become slaves to feelings at the expense of logic.

In other words, the default mode network's self-centered enslavement to feeling good and avoiding feeling bad often over rules the Central Executive network's attempt at cool logical deductive reasoning.

This often leads to selfish and short sighted decision-making which in turn leads to discontentment and suffering in ourselves and others.

In Conclusion

To sum everything up, humans experience fairly widespread discontentment with life.

Our expectations of how we expect life to go are largely created by our beliefs around who we are and how we think the world should work to allow us to experience comfort, happiness and safety.

The totality of these beliefs is our self-identity.

Our conceptual beliefs regarding our self-identity is a necessary part of our species-specific five-aggregate survival strategy.

The central theme of our decision-making survival strategy (and thus our self-identity) is centered around cooperation and competition with other people.

As we decide how to navigate life, our underlying endorphin-driven dictate is to maximize pleasure and minimize discomfort.

Discontentment with life comes because our expectations to feel good are doomed to frequently fail due to the unpredictable and ever-changing world we find ourselves in.

The core neurobiological drivers of this entire process are:

- Endorphins – That enable to us to feel good or bad or like and dislike things
- Dopamine – That makes crave objects and scenarios and drives us to action

- Default mode network – Which underpins our sense of self identity. It dualistically conceptualizes our world and causes us to grasp and cling at the objects of our cravings.

Does anyone have any questions or comments? If not we can end here.