

AN ADEQUATE MODEL OF FREE WILL  
FOR COGNITIVE NEUROSCIENCE

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## **Abstract**

The debates on whether human beings have free will have been widely held in many fields such as philosophy, psychology, neuroscience, law, and physics. Despite some people argue that free will is no more than an illusion, in my thesis, I argue that free will exists. Such position has been furiously attacked in the literatures, largely because it does not fit into our understandings of this mechanical world. Therefore to support that free will exists, we need to suggest a worldview that free will can fit into. The first two chapters will introduce the circumstances when we exercise free will and then introduce a novel model of dualism. From chapter three onwards, I will propose a free will model based on agent-causation theory but goes one step further. I argue that a person can develop a thinking process through holding an idea in his mind. For example when a person is considering what he should eat for dinner, he needs to hold the idea when he is assessing the options. A person is always free to choose to either keep or give up holding the idea (or the thinking process developed from that idea) at any time. This ability, I argue, is from the agent and is not causally determined. No one can force a person to hold or not to hold on to certain ideas apart from the agent himself/herself. Free will thus arises. It is completely up to the agent. Without the main idea, a person is likely to fall into mind wandering. No matter a person is making decision or performing an action, the agent should always follow the logic development of the main idea. If a person does not follow, it is his choice and he will need to be responsible for it. Ultimately, one of the most important purposes of free will is to choose to abide the morally right things. At the end, I will illustrate a possible way to reconcile the mechanical world view and the agent-causation free will ability. I argue that the ability to hold or not to hold on to an idea does not contradict with the findings in neuroscience, psychology or even physics. In conclusion, I think this model can reconcile the findings from various areas and is crucial in understanding human mind.

## **Chapter 1: Everyone has Experiences of Free Will**

### **The circumstances when people exercise free will**

Before discussing the free will model, it is important to discuss the circumstances when people actually exercise free will. From those circumstances, we can then discuss the experience of exercising free will and what free will is. Most people would have the sense that they have free will and can freely decide what to do although some people denied such claim and said that this sense was an illusion (Claxton, 1999; James, 1956; Libet, 1985). Some people argued that it was part of the essence of human beings as rational moral agents (Kant, 1929).

Because there are a lot of debates, definitions and interpretations about free will, it is important to introduce the shared circumstances in which people practice free will. If these experiences had not discussed and analysed first, we will be prone to fall into confusions and misunderstandings. So when do we exercise free will? We certainly experience the freeness during certain cognitive activities. When we contemplate those cognitive activities, we can have a clearer idea towards the free will that this thesis is going to focus on. Hopefully, we all can have the same starting point before we enter the main discussion in chapter two. We practice free will in at least five cognitive activities, namely, creativity, categorisation, understanding ambiguous figures, understanding ambiguous metaphors, and searching for the best options.

### **Creativity**

Free will is employed in creativity. Creativity is used in art, poetry, and music. Lehrer suggested that creative thinking comes from a new combination of existing ideas or when multiple existing ideas being recombined in a new way (Lehrer, 2009). I agree with his remark. To recombine the existing ideas, we use free will to voluntarily connect the two unrelated things in our mind, especially in metaphorical thinking; e.g. we can combine stairs and piano keyboard to create keyboard stairs, or we can put shoes and crocodile together to create crocodile style shoes, etc. A person can recombine unrelated things together because he can search through his memories and think of many different ideas encountered in different settings. He can freely put multiple ideas together and check with his goal.

Creativity requires the ability to direct ideas in certain directions and actively relocate ideas in mind. It is therefore the first kind of cognitive activity in which we can practice free will.

### **Categorisation**

Categorisation is one of the basic features of our perception. When we see or reason about kinds of things, we categorise them (Lakoff, 1987). Free will allows a person to categorise the same thing into different categories. For example, when a person sees a blue car, he can categorise it into the vehicle category along with bicycles, buses, and air planes. He can categorise it into the metal category as something made of aluminium, iron, and steel. He can also categorise it into the blue category along with sky and sea. We can freely use different concepts to categorise the same object. The voluntary use of concepts to categorise something in various ways is a distinct kind of practicing free will.

### **Understanding of ambiguous figures**

The ability to use different concepts to understand an ambiguous figure is also an example of practicing free will. We can use Necker's cube as an example (Figure 1). The Necker's cube can be seen in two ways; the front surface can be the back surface and vice versa (Gillett & Liu, 2012). The perceptual concept can be voluntarily shifted from one to the other because of free will. When someone sees the Necker's cube first this way and then that he can search through his past experiences and find more than one perceptual concept to match with what he is seeing. The example of the Necker's cube in voluntary perceptual shifts will be discussed again in chapter seven when we address the importance of language.

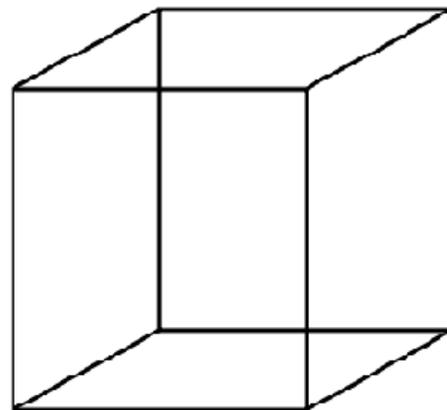


Figure 1; Necker's Cube

### **Understanding of ambiguous metaphors**

A similar ability is employed when someone tries to understand a metaphor. The person will first understand the meaning of the metaphor in one way. He can then search his memories to find another meaning to use in the metaphor and hence understand the object in a metaphorical rather than literal way. To voluntarily shift perceptual concepts in

understanding ambiguous pictures and metaphors is another cognitive activity when people practice free will in that it goes beyond what is given in the stimulus pattern.

### **Searching for the best choice**

Another cognitive process where we utilise free will is when we are searching for the best option. Before making a final decision, a person can analyse the situation by contemplating the possible outcomes. We use free will to shift from one outcome to another. A person can shift his mind from one possible outcome to another. He can also actively evaluate the consequences of each potential outcome before he makes the final decision. For example, when someone is searching for the best move in a board game, he can freely evaluate different options and contemplate the consequences before he makes the move. The person needs to use free will to search for the best choice.

To sum up, most people practice free will when they come across the cognitive activities mentioned above. Free will enables people to relocate and recombine ideas (as in creativity), to see the same thing under the new light with a different perspective (as in categorisation and making senses of metaphors and ambiguous pictures), and to shift between ideas (as when someone is searching for the best choice). Free will is employed in the activities mentioned above. However, subjective experiences would have little use in a thesis. We also need to know more about what others think about free will and what the common consensus is in the current debates. Although people use free will in various activities, huge debates arise when the philosophers, psychologists, and cognitive neuroscientists each tries to interpret free will in their own account (Glannon, 2005; Heisenberg, 2009; Kane, 2005; Libet, 1985).

### **Definitions of free will**

Because of the loose definition of 'free will', different thinkers can often attach different meanings to it (Meynen, 2010). I will try to summarise few main viewpoints about free will in the literatures.

The first and the most basic stage of the understanding of behaviour fits the thesis espoused by physical causal determinism. It concerns the processes that link acts and the states of the brain and body that enable them to occur. People who focus on this stage define free will as an illusion or logically impossible (Claxton, 1999; Hallett, 2007; Libet, 1985; Pesaran,

Nelson, & Andersen, 2008; Strawson, 1998). Some researchers within this group have argued that all our actions and decisions are subconsciously determined and that conscious awareness then follows the actions or decisions (Bode et al., 2011; Hallett, 2007; Strawson, 1986, 2002). They think every action is pre—determined by brain processes and our conscious awareness of the movements is an epiphenomenal experience. Since every cognitive activity has neurological bases, they argue that free will is solely generated in the brain as well and can be explained by brain—oriented explanations.

The second level of free will adds the sense of psychological freedom to the first level and builds on that level but also introduces interactive entities into its modes of explanation. The second level of free will liberates the first level physical mechanism by linking it to options arising from imagination and non-compulsive psychological activity.

The options can be generated indeterministically and because of that, animals are liberated from linear mechanical responses. Kant pointed out that in explaining the structure and behaviour of animals “the laws of simply mechanistic causality do not suffice”(Kant, 1953) even though we must strive to apply those laws in doing physiology and biology animals. Heisenberg (2009) said that “Their (animals’) brains, in a kind of random walk, continuously pre-activate, discard and reconfigure their options, and evaluate their possible short-term and long-term consequences... There is plenty of evidence that an animal’s behaviour cannot be reduced to responses (Heisenberg, 2009).”

The third group of scholars are a bit different from the two groups mentioned above but combines the first two levels. It is also known as the two-stage model. Some philosophers and psychologists have agreed that free will consists of two stages, the ‘free’ stage and the ‘will’ stage, hence the ‘two-stage model’ of free will (D. Dennett, 1978; Heisenberg, 2009; James, 1880; Penrose, 1990). William James is the first person who suggested the idea that we should separate ‘free’ from ‘will’ (James, 1880). He argued for a temporal sequence of random chance (‘free’) followed by determining choice (‘will’). A more recent thinker who adopted the two-stage model is Martin Heisenberg (Heisenberg, 2009). He uses quantum theory as a theoretical support for the random option generating thinking stage and uses behavioural biology to explain the deterministic decision making stage (Heisenberg, 2009). In the two-stage model, options are first generated in an indeterministic way in the thinking processes and then the decision is made in a deterministic way. For example, when a person considers what to do in the weekend, options would generate randomly. He will not know

what he will think at the next moment. Options pop into his mind randomly in a random order. And then he will make up his mind and decide to go with the option that he likes most. Because his preferences are based on his past experiences and memories, his decision is also predetermined. While the two stage model has explained some important features of free will and human behaviours, it still seems to miss some important points and subjects human action, to some extent, to uncontrollable factors (Kane, 1985) by accounting for human thinking processes as merely resulting from chance and randomness with decisions the results of past experiences. I argue the meaning of free will in this context has not explained the core issue of free will, which is that whether a person controls and needs to be responsible for his behaviours.

The fourth group focuses on the coherence or the smoothness of the thoughts and actions. This group says that free will is a process and the only thing that matters is whether the thoughts can be executed. If a person can act according to his rational thoughts, he is free. On the other hand, he is not free when he cannot. Walter Glannon points out that people don't always act as their thoughts. He used the examples of Obsessive-Compulsive Disorder (OCD) and patients with neurologic and psychiatric disorders to argue that they are unfree because they cannot properly control their behaviours and execute their thoughts (Glannon, 2005, 2011). He said: "Free will consist in the ability to initiate and execute plans of action. It involves the ability to control how our motivational and other mental states issue in our actions (Glannon, 2011)." The degrees of free will diminish when one lost the ability to act as he plans or when he acts in the ways that he does not really want (Glannon, 2011). I will come back to this definition again in Chapter 5.

Recently, there is a fifth group that emphasises the fundamental role of the agent. This is called the agent-causation theory. In order for an action to be free, it must not only be such that it is caused by the agent who performs it, but also such that no antecedent conditions were sufficient for his performing just that action. In the case of an action that is both free and rational, it must be such that the agent who performed it did so for some reason, but this reason will not be the sufficient cause of it. "When I believe that I have done something, I do believe that it was I who caused it to be done, I who made something happen, and not merely something within me, such as one of my own subjective states, which is not identical with myself. If I believe that something not identical with myself was the cause of my behaviour - some event wholly external to myself, for instance, or even one internal to myself, such as a nerve impulse, volition, or whatnot - then I cannot regard that behavior as being an act of mine, unless I further believe that I was the cause of that external or internal event." He indicates that the free action must be caused by the agent. Otherwise it is not the agent who has done

it, but some other factors. In other words, although mechanical principles are involved in the action-execution, it is not the cause of the action. It is the result of the agent's initiation. I think the agent-causation theory is the most plausible theory when it explains the essence of free will because it addresses the important role of the agent as well as the importance of physical mechanisms. This model of free will is based on the agent-causation theory but with more details. I will explain more about the free will model in the next chapter.

## Chapter 2: Freedom and Free Will

I have briefly introduced the main viewpoints about free will in the literatures. Is there any way to reconcile them together? In this thesis, I will propose a model that allows all the viewpoints to fit together. While the discussion is going on, all the five groups mentioned in the last chapter will gradually fit together. I will start the discussion with the first group, the level of physical mechanism. I argue that causal mechanism alone is not enough to explain the free will debates and the experiences of practicing free will.

### **Hume's Fork**

Simon Walker remarks that we can only attend one thing at a time<sup>1</sup>. Although the brain can process a large amount of information, we can consciously focus on only one thing at a time at any moment no matter what that thing is (it could be a sound, a colour, an image or a task). When people focus on one thing, they would ignore other events in the environment. An experiment done by Simons and Chabris illustrated that some participants would miss a walking Gorilla in the video when they were counting the passes of the ball (D. J. Simons & Chabris, 1999). Other studies also show that when people try to focus on multiple things at the same time, interferences would often occur (Komada, Shinohara, & Miura, 2007; Lavie, 2005; Pashler, 1994; Strayer & Johnston, 2001).

If a person can only attend to the thing that is happening at the present moment, he is then locked in the present moment. He would have no control over the thing that is going to happen in the next second, nor can he plans ahead or reflects on why he is doing something. Things that happened in the past cannot affect the event at the current moment either. Since the person cannot attend or control things (including his mind) that are going to happen in the succeeding second, he would have no control over his mind in the next moment. Thus there are two ways that can explain things that will happen in the future (both ways suit the physical worldview). One is by the causal relationship. The other one is by completely randomness or no causal relationship. The deterministic view states that the thing that is being attended to at any moment will unavoidably cause specific brain activations in the next

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<sup>1</sup> Personal communication

moment so that brain activities at the next moment are completely caused by the experiences in the past. Hence the human cognitive processes are all determined and the person has no control in making decisions or changes in his life. All the behaviours are simply causally determined transitions of electricity in the brain. On the contrary, if someone argues that the future is not determined, the other mechanism that can explain human cognitive processes in the physical world is the indeterministic view, which states that there is no causal relationship at all between moments. Every moment is completely independent from all other moments. Every idea is independent from other ideas and human cognition processes are made up of random combination of ideas. Again, that means a person has no control in his cognitive processes either. This dilemma between the deterministic and indeterministic view in the physical world is also called Hume's dilemma of determinism or Hume's fork. Hume remarked; 'The problem that our actions are either causally determined or random is, in either case, we are not responsible for them (Blackburn, 2005)'.

If the mechanical monism is right, it will leave people to be either a totally determined organism or totally random organism. Hume's fork showed that in a world that is completely governed by physical mechanisms, people would have no control over their cognitive activities. Hence free will is impossible. Are there other options? One of the possible ways to solve this dilemma is by attributing to the agent causation model. O'Connor put free will in neither the simple deterministic nor the indeterministic worldview. He said: 'Between simple indeterminism (hard indeterminism) and causal indeterminism (two stage model) lies **agent causation** or agent-causally generated activity (something is caused by the agent itself, not other factors)... It remains up to the agent, nonetheless, to determine which ... tendency will be acted on (O'Connor, 2002).' As mentioned before, I think the agent causation theory is one of the most plausible theories because it pointed out something more than the deterministic and the indeterministic model. However, I think his model requires further clarifications. I argue that both the agent-causation theory and the free will model that I will describe later require a dualism model as the background setting. Therefore I will first explain the dualism as the background setting (worldview).

## Dualism

Descartes' most famous quote; 'I think therefore I am' indicates that the thinking self is the most fundamental and essential knowledge before knowing any other things. -This claim indicates a metaphysical necessity before starting to think. Kant, likewise, described some knowledge, such as morality, freedom, and knowledge of God, as *a priori*, which means that the knowledge is independent to experiences. Descartes and Kant both agree that rationality has its limitation.

In Descartes' view, the physical bodies of animals and humans are like automatons or machines, which are governed entirely by the laws of physics and lack of awareness or consciousness. But humans have a non-physical soul, which is vital in awareness and driving physical actions. This view has been called "Cartesian dualism", or substance dualism. It suggests two different substances; the soul and the physical body (Foster, 1991). The soul and the body are two different substances. People who accept substance dualism will accept that soul is a non-physical substance. The other major kind of dualism is called the property dualism or aspect dualism. Whereas substance dualism says that there are two different kinds of substances, property dualism says that there are two different kinds of properties (or aspects) in human. Kant would describe the two properties as the two modes of representations, namely, the sensible and the intelligible representation. More recent philosophers would think that mind is the result of complex interactions of neural pathways and electrical interactions. They accept there are two different kinds of properties; the abilities like consciousness, language and thoughts, can emerge from the brain. Since these human specific abilities are very different from the reflex responses that most of the body does, the brain seems to perform two different functions. Although the recent neuroscience findings suggest that memories and most cognitive activities are the results of brain activities, Kant is still right in saying that some knowledge is *a priori* which is independent to the experiences (for example morality as we will discuss it in Chapter 6). Therefore there are three kinds of knowledge, the sensible representation, the intelligible representation, and the *a priori* representation (Figure 2).

Dualism has drawn lots of attacks. Some people attack substance dualism for the vague point of interaction. Property dualism still renders the human cognitive activities to causal mechanisms. Although property dualism seems to explain where thoughts come from, it neither address the role of the agent, nor the *a priori* knowledge. Here I will first propose a way to reconcile the two kinds of dualism. Therefore I have re-categorised the substance

dualism and the property dualism and separate them into three different levels (Figure 2). If we use substance dualism as the framework and property dualism as the two aspects of physical substance, we will have a model that has two substances with three functions. This will be the background setting (worldview) for the free will model.

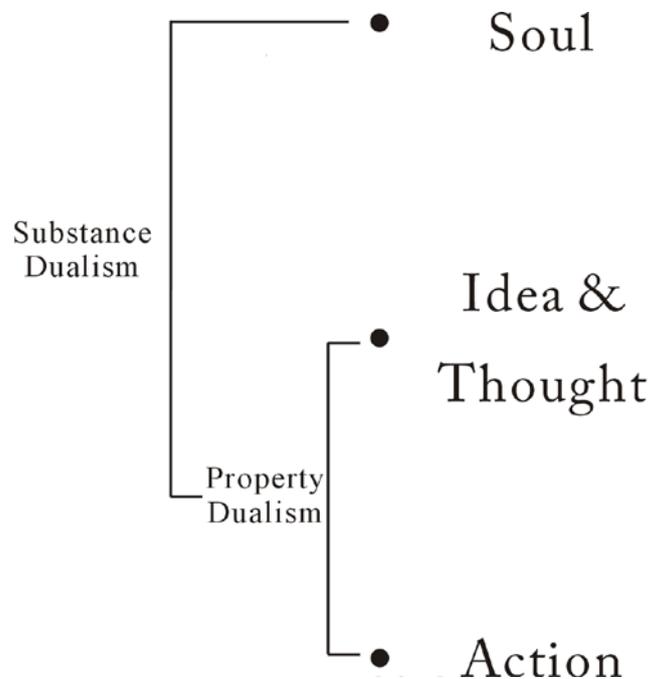


Figure 2: Property dualism within substance dualism

Neuroscience has shown that the information is stored in the neural connections. When people consciously retrieve the information that has been stored previously, they activate the specific neural network, which represents thoughts and ideas. The soul is the driving force of the thoughts. It is a bit like a computer, which is a platform for different kinds of programs and software. As a computer ensures that all the programs and software can work properly, the soul is an entity that ensures all the life experiences can work properly. The soul is the real inner entity that consciously activates thoughts and ideas, but I think it does not store the thoughts and ideas (although it might possess some *a priori* knowledge), the brain does. When the soul and the thoughts work together, people can consciously activate and drive ideas. Together they can be called 'mind' because the mind not only contains ideas, the ideas also need to be consciously activated.

As previously mentioned, although dualism has been fiercely criticised by some philosophers and psychologists because of the undefined nature of non-physical entity, the problem of interaction (Cottingham, 1992), and the advances in behavioural psychology, I think the

dualism with three function can be an appropriate theoretical framework to solve the Hume's fork and explain the agent causation theory. Now I will emphasise the distinctions between thought and physical response (or physical action).

### **Thoughts free us from physical responses**

Hughlings Jackson, the father of English neurology, remarked on the brain, 'if the highest centres were perfectly automatic, there would be no such thing as a 'voluntary' operation, all being organised' (Jackson, 1884, p. 705). He realised that human activity had the form it did because the arrangement of the brain was designed to over-ride automatic and mechanistic responses such that 'the progress of evolution is from the most to the least automatic... those which are concerned during one's present thinking and doings' (Jackson, 1884, pp. 704-705). Hughlings Jackson was aware that mechanistic stereotypy or machine like explanation was only found in the lower reaches of the nervous system and that speech had a crucial role in the adaptation of human beings to their complex and cooperatively constructed world of meanings (Gillett & Liu, 2012). He argued that the human brain has evolved to over-ride automatic or mechanistic responses. He pointed out two important points about human mind, namely the role of language and the cooperatively constructed world of meanings (I will discuss about language in Chapter 7). We shall focus on the cooperatively constructed world of meanings first (Harrre & Gillett, 1994).

If a person does not eat any food for one day, he will feel hungry. If a person faces dangers, he will try to escape. They are due to his physical responses or reactions. But the mind is different from natural reactions. Human beings can keep activating specific ideas from their memories in their mind without the presence of any prominent external stimulus that associate with the ideas. For example, a person can remember the idea 'do not hit people,' which he was taught in primary, when he is not in the primary school. A person may think of his experiences of playing in the playground when he was little when he sees a group of children playing. He might not be in that particular playground at the moment. Although the person is not in his primary school or in the playground, the he can still activate the memories of specific ideas that happened long time ago. I argue the ideas or concepts (or thoughts in a more general term) are part of the constructed world meanings, which forms the contents of

mind. The world of meaning has different properties than the physical responses. People can use concepts and ideas to regulate physical responses and behaviours.

If people do not have concepts and ideas, they will be driven by physical reactions and limited linear thinking processes in a dimension directly related to survival needs. They would do what they felt like doing without the possibility of second thoughts, and would have only means-ends or goal-directed control over their actions. Harry Frankfurt's theory of free will also talks about the possibility of second thoughts. He says that a person is free when he follows his second-order desires (Frankfurt, 1971). I think the second-order desires indicate the way that ideas govern human physical responses. I argue that to follow an idea (when we act) free us from being driven by unreflective human physical responses or impulses. A person is free when he learns to control his impulsive reactions and can do something that is more considered. He is then free from his physical reactions and engaged with a world of meanings (Harrre & Gillett, 1994). One form of freedom exists when someone has the options to follow or not to follow what the physical impulses (obsessions) drive him to do. He can still choose to follow his physical impulses because he has freedom to choose. Here I distinguish thoughts and actions. When people act after reasoning, the action is free from his physical responses. If a person acts without giving any second thought, e.g. a reflex response, this action is not free because there is no option when he acts. Kant remarks on the power of thoughts that the efficacy of reason is evident from the imperatives which in matters of conduct we 'impose as rules on our active powers' (Kant, 1929, p. 575). He says 'This active being would to this extent be independent and free of all the natural necessity present in the world of sense.' Of it one would say quite correctly that it begins its effects in the world from itself without its action being in itself' (Gillett & Liu, 2012; Kant, 1929, p. 569).

I do not mean that physical reactions are ineffective. I think the thoughts and reactions are two different properties and our reactions ought to be regulated by our thoughts. Jonah Lehrer concluded that a rational person can monitor his intuitions and emotions, and then decide either to follow reason or intuition so that he can make better decisions (Lehrer, 2009). He said that sometimes we need to learn to follow our intuitions but sometimes we need to think about our intuitions again before we make decisions (Lehrer, 2009). I argue that this is because people can use thoughts and ideas to regulate their physical reactions or intuitions (the physical reactions and the functions of brain will be discussed in more detail in Chapter 8). In many cases, the physical reactions do follow the thoughts. For example in a basketball game, physical reactions are used within the rules. If a person can think about what he

should do instead of merely carry out his physical reactions, he is free from unthinking physical responses. For example, if someone wants to hit another person but an idea tells him not to because this is not right, the idea allows him to choose not to hit another person. Hence he is free from an impulse<sup>2</sup> that he does not endorse (at second order level).

### **Holding an idea**

I have suggested a theoretical framework of the property dualism within the substance dualism (see Figure 2) and how the thoughts are different from physical actions. If ideas and physical responses are completely independent, our thoughts cannot affect our behaviours. Therefore it is not enough to distinguish ideas and physical responses, human beings also need to be able to consciously hold on to or keep an idea in the mind across time and enforce ideas into actions.

Animals use all their experiences at once. They cannot distinguish the individual memory. They cannot travel back through time and revisit or re-think their decisions. I argue that those smart animals, like chimpanzee and monkey, are smart because they have the brain structure that can store multiple and more complex options. When a human being holds ideas other than goal and purposes, he is experiencing the same event again and re-awakening the tendencies that the memory is associated with. Episodic memory therefore involves mental “time travel” and this can only be found in human beings (Tulving & Markowitsch, 1998).

An idea can be a sentence, a task, a memory, an image, a problem, an aim, a purpose, a moment, a feeling, a dream, a rule or anything that can exist in the human mind. I will start from the simplest ideas in this chapter, such as a random number, an image, or an object, and will discuss some complex ideas in the subsequent chapters. Ideas cannot affect humans if they come and go randomly. If the three ideas of ‘I want to be a geologist’, ‘I want to be a scientist’, and ‘I want to be a lover’ come into a person’s mind randomly, these ideas cannot help him at all. He needs determine his life goal and hold onto that idea when he makes decisions in his life. The ability to hold or not to hold an idea can allow people to bring an idea in their mind from the present moment to the next moment.

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<sup>2</sup> The impulse can be a compulsive feeling, emotional impulse or physical impulse. I argue that they are resulted from the hormonal imbalances in the brain. I will discuss this in Chapter 5 in detail.

The decision about whether to hold or not to hold on to an idea is not determined by experiences. Every moment is new to a person. He can hold the idea for no reason. He can also give up holding an idea and shift to other things at any time. For example, a person can hold and repeat a random number '77398' in his mind for any length of time. Is there any reason for keeping holding this number for a longer or shorter period? There may be no such reason and therefore past experiences cannot determine whether a person wants to hold or not to hold an idea in mind. I argue that it is purely from the person and what s/he decides to do. A further argument is found in the indeterministic view, which argues that it is randomness that dictates whether a person wants to keep or not to keep holding an idea in mind. But that is not the case when we see somebody pursuing their dreams throughout their whole life (like, for instance, Martin Luther King). Randomness cannot be the sufficient reason for keep activating the same idea over the whole life time. Some people still argue that unconsciousness or unknown brain events determine the decisions to hold or not to hold an idea at the present moment. I argue that if it is so, people would not have second thoughts regarding their actions in which they reflect and reason about why they are doing what they are doing. People should not feel unsure about anything or sense any contradiction in thoughts if unconscious events will automatically generate the only and most suitable option for them. If both thoughts and physical responses are from the same mechanism, no contradiction should occur between them. However, we often feel that we want to do something that we know we should do and vice versa. Hence we can often feel the contradiction. Therefore the initiation and the ability of holding an idea cannot be from the same system that generates physical (automatic reflective) responses. Therefore the substance dualism works here (Figure 2). I argue that it is the non-physical soul that holds an idea among other possible options and prolongs the staying of that idea in the mind/brain (see Figure 3). That willed holding is initiated from the highest place of a thinking being.

The soul holds or discards ideas in the mind. No other factor can affect the ability to hold or not to hold an idea. No one else can force a person to think or not to think something. Although sometimes people might have addictions or compulsions, e.g. the desire to wash hands in the patients of Obsessive-Compulsive Disorder (OCD), I argue that they can still hold ideas in mind in a different way and that this "an compulsive idea staying in the brain" is different. Their brain seems to produce a different set of information while they try to preserve others (I will discuss these cases in Chapter 5). The decision about whether to keep holding an idea and bring it to the next moment is completely initiated from the soul as an

active source of direction of the mind. If people can carry an idea at this moment into the next moment, they can carry an idea at the next moment into further moments as they follow the same train of thought over a succession of brain states.

Although the ideas and memories are stored in neuronal connections, the ability to keep activating a specific idea without any reason has not been found in any specific part of the brain. Human beings had not learned to hold an idea in their mind or carry an idea when they were young (although they can train themselves to do it better). The ability holds information from life experiences but it is not obtained from life experiences. People can do this naturally and we cannot observe it. When they are born they don't have the brain structure to store ideas so they cannot hold any idea. The ability is innate and the idea can only come into realisation when the brain has accumulated a certain amount of information. People learn new things through experiences, but the ability to keep holding a specific idea in the memories is not obtained from learning. I argue that only a human being has this ability, but animals do not<sup>3</sup>. The ability to hold an idea in mind also allows people to accomplish things far greater than what can be done by any other animal. Because people can hold an idea, they can hold the idea long enough until it turns into long-term memory (LTM). That ability also allows people to reactivate and hold the neural patterns that correlate with specific events in the past so that people can re-experience or recall at will events in the past. This can be the basis for episodic memory (Tulving, 2002). The ability to reactivate and hold an idea could also be the basis of working memory<sup>4</sup> because the specific idea in the memories is to be reactivated, new thoughts, concepts and ideas can be added to the old idea. Therefore new associations and linkages between the neurons can form. Nicholas Shea and his colleagues distinguished conceptual representations from the non-conceptual representations and argued that animals do not have conceptual representations (Shea, Krug, & Tobler, 2008). Animals only have non-conceptual representations: "in order to possess concepts, a thinker must have internal representation with a semantically constituent structure (Shea, et al., 2008)." I argue that the internal representation is the idea that people hold in mind. This ability requires a specific kind of attention that allows humans to attend to ideas (internal representations) created in the mind/brain<sup>5</sup>. The organisms which do not have this ability can only attend to

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<sup>3</sup> I will talk about this again in Chapter 8.

<sup>4</sup> I will discuss working memory again in the next chapter

<sup>5</sup> Animals can focus on external stimuli and respond to them but they cannot attend specific ideas in their mind.

things in the external environment. When William James talked about attention, he said: ‘It is the taking possession by the mind, in clear and vivid form, of one out of what seem several simultaneously possible objects or trains of thought. Focalization, concentration, of consciousness are of its essence. It implies withdrawal from some things in order to deal effectively with others, and is a condition which has a real opposite in the confused, dazed, scatterbrained state which in French is called distraction (James, 1890a, pp. 403-404).’ I argue this kind of attention is a feature of human beings. James also remarked that ‘effort of attention is the essential phenomenon of will (James, 1890b, p. 602).’ I argue that the ‘effort of attention’ is to keep attending to or holding an idea in mind; in other words, to keep activating a specific neuron pattern in the brain. Animals do not have the ability to hold on to a specific idea in mind. They only have linear thinking processes and cannot have second thoughts when they are about to act. When they perceive an external stimulus, all the neural pathways that are associated with that stimulus will be activated and then produce a response to it. Only humans can reactivate and keep a specific idea in mind without the presence of the external stimulus. Only humans can keep holding on to an idea across time in mind even though physical reactions and distracting stimuli might push people to do other things (the contradiction between physical reactions and thoughts will be discussed in Chapter 5). I will discuss the differences between humans and animals in more detail in Chapter 8 when I discuss the functions of brain.

I argue that the ability to keep or give up holding an idea is a critical point in the discussions of free will. A person is free to keep holding on to an idea in his mind. But he can give up holding that idea at any time as well. If a person consciously chooses to keep holding an idea in his mind, he is consciously, at the same time, choosing not to give up holding the idea. The options between keeping and giving up holding an idea are always present and depending on the will. The human ‘Will’ is ‘free’ in part because people can always choose whether to keep willing something so that free will should be understood as the ability to freely decide whether to keep holding or attending certain ideas in mind at any moment<sup>6</sup>. If people give up holding an idea, their mind can shift to other thoughts or ideas. But that decision from moment to moment is from the thinking self and not determined by past experiences, randomness, or unconscious brain events. We shall dig further in the next chapter.

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<sup>6</sup> The efforts of holding an idea will be discussed in chapter 5.

### **Chapter 3: Holding an Idea Can Generate Options**

The ability to hold or not to hold an idea is used in many cognitive processes. Sometimes people can hold a complex idea like ‘what I am having for dinner tonight’ or ‘I want to be a millionaire when I am 40 years old.’ These ideas imply a sustained thinking process and a future perspective. I argue that to hold on to a more complex idea can explain the free will experiences that I mentioned in the first chapter. Humans need to hold a specific idea in the mind to be able to form meaningful associations between ideas. This is the basis of creativity. People need to hold the idea of the object first before they can find the appropriate categories to categorise the object. People also need to hold the image of an ambiguous figure or the metaphors in their mind before they can find the appropriate ways to understand it. When people are trying to find the best choice in a task, they need to focus on the task and hold on to the task while they are searching for the best choice. I argue that these processes all use the same mechanism that people use to make decisions.

To hold an idea does not equal making decisions in daily life. Many people argue that free will is used at the moment when someone is making a decision. I argue that people need to hold on to their main ideas while they are considering before making decisions. Although there are various kinds of ideas, the ideas which require decisions (or judgements) may be tasks, problems, goals, purposes, questions or plans. These ideas all involve some unknown or future perspectives. These ideas are more complex than simple ideas such as images, random numbers, or objects. Depending on the duration which they consider and hold the problem, the decisions may be different. For example, in a chess game, a move after a long consideration is often different to the move under time pressure. Therefore the decisions that people make are associated with the ability to hold or not to hold an idea. A person must have options before he can make a decision. In this chapter, let us just focus on the options. Decision making will be discussed in the next chapter.

#### **Memory and neural structures**

Before a person makes a decision he needs to search for the available options from his memories. There are two kinds of sub-system involved in memory, namely, long-term

memory (LTM) and short-term memory (STM). Although Engel et al (1999) defined STM in a more extensive way, I will use one of the criteria that he used; ‘STM consist of those neural traces active above threshold with loss of activation as a result of decay or interference (Engle, Tuholski, Laughlin, & Conway, 1999).’ Within STM, working memory (WM) is defined as ‘a dedicated system that maintains and stores information in the short term, and that this system underlies human thought processes (A. Baddeley, 2003).’ LTM can be further divided into declarative (explicit) memory and non-declarative (implicit) memory (A. D. Baddeley & Mehrabian, 1976; Miyashita, 2004; Squire, 2004). Non-declarative memories are those that a person cannot recollect in mind or describe in language. It includes procedural memory and perceptual representation like skills, habits, familiarity to objects and priming (A. D. Baddeley & Mehrabian, 1976; Miyashita, 2004). Roediger called it “retention without remembering” (Roediger, 1990). Declarative memory means the memories that can be verbally described or articulated (Light & Singh, 1987). It includes both episodic memory and semantic memory, which is the memories of specific incidences from the past, knowledge and meanings (A. D. Baddeley & Mehrabian, 1976; Miyashita, 2004).

I argue that WM and declarative memory both require the ability to hold an idea<sup>7</sup>. People can hold an idea from the STM and LTM. A critical definition for WM is the ability to hold information. Randall W. Engle and his colleagues said: ‘it reflects the ability to maintain the activation of knowledge units in the focus of attention (Engle, et al., 1999).’ Cowan said that one relied on WM to retain partial results while solving an arithmetic problem without paper, to combine the premises in a lengthy rhetorical argument, or to bake a cake without making the unfortunate mistake of adding the same ingredient twice (Cowan, 2008). As noted, Baddeley also remarked that WM was a dedicated system that maintained and stored information in the short term (A. Baddeley, 2003). Baddeley (1993), ‘the central-executive component of working memory does not itself involve storage, which produces the apparently paradoxical conclusion that not all working memory studies need involve memory’ (Engle, et al., 1999). I argue that declarative memory also retains specific information so that people can describe it in language. Ericsson and Kintsch (1995) and Fuster (2008) both described a kind of WM obtained from the LTM (Ericsson & Kintsch, 1995; Fuster, 2008). I argue that the ability to hold an idea plays an important role in retaining WM and declarative memory. Although tons of information has been stored in

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<sup>7</sup> I argue that ‘the ability to hold’ is from a parallel system or the dualistic mind and ‘the ideas’ are from brain structures and neural connections.

neuron connections, we need to hold specific information among them so that we can make use the information. If information activates randomly, we cannot use the information in useful ways.

External stimuli activate neurons and when two neurons are activated together, the connectivity between them increases. Hebb's law states that 'neurons that fire together will be wired together.' The changing in neural connectivity in response to external stimuli is called neuroplasticity, a property of almost all neurons (Dityatev & Bolshakov, 2005; Quinlan, Philpot, Huganir, & Bear, 1999; Whitlock, Heynen, Shuler, & Bear, 2006). There are three types of neuroplasticity: post-tetanic potentiation (PTP), short-term potentiation (STP), and long-term potentiation (LTP) (Bliss & Collingridge, 1993). The three types are distinguished by the duration of the increased excitatory postsynaptic potential (EPP). PTP can last for seconds to minutes, STP can last for minutes to hours, and LTP can last for hours to weeks, months, or even years. Among the three types of the neuroplasticity, LTP has been hypothesized to be the neural basis for memory (Bliss & Collingridge, 1993) not only because it lasts longer, but also because LTP is experience dependent (Abraham, Logan, Greenwood, & Dragunow, 2002; Whitlock, et al., 2006) and has properties of rapid induction (can be induced in milliseconds), input specificity (only the activated synapse will increase the connectivity), and cooperativity (if a weak impulse arrives at the post synaptic neuron at the same time as a strong impulse, LTP can still result) (Bliss & Collingridge, 1993). Animal experiments also showed that if the LTP in hippocampus was blocked, memory formation is impaired (Bailey, Kandel, & Si, 2004; Martin, Grimwood, & Morris, 2000).

The properties of LTP form the neural basis of classical conditioning (Maren, 2001). When a conditional stimulus (CS) is presented with an unconditional stimulus (US), animals develop an association between the CS and the US. A similar mechanism can be seen in other places; animals that receive more external stimuli have more synapses on their neurons. When comparing the number of synapses between two mouse's brains, one of which lives in a deprived environment and the other in an enriched environment, the number of dendrites in those that lived in the enriched environment is significantly more than the number of dendrites in the other (Meshi et al., 2006). People are the same; more neurons (and therefore ideas) will be connected together if people receive various stimuli.

Every piece of information has a corresponding set of neural activation. I argue that a word or an idea is meaningful because there are many neurons or other ideas interacting with it.

When an idea is activated, the neurons that are linked with the activated neurons will be depolarised (partially or fully) because of the neuron electric-physiology. For example, when the idea 'apple' has been presented with the word 'fruit', these two ideas can be linked together. The idea of apple is activated when the word 'fruit' is presented. If more ideas are linked with the word 'fruit', more neurons and ideas will be linked together with this word, and more ideas will be easily activated if 'fruit' is activated next time.

### **Options are generated passively and randomly.**

Neurons that have the strongest connectivity with the activated neurons will be activated first and even if the two neurons are not connected together, they can be if they are activated together on a sufficient number of occasions. Therefore I argue that options can come from two main sources: already associated ideas and un-associated or novel ideas (supported by novelty effects).

Because of the neuron linkage, the ideas or the options associated with the main idea and their neural linkages are one of the internal sources for generating options. When people hold an idea, things that relate to that idea will automatically pop into their mind. More ideas will be activated if we hold an idea for longer. I argue that this is because the neurons which bear similar functions will be wired together. If people keep activating the same neurons (a specific pattern of activation), the neurons that have stronger connectivity with the activated neuron will be activated first. Neurons with weaker connectivity will be activated later. Other neurons or ideas that are not linked with the activated neurons should not be activated.

The other source of options is from the novel ideas. When people pick up things in a dialogue or from the random external or internal stimuli, neuron linkage and option will increase (Gillett, 1988; Guic, Carrasco, Rodríguez, Robles, & Merzenich, 2008; Meshi, et al., 2006; Rema, Armstrong-James, Jenkinson, & Ebner, 2006)<sup>8</sup>. Let us look at the random received options at the moment. People receive random stimuli and ideas all the time. Most of them are meaningless unless people use a main idea to access the randomly perceived event in a meaningful way. Most people have the experiences that the same old thing can have a new meaning if people put it in a new context. Therefore when people hold a main

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<sup>8</sup> I will discuss the role of language in Chapter 7.

idea and use it to access the randomly perceived stimuli, these stimuli can have new meanings and become alternatives to the main idea. For example, a bunch of books on the bookshelf may mean nothing until someone is trying to ‘search for a blue book with hardcover’ on the bookshelf. All of the randomly received book images then become targets for the idea ‘to search for a blue book with hard cover’ and each book could possibly be the blue book with the hardcover.

I argue that by using the same mechanism, sometimes a creative idea can emerge. When a person is focusing on an idea, sometimes a novel idea or new option that he has never thought before comes into his mind. For example, when someone is trying to use his creativity to create an imaginary creature in the sea, he can hold the image of fish while he is searching through hundreds of different combinations that generate randomly in his mind. He may combine the idea of elephant with that of fish and create elephant-salmon (Figure 3).



Figure 3: Elephant-salmon from One Piece

No matter which source the options come from, I argue that options are generated randomly and passively. The options can be the associated ideas or novel ideas. A person can actively hold a main idea, but he cannot know what option he will consider next. Because electricity spreads passively, a person does not know exactly what related idea will be activated at next moment. If electricity in the brain spread passively, how anyone can construct any meaningful thinking process? If a person has no control over the spreading of the electrical current, how we can consciously analyse any situation? Therefore, a person much be able to influence the electrical current to some extends. As shown in Figure 4, the soul should be able to interact with the mind. I argue that a person can actively hold an idea, but the options are generated passively and randomly (see Figure 4). The voluntary process of holding an idea in mind allows associations to be triggered and thought to be directed. If a person is randomly searching for options, they cannot know what option they will attend to at the next moment. This is also consistent with first stage of the two-stage model, according to which

Heisenberg suggests that the options arise passively through chaotic theory or quantum physics (Heisenberg, 2009).

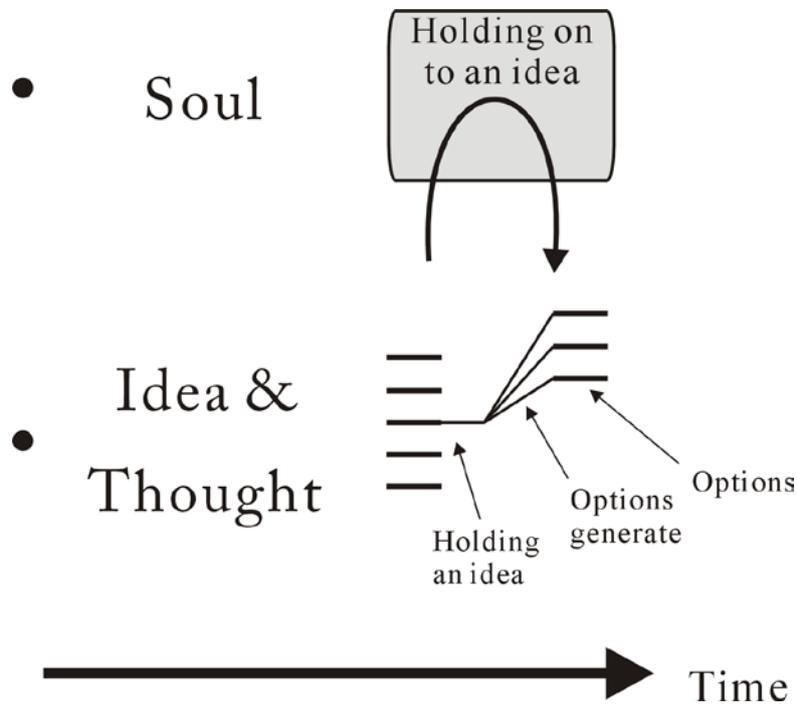


Figure 4: Options generate passively and randomly

**An idea can give meaning and be a standard for each option**

I argue that options can be from experiences, dialogues, and chance. A main idea not only generates options, but also gives meaning to each option. Each option means something in relation to the main idea. Although beef, chicken, or fish each has its meaning, they cannot be meaningfully compared just between themselves. They can be compared under the idea of ‘dinner for tonight.’ The main idea sets the standard for the options to be judged between. In a similar way, when a person tries to understand a metaphor, he would try to put the metaphor under different interpretations and see which one best explain the metaphor. But the option that can best explain the metaphor will be chosen. The individual explanations cannot be compared directly without the metaphor. I argue that an idea gives meaning to each option by framing the options in a context of evaluation.

There is often only one best answer for most of the decisions (except the dilemmas), as there is one best move at a particular stage in a chess game or only one correct answer to a

mathematical problem. There may be only one best investment strategy to minimise an economic risk. If there are two or more equally best options to a particular question, e.g. should I step with my right foot or left foot first, the best way may be to leave it to chance. If a person has enough knowledge and experiences plus sufficient effort and time, he will be able to find the best answer for the main idea if he can hold and work with that idea thoroughly. I will discuss the decision making process in the next chapter

## **Chapter 4: Making Decisions: Finding the Best Option**

### **A complex idea**

I argue that making rational decisions is finding the best (or most reasonable) options in regard to a main idea rather than merely making random decisions. If a person follows the most rational development of the main idea in the thinking process, he will naturally come to the best answer among all the available options. I have discussed that people has the ability to hold (or not to hold) a simple idea and a complex idea. In the previous chapter, I argued that a person needs to hold a complex idea in order to have options and evaluate each option. In this chapter, I argue that holding a complex idea is also crucial in decision making process. But more needs to be said about the meaning of the complex idea.

In a complex idea, the main idea and its most logical development are not two separated things. The person holds the main idea and then follows the most logical development of it. For example, the idea of ‘what is the safest investment strategy’ involves both the main question and the potential best answer. Although the person does not know the best answer yet when he holds the problem in mind, one logical development comes together with that main idea. Therefore I argue that when a person holds a complex idea, it involves holding the main idea (the question or the problem) and following the most logical development of it. If the person is not following the most logical development of the main idea, he fails to hold the whole main idea. If the thinking process is consistent with the most logical development of the main idea, he is holding the main idea. The main idea provides a direction to the thinking process, and also the decision and the action. Everything that develops from it should refer back to it, and should compare with it. If things (thinking processes, decisions, or actions) that develop from the main idea do not follow the logical development of the main idea, the person does not act rationally.

### **Making a decision is to find the best option**

I argue that making reasonable decisions is finding the best (or most reasonable) options in regarding to a main idea rather than merely making random decisions. Therefore making a reasonable decision is just the part of the development of the rational thinking process. It is

simply the result of following the most logical development of a complex idea in a thinking process. If a person follows the most rational development of the main idea in the thinking process, he will certainly come to the best answer available to him. Galen Strawson attacked moral responsibility and argued that moral responsibility is impossible because a person is not free when he makes decision (Strawson, 2002). I affirm that because if a person holds an idea and follow the most rational thinking process, he will find and choose the best option. But this is only when he is able to hold an idea until the last. I argue that free will does not occur when a person makes a decision because the decision has been determined by the rational development of the main idea<sup>9</sup>. If the person can hold the main idea until he finds the best answer, he will choose the best answer. If he gives up thinking about it during the thinking process, he will choose other things rather than the best answer. Free will depends on whether the person keeps holding and following the main idea and therefore combines cognition and action. A computer cannot give up holding an idea, it can only run a set of programs until their ends are accomplished. When a person is solving a mathematic problem, he will get the same answer as a computer does. However, if he gives up solving this question at any time or uses a random formula instead of the correct one, he will get a different answer. The best available option is in one of the many potential options. Objectively, in most problems and situations, there is one best answer even though the person might have not thought about it. If people decide to find the true answer to a problem, provided that it has a plausible answer, they can usually find it if they spend enough time and effort on it. I argue that free will lies in whether the person keeps true to a logical development of an idea or, in a choice context, finds the “all things considered” best option in his or her guiding thoughts. Free will is used to remain committed to the most reasonable thinking process as part of the determination of which option to take or action to perform (Stump, 1997)<sup>10</sup>.

I argue that to make a decision is to follow the most rational development of the main idea. The decision can then be translated into action. For example, if a person considered what to have for dinner and decides to have beef for dinner, he has chosen an option in responding to a main idea. I argue that both the searching process and the decision making process are

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<sup>9</sup> The inevitability does not equal to the determinism that I discussed in Chapter 1, 2, and 3, The determinism in the previous Chapters means the physical determinism, but the inevitability here comes from rationality.

<sup>10</sup> This is also Thomas Aquinas’ theory of the will.

based on the ability to hold an idea in mind and keep true to the most logical development. Free will is about keeping true to an idea and penetrating that idea. In a similar way, Radden argues that free will allows people to follow plans (Radden, 1994). A person is free to decide whether he wants to accomplish the main idea by following the most reasonable development of it or to give up following it (see Figure 5). Hume is right in saying that people use instrumental reasoning to find the most appropriate way to achieve their goal, but he does not consider holding that idea in place as itself an expression or use of the will (Norton & Norton, 2007).

Fischer suggests a semi-compatibilist free will model that changes from **regulative** control (genuine assessing to the alternative possibilities) to one that only requires **guidance** control (which involves a distinctive kind of guidance but does not assess the alternative possibilities) (Fischer, 2007). The regulative control is the freedom to choose and possibly to do otherwise (Fischer, 2007, p. 57). He remarks that “an agent exercises guidance control of his behaviour insofar as it issues from his own, appropriately reasons-responsive mechanism (Fischer, 2007, p. 78).” ‘Mechanism’ means ‘the way things go’ and it does not involve human effort or commitment. I think that the guidance control that Fisher mentioned is the ability to hold a main idea that I mentioned before.

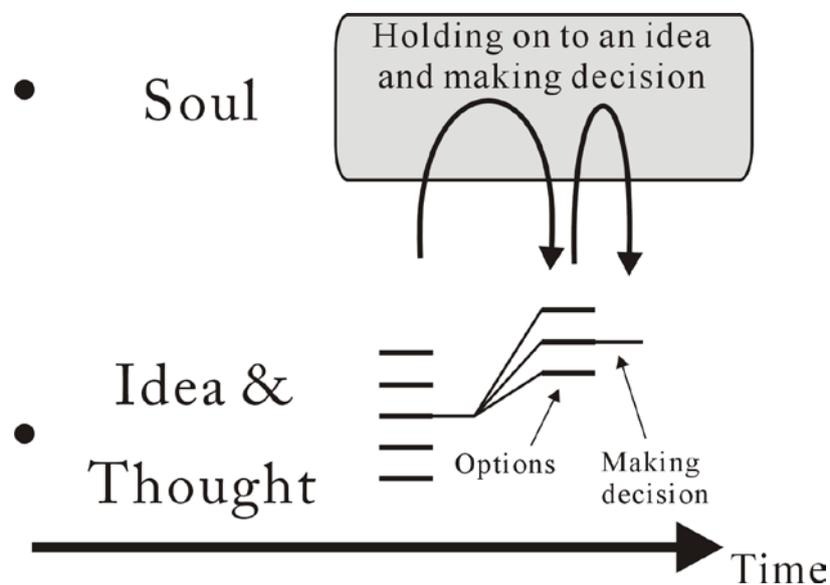


Figure 5: Making decision is to find the best option

### Rationality and intuition

As some philosophers have remarked, humans not only have rationality (instrumental reason), they also have intuitions (Lehrer, 2009; Norton & Norton, 2007). In chapter two, I argued that intuition should be regulated by rationality. I will now briefly discuss the role of intuition in the decision making process.

Lehrer points out that there are two main ways of making decisions; one is by rationality and another one is by emotional feeling, instinct, or intuition (Lehrer, 2009). Lehrer argues that a person needs to consider reason and intuition in order to make a good decision (Damasio, 1994; Lehrer, 2009). For example, we can use rationality to do maths, make sense of something, and form arguments. But a good basketball player can instantly know when to pass the ball and to whom it should be passed. A professor can easily see the main point in an argument or a theory. Experts can make their decision by intuitions perhaps related to emotional or somatic indicators because they have accumulated more experiences in their fields than normal people. In other words, they have voluntarily shaped their intuitions to fit their chosen and settled path of life (a great purpose in their life). When the experts look at the options, they can feel a strong negative feeling to the wrong options and a positive feeling to the right one. Sometime they can just tell which the right option is by simply scanning through the options. They don't even need to think about those options.

If a person can keep himself applied to the required thinking process (consider all the possible factors and use the right amount of reason and intuition<sup>11</sup>), he can make the best decision available at the end. The whole process requires free will to hold the idea in mind and maintain the effort and commitment to see it through.

### **A serial thinking process**

Making a decision is to take one step forward in the thinking process in mind while continuously referring back to the most logical development of the person's main idea. As I mentioned in Chapter 3, ideas that require decisions involve the main idea and the logical development of it. The main idea could be the problem that we want to solve or an action to

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<sup>11</sup> Since intuition is the results of life experiences, it is the response that the brain gave automatically. Such response should be regulated by reason because mere intuitive responses can sometimes generate unwanted or inappropriate outcomes.

be taken. I argue that the cycle of 'idea, options and decision' is the simplest cycle in a thinking process. However, sometimes a complex idea is too big to find the answer in a single cycle, and a person needs to repeat the cycle for two or three times in order to find an answer while holding in mind the cognitive project being pursued. I argue that this is where the serial thinking processes come from.

In a serial thinking process, the main idea in the first cycle can be called the first main idea and the main idea in the second cycle can be called the second main idea. As I argued before, there is one potential best available answer regarding to the main idea if the person can always follow the best option. The decision in the first cycle can be used as the main idea in the second cycle. By repeating the instrumental reason and continuously choosing the best option available, a rational serial thinking process can develop.

As the thinking process develops, a person always needs to refer back to the first main idea and use it to assess the development of the thinking process. If a person does not use the first main idea to assess the development of the thinking process, he is not on the track of most logical development. Therefore he fails to hold the main idea. I will then give two examples to show how a person uses the first main idea to evaluate a serial thinking process.

1. When a person is solving a math question like  $[(X+4Y) =12, (X-Y) =2]$ , the question is a complex idea. When he calculates that  $Y=2$ , he needs to put it back to the main question to calculate the value of  $X$ . When he gets the values of  $X$  and  $Y$ , he needs to put them back to the question again to see whether the answer is correct. If he gets that  $Y=3$  and  $X=5$  and uses it as the answer, he fails to hold the most logical development of the main idea because it is not consistent with the main question.

2. When a person invites some important guests to dinner to his house, he needs to think of how to please his guests. He will first think of what his guests would like to have. He can consider beef noodle soup, pasta, steak or pizza. When he is considering these options, he needs to refer back to the main idea, how to please his guests, continuously so that his mind won't go wandering. When he has decided the food for dinner, he can then start to think of how to prepare it. The thinking process of how to cook certain dishes is the second cycle, and it is not separated from the first cycle. When he is considering how to cook certain dishes, he always needs to refer back to the first main idea. He always needs to think of how to please his guests even when he is cooking the dishes.

The two examples above show that throughout the whole serial thinking process, the first main idea and its logical development is very important. The rational thinking process is based on the continual assessments and evaluations by the first main idea. Just as using the main idea to assess and evaluate each randomly generated option, a person needs to use the first idea to test the possible developments of the first idea. The development of the main idea cannot be separated from the main idea. In solving a math question, a person always needs to use the question to test the calculation. When inviting some guests to dinner, a person always needs to think of how to please his guests. Even when someone is constructing a philosophical argument, he always needs to know the main problem that he is targeting with. The model is illustrated in Figure 6 and shows that the combination of thinking and decision (and action) to carry through a main idea is an extended process requiring commitment.

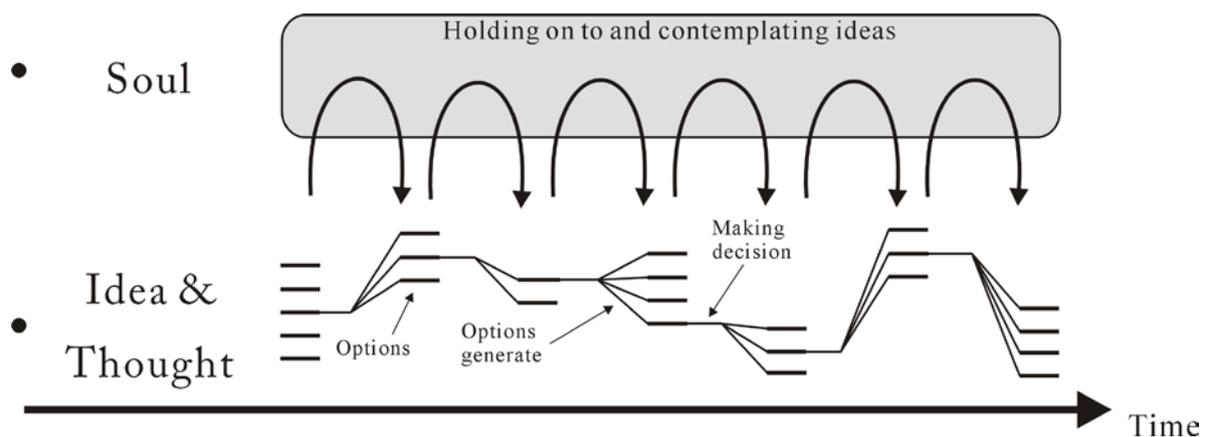


Figure 6: Rational thinking process – The straight line is the most logical development of the main idea. Other routes are the less reasonable options. A person needs to continuously refer to the first or previous idea in order to find the most reasonable option. However, the person can give up following the rational thinking process and choose other options at any moment.

(Only the arrows that hold the idea forward are shown. The arrows that indicates the travelling back are not shown in the picture)

### **Rationality and deviation of it**

To find the best decision, people need to hold on to and follow the main idea. After a few cycles of 'idea, options and decision' and continuously referring back to the first main idea, the first main idea can develop into a serial thinking process. A person can continuously choose the most reasonable option in a serial thinking process. Rationality thus arises here. But often we will not do the most rational thing. There are at least three examples.

Firstly, deciding without sufficient previous thinking process - Normally a person will consider the options and then makes the decision. But sometimes a person can act recklessly without considering enough details. If a person tries to hold and follow an idea but acts without finding a conclusive answer, his action is less reasonable. His decision is thus vulnerable to random chances and the chaos of undirected brain activity<sup>12</sup>. In this case, there is a disconnection between their mind and action because of the lack of rationality. Holding a reckless idea (decision) as answer might hinder people from knowing the true answer. Gillett invokes that reasonable thought and action, seen in this way, is linked to Aristotle's continence - the ability to do what you think, all things considered, is best and therefore properly engage your intellect – the mark of your moral and intellectual being as a creature that is distinct from mere brutes, with your activity<sup>13</sup>. Gillett also notes that this is Aquinas' position – the will is free when our faculty of intellect is rightly engaged in our decision-making so that we act for good reasons rather than just for whatever reason or impulse dominates at the moment<sup>14</sup>. Thus I want to argue that random decision without any previous thinking or personal decision process is a deviation of rationality. An action without thoughts is not from rational thinking process. It is just following a random idea<sup>15</sup>.

Secondly, mind wandering - People can consider each option in relation to the main idea for as long as they want and then shift to and consider another option at any time when they hold an idea. If people consider only the option without the main idea, this can be called mind wandering. For example, when a person is thinking about what to have for dinner, he can start to consider the options that the main idea generates such as sushi, beef and pasta. If he does not hold the main idea, his mind will go like; 'pudding, I once had a great pudding when I was 13. When I was 13 I read a great novel about a dog. The dogs from my neighbour are really cute, I wonder if they are pure breed, and so on.' This is when a person goes mind

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<sup>12</sup> Dennett calls this the Joycean Machine in his book *Consciousness explained*

<sup>13</sup> Personal communication

<sup>14</sup> Personal communication

<sup>15</sup> I will discuss this in the next chapter again when I discuss thoughts and actions.

wandering. Holding a main idea can prevent a person from thinking about the breed of a dog while the person is thinking about his dinner. This mind wandering is also, when we consider the role of the will in directing thought, a form of akrasia – or failure of the will according to Aristotle. The ability is used to hold intentional focus as an expression of one's whole self – a skilled moral agent who realises that certain things ought to be valued whatever the distractions and temptations are.

Thirdly, distraction - While the person is searching the most logical development of the main idea, he might get distracted by something else. The distraction can annoy a person's thinking process and sometimes drag away the person's attention. I will discuss this in more details in the net chapter.

Thus, to randomly set up an idea in the brain as an active pattern of excitation is not hard and requires no control or effort; the hard thing is to make a good decision following the previous thinking processes and not to give up thinking about it until you find the most reasonable path. This takes will-power and self-control in the light of reason or a commitment to certain values.

## Chapter 5: From Thought to Action

I have talked about how the ability to hold an idea can affect thinking and decision making. I argue that the ability to keep us up to the rational thinking process and the ability to execute actions from thoughts are the same. They are both from the non-physical soul (Figure 7). However, the brain can sometimes produce impulses (which are different from the rational thoughts). Sometimes it is very difficult to overcome the bodily impulses and execute the thoughts. That's why some people feel that free will is a more-or-less effort, rather than an either-or ability. In this chapter, I will discuss how free will can affect actions and use a negative example to demonstrate my main points.

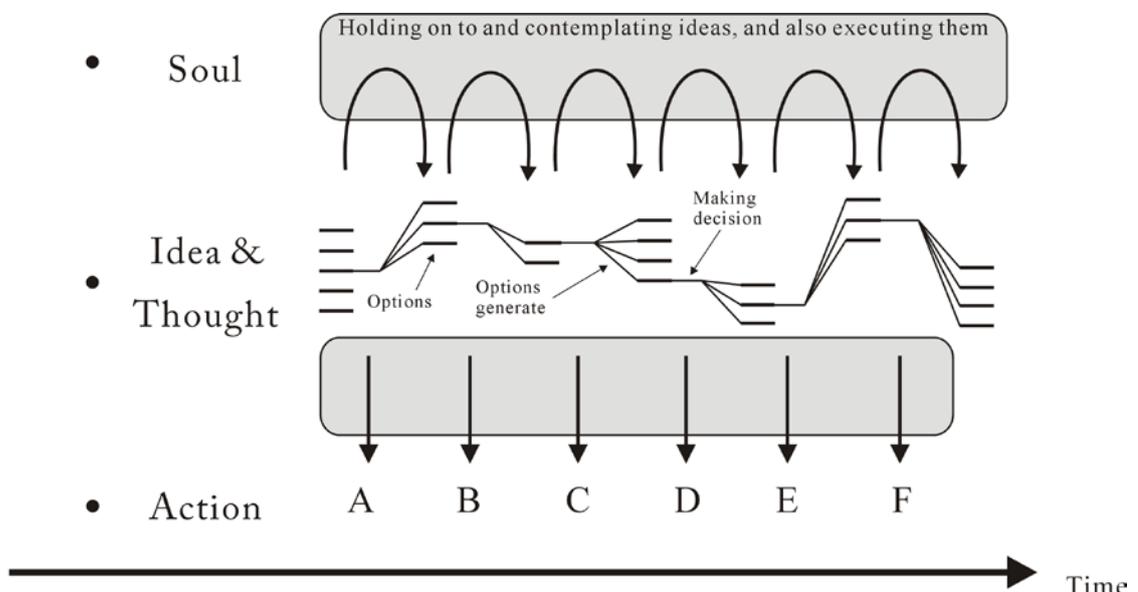


Figure 7: Execution of actions, implementing thoughts into acts.

### From thought to action

When a person has made a decision, s/he needs to put it into action. Normally, the physical body follows the ideas and thoughts. An idea can become an action plan and then be translated into action without any difficulty. It is so natural that we do not even notice it. However, sometimes things can go wrong. When a person tries to translate the thoughts into actions, sometimes he does not actually act according to his plans but acts otherwise. A person can have an idea of what he ought to do, but he does not always act in the ways that he knows he ought to. A person sometimes fails to follow the idea and do other things. This is

an example of failing to follow the main idea when acting. If I am a student and I know that I should study, but instead of studying, I spend my time watching a drama or playing computer games. I am not doing things that I know I ought to do. In the same way, if a person who knows that he should not smoke but keeps smoking, fails to follow what he thinks is right.

Freedom of action depends on whether a person can penetrate the ideas so as to influence their direction or take some control over them. A person is free to decide whether to follow or not to follow an idea in his actions only if he knows what ideas are guiding that action<sup>16</sup>. A person can act randomly, spontaneously or without sufficient previous thinking. A person can also behave in accordance to and follow the main idea. I argue that everyone is free to decide whether to keep or not to keep following the rational development of the main idea although different people might experience different levels of difficulties (Figure 7, Figure 8). For a non-smoker, it is easy to refuse smoking, but for a regular smoker, it requires more efforts for him to refusing smoking. Free will is used to follow and keep true to the main idea in the execution of an action. If a person chooses to keep true to the main idea, he will have one best option. If he gives up following the main idea, he will end up choosing one of the less good options.

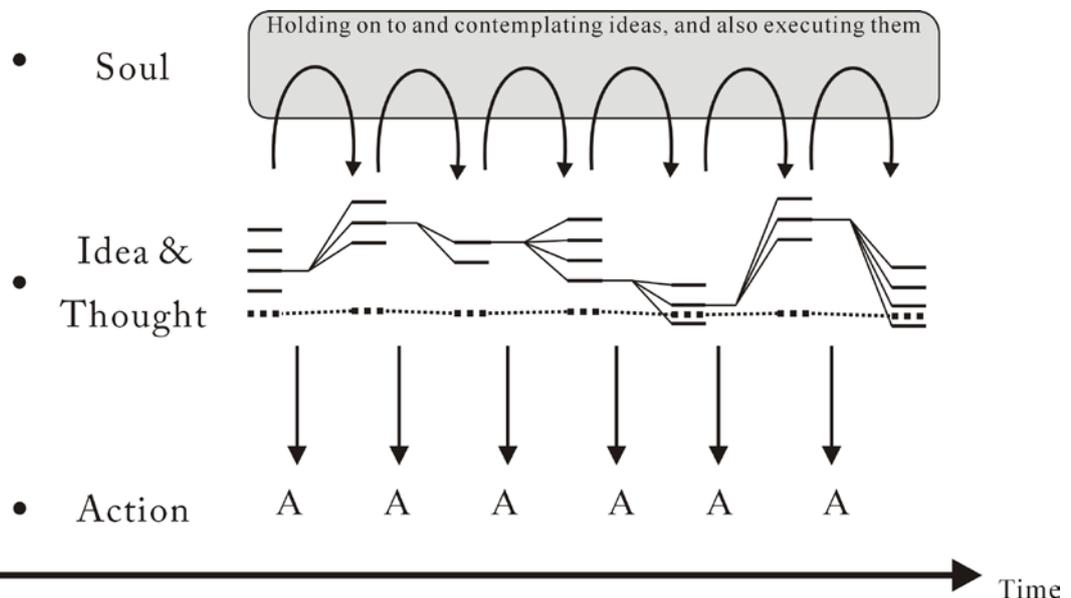


Figure 8: Sometimes the brain can generate impulses (the dotted line) that drive the person to do otherwise.

<sup>16</sup> This is especially important if a person is acting for reasons he does not understand as in a mental disorder.

## **Contradiction within the self**

When a person is trying to act in accordance with the main idea, sometimes he can experience contradictions within himself. In Chapter 2, I have introduced the two properties within human; one is thoughts and the other one is physical reactions. Sometimes the physical reactions do not follow the thoughts. The physical reactions and the thoughts can contradict with each other especially when the physical reactions are the result of strong emotions or compulsions.

Sometimes physical impulses push people to do things that they know they should not do (i.e. act violently or repeat certain habitual actions as in patients with OCD). When their physical reactions generate another opposite force to their thoughts, there is a contradiction within the self. The physical reactions can be distractions to the person (prompting the person to stop keeping focusing). For example, when a person is trying to concentrate on his assignment, a movie which is playing beside him or a random thought inside his head can distract him. If other random stimuli continuously distract a person's attention, it will make it harder for him to complete the requirement of his main idea because he needs to spend more efforts to overcome the distraction. The body sometimes can generate strong desires that prevent us from keep following the rational thoughts, for example in the case of OCD and addiction (Buchman, Illes, & Reiner, 2011; Wallace, 1999). Patients with these two disorders can experience a force that drives them to do things that they know they should not do. I argue that everyone has the need for self-accomplishment and when a person does something that he knows he should not do; there will be a contradiction within him that could lead to guilty feeling, anxiety, or depression. I will use OCD as a negative example to explain how the body impulses can affect 'the stages of action, decision and thinking', and drive people away from their goal<sup>17</sup>.

## **Obsessive-Compulsive Disorder (OCD)**

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<sup>17</sup> The inability to act out the thoughts has been called a diminished free will in some writings (Glannon, 2009, 2011). Glannon defines 'free' or 'free will' as a feeling of unclogged, unimpeded, elegant, fluent, flowing, or smooth. This definition also implies a status of self-accomplishment or self-fulfilment. I have briefly discussed this definition in chapter one. However, since this definition of 'free' and the definition that I use in this thesis are different, I will discuss this again in the final chapter.

The symptoms of OCD have been associated with chemical imbalance in the brain critically involving conditions signalling fear or anxiety. Obsessions usually centre on thoughts and images that continuously and persistently dominate the patient's mind and induce anxiety. The strategy that the patient uses to relieve the anxiety could result to obsessive behaviours. Patients feel compelled to take certain actions and behaviours as the only way to reduce their anxieties even though the ritual itself does not achieve any more than temporary relief (Stein, 2002). OCD patients are often aware of their obsessions and compulsions and of the ways they disrupt their lives but they cannot control them. The repetitive behaviours may be ordinary daily activities such as hand washing so any blanket ban on them is not possible because everyday life inevitably makes them appropriate and even necessary from time to time (Graybiel & Rauch, 2000). OCD can express itself as primarily a cognitive-affective disorder or primarily an executive-behavioral disorder even though the underlying problem seems to be in emotive-motivational circuits reinforcing patterns of response so that in either case the obsessive-compulsive behaviours can go on for hours, as they carry within their very performance, the reward that maintains them and are therefore truly addictive (Gillett & Liu, 2012).

There is marked cross-cultural consistency in the forms of behaviour and the common mechanism underlying those means that there are possible applications of knowledge and intervention techniques beyond the context in which they are developed. Thus techniques developed for kleptomania, may also (when one thinks about what is involved) be applicable to other comfort seeking behaviours such as obesity related eating disorders or markedly maladaptive complexes of behaviour and thought such as Body Dysmorphic Disorder (Gillett & Liu, 2012).

Functional imaging studies suggest that in OCD patients, there is abnormal metabolic activity in the orbitofrontal cortex (OFC, BA 11,12), the anterior cingulate/caudal medial prefrontal cortex (ACC, BA 12,25), caudate nucleus (the anterior part of the striatum), and the medial thalamus (Graybiel & Rauch, 2000; Tye, Frye, & Lee, 2009). Abnormal metabolic activities in these areas (frontal-basal ganglia-thalamic circuits) are associated with increased OCD symptoms (Aouizerate et al., 2004; Graybiel & Rauch, 2000; Greenberg, Rauch, & Haber, 2010; Tye, et al., 2009). In addition, neurotransmitters such as serotonin and dopamine are also important in triggering OCD (Stein, 2002). Serotonin reuptake inhibitors (SRIs) and neurosurgical treatments such as Deep Brain Stimulation (DBS) and limbic leucotomy have

been shown to have efficient therapeutic effects on OCD (Graybiel & Rauch, 2000; Greenberg, et al., 2010).

These brain areas are closely associated with emotion regulations and reward circuits (Bear, Fitzgerald, Rosenfeld, & Bittar, 2010; Graybiel & Rauch, 2000; Schultz, Tremblay, & Hollerman, 2000; Shima & Tanji, 1998; Tremblay & Schultz, 1999). The functional anatomy of these areas implicates executive intelligence and emotive/anxiety modulating areas of the forebrain. It is consistent with the proposed cause of OCD that there is an anxiety based or aversive/avoidance driven response at the heart of the disorder [so marked that it interferes with normal daily activities to the point where the patient's general executive capacities fail or self-harms (e.g. skin abrasions) occur]. Existing patterns of brain events may be pushing a person in certain directions – towards an anxious ritual in OCD, psychomotor retardation in depression, or an explosive rage in impulse disorders to the extent that the normal operation of the will in directing and enacting thought has been distracted or over-ridden<sup>18</sup>.

### **What can we do?**

A person, as a conscious agent has intact volition to the extent that his or her thoughts about what it is best to do can be translated into action. But the example of OCD shows that sometimes a person will have difficulty to do the things that he plans. Sometimes a person cannot choose to take the most reasonable action or do the thing that he knows is right. This can be due to a hormone or chemical imbalances which affect the reward system in a person and thus drive a person to do certain behaviours. I argue that the compulsive feeling represents a hormone or chemical imbalance and will give a feeling to a patient of being compelled. Hormonal levels might affect our emotions, expectations, reward signals, and feelings of satisfaction or anxiety. I have discussed that holding an idea can free a person from automatic and stereotyped activity in Chapter 2. The flexibility and the freedom from compulsion or stereotypy is, of course, markedly deficient in many patients with disorders of volition (such as OCD or the psychomotor retardation of depression) because they have a strong feeling within them generated by hormone imbalance and urge them to satisfy their compulsive feelings. The chemical imbalance inside the body is very hard to ignore. It is

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<sup>18</sup> It is an example of when the mind is over-ridden by physical reactions when a person acts.

like someone who is continuously poking at you and you can always feel it. It could even interrupt a person's normal thinking process.

Although they are still free to choose what to hold in mind, their freedom to act has been largely diminished. It would be really hard for the patient to think clearly and to hold on to the right idea. However, even though it is really hard, I argue that the person can still decide whether to hold and follow a main idea. If the person cannot act in a reasonable way, maybe the person can learn to endure and not act until the compulsive feeling fades (like getting used to the sensory input from unusual clothes). If a person often obeys their urges, the neural connection will become stronger. The person will then be more addicted in the future because he will get used to this way of resolving the tension. This means that the compulsive feeling will be even harder to resist in the future. The more the person runs himself to resist, ignore or displace the intrusive thoughts, the weaker the thoughts would become (due to the establishment of other connections in the brain) (Schwartz, 1999). A person is not only responsible for his behaviours; he is also responsible for his past decisions and becoming the person who he has become now.

Some patients with OCD might have undergone surgical procedures to compensate the hormone imbalance (Abelson et al., 2005). But correcting that deficit is not just a matter of manipulating the signalling systems in ways that bypass the development of new learning (Gillett & Liu, 2012)<sup>19</sup>. Regulating the signals can remove the feeling that drives them to do certain behaviours. But it is still the patients' freedom to follow or not to follow the right idea. They can still choose to do the old things again even though they do not feel the compulsive feeling anymore. After the surgery, patients still need to use their free will to learn and follow the right ideas and contribute to the recovery process (Schwartz, 1999). Each time they successfully use an alternative strategy it would become easier for them to do so in future.

## **Conclusion**

In conclusion, there are three main points in this chapter. Firstly, the brain is a complex organ and it can generate many complex behaviours and activities. Secondly, OCD, physical

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<sup>19</sup> The new learning can be form through dialogues. I will discuss the role of language in Chapter 7.

reactions, and body impulses can distract the process of implementing the thoughts. However, the agent can still decide whether to obey the impulses. A person who experiences the contradictions in self will need to spend more effort to overcome the impulses or wait until the impulses disappear. If the person often obeys the compulsive feeling, the person will need to expend more effort to overcome the compulsion in the future because the neural linkages will have strengthened. Thirdly, after treatment or surgery for a condition such as OCD, although the compulsion might disappear, the patients still need to use their will power to fully recover and reconstruct their neural linkages (Schwartz, 1999). If the patient purposely picks up the old habits again, the compulsive feeling can come back because the abnormal neural linkages can regenerate.

## Chapter 6: Morality as the Higher Reason

I started discussing free will with the ability to hold or not to hold an idea. Most of the cognitive activities depend on a crucial factor that human has the ability to hold or not to hold onto an idea. When I talked about decision making in Chapter 4, I commented that to make a decision, a person needs to attribute to a main idea. If there is no a main idea or when the main idea is not sufficient to lead to a final decision, the decision will be left to randomness. But why do we hold the main idea in first place? Is there any fundamental idea that guides us to hold the main idea? If there is nothing before starting to hold a main idea, that means all of our thinking processes and cognitive activities are fundamentally based on emptiness. There is no fundamental meaning for everything because everything starts from randomness and chaos at the first place. This problem must be addressed if I want to propose an adequate model of free will.

As mentioned in Chapter 2 when I talked about Kant's idea about dualism, some knowledge exist as *a priori*, which mean independent to experiences. I argue that the *a priori* knowledge provide the ultimate meanings and foundations to our thinking and most of our decisions. They include the knowledge of knowing morality, rationality, justice, love, God, and exercising free will. John Calvin commented that one of the functions of human soul is to understand right and wrong (Calvin, 1559(2008)). Kant talked about *a priori* entities as something that human reasoning power cannot fully grasp. He remarked that "I may not know my soul, as a thing by itself, by means of speculative reason (still less through empirical observation), and consequently may not know freedom either, as the quality of a being to which I attribute effects in the world of sense, because, in order to do this, I should have to know such a being as existing, and yet as not determined in time (which, as I cannot provide my concept with any intuition, is impossible)." In this chapter, I will focus one of the *a priori* entities, morality, and explain why this can provide the meanings to our thinking and cognitive activities<sup>20</sup> (see figure 9).

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<sup>20</sup> Hume denies the existence of *a priori* knowledge. However, I think there are things that people cannot experience through the sensible world or the intuition (like-dislike). People can only perceive the things like justice, morality, and free will, through self reflection. It is directly experienced by the person within himself, not from the external world.

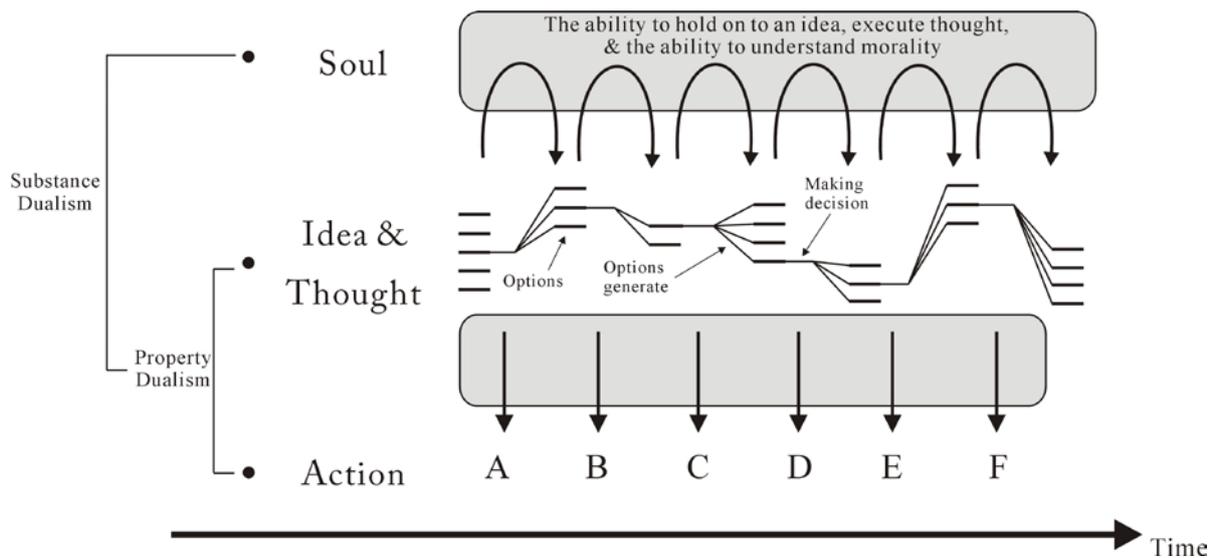


Figure 9: Morality is one of the *a priori* knowledge

### Where does morality come from?

Many scholars have talked about the origin of morality. Gazzaniga suggests that morality evolved from human societies. He argued that human are social animals and human brain evolves because of the increasing requirements of the complex social interactions (M. S. Gazzaniga, 1985). Morality thus evolves as the by-product of social interactions. He gave five reasons explain how morality could evolve from the social interactions; they include reciprocal behaviours, classification, alliance, suffergin and alliance. Patricia Churchland also has a similar viewpoint that morality is originated from the deep desires that we are social beings and we would like to do things that can increase social connections (or social value, in her words) (Churchland, 2011). Both of them seem to agree that morality is the by-products of social interactions. In addition to the social requirements theory, Steven Pinker argued that morality is the results of rationality. When people wrote the laws, they use reason to decide the punishments. For example, if we punish stealing in the same way as punishing killing, then the burglar might as well kill the owner when he steals. He argued that the social contracts or morality develops from the reasoning power (Pinker, 2000). Peter Singer suggestss that we need consciousness to have morality. Because without consciousness, we cannot fell others pain (Singer, 2011).

## **What is morality?**

Scholars provided some explanations to the origin of morality, but what are the fundamental principles of morality? Are there any moral laws that can be applied globally? There are two important models in moral philosophy. One is the deontology view that Kant had suggested. The other is the utilitarianism which was first suggested by John Stuart Mill. The deontology view states that each of us bears certain responsibilities at all times, such as we shall not lie and we shall fulfil our duties. Utilitarianism states that we shall try to achieve the greatest good to the greatest numbers of people. Therefore the behaviours should be valued by their utilities to the society.

We would know that we should do the morally right things and we know that helping others and doing favour to others are enjoyable, no matter whether they can repay us. Because of the deep urge to make other people happy, people normally adopt utilitarianism as the major moral principle. We would try to generate the greatest good to the greatest numbers of people. However, the utilitarianism view has its limitations and is not enough to account for all the moral situations. In my opinion, while utilitarianism focuses on the broader sense in the society, Kantian deontology focuses on the individual and the self-responsibility. If we use deontology only, we would end up caring only for our own advancements and benefits and not others'. On the other hand, if we use utilitarianism only, we would end up becoming the people who think that as long as we don't harm others, we can do whatever we like. Then things like watching pornography and violent videos, going to prostitute, self-harm, and incest should not be blamed because doing these things will harm others. But clearly we know that these things are wrong even though they will not harm others.

Therefore I think both deontology and utilitarianism are right in some aspects. We need to employ both principles to have a more complete viewpoint of morality. When the decisions are not likely to affect many other people, we should use deontology to regulate ourselves and fulfil our duties. If the decisions would affect many people, we shall use utilitarianism and try to achieve the greatest good to the greatest number of people. However, detail discussion about morality is not the main concern of this thesis. The main point is how morality can fit into the model of free will.

## **Moral judgement**

Many studies have investigated the brain activities when people are making moral judgements. Different parts of the brain are associated with different moral tasks (Greene & Haidt, 2002). For example, orbitofrontal cortex is associated with simple moral judgement, dorsolateral prefrontal cortex is involved with impersonal moral judgement, and medial frontal gyrus is involved in personal moral judgements. Studies showed that people often use two strategies to help them to make moral judgements. Greene, et al (2008) asked participants make moral judgement in moral dilemmas which required either utilitarian moral judgement or non-utilitarian moral judgement. While the participants are making the moral judgements, other cognitive tasks will distract them. They found that the cognitive load selectively interfere the utilitarian judgement. This study shows that utilitarian moral judgement requires conscious cognitive input. Apart from the cognitive deliberation, Haidt (2001) pointed out another important factor when people are making moral judgement. He suggested the social intuitionist model, which claimed that ‘moral judgement is caused by quick moral intuitions and is followed by slow, ex post facto moral reasoning’. He explained moral intuition: “Moral intuition can be defined as the sudden appearance in consciousness of a moral judgement, including an affective valence (good-bad, like-dislike), without any conscious awareness of having gone through steps of searching, weighting evidence, or inferring a conclusion (p.818).” Therefore we have these two strategies; rationality and intuition (we have come across rationality and intuition in chapter four as well). I have argued that while the emotional intuition is the result of the implicit unconsciousness brain activities, the controlled cognition reasoning is the result of free will intervention. When people are making moral judgements, they need to use both controlled cognition reasoning and the *a priori* morality. Therefore both free will and morality are needed in a moral judgement. People have the innate ability to recognise the morally right things in most circumstances (no matter through deontology or utilitarianism model). People would normally know what the right things are. I argue that people should always use free will to choose to abide to the morality because morality should have higher priority than logic or intuition in a decision making process.

### **Morality should have highest priority**

When other main ideas contradict with the morally right things, we ought to do the morally right thing instead of others because the morality should always possess higher priority. The

sense to do the morally right things, and the vague idea of moral standards (as expressed, for instance, in universal conventions of human rights) are shared by nations worldwide (Kant, 2008; Lewis, 1955 (2002)). I will regard this transcendent knowledge as self-evident. We cannot explain why we need to be fair to other people or do the morally right thing. Morality can make us feel guilty and want to find excuses for what we did (Lewis, 1955 (2002)) And, in that way, it has authority over us (Kant, 2008). Kant has argued that as a human being with reason, we should all do thing that we have what we have obligation to do. A being with reason should follow what the morality tells him to do. Otherwise he is not acting in reason. The reason that Kant talked about was a tendency that we know we ought to satisfy (not the instrumental reason). Reason, in Kant's view, pushes us to set a goal or act in according to our conscience. He points out that we do not need reason to follow the morally right things. Although we do not have reason to follow morality, it is one of the most fundamental things that we have to consider when we make decisions. Kant said:

'Thus not only are moral laws with their principles essentially distinguished from every other kind of practical knowledge in which there is anything empirical, but all moral philosophy rests wholly on its pure part. When applied to man, it does not borrow the least thing from the knowledge of man himself (anthropology), but gives laws *a priori* to him as a rational being. No doubt these laws require a judgement sharpened by experience, in order on the one hand to distinguish in what cases they are applicable, and on the other to procure for them access to the will of the man, and effectual influence on conduct (Wood, 2001, p. 147)' and

'When we add further that, unless we deny that the notion of morality has any truth or reference to any possible object, we must admit that its law must be valid, not merely for men, but for all *rational creatures generally*, not merely under certain contingent conditions or with exceptions, but *with absolute necessity*, then it is clear that no experience could enable us to infer even the possibility of such apodictic laws (Wood, 2001, p. 166).'

I realise that Kant's view may only represent a small portion of the moral philosophy. But I think the fundamental principle that we do not need to have reason to choose the morally right thing. It always has higher priority in human. We have responsibility and obligation to follow the morally right things. However, when we are judging what morally right thing is,

come to individual cases, there are several models or theories to choose from, like utilitarianism, deontology, and other moral philosophical models.

Doing the morally right things are always better than doing the wrong things even though the morally wrong things might seem to have stronger attractions. Kant's argument that a person has no survival related reason to follow moral commands which may, in some cases, lead to his denying his desires in order to do what he ought to. For example, we know what we ought to do in cases like eugenics. Morally right things are always in a higher position. This obviously restricts our freedom in some senses because we cannot escape from it. But in return, it gives us the true freedom. I argue that free will is ultimately a means to be used to follow morality.

### **Free will is used to follow morally right imperatives**

Choose not to follow the rational processes is less reasonable, not random. If the logical thinking process does not give any preference to the options, the choice is then random. Everything must have a previous reason, if something has no reason, no previous thoughts, that thing is chaotic. Therefore there are two ways that can deviate from the rational process. One is to purposely do something against the thought. The other is not related to thought or when thought has no preference, e.g. what colour of jelly bean I am going to eat. Although there must be something before I make this decision, but the decision itself does not require reason. The thought do not have any preference in this case. I will discuss this in the following section. Does it mean that it can jump into the thinking process at any time? Yes, at any point of time morality would have higher priority. In normal cases we can solve the situation by simply using reason and rationality. However, when normal reasoning cannot justify certain actions and behaviours, we need to refer to the morality as the ultimate reference and make decision. Here we talk about the priority of thoughts, how different level can affect each other? Morality does not seem to affect the rational processes in a hierarchy order. It does not affect at only one stage of rational thinking process but not others. Morality is in a parallel order and can affect rational thinking process all the time. If I am working in front of my computer but I suddenly want to be slack and play computer game. If I keep studying I am fulfilling my responsibility and hence act in according to

deontology. If I choose to play computer game, I am acting in a less rational way although I can still find some reasons to justify my action.

Free will is always implicit in pursuing the right course of action (especially when it acts against what you desire to do) and no one can escape from having a moral sense. One can always choose to follow or not to follow this idea. It is a potential capacity that is arguably intact when everyone is born and awakened as we grow<sup>21</sup>. Therefore human can understand right and wrong when they grow. For the purpose of this thesis it is only important to accept that it is the higher goal in human and it gives meaning to almost every human decision.

Although holding an idea in mind (thoughts) can free us from physical reactions, not all the ideas have the same weighting. Morality should have higher priority than all ideas. Holding on to an idea can free people from directly responding to external stimulus. But holding the ideas of morality can determine the priority of different ideas. When a person does not know which idea to follow or to hold, morality can be a standard or direction for judging the merit of alternative ideas in a person's mind. A concept like morality (or authenticity) therefore provides a direction to the options and the thinking process. Once people understand the right and wrong, they can have the freedom to choose whether to hold onto the right thing, especially when it conflicts with his or her desires.

Because the ideas of morality is the most fundamental idea and has highest priority, the higher degree of freedom lies whether people want keep on doing and thinking the morally right things or not. To decide to choose to follow or not to follow morality is the highest degree of freedom that one can have. Wolf stated that; "Actions of a person are free, if and only if she is able to form her actions on the basis of her values and is able to form her values on the basis of what is true and good (Wolf, 1980, 1981)." This is consistent with Kant's claim that freedom is when one can choose to not to do things that he doesn't want to do. If a person doesn't hold morality, he can shift his mind and hold other lower ideas, he is not being true to himself and need to be responsible for what he decides. Because free will is used to keep up with the morally right things, a person is responsible for falling short of the morality. I argue that everyone has the ability to do things in according to morality. I have also argued that everyone is also responsible for what he holds in mind and what his brain has become in Chapter 5.

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<sup>21</sup> I shall not argue for the innateness of morality but accept the Platonic view.

### **Freedom cannot exist without morality.**

Most people think that freedom is simply without rules, regulations, or limitations. When people protest about the freedom for religion, they simply mean they don't want any regulations on what kinds of religious activities they attend. It is freedom in external terms and I argue that it is only the superficial meaning of freedom. The true and highest freedom lies within the self. A person can always choose to follow the morally right things or not. A beast is free to do whatever it wants but it does not have free will or freedom.

As free will is used to follow the ideas of morality or what is ultimately good and freedom is attributed to people when they can guide themselves according to morality and use their freedom to achieve the greater good. Freedom without any main idea to guide thinking and behaving are just chaos. Freedom itself means nothing without a higher concept. Even though the article 1 in the Universal Declaration of Human Right says that; 'All human beings are born free', a person cannot ask for freedom of the things which are contrary to morality. One does not have freedom to do the morally wrong thing just because it seems to be something one wants.

## Chapter 7: From Self to External: Language

So far I have talked about how we can hold an idea and choose the best option. But this is based on the assumption that people always know all the available options. Sometimes the best option for certain situations does not exist in a person's experiences or memories. In many cases, a person needs to learn the knowledge and wisdom from other people in order to increase the available options and find the best option. Grant Gillett has many works on the role of language in human mind and will (Gillett, 1993, 2001). When a person tries to solve a question or accomplish a goal sometimes he will not have the skills or knowledge to achieve that goal. If he cannot find the best answer, he can randomly choose one thing to do and use it as the solution. Or he can listen to the advice of others so that he can have more options available. The meaning that lies within the conversation or words of others can become part of a person's memories and hence part of his lived being. When he faces similar situations again he can search his memories and find the better option than before. We can understand how language can increase our options by looking at the example of Necker's cube.

### Necker's cube

Consider the example of the Necker's cube (Figure 1) and the two ways of seeing it (Ludwig Wittgenstein, 2009). When a person sees this figure for the first time, he may only see it in a preferred or automatic way. Although he only has one view point (one internal representation) when he first sees the Necker's cube, the other person might ask him to switch his point of view or request him to see it in a particular way (with either the top or the bottom corner coming out of the page). A person can learn to see the Necker's cube in another way if he learns to follow the instructions of others (Gillett and Liu 2012). Because his perception of stimulus array is based on a specific brain state, he can voluntarily change his brain state once he has learned the other way of seeing it.

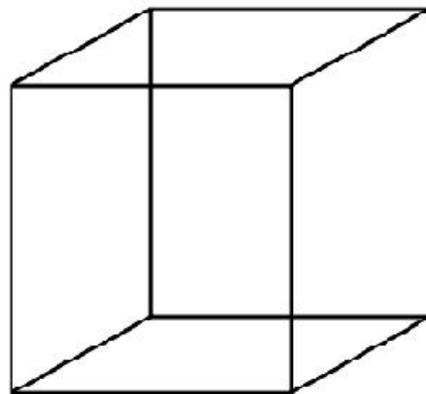


Figure 1; Necker's Cube

## **Listening to others**

Thus a result of learning from others is the ability to use the structure of language to open a gate of possibilities and have a new light on the existing options so that a person is empowered to think through those options and, as Popper remarks “my hypotheses die in my place” (D. C. Dennett, 2004; McCrone, 1999). People will be able to think of other ways of applying the rules governing an activity (like chess or basketball) when they are familiar with the rules. In a different case, a person may approach a topic with a specific idea but be told by his teacher that he could use another way to approach it. Despite his misgivings, if he decides to follow his teacher’s suggestion and, as a result, his neuro-cognitive state changes (according to the teacher’s instruction), he might come to see the problem quite differently from the new perspective. If that happens, he learns a new technique, skill, or option that he can use to solve the problem in similar situations. Therefore his mind extends through voluntarily choosing to follow the instructions or heed the advice of another. Thus when a person chooses to listen to and has the ability to understand others, he can have more options (Gillett & Liu, 2012).

When someone shows a person a puzzle picture and says ‘See it thus!’ he can either hold on to the command and try and obey it or ignore it. If the person holds the command in mind until he learns to see it in the way that he has been asked to, his brain state changes. Gillett and I have argued in another paper that the ability to heed and follow commands can result in an agent developing perceptual techniques that enable him to see the different views of Necker’s cube (Gillett & Liu, 2012). Considered as a whole organism, a person is attuned to languages and the rules that can frame his behaviours in a variety of ways in diverse situations. That attunement and self-regulation, “with the close participation of speech”(Luria, 1973), comes into play in the same way as the ability to learn to see the Necker cube in different ways (Gillett & Liu, 2012).

I have also argued that the concepts *attunement* and *enactment* are the perceptual and motor sides of our adaptation and relate the human organism to its environment (Gillett & Liu, 2012). Attunement can be used to refer to the perceptual tracking of significant features of the environment in general perception (like categorisation) but is also understood as it is used

in social cognition where one individual can attune him or herself to the way that others act and react through activation of the mirror neuron system (Gallese, 2006). Attunement in this sense allows the enactment of patterns of perceptual organisation and motor activity so as to deal with a problematic situation in a way that draws on existing cognitive resources (Prinz, 2006; Weick, 1988).

### **The role of language in the free will model**

The main idea in the example of Necker's cube is 'there are two views of seeing this cube' and the two viewpoints are the options of this main idea. Each viewpoint represents a holistic excitation state of the neuron networks. Once the person has learned to enact the instruction, it can become an option and be stored in his mind. Most people can voluntarily switch the viewpoints once they have learned the interactions between the main idea and the options (Ludwig Wittgenstein, 2009). Through instruction and submission to prescriptive norms a person can voluntarily mobilize combinations that he has hit on, perhaps by chance (L. Wittgenstein, 1972, p. 5).

Voluntary aspect seeing, which I argue comes after holding a main idea, is the brain acting as a whole system imposing top-down changes on perceptual assemblies on the basis of the engagement of the human organism in a context of discourse (Gillett & Liu, 2012). A person can use free will to hold ideas and allow ideas to be linked to other cognitive processes and to manipulate internal representations. Therefore he can adapt to the environment (Gibson 1986).

### **Conclusion**

Gillett has outlined the way that language can be used to open people's mind in current or future situations. Listening to advice from other people can give people wisdom so that they come to know how to solve a situation more freely. Sometimes wise advice can help people to see the situation with a new light and suggest different options for dealing with it (similar to the use of metaphor). When people learn from others, they can have more available options in any given situation. Hence, their option increase and they are more open to act in a number of different ways.

The translation of dialogue or argument into neural patterns able to modulate human activity and structure our interactions with the world is, in part, the interaction between mind and brain and, in brain terms, that flow between higher order ideas and basic patterns of stimulus registration and classification implies that the brain works both from top down and from bottom up (Gillett, 2009; Gillett & Liu, 2012; Luria, 1973, p. 93; McCrone, 1999) .

## **Chapter 8: Functions of Brain and Mind**

I will need to discuss the functions of the brain in this chapter. Can findings in neuroscience support the 'hold or not to hold' model that I am using? If the findings in neuroscience or psychology do not support that approach, this thesis cannot provide a useful model of free will for cognitive neuroscience.

### **Neuroscience findings – what does brain do?**

The functions of brain can be understood in three basic ways; input, internal states, and output (Miller & Cohen, 2001).

#### **Input**

The brain can receive external stimuli through the sensory organs. When animals see an image, the visual cortex will be activated. When animals hear a sound, the primary auditory cortex will be excited. When animals touch something, the primary sensory cortex will be stimulated. I argue that most of the posterior part of the brain (parietal lobe, occipital lobe and posterior temporal lobe) is used to perceive external stimuli.

#### **Internal states**

##### **Memory**

The neural basis for memories has been discussed in Chapter 3 when I discussed options. Brain is essential for storing information. One interesting brain area for memory is hippocampus. The hippocampus is crucial in transferring short memory into long term memory. If the hippocampus is damaged, a patient cannot memorise new things, as in the case of Alzheimer's disease and patient H.M. (Henry Gustav Molaison). The information that a person receives is normally stored in the brain through the formation of LTP in hippocampus (Knierim, 2003). This works probably by storing a virtual address for all the components of the memory from which the person can, in recall, reconstruct the memory by reactivating the relevant connections (Collins & Loftus, 1975).

Alzheimer's disease obviously has devastating impact on self and identity. It is a progressive, fatal neurodegenerative disease with the symptoms of impaired memories and abilities to carry out daily activities such as language, visuospatial functions, and attention (Jalbert, Daiello, & Lapane, 2008). The prevalence increases with advancing age (Bachman et al., 1992). It is characterised by senile plaques, neuritic tangles, progressive loss of neurons, and atrophy of brain tissue (Jalbert, et al., 2008). The case of Alzheimer's disease shows that animals use their neurons to sustain information and provide the biological basis of memory function.

### Representation

Hughlings-Jackson argued evolution cause representation and re-representation in the brain (Jackson, 1887). The higher organisms would have a more complicated representation of information. I argue that because the brain is used to respond to external stimulus, it can shape itself in a more organised way so that it can better respond to the same stimulus next time. Hughlings-Jackson also points out that this function in humans is under conscious control or the highest level of coordination and reintegration (Franz & Gillett, 2011)

### Reward system

Dopamine is one of the most important hormones in reward circuits. When animals obtain unexpected rewards, dopamine will release in the brain and generate a positive feeling and the neurons of the stimuli will be linked with the rewards. When the animals see the stimulus next time, they will expect rewards. If a punishment comes with another stimulus, animals will link the negative feeling with the stimulus and when next exposed to the stimulus, they will try to escape from it (Lehrer, 2009). This phenomenon is also called classic conditioning (Bechara, Damasio, Tranel, & Damasio, 1997; Klein, 2004). In fact, I argue that one of the functions of brain is to generate expectations through experiences. When the animals have associated a positive feeling with a particular stimulus, they will expect to obtain the same positive feeling again when they sees the stimulus. On the contrary, if the animals have linked a negative experience with a stimulus, it will expect to obtain the negative feeling when they see the stimulus again. In classic conditioning, when animals see the stimuli the brain will automatically generate expectations even though the rewards had not yet been delivered.

Many researches showed that lesions of basal ganglia can lead to the dysfunctions of motivations of behaviours, reward-directed learning, movement initiation, movement preparation and coding for rewards. Wolfram Schultz (1999) argued that neural activities in striatum (as part of basal ganglia) precedes the actual rewards delivery. He therefore suggested that 1) striatum is responsible for the expectation of rewards. 2) The expectations of rewards can change into “intentions” and “goals” for behaviours and actions. Intentions and goals are then posited to lead to behaviours and activities. Schultz found that neurons in the striatum would be activated when they were expecting rewards or when the individual received rewards. These particular striatal neurons are activated when the rewards are presented before any movement can be seen. That means the neuron activation did not correlate with eye or arm muscle movement but correlated with rewards. He showed that neurons in striatum can have different responses towards rewards by using the single cell recording in monkey. Some neurons represent expectation of rewards when the rewards were delivered. Some represent the detection of rewards. And some predict the rewards before seeing any. In fact, Schultz showed that the different regions of neurons in striatum can have a continuous activity from the reception of instruction, initiation of movement, expectation of movement, expectation of rewards, to the reception of rewards.

Since striatal neurons were activated before any movement when the animals perceive rewards, the author suggested that these neuron activities could represent the intentions of animals. Schultz also pointed out that the reward relating properties can be found even in single neurons because of the results of single neuron recordings in primate striatum (Schultz, 1999). The study showed how the activations of striatal neurons can reflect rewards aspects and generate what Schiltz calls intentions. I argue that basal ganglia and limbic system are mainly responsible for reward perception and linking to behavioural patterns. The expectation of the rewards will then be sent to medial part of the brain and this expectation could turn into the motivations for human. Whether the actions will be performed in humans depend on holding the ideas in mind at a higher or more integrated and coordinated level in the brain (Franz & Gillett, 2011; Jackson, 1884).

### ACC

ACC (Anterior Cortical Cortex) is anatomically between the basal ganglia and frontal lobe. Therefore functionally, ACC is should bridge the function between reward signals and LTM as well. Frontal lobe has been suggested to associate with LTM (Blumenfeld & Ranganath,

2007; Jetter, Poser, Freeman, & Markowitsch, 1986; J. S. Simons & Spiers, 2003). There are two facts that support this claim. 1) It has the highest density of dopaminergic neurons (Paus, 2001). 2) It has been observed to have higher metabolic activities when mental load, task difficulties, or response competition increases (Carter et al., 1998; Paus, 2001). Increased competition can mean more error rates. Bush et al. (2000) also suggested that ACC might work when the organism is processing conflicts or competition between behavioural tendencies (Bush, Luu, & Posner, 2000). Some other papers suggested that ACC is used in error detection and behavioural monitoring (Carter, et al., 1998). These studies showed that ACC will increase metabolic activities when error rate increases. In order to detect errors, the animals must compare the perceived information with the existing (or expected) information. The error signals will be sent to basal ganglia if the perceived information does not match the existing information.

Since error detections and dopamine are associated with reward signals and LTM, I argue that ACC is one of the important brain areas that bridge frontal lobe and reward system. I argue that ACC can send the reward signals to the frontal lobe and form intentions and goals (but the human intentions and goals themselves are subjected to the highest level of voluntary coordination of activity).

### Mirror neurons

An interesting brain area that can perceive intention is inferior-frontal cortex (IFC). They are also the place where mirror neurons are. Mirror neurons have multiple functions. These functions includes aspects of language production, movement execution, action recognition and understanding (Hamzei et al., 2003), intention understanding (Rizzolatti & Sinigaglia, 2010), imitation, and emotional feeling (Fabbri-Destro & Rizzolatti, 2008). A study done by Umiltà et al (2008) had shown that neurons in F5 (corresponding to IFG in humans) are involved in goal directed actions independent of the actual hand movements that are used in those actions (Umiltà et al., 2008). An experiment done by Koski et al (2002) also suggested that area F5 (in the monkey brain) was involved in target directed action (Koski et al., 2002). Another experiment also argued that IFG was involved in goal-directed hand movement (Buccino, Binkofski, & Riggio, 2004). These experiments all implied that IFS is involved in perceiving and generating goals or intentions. IFS will be activated when the animals perceive and perform certain actions with specific intention, especially the intentions with hands. Therefore I argue that IFS is one of the places for LTM that stores intentions and

goals (in Schultz's sense). When the animals perceive or generate the intentions that are associated with hands, IFS will be activated. I argue that the medial part of the frontal lobe can send the motor patterns corresponding to intentions or goals to the anterior frontal lobe for activation or enactment depending on the higher order integration (e.g. PFC) that expresses a person's directed thought and intentional action.

## PFC

Before an action has been performed, an action plan needs to be constructed from intentions and goals. The action plan involves selecting actions, or to generate the most appropriate response. I argue that prefrontal cortex (PFC) is an area that receives blueprints for intentions and the associated actions from the medial frontal cortex and then generates action plans.

Studies show that PFC seems to have the ability to generate and perceive intentions in actions.

1) PFC damages can diminish the ability to use behaviour-guiding rules (Miller & Cohen, 2001). 2) PFC is also an important area in executive function (Paus, 2001). Action execution involves motivations, action selection and action execution. The reward circuit can motivate people to do things that can either obtain the rewards or escape from punishments. However, the information about reward and error need to be sent to the prefrontal lobe first so that the actions can be executed. 3) It has been associated with lots of other cognitive activities, such as attention, performance monitoring, decision making, memory, planning, internal goal (Miller & Cohen, 2001), temporal integration, and working memory (Fuster, 2008).

Although PFC is involved in these activities, these activities are not constituted in PFC alone. PFC is working as part of the neural circuits for these activities. It could probably remain activated while the agent is performing the actions. The work of PFC involves coordinating activity from many parts of the brain to combine that activity into an overall integrated plan or to direct it according to a guiding thought or main idea. I suggest that PFC might bear the functions of constructing, sustaining, and receiving action plans.

## **Output**

Output is fairly straightforward compared to the internal states preceding it. It involves electro-physiological effects being communicated from the premotor cortex to primary motor cortex and from primary motor cortex to neuromuscular junction through motor neurons. The muscles will contract when they receive stimuli from the motor neurons.

Overall, I argue that the brain is a well organised organ that can function well even without the ability to hold an idea. By using the mechanism of input, internal states and output, animals can construct most of the behaviours (see Figure 10). I argue that the suggested functions of brain is generally consistent with Hughling Jackson’s theory of nervous evolution, which suggested that the action is responsive to increasingly integrated patterns of sensorimotor representation (Franz & Gillett, 2011). The main purpose in this section is to provide an alternative and purely neuroscience related explanation for the functions of brain and argue that a mechanistic brain is working in both humans and animals. But as I have argued before, a human being has the ability to hold specific ideas in mind. I will further discuss the differences between animals and humans in the following section.

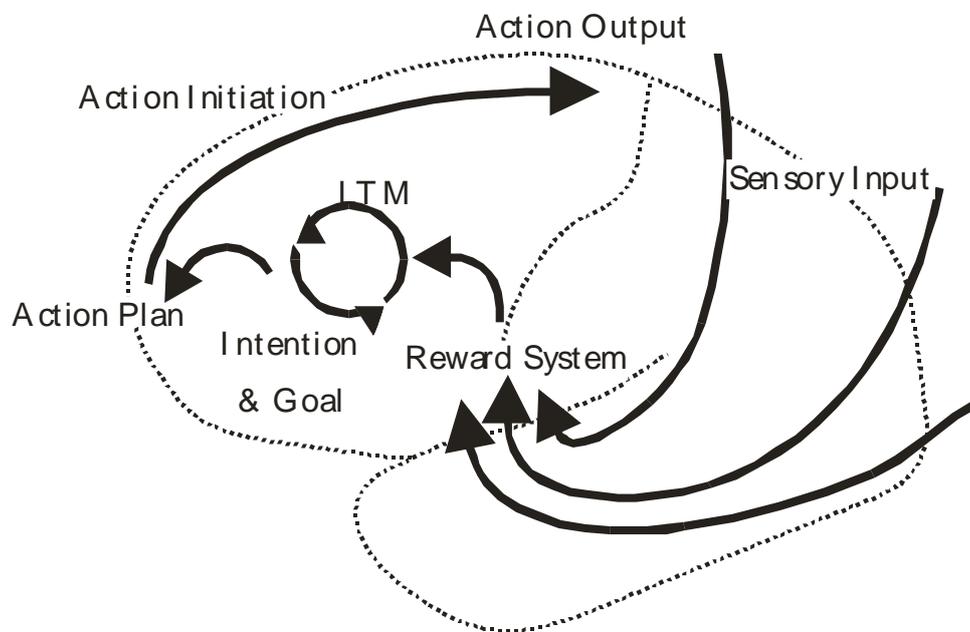


Figure 10: The hypothesised function of the brain (the bold lines represent the information flow)

### **Animal and Human**

Lower animals are not like humans. They don't have the ability to hold ideas in mind where the ideas are richly informed by meanings, metaphors, moral frameworks, and a wider context than the animals own survival needs or genetically predisposed behaviour patterns. They can only respond to the internal and external stimuli. The responses can be shaped by experiences but animals cannot hold ideas in mind, nor can they consider or analyse

something. Their brain will generate a best available option in every situation (if there is no best option, they will act randomly). Animals use all their experiences at once. They cannot distinguish the individual memory. They cannot travel back through time and revisit or re-think their decisions. I argue that those smart animals, like chimpanzee and monkey, are smart because they have the brain structure that can store multiple and more complex options.

Humans share everything that a monkey might have. The gene divergence between human and chimpanzee is less than 2 percent (Mikkelsen et al., 2005). Our brain structures are very similar. But there is one critical difference between human and monkey, that is, the ability to hold an idea in mind without the presence of external stimulus. The internal goals of animals are simply the results of hormone imbalance or chemical responses. The internal goal of humans could mean a hormone imbalance but it can also mean an idea that people hold in mind or a moral conviction to which a person is committed. It is the same in language, animals can respond to sounds and voices, but they cannot hold the meaning of words in mind. They can only respond to the tone of the voices. Animals cannot purposely choose the second favourite object. They always choose the favoured object of the moment if they can. Only human can purposely choose the second favourite thing because of some more remote consideration. Animals do not have ability to actively maintain the representations in their minds that allow that wider context of meaning to influence them (Miller & Cohen, 2001). When we try to understand how human minds work, we have to appreciate this difference.

### **Psychology findings – How does mind affect brain?**

I have argued that one of the brain's functions is to generate expectations from our memories. Sometimes people can sense the expectation but sometimes they cannot (expectation generated automatically). Libet did an experiment on measuring the initiation of the brain activities on voluntary actions (Libet, 1985; Libet, Gleason, Wright, & Pearl, 1983). He found an increased brain activity before voluntary decision had been made. He called it readiness potential. In his experiment, he also found that free will can stop the execution of the readiness potential. He then concluded that free will does not initiate the neural process that leads to action but is able to control it.

Just let us do an experiment, let's put our hand on the table and raise our index finger and hit the table when we count onto three. When did we start to have voluntary will? Is it when we

count one, two or three? It may feel like we determine to hit the table when we count onto three. But in fact we have decided to hit the table when we counted one. We have hold the idea “I want to hit the table when I count on three” when we are count on one. When we count number two, our brain will automatically generate activities to accomplish this coming event. Interestingly, most people feel that they determine to hit the table when they count on three. In my opinion, it is the same in Libet’s experiment. Participants had been preparing to press the button when they started the experiment. The volitional process about pressing the button started when the experiment started. They determined to press the button because the instruction “press the bottom at any time as you like” in their mind. When they were about to press the button, their brain will automatically generate expected activities that the participant required to achieve this task.

It is the same for human’s brain. When people see certain stimulus, they will automatically have an expectation of what is going to happen next and our brain will generate an expected activity. We can use an example from Gazzaniga’s writing (M. Gazzaniga, 2009). When people use a finger to touch their nose, both the nose and the finger will sense the touch at the same time although the lengths of sensory neuronal pathways are different. It is because the brain automatically compensates for the time differences that might appear due to the different lengths of sensory pathways.

The above example showed that mind initiates the brain to generate expected or automatic activities before they happen. In another example, we can look at the episodic memory and see how mind can induce brain activities (Tulving, 2002; Tulving & Markowitsch, 1998). I argue that human is the only creature that has episodic memories. Although Tulving argued that episodic memory is different from the semantic memory because episodic memory is time dependent and semantic memory is time independent. I argue that both episodic memory and semantic involve holding ideas in mind, and every memory is time dependent since they are in the past. However, animals cannot re-experience event in the past, but humans can. They can re-experience the event knowing it was in the past and place it in relation to a narrative of their life and the events that have happened in it (autobiographical memory). When a human being holds ideas other than goal and purposes, he is experiencing the same event again and re-awakening the tendencies that the memory is associated with. Episodic memory therefore involves mental “time travel” and this can only be found in human beings (Tulving & Markowitsch, 1998). Again, we see a higher level integrative and meaningful function of the mind that can induce brain activity of a certain distinctive kind.

Only human beings can use their minds to hold on to an idea and expect something on the basis of what is in their conscious mind and the ideas they are holding on to. Only human can therefore re-experience the unsatisfied feeling after being distracted from something they were doing, and re-experience the expectation or expect something without the external stimulation that evokes it in the (specious) present moment inhabited by most animals.

### **Physics and the findings of science**

Does holding an idea violate with any physical laws? No, activation of the same area (or distributed pattern) in the brain does not violate any physical laws. The randomness of quantum physics in association with local entropy reversal also allows a continuous activation of the same area for a period of time even though it does not give us any way of explaining it.

Hodgson, leaves an unknown domain, after briefly explaining how quantum physics could generate a capacity that the agent can choose within. He remarks that the agent by itself can choose the alternative options that the rules (inconclusive reasoning) left open to them, but he does not point out how (Hodgson, 1999). Wilson has also argued that for a soul to influence the brain without violating physical laws, the effect should be within the levels of quantum physics (Wilson, 1999). I argue that the ability to hold an idea neither violates first (energy does not increase or decrease energy) nor second energy law (there is a continuous overall increase in disorder or entropy over time despite local entropy reversals). If people don't have glucose, people cannot think and will die. If people don't concentrate and hold an idea, their mind will just wander and wander and cannot achieve anything (increasing disorder). But the human body and the brain in particular represent local reversals of entropy or imposed biological order and thus it is perfectly understandable that if people don't have brains, they cannot hold any idea even though the workings of the brain do not explain their ability to hold on to and develop ideas according to the human and moral context to which they belong.

Stapp argues that the mind-brain interaction should be explained by the dynamical effects of quantum theory. He argues that the increased knowledge can cause a collapse of wave functions in the quantum state of the brain and hence settle the quantum state on a particular state of matter. He quotes The Copenhagen Interpretation, which states that "the **wave**

function represented our knowledge of the system, and the reduced **wave** packets our more precise knowledge after measurement (Stapp, 1999).” I think that the ability to hold an idea not only does not contradict the model, it can even enrich the model but analysing the way in which observation and the human brain can form knowledge (a topic for further investigation). I argue that people, at least, have an ability that animals do not have and this does not contradict any physical laws.

## **Chapter 9: Conclusion; a free will model**

I argue that people not only have brain structures that can store information, they also have a parallel non-physical entity that can hold a specific idea in place despite random distractions and interference occurring in the brain. Thoughts and ideas use brain structure but this rationally maintained ability to maintain a commitment or hold an idea in mind does not come from brain structure (considered in its own terms). I argue that the parallel system can not only hold an idea, it also enacts or realises the knowledge to do the morally right thing and can also, in a very important sense, travel in time to activate past events.

When people give up using their free will to hold certain ideas, they can simply follow their body impulses and physical reactions. Kathleen Vohs and Jonathan Schooler showed that participants who reported weaker belief in free will were more likely to cheat (Vohs & Schooler, 2008). Roy Baumeister et al (2009) also showed that people whose belief in free will was challenged were less altruistic than others (Baumeister, Masicampo, & DeWall, 2009). Therefore it is very important for the society to realise that everyone has free will. All of us need to be responsible of what we do, even though neuroscience, psychology and physics might try to convince us to believe in the other way.

### **The free will model**

I argue that people can decide whether they want to keep holding certain ideas in mind. The ideas can be as simple as a colour, a word, and an object. They can also be as complex as a sentence, a purpose, or a task. When people hold a complex idea, options can be obtained from memories and external stimuli. If people need to make a decision in regarding to their main idea (or guiding thought), they should always choose the best option that is available to them. I argued that the “idea, options, and decision” process is the simplest unit in a serial thinking process. When the main idea develops into a serial thinking process, the “idea, options and decision” process can be repeated many times. However, a person should always refer back to the primary or first main idea and use the idea to access each decision that a person makes in a serial thinking process. If a person can use his free will to hold the primary main idea and keep true to the idea (always chooses the most logical option in

regarding to the primary main idea), he should be able to find the best option in the end of the thinking process or the serial thinking process (Figure 5).

However, sometimes they can give up holding and following the main idea for no reason. Sometimes they can experience hardship and contradictions within self because of the body impulses and physical reactions resulting from hormone imbalances or fixed maladaptive neural circuits. In these cases, people will need to spend more efforts to overcome the body impulses. At the end, they are still responsible for their behaviours if they decide not to follow the most logical development of their main ideas.

I have argued that some *a priori* entities, like morality, would have higher priority in a thinking process. Kant stated that the morally right things should always have higher priority and we do not need a reason to follow the right things. Morality is a transcendent entity. Therefore it can be used to evaluate all the cognitive processes. Ultimately, free will is used to hold or abide to the morally right things.

Sometimes a person can be trapped in certain situations and cannot find his way out because of the lacking of the sufficient knowledge and experiences. At that time, talking to other people might help him out because he might hear some wise advices from other people. Through discourse, he could learn a new way of seeing the problem. Therefore, his options expand to the extent that he exercises his ability to listen and to heed others and relate himself to a framework of meaning. If the person can learn the perceived advice really well, it can become part of his familiar ways of seeing things. However, the person can still decide which option he wants to use to solve certain situations.

The ability to hold or not to hold an idea does not contradict to any physical laws. It is within the possibility of quantum physics and is consistent with the law of conservation of energy. Although the ability to consciously control and direct thoughts and actions uses the brain, but the brain structure alone cannot fully explain free will. The function of the brain is to “perceive, store and respond.” The brain can be shaped and modified by the experiences so it can produce better responses in the future. All the information seems to enter the brain through occipital and parietal lobe. The information is then transferred to limbic system and frontal lobe through temporal lobe. Limbic system can produce reward or error signals by comparing the received information with the expected information. The reward or error signals can generate certain goals or intentions from the LTM. The intentions or goals can

then be used to understand the intentions of others. Intentions can then form action plans and transfer to pre motor cortex and primary motor cortex (*probably BA 4, 6, 8, 32 as well*). Although the brain and its neural mechanisms is sufficient to explain most of animal behaviours and the findings in neuroscience, the whole person should include something more than just the brain as is evident from their participation in a moral and meaningful sphere of thought and action.

I argue that this model is consistent with most findings in neuroscience and psychology. It also works well under the major laws of physics. In addition, it can also solve some debates in philosophy in regarding to free will. I believe that unless people realise that humans are dualistic beings (participating both in a physical world and in a world of goodness and truth), people cannot fully understand the human mind, freedom, and free will.

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