

IBN HALDUN UNIVERSITY
ALLIANCE OF CIVILIZATIONS INSTITUTE
DEPARTMENT OF CIVILIZATION STUDIES

MASTER'S THESIS



**A COMPARATIVE APPROACH TO THE
NEUROBIOLOGICAL BASIS OF HUMAN WILL:
KANT AND AL-GHAZALI**

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AUGUST 2019

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ABSTRACT

A COMPARATIVE APPROACH TO THE NEUROBIOLOGICAL BASIS OF HUMAN WILL: KANT AND AL-GHAZALI

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MA in Civilization Studies

Thesis Advisor: Assoc. Prof. Dr. HEBA RAOUF EZZAT

August 2019, 92 Pages

This study aims to present both the neuroscientific findings on Human Will and its philosophical perspectives from the Civilisations of the West and Islam. It aims to correlate the philosophies of the concept Human Will with the Neuroscientific evidences deduced from human brain experiments. The central thesis of this research claims that the Neuroscientific perspectives on the issue of Human Will are compatible with the Human Will concepts of Kant and Al-Ghazali. This compatibility is argued for in order to frame a more informed conversation between Neuroscientists and Philosophers. This argument is contrary to the belief that the findings of Neuroscientific studies are in opposition to the transcendental connotations that are embedded in the works of Kant and Al-Ghazali.

Keywords: Al-Ghazali; Kant; Free Will; Neuroscience; Philosophy;

ÔZ

İNSAN İRADESİNİN NÖROBİYOLOJİK TEMELINE KARŞILAŞTIRMALI BİR YAKLAŞIM: KANT VE EL-GAZALİ

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Medeniyet Araştırmaları Yüksek Lisans

Tez Danışman: Dr. Öğr. Üyesi HEBA RAOUF EZZAT

Ağustos 2019, 92 Sayfa

Bu çalışma hem insan iradesi hakkındaki sinir bilimsel bulguları hem de Batı ve İslam medeniyetlerinden felsefi bakış açıları sunmayı amaçlamaktadır. İnsan iradesi kavramının felsefelerini, insan beyni deneylerinden elde edilen sinir bilimsel kanıtlarla ilişkilendirmeyi amaçlamaktadır. Bu araştırmanın ana fikri, insan iradesi hakkındaki sinir bilimsel bakış açılarının Kant ve gazali'deki insan iradesi kavramları ile uyumlu olduğunu iddia etmektedir. Bu uyumluluk, sinir bilimciler ve filozoflar arasında daha bilinçli bir ilişki oluşturmak için çalışılmıştır. Bu argüman, sinir bilimsel çalışmaların, Kant ve Gazali'nin eserlerinde içkin olan spiritüel çağrışımlarla çatıştığı görüşüne karşı çıkmaktadır.

Anahtar Kelimeler: El-Gazali ; İnsan iradesi; Kant; Nörobiyoloji

DEDICATION

To My Friends and To My Family.....



ACKNOWLEDGMENT

I am grateful to Dr. Heba Raouf Ezzat for the guidance and patience in supervising my research. I am thankful to Prof. Alparslan Açıkgenç for the inspiration in formulating the ideas which guided me to pursue this work. For Dr. Ercument Asıl and Prof. Recep Şentürk for providing critical comments during my thesis defence.

My gratitude for the support and inspiration from my dear friends Christopher Handwerker, Lu Lu Handwerker, Mihajlo Bojovic, Osama Ashraf, Lorraine Klein, Hassieb Al-Bhaktary, Colin Colter, Dr. Nassef Adiong, Dr. Maria Cynthia Herrera and Melanie Cadiz.

Muhammad Yusoph Balindong Ramos

Istanbul, 2019

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INTRODUCTION

Free Will and Civilisation

Various conceptions of Human Will that have been lamented in the lettered traditions of each civilisation are among the fundamental hallmarks that can be used as a unit of analysis in an endeavour to holistically comprehend the distinct frameworks of civilisations. Within these civilisations, the emergence and subsequent evolution of Human Will debates have gradually developed with inseparable linkages to other central tenets which have moulded historical dynamics. Among these which are intricately tied to the issues of the Will are the notions of causality, the quest for knowledge, the defiance against the domination of authorities, the perpetuations of politics and order, the demarcation between public and private spheres, the crafting of what is deemed a just judicial system, the moulding of societal structures and even through the contemporary conceptualisations of citizenship, love, friendship and marriage. All of these point the Human Will notion(s) as among the crucially significant concepts that are firmly relevant to the affirmation or the denial of Human Responsibility. The conception of human responsibility, when asserted or distorted by an individual or by the collective many, could be attributed to the rise and fall of a community, a state or that of a civilisation. Hence, it is apparent that re-visiting and dissecting this century-old issue of Free Will is of prime intellectual worth in deciphering the many discourses contextualised in the past, present and in the perceived future of every civilisations.

Both the terms “Free” in relation to Human Will and “Civilisation” are concepts whose respective definitions could not be unilaterally imposed nor agreed upon in unison. Neither of these terms are interpreted on the basis of singular understanding. The diverse characterisations of these concepts have been continuously queried and debated. Thus, an enquiry arises pertaining to the plausibility of correlating perceived relationships embedded within these two disputed notions. In the context of this research, to emphasize the relevance of tackling the concept Human Will, whether it is free or determined, to the study of Civilisations, two approaches are proposed to satisfy this question of conceivability. First, as a conventional method, the operationali-

sation of each terms has been resorted to, that is, adhering to a particular definition explicitly given by a specific scholar which is contextualized within a framed issue. The second scheme is to focus on the methods that have been used to explain Human Will. These methods are deduced from the sciences that have emerged within each civilisation. For centuries, Human Will has been studied in the field of Philosophy designated as the discipline that logically ponders on the nature of knowledge, reality, and existence within the grasps of the human rationality. From the Ancient era to the contemporary time, distinct Philosophies of Human Will have always been enshrined in the Islamic and Western Civilisations. In the past two decades, Neuroscience, a discipline that has been produced by today's globalized interlinked civilisations, has been dissecting the biological dimension of Human Will. It is through this neuroscientific approach that has contributed to the revival of Human Will debates in philosophy. Evidences put forward by the study of neurons seem to be taken by Philosophers as insignia of certitude to further their respective viewpoints in the wide spectrum of this Free or Determined Will discourse. Henceforth, the many philosophical perspectives on Human Will may be conceived as contextualised from the past and present ideological conceptualisations which are particular to each civilisation while the Neuroscientific method of analysis could be proposed as the common vantage point to support or debunk the differing views on the civilisation-specific philosophies of Human Will in today's globalised, interdependent era of open-civilisation. This approach that combines Philosophy and Neuroscience could potentially assert degrees of clarity and certitude on intricately tangled factors that have enveloped the discourses on Human Will.

Research Framework

Indeed, scholarly thoughts on Human Will in Philosophy are diversely plethoric. Further, when civilisational point of origin is to be considered, there are differences in the enunciation of Free Will among thinkers from different civilisations. Moreover, great minds belonging to the same civilisation who have tackled this concept at hand have provided different arguments as such that both groups of scholars within the Islamic and Western Civilisations have manifested opposing viewpoints. As for the Neuroscientific dimension, though this science is to be considered as a product of the sophistication of modernity, the degree of varied, conflicting, and ever evolving arguments on the physiology of Human Will are persistently similar to that of Philosophy.

This research also endeavours to present both the neuroscientific findings on Human Will and its philosophical perspectives from the Civilisations of the West and Islam. It aims to correlate the Philosophies of the concept Human Will with the Neuroscientific evidences deduced from human brain experiments. The central thesis of this research claims that the Neuroscientific Perspective(s) on the issue of Human Will can be appropriated and accommodated to the Human Will Concepts of Kant and Al-Ghazali. This argument is contrary to the supposition that the findings of Neuroscientific studies are in opposition to the transcendental connotations that are embedded in the works of Kant and Al-Ghazali.

This research rationalises its aims on the basis that the correlation of neuroscientific findings to the philosophies of free will is necessitated by the indispensable notion of certitude in the context of establishing true knowledge on the matters of Human Will. This requirement for the notion of certitude which has to be established in seeking authentic knowledge is an epistemological standard demanded both in the Islamic and Western Civilisations. It also asserts the plausibility and necessity of integrating the neuroscientific basis in teaching the many Philosophies of Free Will in Social Sciences. This research also contends that the neuroscientific evidences pertaining to the Human Will could be used to support most of the opposing claims in Philosophy.

Having considered the broadness of differing thoughts on Free Will in both sciences and in both civilisations, this research proceeds by narrowing the subjects and scope of its enquiries.

Three factors have been considered in the framework of reducing the scope of this research: (1) selection among representative thinkers from the Islamic and Western Civilisations, (2) selection among fundamental notions linked to Free Will debate and (3) a choice of a specific field of research among many interrelated sub-disciplines of Neuroscience. In the Philosophy of Free Will, the expositions of Abū Ḥāmid Al-Ghazāli and Immanuel Kant whose intellectual imprints relevant to the issue of Human Will have been extensively studied for the past centuries are selected to represent distinct arguments among many other positions in the Islamic and Western Civilisations, respectively. In the context of this research, the concept(s) of Human Will is approached through its link to the notion of Human Responsibility. Discussions on Human Will Concepts can only be of significance when approached vis-a-vis their relevance to the notion of human responsibility, that is, the determined moral demands expected from each individual member of a constructed community. The relationship of a man's Will to his moral responsibility is interlocked with other notions that are fundamental in a society. For the Neuroscience of Human Will, it must be highlighted that there are many independent, inter-linked disciplines within the study of human biology that have been tackling the Will via anatomical and physiological perspectives. Thereby, this research selects the Neuronal Studies of Free Will which examine the biological grounds of human Free Will both in holistic and reductive approaches. Neuroscientific studies discussed in chapter 3 and correlated with the Philosophies of Free Will in Chapter 4 are deduced particularly from laboratory experiments that have established conclusions derived from the anatomical, physiological, and molecular dynamics of neurons in pertinent to the issue of Free Will.

Linking Neuroscience and Philosophy on Free Will

It is the notion of certitude towards knowledge that demands the correlation of Neuroscience and Philosophy. Free Will debate is among many contemporary issues

where the union of Neuroscientific evidences and Philosophical reasoning could be put to test to provide a new dimension of clarity to the fate of Human Free Will discourse.

In the context of this research, certitude is the compatibility of the abstract and the physical. The abstract pertains to the emergence of thoughts and the subsequent development of its connotations through logical reasoning. The physical is the manifestation of what is or has been thought that is explicitly evident to the auditory, sensory, and visual perceptions within the context of space and time. It is the affirmative agreement between the reasoning of the mind and the functional perceptions of the brain. In the advocacy of most contemporary Western scholars, what is known as subjective has to conform with that which is objective. Among some scholars in the Islamic Civilisation, there is no dichotomy between what is subjective to that which is deemed objective. Rather subjectivity and objectivity are complementary approaches to ascertain knowledge and the mind must find this link of complementarity of the subjective and objective to obtain a sense of certitude towards knowledge. Therefore, it could be discerned from these two civilisational perspectives on certitude that which is labelled as objective in relation to what is physically manifested, that is, observed systematically via the auditory, sensory and visual, could affirm the subjectivity of the abstract constructs of the mind. Hence, if it is to be considered that the many philosophical reasoning on Free Will are subjective outputs of many great thinkers and that the observations of Neuroscientists derived from their controlled experiments qualify for what is to be accepted as objective, then the correlation and compatibility of the philosophical reasoning and neuroscientific evidences must be established to assert certitude to the notions of Free Will and Human Responsibility.

Challenges in Linking Philosophy and Neuroscience

To link these two sciences to discuss Free Will is an enormously delicate task owing to the asymmetrical dimensions on which these disciplines are grounded. First, Philosophy as the study of the rationality of the human mind is a science that has been developed for centuries whereas Neuroscience as the physio-anatomical analysis of the brain is a recently founded discipline that is still inchoate when compared to the heights of Philosophy. Second, Philosophers both from the Western and Islamic

Civilisations have different conceptualisations of what Free Will is. Third, due to these varied philosophical conceptions of Free Will, what have been being undertaken in the laboratories of neuroscientists have also different interpretations of Free Will which in most research set-ups are pointed to the biological mechanisms of physical human actions in relation to the timing of the “thinking about an action” and the “actual physical implementation of an action”. In addition to the different conceptions of Free Will when civilisational factors are to be considered, it is evident that the definitions of Free Will as uttered in Philosophy and that which is tested in Neuroscience are perceived and studied incoherently, that is, a conclusion from a particular Neuroscientific research on Human Action cannot be applied to the broad Philosophical discourse on Human Free Will and Moral Responsibility. Hence, this research intends to develop a method to integrate the Neuroscience and Philosophy that embarks with the presentation of particular Philosophical conception of Free Will from the Kantian perspectives of the Western Civilisation and the notion of Human Responsibility from the Ghazalian perspectives of the Islamic Civilisation. The arguments of these two Philosophers are to be compared to the laboratory findings of contemporary Neuroscientists who have experimented extensively on the subject of Free Will. Consequently, this research in its reliance on the notion of certitude aims to test the plausibility of implementing a framework that points to the compatibilities and incongruities of the Neuronal basis of Free Will and Human Responsibility to the Philosophies of Kant and Ghazālī.

The Free Will Discourse

The understanding of what are meant by “To be Free” and “To have the Will” constitutes the conception of Free Will. In a minimalist definition, “To have the Will” connotes having the motivations, interests, desires, and abilities to implement an action. “To be Free” is the absence of obstructions or restraints external to the person who intends to implement an action. Hence, in its mere simplistic form, Free Will pertains to a man’s ability to act based on his own choosing without any external impediments. By this elementary definition alone, there is this emergence of series of other inquiries aimed to clarify what is really meant by the concept Free Will.

In the Islamic Civilisation, the Quran and the hadith are the bases of the scholars' discourses on human action and predestination.¹ Verses in the Quran have declared that humans have freedom to choose their willed actions and God has foreknowledge of all their actions. In the tradition of the Prophet Muhammad, the affirmation of God's divine will and knowledge over human actions as well as the human capacity to freely choose and decide for his actions were clearly emphasized. Discussions about the predestination and one's capacity to freely choose his actions have been noted among the disciples of the prophet Muhammad.

In the Islamic civilisation, interactions with other religions and the influences of Greek philosophy to the scholars of the Ummayad period have contributed to the emergence of two schools of thought, the "Qadariyyah" and the "Jabariyyah", which debated the issue of destiny and freedom. The Qadariyyah claims that man has the capacity to act freely and his chosen actions are his own.² In addition to this, the scholars of the Qadariyyah also believe that because man has the freedom to choose his actions, he will be held accountable to these actions in the day of Judgment when God provides rewards of the right actions and punishments for the deviant deeds. They claim that seeking knowledge and understanding are necessary for a person to have true iman (belief) from which one can direct his actions virtuously. The school of Jabariyyah entirely contradicts the principal claim of the Qadariyyah. For the Jabariyyah, man is not the prime originator of his actions rather God determines all his actions including his "acts of faith, faithlessness, good and evil".³ The main point of disagreement from these two opposing views pertains to the acceptance or rejection of the argument that man has total freedom and authorship of all his decisions and actions. The socio-political context when these debates between the Qadarites and the Jabarites were at its peak is critically significant to consider in understanding

¹ As I do not have the sufficient understanding of the Quran and the Hadith, I have intentionally avoided the use of citing Quranic verses and the words of the Prophet Muhammad so as not to misrepresent their meanings. It is my belief that only those who have spent extraordinary time and effort to truly understand the Quran and the Hadith have the scholarly command and reliability to resort to explaining concepts by resorting to them. In relation to the aim of this section, that is, to describe the variations of arguments on human will among scholars of the Islamic Civilisation, I have focused on the emergence of varied school of thoughts that became prominent after the Prophet.

² Abdur Rashid Bhat, 'Free Will and Determinism: An Overview of Muslim Scholars' Perspective' (University of Kashmir, n.d.), https://www.muslimphilosophy.com%2Fjournal%2Fis-01%2Ffreewill.doc&usg=AOvVaw2q1llxPa7-tK8j_BazW_Lb.

³ Ibid

the motivations that drove their arguments for and against absolute free acts and determinism.⁴

During the realm of the Abbasids, the Mu'tazila and the Ash'ariah theologians pondered upon the conflicting issues relating to the degree by which man has freedom and authorship over his actions and, on the other hand, determinism through God's divine Will and Power.⁵ The Mutazilites adhere to their five doctrines. These pertain to the (1) Divine unity (Al-tawhid), (2) advocating for those that are deemed good (ma'ruf) and forbidding the evil (munkar), (3) Divine promise and threat (al-wa'd wa-al-wa'id), (4) for those muslims who have committed grave sins, they are categorised to belong a place between two places (al-manzilah bayn al-manzilatayn), and the doctrine of Justice (Al-adl).^{6 7} Among these interrelated doctrines, it is through their doctrine of Justice where they claim that man is the originator of his actions and that he is responsible for his all his decisions to act.⁸ It is because of this authorship of willed acts that a man can be held accountable to the consequences of his actions. For the Mutazilites, if man is not the source of his actions, then he is not free and thus cannot be held accountable to his actions.

In contrast, the Ash'arites rebuke the claim that man is the absolute originator of his actions. Adherents of the Ash'ari doctrine argue that man has no absolute power over his decisions to act. The Ash'arites deduced their arguments against the Mutazilites by thoroughly interlinking and discussing notions and concepts of *khalq* (creator), *kasb* (acquisition), categories of *qadimah* (original) and *hadithah* (derived), *qudra* (power given to man by God) *ikhtiyar* (free choice, good choice), and *ikhtisab* (appropriation).

⁴ Maria De Cillis, *Free Will and Predestination in Islamic Thought: Theoretical Compromises in the Works of Avicenna, al-Ghazali and Ibn 'Arabi*, 1st ed. (Routledge, 2013), <https://doi.org/10.4324/9781315858548>.

⁵ De Cillis, *Free Will and Predestination in Islamic Thought* (2013).

⁶ M.M. Sharif, *History of Muslim Philosophy*, vol. 1 (Lahore: Pakistan Philosophical Congress, 1963), 200-201. <http://www.muslimphilosophy.com/hmp/hmp-v1.pdf>.

⁷ Mohammad Ali Amir-Moezzi and Sabine Schmidtke, 'Rationalism and Theology in the Medieval Muslim World: A Brief Overview', *Revue de l'histoire Des Religions* Volume 226, no. 4: 613-38, accessed 16 September 2019, https://www.cairn-int.info/article-E_RHR_2264_0613--rationalism-and-theology-in-the-medieval.htm.

⁸ Bhat, 'Free Will and Determinism: An Overview of Muslim Scholars' Perspective', 2-3.

For the Ash'arites, God, as the Creator of all, created all that man has including all of his actions. To God belongs the true origination of causative power while man derived power from the Original source. This derived power which man has and which enables him to implement actions is what he uses to make choices freely between wrong and right. It is through the appropriation of the derived power that man becomes able to act upon his intended actions. Central to this claim is the origination of a true causative power. Ash'arites argue that God is the only prime source of power as God is the sole Creator. To attribute the ability to create among men by stating that they have power over their actions and that men alone created their actions is for the Ash'arites tantamount to deviating from the affirmation of God's Omnipotence and could imply that there are two creators, God and man. Thus, the Mutazilites claim that man is the sole author of his actions, for the Ash'arites, diminished God's Supremacy over the created.

Thus, according to the Ash'ariah, man's action is created by God. Man is free in making the choice and intending to do the act he acquires (ikhtisab), the merit of appreciation and demerit of condemnation i.e. reward for good choice and punishment for wrong choice. To avoid fatalism the Ash'ariah have introduced the doctrine of acquisition (iktisab) by which man is, however, different from that conceived by Mu'tazilah who attribute real power to man while in the Ash'ariah doctrine, man has no real and effective power but has the derived power to share in the production of an act. According to Ash'ariah, God creates in two ways—either with locus (mahal) or without it. Human actions are God's creation with locus. "God creates in man the power, ability, choice and will to perform an act, and man endowed with this derived power, chooses freely one of the alternatives and intends or wills to do the actions corresponding to his intentions, God creates and completes the action." So Ash'ariah try to reconcile the two rigid positions of Mu'tazilah and Jabariyyah while granting man freedom of action (ikhtiyar al-amali) in a limited way reserving the absolute power of producing an act with God.⁹

The Ash'arites' theory of Kasb (acquisition) could have been formulated, influenced and developed by several thinkers and could have different variants of interpretations.¹⁰ In general, the theory of Kasb has been intended to affirm and preserve

⁹ Bhat, 'Free Will and Determinism: An Overview of Muslim Scholars' Perspective'; 4-5.

¹⁰ Abū al-Ḥasan al-Ash'arī, from whom the Ash'ariyah School was named after, used to be an adherent of the Mutazilite doctrines. It was when he completed his book, *Kitab al-luma*, that it became clear that he broke away from the beliefs of the Mutazilites. It was noted by those who studied the works and life of Al-Ash'ari that his theory kasb could have influences from his mentor Al-Najjar who was a student of the Ibadi theologian Abdullah Ibn Yazid. The followers of Al-Ash'ari had varied versions

God's Omnipotence and at the same time reconciles it with the idea that man has certain freedom to act and is accountable to the consequences of his actions. However, opponents of this view argue that the theory of Kasb is not sufficient to resolve irreconcilable issues relating to the sole authorship of an action and moral responsibility. If man has no absolute power over his actions but merely an instrument of another power which is said to be the original source of causative power, then man is not truly free and his actions were not his. Thus, he cannot be held morally responsible for the consequences of his actions. It is evident from this disagreement that when the Greek frameworks of logic and causality are to be applied to understand the theory of Kasb, there is a clear incongruity of comprehension particularly to concept to moral responsibility. As for the problem of evil, Abrahamov(1989) interprets that Al-Ash'ari has addressed this in his theory of Kasb:

Al-Ash'ari is of the opinion that God not only creates man's action, but is also its only real agent. That God is the creator and the real agent of man's action lays al-Ash'ari open to the charge that God is an evil-doer (jd'ir) when he creates evil in man. In order to meet this charge al-Ash'ari states that God creates in man his action, be it an act of appropriation or an involuntary act. Concerning an involuntary movement, the meaning of "man moves" is that he is one in whom movement inheres (ma'na al-mutaharrik anna al-haraka hallathu), and this cannot be possible with regard to God, i.e.. God cannot be spoken of as moving. The same holds true with reference to kasb: God creates it in man and is its real agent, but the act is performed in man, not in God. Man is called an appropriator (muktasib), because the act takes place through power created for him by God. Thus al-Ash'ari deduces from analogy that just as God does not move when He creates movement, so He is not an evil-doer when He creates evil.¹¹

In the Islamic Civilisations, the debates on "Human Will", being free or not, have always affirmed God's involvement. Scholars have differences primarily on the degree they attribute relative or absolute power and freedom given by God to man. As all scholars adhere to the recognition of God's Supremacy over His creations, the contemporary debates in the Islamic Civilisation on the issue of Free Will remain

on interpreting terminologies used by Al-Ash'ari in his book *Kitab Al-Luma*. What exactly was meant by Al-Ash'ari by such terms Qudra and istitâa has been a contentious issues among scholars. Contemporary scholars also have varied interpretations of the theory of Kasb. For details, see Abrahamov(1989).

¹¹ Binyamin Abrahamov, 'A Re-Examination of al-Ash'arî's Theory of "Kasb" According to "Kitâb al-Luma"', *Journal of the Royal Asiatic Society of Great Britain and Ireland*, no. 2 (1989): 217, <https://www.jstor.org/stable/25212485>.

within the discourses of the past and confined within the arguments of their earlier scholars.

In the Western discourse, there are three factors to which the Free Will argumentations have been revolving. First is the issue of what constitute desires, motivations or interests that are deemed as catalyst for a man's Will to implement an action. Second is the issue of what comprises an action, that is, is an action confined with physical actualisation of it or is "thinking to do an action" be deemed an action itself. Third is the issue of what constitute "impediments" to a man's action, that is, should these externally-driven restrictions be confined solely to a man's physical action or should the effects of these exogenous obstructions be considered in relation to how it influences a man's motivations, desires and interests that constitute "his thinking to do an action". It is evident to assert that the many enquiries that evolve within these three factors are mainly focused on the notion of "Causality". Hence, the debate on Free Will is a question of what really causes human action. It explores the various perspectives on the causative agents or factors that lead man to decide and implement his actions. Considering these three factors, various positions and arguments have been proposed by the scholars of the Western Civilisation.

Representative Positions: Libertarianism, Compatibilism, and their Variants

A man's will, either it is free or not, is the prime subject of various arguments put forward by generations of scholars. Determining its state of being free has been deemed inseparable to the notion of moral responsibility which has been the basis of holding a person accountable to his actions. Personal accountability is the prowwess of the punitive legal system. In these many positions, three factors seem to be present in all the arguments that have been advocated. These include (1) the question of Freedom, that is, whether a person has acted freely between or among options that he could have chosen, (2) the degree of rationality of one's chosen action which is linked to the assertion that any implemented actions must be based on reasons which must be intelligible to the doer as well as these reasons must be understandable to others, and (3) the person has to be the bare source of an action that entails that one has total control in the actuation of a decision. These wide spectra of positions are based on the dichotomy between the idea that a person's will is absolutely free and

the notion that it is determined by other causal exogenous factors. In the succeeding paragraphs, brief descriptions of these differing views on the relationships among “having Free Will”, “having one’s Will being determined” and “moral responsibility” are provided.

Libertarianism

Libertarianism argues that a person’s freedom with regards to his chosen actions are not subject to determinism. It contests the plausibility of Free Will with that of Determinism and thus conforms with incompatibilism. Incompatibilism signifies that:

If determinism is true, no one can act otherwise than he does. If determinism is true, no one has it within his power to realize any possibility that is in fact unrealized. If determinism is true, no one has any choice about anything. In short, if determinism is true, there is no free will.¹²

Fundamental to Libertarian arguments is the rejection of the notion that strict determinism is compatible to Free Will. It asserts that a person has the ability to act freely and his capacity to do so is not causally determined by factors beyond his control.¹³ Libertarian views can be categorised into three. These are known as Event-Causal Libertarianism, Agent-Causal Libertarianism and Non-Causal Libertarianism.

Event-causal libertarianism argues that a person has free will or has acted freely if his “actions are indeterministically caused by prior events”.¹⁴ In this view, the term “actions” is regarded as “agent-involving events”. The use of the term “event” implies “agents acting at times” and thus it could be similar with the terms “states or property instances”. The phrase “prior events” could refer to a person “having a desire at a time”. For the sort of free acts required for moral responsibility, event-causal

¹² Peter van Inwagen, *An Essay on Free Will* (Oxford: Clarendon Press, 1983), 106.

¹³ Michael McKenna and Derk Pereboom, *Free Will: A Contemporary Introduction*, Routledge Contemporary Introductions to Philosophy (New York: Routledge, Taylor & Francis Group, 2016), 232.

¹⁴ Michael McKenna and Derk Pereboom, *Free Will: A Contemporary Introduction*, Routledge Contemporary Introductions to Philosophy (New York: Routledge, Taylor & Francis Group, 2016), 232.

libertarians contend that it is necessary for actions to be caused solely by prior events which have some mode of indeterminacy.¹⁵

Agent-causal libertarianism asserts that agents indeterministically cause free actions. In this view, a person who acted freely is considered as “an agent who as substance has the power to cause actions without being causally determined to do so”.¹⁶ Two factors are being implied in this given condition of acting freely: (1) because the agent is designated as a substance that has the ability to cause decision thus “causation among events” cannot be caused by the type of causation which is particular only to the agent’s acting freely, and (2) an agent who acts freely is not causally determined by factors beyond his control to cause it.¹⁷ It could then be deduced from these claims that Agent-Causal Libertarianism is firm to argue that a person has an ability to cause an action and dimension of that ability of causing is “a kind of agency which cannot be explained in terms of physical events”.¹⁸ Hence, an agent-causal action is a free action that is not determined by any factors that precede the decision.

Non-Causal Libertarianism relies on ascribing the ability to act freely on the properties of “the mental activities” which could be implied in the terms of decision, intention, choice, or urge. It supposes that the mental is of its own kind and is not on a par with the physical. It follows then that if causations determined by the law of nature pertain to the physical, and to suppose that the mental is not part of the physical, therefore, the mental is not involve in the series of causations determined by the law of nature. It seems that this non-causal view tends to imply that the agent has two dimensions. The conscious agency is pertinent to the mental dimension which has temporal properties that cannot be subjected to the applicability of causal laws which invoke physical concepts. This non-causality of the mental renders actions to be free.¹⁹ Reasoning is among the humanly mental activities. In a general sense, it could be said that there is reason for every action. One may assert that reason causes action.

¹⁵ Ibid

¹⁶ Michael McKenna and Derk Pereboom, *Free Will: A Contemporary Introduction*, 232.

¹⁷ Ibid

¹⁸ Bob Doyle, ‘Libertarianism’, *Information Philosopher*, accessed 26 July 2019, <http://www.informationphilosopher.com/freedom/libertarianism.html>.

¹⁹ Michael McKenna and Derk Pereboom, *Free Will: A Contemporary Introduction*, *Routledge Contemporary Introductions to Philosophy* (New York: Routledge, Taylor & Francis Group, 2016), 232

In contrary, recent views on non-causal libertarianism claim in the case of “reasons explanations” that there is no causal link between the implied or cited explaining factor and the action.²⁰ The claim that the “explaining state” causes the “explained action” cannot be inferred from the truth of reasons explanations.²¹ The non-causal libertarianism in consideration of the “reasons explanations” argues that:

...a desire an agent has that is a reason for doing what an agent has done fails to be a reason for which the agent performed the action if it's neither the case that the agent has the appropriate concurrent intention nor the case that the desire caused the action.²²

Indeed, libertarian views are uttered and imprinted in different forms of argumentation and each with different approach to prove their main claims that humans have free will and having free will requires the rejection of determinism. Thus, Libertarianism is a conjunction of “Incompatibilism” and the proposition that “Free Will does exist”.²³ It asserts that man is able to act freely and upholds the fundamental argument for incompatibilism, “The Consequent Argument”, which can be succinctly stated as:

If determinism is true, then our acts are the consequences of the laws of nature and events in the remote past. But it is not up to us what went on before we were born, and neither is it up to us what the laws of nature are. Therefore, the consequences of these things (including our present acts) are not up to us.²⁴

Compatibilism

The notion of Compatibilism claims that “free will” and “determinism” are compatible. In other instances, it is also used by some philosophers to denote the compatibility of “determinism” to “moral responsibility. Two basic assertions are used to defend compatibilism: (1) It is not necessary to establish if a person's actions were undetermined by past events in order to assess if a person could have done otherwise

²⁰ Carl Ginet, ‘In Defense of a Non-Causal Account of Reasons Explanations’, *The Journal of Ethics* 12, no. 3–4 (September 2008): 230, <https://doi.org/10.1007/s10892-008-9033-z>.

²¹ Carl Ginet, ‘In Defense of a Non-Causal’: 236-237.

²² *Ibid*

²³ Peter van Inwagen, *An Essay on Free Will* (Oxford: Clarendon Press, 1983), 12-13.

²⁴ *Ibid* 56.

,and (2) even if a person's actions are programmed by, known to or determined by X, a person can still act freely based on his ability to decide to act or not to act on certain manners as X has features provided that allows a person to decide.

The significance of asserting the compatibility of "free will" and "determinism" is aimed to satisfy the need to hold a person's action accountable to the demands of the concept "moral responsibility". Arguments that support compatibilism can be grouped into three: The Paradigm Case Argument, the Conditional Analysis Argument and the Mind Argument.²⁵ When a scholar delineates the compatibility of free will and determinism, she starts by defining the terms "Free" "Will" and "to be determined". The meanings attributed to these terms are derived from cases, instances, or situations of human behaviours. From these cases of human interactions, paradigms for the teaching of the meanings of the words such as "Free", "Will" and others are deduced.²⁶ Van Inwagen (1983) noted that assertions within the Paradigm Case Argument have the following pattern of definition and argumentation:

...the Paradigm Case Argument (i) purports to establish the existence of actual occasions of free action by an appeal to the necessary correctness of applying the term 'a free act' to those acts that are used to teach the meaning of this term, and (ii) proceeds, by means of argument (b), to derive from the possibility of so establishing the existence of free action the conclusion that free will and determinism are compatible.²⁷

A Conditional Analysis Argument is grounded on an aim to show that a person has the capacity to act freely, that is by having the ability to do otherwise, in given conditions. Proponents of compatibilism who argue by means of conditional analysis provide statements or propositions of conditions in which the agent's ability to do otherwise is emphasized. Then, counterexamples against these conditional propositions are either rebuked by pointing to the perceived strengths of the provided conditions or modifications to the initial conditional propositions by means of adding qualifications are utilized to defend the compatibility of free will to determinism. Frankfurt (1983) enumerated these patterns of conditional propositions:

²⁵ Peter van Inwagen, *An Essay on Free Will* (Oxford: Clarendon Press, 1983), 106.

²⁶ *Ibid* 15.

²⁷ *Ibid* 109.

x could have done y =_{df} if x had chosen to do y, x would have done y, and x COULD HAVE chosen to do y²⁸

x could have done y =_{df} if Rxy, then x would have done y, and A, ('Rxy' represents some condition on x and y such that it is possible that this condition hold without x's doing anything antecedent to his doing y)²⁹

if x had wanted to do y (more than anything else), then x would have done y³⁰

x could have done y =_{df} if x had wanted to do y, x would have done y and it is false that if x had wanted to do y, x would have possessed some advantage with respect to doing y that x did not actually possess³¹

if x had wanted to do y, x would have done y and x's wanting to do y would not have been sufficient (in the "broadly logical" sense) for x's possessing an advantage with respect to doing y that x did not actually possess³²

Whenever these patterns of conditional propositions are used to support the argument that free will is compatible to determinism, the emphasis being intended is that these conditional formulations demonstrated that human actions are dependent on their wills which are deemed free because, as captured by these conditional propositions, "an agent is free if and only if he acted in the way that he did because he wanted (or chose) to do so and would have acted otherwise if he had wanted (chosen) to".³³

The Mind Argument asserts that Free Will is congruent with Determinism by rebuking the plausibility of categorizing undetermined acts as free. This means that Freedom is not compatible with the notion of indeterminism. It firmly argues that "Free Will is not only compatible with determinism but entails determinism".³⁴ Compatibilist arguments that are aligned with the Mind Arguments have the following forms of assertions:

²⁸ Ibid 117.

²⁹ Ibid 117-118

³⁰ Peter van Inwagen, *An Essay on Free Will* (Oxford: Clarendon Press, 1983), 118.

³¹ Ibid 119-120

³² Ibid 120

³³ Bernard Berofsky, 'Classical Compatibilism', in *The Routledge Companion to Free Will*, 2016, 77-78.

³⁴ van Inwagen, 106, 126.

(1) If the incompatibilist's account of free action is correct, then a free act is an act that is undetermined by prior states of affairs. But an act that is undetermined is a mere random or chance occurrence, and a random or chance occurrence is hardly the kind of thing that could be called a free act.³⁵

(2) If an act is not determined to occur by prior states of affairs, then it is not really an act at all.... This is because, whatever else an act may be, it is a production of its agent. But if an "act" is undetermined, it is not a production of its putative agent and hence not really his act at all. We have seen, therefore, that an act, and a fortiori a free act, cannot be an undetermined act, for an undetermined act is a contradiction in terms.³⁶

(3) In a world in which events relevant to the formation of free actions are undetermined, actions are caused by, but not determined by, the prior states of mind (e.g. desires and beliefs) of agents. But, in such an indeterministic world, no one has a choice about whether one's state of mind will have a particular result or not. Similarly, one's state of mind, being an ultimate result of earlier events over which one has no choice, is also not something one has a choice about. Thus, since one has no choice about anything that is relevant to the bringing about of one's actions, one has no choice about those actions themselves.³⁷

Semicompatibilism

Semicompatibilism considers the relationship among "God's foreknowledge of human behaviours", "causal determinism" and "one's freedom to do otherwise".³⁸ Semicompatibilism primarily asserts that moral responsibility is compatible with both God's foreknowledge and Causal Determinism. In addition to this, Semicompatibilism does not argue whether God's foreknowledge and Causal Determinism rule out one's ability to do otherwise. Semicompatibilists also assert that "the compatibility of causal determinism and moral responsibility does not hinge on the compatibility of causal determinism and freedom to do otherwise".³⁹ Another semicompatibilist assertion is that "even if causal determinism is to rule out freedom to do otherwise,

³⁵ Van Inwagen 128

³⁶ Ibid, 129.

³⁷ Dana K. Nelkin, 'The Consequence Argument and the Mind Argument', *Analysis* 61, no. 2 (2001): 109.

³⁸ John Martin Fischer, 'Semicompatibilism', in *The Routledge Companion to Free Will*, 2016, 30.

³⁹ Ibid 31.

causal determinism would still be compatible with moral responsibility”.⁴⁰ Semicompatibilists disagree with the claim that causal determinism dissolves moral responsibility because causal determinism leads to lack of “creativity”, “initiation” and “Sourcehood” which are fundamental to hold someone morally responsible. In relation to the notions of Creativity, Initiation and Sourcehood, in the perspective of semicompatibilism, there are “Ordinary” and “Rigorous” versions for each of these factors. Fishcer (2016) emphasized the significance of the “Ordinary” and the “Rigorous” by stating:

...it seems to me that the plausibility and general appeal of the contention that moral responsibility requires sourcehood (similar as in creativity and initiation) derives from employment of the ordinary, commonsense notion of sourcehood. If we plug in the more rigorous notion of sourcehood, we lose the broad and uncontroversial appeal of the principle, and we are left with something highly contentious.⁴¹

It concludes that the ordinary versions are necessary to hold a person’s morally accountable and it is compatible with causal determination. On the other hand, the rigorous versions of Creativity, Initiation and Sourcehood are contentious and there is no “widespread intuition” in relation to whether these are required for moral responsibility and these rigorous versions cannot be accommodated to causal determinism.⁴² If the rigorous interpretations of Creativity, Initiation and Sourcehood are to be invoked as the tenets of one’s ability to do otherwise which is claimed to be necessitated by moral responsibility, then, as the semicompatibilists have claimed, “the argument for the incongruency of causal determinism and freedom to do otherwise is considerably stronger than the direct arguments for the incompatibility of causal determinism and moral responsibility”.⁴³ These assertions are both in accordance to and against classical compatibilism, hence the name “Semicompatibilism”.

Identificationist Views

Identificationist Views are based on the impact of a person’s internal motivational structure or his desires to his ability to act freely. Many scholars have provided Iden-

⁴⁰ Ibid

⁴¹ John Martin Fischer, ‘Semicompatibilism’, 35.

⁴² John Martin Fischer, ‘Semicompatibilism’, 34-36.

⁴³ Ibid

tificationist arguments to explain Free Will and Moral Responsibility and these arguments could be traced on the notion of “Hierarchy of Desires” which suggested that humans, in contrast to other species, have both “First order desire” and Second Order Desire”. The former refers to “simply wanting to do or not to do one thing of another” and the latter implies “capacity for reflective self-evaluation that is manifested in the formation of wanting to have or not wanting to have certain desires and motives”.⁴⁴ This could mean that the second order relates to a person’s capacity to reflect on initial, distal desire that precedes and leads the desire to act while the first order pertains to one’s desire proximal to his act. Frankfurt (1971) explains that “someone has the first order desire when he wants to do or not to do such-and-such, and he has a second order desire when he wants to have or not to have a certain desire of the first order”.⁴⁵ The primary assertion claimed by the Identificationist Views is that a person “is free to the extent that one is able to do what one truly wants to do, where true wants are understood as desires with which the agent identifies”.⁴⁶ There are two categories of Identificationist views that have different stances on the relevance of the ability to do otherwise to freedom. These are the “Broad Identificationist Approach” and the “Narrow Identificationist Approach”.

The Broad Identificationist Approach emphasizes that for a person to have Free Will, he must have the capacity to act on motivations with which he is identified with. These capacities to act on certain motivations are both manifested (1) when a person implemented an action due to this motivation that he clearly identifies with, and also (1) when a person identifies with this motivation but does not exercise it and implement an action that is not relevant to this motivation. This motivation constitutes “what an agent truly want to do” that is different from “what effectively moved an agent”.⁴⁷ In this view, it is asserted that a person has the ability to do what he truly wants to do if he has also the ability to do otherwise than what he did.⁴⁸ A person’s Freedom, as it is implied in the Broad Identificationist Approach, that is relevant to Moral Responsibility is “either (1) having one’s action governed by one’s identifica-

⁴⁴ Harry G. Frankfurt, ‘Freedom of the Will and the Concept of a Person’, *The Journal of Philosophy* 68, no. 1 (14 January 1971): 6-7. <https://doi.org/10.2307/2024717>.

⁴⁵ Frankfurt, *Freedom of the Will*: 7.

⁴⁶ Agnieszka Jaworska, ‘Identificationist Views’ in *The Routledge Companion to Free Will*, 2016, 42-43.

⁴⁷ *Ibid* 44-45.

⁴⁸ *Ibid*.

tion or (2) being free to have one's action governed by one's identification"⁴⁹. This identification-based distinctions are similar to the differences between "to act based on one's own free will" and "to have freedom of the will"⁵⁰. The Narrow Identificationist Approach defines Freedom as "acting on a motivation with which one is identified" and this means that "an action is free if, and only, if it flows from one's identification"⁵¹. The difference between the Broad and the Narrow versions of Identificationism focuses on which notion freedom is necessitated by moral responsibility as these two approaches differ on "what it takes for an agent to be identified with a motivating attitude" that constitutes Freedom.⁵²

Reason-Responsive Theories of Freedom

Reason-Responsive Theories of Freedom explicate that a person has free agency in accordance to his reactivity to a wide range of different reasons in relation to the assumed control condition of moral responsibility.⁵³ Scholars who advocate within the reason-responsiveness position claim that one is said to have acted freely if his actions were based on a standard of reasons. Some scholars have used the distinct terminologies such as "good reason", "True reason", "right reason" and many other appropriations of the word "reason" to certain categories. Reason-Responsiveness Theories of Freedom could be differentiated from the "Mesh Theories" such as that of the Hierarchy of Desires proposed by Harry Frankfurt and other Identificationist scholars. To recall that within the Identificationist views, a person acts freely when his actions are initiated based on higher order desires (the Frankfurt's second order desire) and a person is deemed to have acted in an unfree condition if he acted from desires or motivations that "he did not want to" move him. This could be true in cases of those persons with addictions. However, there are some situations wherein the notion of "weak will" seems to be evident which the Frankfurt-based Mesh Theories find difficult and uncertain to explain. In some addiction-related cases, "it seems more plausible to say that the agent freely acts from desires that at a higher order she prefers not to act from"⁵⁴. Proponents of reason-responsiveness theories assert that

⁴⁹ Ibid 47.

⁵⁰ Frankfurt, Freedom of the Will: 14-17.

⁵¹ Agnieszka Jaworska, 'Identificationist Views': 46.

⁵² Agnieszka Jaworska, 'Identificationist Views': 49

⁵³ Michale Mckenna, 'Reason-Responsiveness Theories': 59.

⁵⁴ Ibid 71.

the difference between an “unfree action” and an “addictive desire” is that a person who had unfree actions was responsive to narrower class of reason than those who acted based upon addictive desires.⁵⁵ It could be deduced from the many Response-Responsiveness Theories that a person’s decision to act or not to act is dependent on a scale of reasons wherein each of these scaled reasons could increase or decrease one’s inclination to implement or not to implement an action. These reasons are then measured based on distinct categories. Among these mechanisms that were proposed to ensure soundness of a reason to consider an action to be free and morally accountable include (1) a sanity constraint which involves a hypothetical interviewer who ascertains that a person has a intelligible understanding of a reality-based world, (2) a condition that a person must have competent awareness of moral actions, and (3) other scholars added a more stringent requirement that a person must have some degree of metaethical views about morality and reasons.⁵⁶ Holding a person morally responsible because he has acted freely must also consider the degree by which a person is receptive and reactive to these spectrum of reason categories. The degree of a person’s “Receptivity” and “Reactivity” to reasons have been asserted as crucial factor that enable a person to have “guidance control” over his behaviour, thereby he can be blameworthy or praiseworthy of his action.⁵⁷ Reason-receptivity is a condition in which a person recognizes and assesses the reasons he consider to be adequate to act otherwise or instead to continue in performing as the person actuates.⁵⁸ Reasons-reactivity refers to one’s choosing and acting based on the reasons one considers to be enough for his actions. Proponents of theories of freedom based on reason-responsiveness differ as to what degree of receptivity and reactivity should be expected from a person to be held morally responsible. Some are inclined to attribute a mild reason-receptivity and a weak reason reactivity to a person who acts freely while others propose that an asymmetry is not sufficient rather a similar degree of reactivity and receptivity is necessary. Thus, one’s responsiveness to a range of reasons which one attributed to his actions determine his moral accountability.

⁵⁵ Ibid 72.

⁵⁶ Mckenna, ‘Reason-Responsiveness Theories’: 68-69.

⁵⁷ John Martin Fischer and Mark Ravizza, *Responsibility and Control: A Theory of Moral Responsibility* (Cambridge: Cambridge University Press, 1998), 6, 81, 210.

⁵⁸ Mckenna, ‘Reason-Responsiveness Theories’: 68-69.

CHAPTER 1: IMMANUEL KANT ON HUMAN WILL AND ACTION

To present Kant's position on the entangled notions of the will, whether it is free or determined, it is necessary to understand his perspectives on the nature of man. A prerequisite to comprehend his thoughts on the nature of man is to analyse his theory of knowledge. In this chapter, I briefly present the fundamental concepts that are necessary to appreciate Kant's theory of knowledge. These basic concepts are to be understood by meanings which Kant has designated to the notions of (1) Noumena and Phenomena, (2) Space and Time, (3) A Priori and A Posteriori and (4) Synthetic and Analytic. I then equate these to his concepts of Transcendental Idealism and Transcendental Freedom. These are then linked to Kant's notion of a Good Will and subsequently related to his blueprint of the Categorical Imperative. At the end of this chapter, I conclude that the interpretations of Kant's position pertinent to the Human Will and Moral Responsibility is that (1) determinism is true, (2) there is free will, and (3) having free will and being determined are compatible with moral responsibility.

1.1. The Noumena and The Phenomena

For Kant, the Noumena pertains to "the things as they are" while the Phenomena refers to "the things as they appear". The "things" could mean all that are to be relevant to, interact with or perceived by humans. Among these, all those sensed things belong to the realm of Phenomena. As for the "Noumena", its existence can be perceived but its nature cannot be. The "Noumena" as to be understood from Kant is a realm that directs the manifestations of the Phenomena as humans experience it. In Kant's writings, the Noumena and the Phenomena are characterised as:

Appearances, to the extent that as objects they are thought in accordance with the unity of the categories, are called phenomena. If, however, I suppose there to be things that are merely objects of the understanding and that, nevertheless, can be given to an intuition, although not to sensible intuition (as *Coram intuiti intellectuali*), then such things would be called noumena (*intelligibilia*)⁵⁹

⁵⁹ Immanuel Kant, "Critique of Pure Reason" in P. Guyer and A. Wood (trans. and eds). (Cambridge: Cambridge University Press, 1998), 347 (A249), <https://doi.org/10.1017/CBO9780511804649>.

With these two realms, all of which a person experiences and everything that a man feels and comprehends depends on. The distinction between these two realms does not imply that they are separated and contradictory to each other, rather their distinction could signify that there is a mechanism of interaction that in a way could be complementary. The experiences that humans can deduct from the complementarity of these two realms can only be manifested and perceived through space and time.

1.2. Space and Time

For Kant, experiences of all the things that human senses are capable of perceiving are constituted through space and time which are the pure forms of experience and for this reason, space and time cannot be derived from experience.⁶⁰ Within the domain of space and time “the sensations can alone be ordered and placed in a certain form” thus space and time “cannot itself be in turn sensation” and space and time “can therefore be considered separately from all sensation”.⁶¹

Space is not the absence of things nor the gap between certain areas occupied by things. Space is not the distance which is a description of farness or nearness of physical objects from one another. Unlike distance which can be measured to understand physical remoteness and adjacency of objects, in Kant’s concept of space, it cannot be determined neither in an absolute or relative manner, and it “represents no property at all of any things in themselves nor any relation of them to each other”.⁶² The way by which the human mind experiences objects in terms of distance is made possible through the mind’s intuitive awareness of space but this “space” which the mind is aware of cannot be related to how the mind represents distance. For Kant, space enables the experience of distance among objects, but it is beyond the mind’s capacity to attribute physical features on it. As Kant says “Space is nothing other than merely the form of all appearances of outer sense, i.e., the subjective condition of sensibility, under which alone outer intuition is possible for us”.⁶³ This could

⁶⁰ Kant, “Critique of Pure Reason”, 157(A22).

⁶¹ Kant, “Critique of Pure Reason”, 156-157 (B34/A20).

⁶² Ibid 159 (A26/B42)

⁶³ Ibid

mean that the space which Kant intends to distinguish is metaphysical or that which is ideal and real.

These are Kant's conceptualisations of "Space":

1. Space is not an empirical concept that has been drawn from outer experiences.⁶⁴
2. Space is a necessary representation, a priori, which is the ground of all outer intuitions.⁶⁵
3. The apodictic certainty of all geometrical principles and the possibility of their a priori construction are grounded in this a priori necessity.⁶⁶
4. Space is not a discursive or, as is said, general concept of relations of things in general, but a pure intuition.⁶⁷
5. Space is represented as a given infinite magnitude.⁶⁸

Time is inseparable to space as this complementarity enables humans to have experience of themselves and the objects around them. The concept of time which Kant intends to emphasize is relevant to but not the milliseconds, seconds, minutes, hours, days, weeks, months, years, decades, scores, centuries and millenniums which are measurables through devices of technology that is based on the physics of the solar system. The time that Kant intends to discuss about is the template or origination of the human perception of time. It is the time which is one and infinite. It is the ultimate template of the measurable time. This time which Kant argues about is established and cognized in the mind in order for it to represent the measurable time. The mind has this inner recognition of the Time which it relies upon to create a distinctive assessment of objects in conjunction with its awareness of space. From this, experiences arise.

These are Kant's conceptions of time:

1. Time is not an empirical concept that is somehow drawn from an experience.⁶⁹
2. Time is a necessary representation that grounds all intuitions. In regard to appearances in general one cannot remove time, though one

⁶⁴ Kant, "Critique of Pure Reason", 157 (B38)

⁶⁵ Ibid 158 (A24)

⁶⁶ Ibid (B39)

⁶⁷ Ibid (A25)

⁶⁸ Ibid 159 (A25).

⁶⁹ Ibid 162 (B46)

can very well take the appearances away from time. Time is therefore given a priori.⁷⁰

3. This a priori necessity also grounds the possibility of apodictic principles of the relations of time, or axioms of time in general.⁷¹
4. Time is no discursive or, as one calls it, general concept, but a pure form of sensible intuition.⁷²
5. The infinitude of time signifies nothing more than that every determinate magnitude of time is only possible through limitations of a single time grounding it.⁷³

From these, Kant's concluded that:

1. Time is not something that would subsist for itself or attach to things as an objective determination, and thus remain if one abstracted from all subjective conditions of the intuition of them; for in the first case it would be something that was actual yet without an actual object. As far as the second case is concerned, however, time could not precede the objects as a determination or order attaching to the things themselves as their condition and be cognized and intuited a priori through synthetic propositions.⁷⁴
2. Time is nothing other than the form of inner sense, i.e., of the intuition of our self and our inner state.⁷⁵
3. Time is the a priori formal condition of all appearances in general. Space, as the pure form of all outer intuitions, is limited as an a priori condition merely to outer intuitions.⁷⁶

For Kant, the concepts "Space and Time" are the bases by in which the mind deduce experiences from objects. Both are ideal and real. Though these two conceptions are not that of the obvious understanding of space and time which can be measured. Rather these are concepts are sorts of which the mind apprehended prior to and necessary for the determinations of the space and time in the physical sense. Time and Space are a prior intuitions.

⁷⁰ Kant, "Critique of Pure Reason", (A31)

⁷¹ Ibid (A47)

⁷² Ibid (A32)

⁷³ Ibid (B48)

⁷⁴ Ibid 163 (A33)

⁷⁵ Ibid (B50)

⁷⁶ Ibid (A34)

1.3. A Priori and A Posteriori

Scholars who have thoroughly studied Kant's Critique of Pure Reason noted that from Kant's views, humans obtained knowledge mainly from two mechanisms. These are through the sensibility (Sinnlichkeit) and by understanding (Verstand).⁷⁷ The former means that knowledge of objects are given through the human senses while the latter signifies that knowledge are obtained through means by which the objects are thought by the intellect(nou̇s).⁷⁸ Kant argued for these two means by which knowledge is derived by stating that:

The capacity (receptivity) to acquire representations through the way in which we are affected by objects is called sensibility. Objects are therefore given to us by means of sensibility, and it alone affords us intuitions; but they are thought through the understanding, and from it arise concepts.⁷⁹

For Kant, cognition as a process by which the mind acquires understanding of the relations of among objects, that is, knowledge, is classified into two categories. These are "a priori" and "a posteriori" cognitions. When a person encounters events or ideas, may these be entirely new to him or those which are routine, the first factor of which his mind uses to derive understanding from these encountered events and ideas is the experiences he previously had or that of which he is experiencing. From these experiences, a person formulates his understanding and obtains knowledge. These knowledges which are derived from a person's synthesis of his experiences is what Kant defines as "a posteriori". The other category of cognitions is "a priori" which refers to all forms of knowledge which are not derived from experiences. A prior cognitions, according to Kant, gives a person an ability to speak more about the objects which are perceived by his senses more than what his experiences would allow him to understand those sensible objects.⁸⁰ A prior knowledge does not require to be validated by any experiences to ascertain its truth. Appeal to senses which is the way experiences are justified is not prerequisite to a person's perceptivity to a

⁷⁷ Alparslan Açıkgenç, "Kant and Ghazali on Human Nature":167.

⁷⁸ Kant, "Critique of Pure Reason", 62.

⁷⁹ Ibid 155 (B34/A20)

⁸⁰ Ibid 126 (B3).

prior knowledge. Kant attributes universality and necessity to all knowledges that are derived from a priori cognitions. Thus, Knowledge which is learnt through experiences is “a posteriori” while knowledge that is acquired independent of experience is “a priori”. In Kant’s own words:

Now such universal cognitions, which at the same time have the character of inner necessity, must be clear and certain for themselves, independently of experience; hence one calls them a priori cognitions: whereas that which is merely borrowed from experience is, as it is put, cognized only a posteriori, or empirically.⁸¹

For the universality and necessity of a priori knowledge, Kant explained that:

First, then, if a proposition is thought along with its necessity, it is an a priori judgment; if it is, moreover, also not derived from any proposition except one that in turn is valid as a necessary proposition, then it is absolutely a priori. Second: Experience never gives its judgments true or strict but only assumed and comparative universality (through induction), so properly it must be said as far as we have yet perceived, there is no exception to this or that rule. Thus, if a judgment is s thought in strict universality, i.e., in such a way that no exception at all is allowed to be possible, then it is not derived from experience, but is rather valid absolutely a priori.⁸²

From the above passages of Kant’s expositions, the a priori knowledge are perceived by the mind in a manner that does not require thorough mechanisms of proving its validity. It is something which is built-in to mind and, in a sense, that it is a bare intuition. Though some scholars have contested that nothing is innate to mind, but in a common terminology, a priori knowledge could be equated to something that is innate to the mind, that is already perceived by the mind without the usual degree of consciousness that is required in making sense of other forms of knowledge. The “a posterior” acquisition of knowledge is equivalent to all that the mind perceived based on the senses. These include knowledge that are learnt through human daily encounters with their environments and all that are from the enquiries of sciences which are commonly referred to as empirical results. As Kant has indicated, the empirical re-

⁸¹ Kant, “Critique of Pure Reason”, 127 (A2)

⁸² Ibid 137 (B4).

fers to understanding or sensibilities which the mind infer from experiences, direct or indirectly, of objects.⁸³

1.4. Synthetic and Analytic

Propositions which are statements that expresses judgments are among the focus of Kant's views on the nature of pure reasons. For Kant, judgments are of two forms. These are synthetic and analytic. Analytic judgments are conveyed in a proposition when the predicate is contained in the concept of the subject. Whereas, Synthetic judgments are deduced from propositions wherein the predicates are not contained in the subjects rather the predicates are related to the concept of the subject and creates a new concept. With these definitions, a distinguishing factor is the degree of amplification of knowledge that is to be taken from any given propositions. As for the analytic type, there is no amplification as the predicate does not add new concepts to the truth of the subject. Kant called analytic judgment as "Judgment of Clarification". In contrary, in a synthetic judgment, a new concept is produced and thus amplification of understanding is manifested. The predicate in a proposition which has synthetic judgment extends a person's knowledge beyond what is contained in the subject. Hence, it is also referred as "Judgment of Amplification". Kant defines these two forms of judgments as follows:

In all judgments in which the relation of a subject to the predicate is thought (if I consider only affirmative judgments, since the application to negative ones is easy) this relation is possible in two diverse ways. Either the predicate B belongs to the subject A as something that is (covertly) contained in this concept A; or B lies entirely outside the concept A, though to be sure it stands in connection with it. In the first case I call the judgment analytic, in the second synthetic.⁸⁴

1.5. Intuitions and Concepts

For Kant, a representation (*vorstellung*), as the most generic to describe the manner by which the mind acquires knowledge, are of two basic types. Under representation is perception which could be either subjective "sensation" or objective "cognition".⁸⁵

⁸³ Ibid 155 (B34/A20)

⁸⁴ Kant, "Critique of Pure Reason", 141 (A7)

⁸⁵ Ibid 398-399 (A320/B377)

Cognitions are of two types. These are intuitions and concepts. Thus, intuitions and concepts are the basic types of representation.

Kant defines intuition as “In whatever way and through whatever means a cognition may relate to objects, that through which it relates immediately to them, and at which all thought as a means is directed as an end”.⁸⁶ Intuition is “to have singular and immediate representations of particular objects by means of the senses”, whereas Concept is “the capacity to form abstract and general representations by means of the intellect”.⁸⁷ Concept having the characterization of “general representations” mean that it “can be common to several things”.⁸⁸ Concept can be empirical or pure. A pure representation is what Kant describes as “in which nothing is to be encountered that belongs to sensation”.⁸⁹ A pure concept that is not based on the sensibility rather entirely dependent on the understanding is termed “notion”. A concept that is constituted by notions is called “idea or a concept of reason”.⁹⁰ Thus, intuition pertains to a single object that is presented to the mind while concept has domains of objects which refer to it.

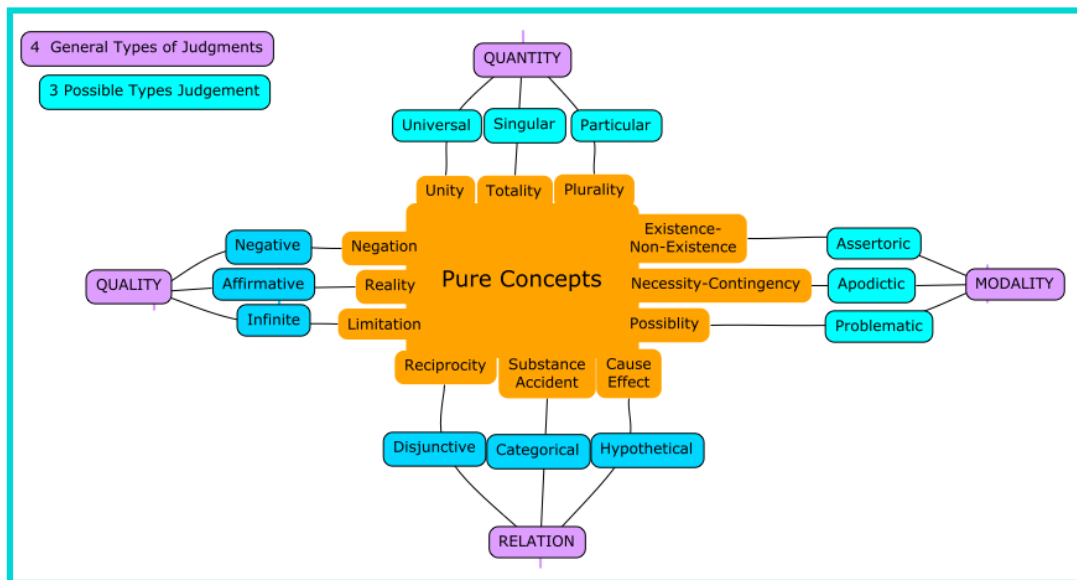


Figure 1 Types of Judgments and Categories of Pure Concepts.

⁸⁶ Ibid 172 (A19/B33)

⁸⁷ Ibid 36.

⁸⁸ Ibid

⁸⁹ Ibid 156 (B35/A21)

⁹⁰ Ibid 399 (B377)

Concepts can be classified as “a posteriori-empirical concepts” or “a priori concepts”. The former are concepts that are from empirical intuitions whereas the latter are produced by the mind’s spontaneity with no reference to the sensibility. Pure concepts of understanding are called “categories”. Categories could partly be deduced from the sensibility which Kant calls “schemata”. Categories which are derived from “notions” are called “Concepts of Reason”.

Kant proposes what he calls “Transcendental Deductions” based on the “Categories of Pure Concepts”. These categories of pure concepts of reason allows the faculty of understanding “to say about or to act upon” the inputs from the faculty of sensibility. As the bases of the mind to come up with an understanding of the objects of sensibility, these categories of pure concepts serve as fundamental “spectacles” in which sensed objects are interpreted by the understanding of the mind.⁹¹ Thus, it could be that these presupposed categories are being implied by the faculty of reason which Kant’s characterizes as a spontaneous faculty capable of generating a priori concepts whose formulations do not involve any inputs from experiences. Kant defines the faculty of reason by stating:

...reason is the faculty of the unity of the rules of understanding under principles. Thus it never applies directly to experience or to any object, but instead applies to the understanding, in order to give unity a priori through concepts to the understanding's manifold cognitions, which may be called "the unity of reason," and is of an altogether different kind than any unity that can be achieved by the understanding.⁹²

1.6. Reasons and Actions

For Kant, all voluntary actions are grounded on undetermined reasons. These reasons are free from determinations of both external and internal factors. These reasons are not determined by experiences nor by the understanding synthesized by the mind from the objects of experiences. Rather these reasons cause the understanding that leads to the implementation of an action. These are the pure reasons which have to be

⁹¹ Kant, “Critique of Pure Reason”, 399 (B378)

⁹² Ibid 389 (B359)

distinguished from the reasons attributed to have causality in the realm of the phenomena due to a person's having "an empirical character for his power of choice" which merely conveys an experience-based interpretation of "a certain causality of his reason".⁹³ Though their effects are manifested in the series of appearances as in mental cognitions and implemented actions, these pure reasons have no prior causes as such that they are the "unconditioned condition" of every voluntary action.⁹⁴ For the crucial argument that all actions are direct consequences of pure reasons, Kant explained that:

...reason therefore acts freely, without being determined dynamically by external or internal grounds temporally preceding it in the chain of natural causes, and this freedom of reason can not only be regarded negatively, as independence from empirical conditions (for then the faculty of reason would cease to be a cause of appearances), but also indicated positively by a faculty of beginning a series of occurrences from itself, in such a way that in reason itself nothing begins, but as the unconditioned condition of every voluntary action, it allows of no condition prior to it in time, whereas its effect begins in the series of appearances, but can never constitute an absolutely first beginning in this series.⁹⁵

The manner by which Kant argued for the irrelevance of experiences to pure reasons was primarily based on the mechanisms that underlie the three faculties of the mind namely "the faculty of sensibility", "the faculty of understanding" and the faculty of reason". From his expositions on these faculties, it could be understood that there is a bi-directional relationship between the faculty of sensibility and faculty of understanding. Whereas for the faculty of reason, there is only a uni-directional flow of input towards the faculty of understanding. Through these mechanisms of relationship, the reason was evidently distanced from the action. This is because in Kant's mechanism of the faculties, any effects of actions would be contained within the selectivity of the faculty of sensibility and faculty of the understanding. While the effects of reasons flow throughout the two faculties. Hence, within these mechanisms, reasons are entirely isolated and free from any influences from actions.

⁹³ Kant, "Critique of Pure Reason", 543 (A549 / B577)

⁹⁴ Ibid 543 (A554/B582)

⁹⁵ Ibid 543 (A554/B582)

1.7. Transcendental Idealism

As described from the preceding sections of this chapter, Kant have ventured into clearly distinguishing sets notions of from each other in a manner of some degrees of opposition and at most with complimentary relationships. All these distinctions are intended to elucidate the means by which knowledges are to be acquired and classified. The Transcendental Idealism can be understood based on these distinctions of the originations, formulations, and categories of knowledge in relation to the mechanisms employed by the three faculties of the mind. As Kant noted:

We have sufficiently proved in the Transcendental Aesthetic that everything intuited in space or in time, hence all objects of an experience possible for us, are nothing but appearances, i.e., mere representations, which, as they are represented, as extended beings or series of alterations, have outside our thoughts no existence grounded in itself. This doctrine I call transcendental idealism.⁹⁶

Fundamental to Kant's Transcendental Idealism is the strict distinction between the noumena and the phenomena which asserts that the objects in world as humans perceived them "are the things as they appear" which is implied by the concept phenomena and the objects in the world "as they really are" as contained in the concept noumena. With this distinction, what is being intended to be asserted are the truths and limitations of knowledge of which humans are capable of apprehending. Thus, in the realm of Phenomena, knowledge is evidently accessible and open for investigations subject to the presupposed intuitions of time and space of the faculty of sensibility and in conjunction with faculties of understanding and reason, whereas in the noumenal dimension, it is to be acknowledge that it exists and that a prior knowledge are caused by the noumena. Humans cannot validate the noumena to the inquisitiveness of sciences as the noumena is not subject to the physical laws implied in these sciences which are products of the dynamics of the phenomena. It is the noumena that determines the phenomena, that is, the things are they truly are determines as the things as they appear to humans.

Perhaps, a way in which a certain feature of the noumena is reflected in the realm of the phenomena is the manner by which the categories of pure concepts of reasons

⁹⁶ Kant, "Critique of Pure Reason", 511 (A491/B519)

determine the use of the understanding in relation to objects brought upon and perceived by the faculty of sensibility. As Kant has argued that these pure concepts of reasons which determine actions have not causes that precede them as they become manifested in the realm of phenomena. Though there is a clear demarcation between the known phenomena and the known unknown noumena, their supposed complementarity validates of the scope of knowledge cognized by the mind. This can be understood from Kant's meticulous distinctions of the concepts "a priori" and "a posteriori", "analytic" and "synthetic", as well as his explanations relevant to the three faculties of the cognitive abilities which involve "intuition" and "concepts" and other terms which have been briefly described in the earlier sections of this chapter.

The mind is the core significance of Kant's Transcendental Idealism. This mind is supposed to accept that there is noumena and it has to find within itself that the very tenet of its cognitive function relies upon the noumena and that its ability to make sense of the experiences that are perceived by its senses is limited to the physics of the phenomena that is ultimately determined and caused by the noumena. The awareness of the mind that whatever it perceives are mere representations of "the things as are they are" is both the validation of the certainty of the knowledge it perceives as well as the limitation by which inquest of knowledge is to be sought. Further, It could also be understood from the Kant's Transcendental Idealism that what is to be labelled as "real" has to be based on what the mind cognizes in pertinent to the mere appearances of the phenomena as such are real empirical knowledge which cannot exist beyond the receptivity and spontaneity of the mind.⁹⁷ This could also be related to what Kant has intended to imply in this passage:

Our transcendental idealism, on the contrary, allows that the objects of outer intuition are real too, just as they are intuited in space, along with all alterations in time, just as inner sense represents them. For since space is already a form of that intuition that we call outer, and without objects in it there would be no empirical representation at all, we can and must assume extended beings in space as real; and it is precisely the same with time. Space itself, however, together with time, and, with both, all appearances, are not things, but rather nothing but representations, and they cannot exist at all outside our mind.⁹⁸

⁹⁷ Kant, "Critique of Pure Reason", 427 (A371/A372)

⁹⁸ Ibid 511 (B520/A492)

Transcendental Idealism, as pertinent to the distinctions of knowledge which the mind is capable of acquiring and comprehending, does not argue for the falsehood of knowledges obtained via experiences which are the subjects of sciences, rather Transcendental Idealism provides a supplementary mechanism by which sets of knowledge are produced, understood and synthesized.

1.8. Transcendental Freedom

Suppose there were a freedom in the transcendental sense, as a special kind of causality in accordance with which the occurrences of the world could follow, namely a faculty of absolutely beginning a state, and hence also a series of its consequences; then not only will a series begin absolutely through this spontaneity, but the determination of this spontaneity itself to produce the series, i.e., its causality, will begin absolutely, so that nothing precedes it through which this occurring action is determined in accordance with constant laws.⁹⁹

For Kant, Transcendental Freedom implies that due to the empirical and intelligible characters which the mind has, all voluntary actions signify freedom and at the same time congruent to the laws of nature. The source of freedom which Kant intends to emphasize is grounded on the intelligible character of the mind. This intelligible character has been formulated by Kant based on his distinctions between the noumena and the phenomena as well as the differentiations of knowledge that the three faculties of the mind acquire and synthesize.

In its bare connotations, freedom implies “being free from something” and “being free to do something”. Conditions opposite to freedom could include among many others the “being controlled or manipulated” or “being coerced or forced”. Kant defined and contrasted the state of having “freedom” from the state of being subjected to the “laws of nature”:

Thus, we have nothing but nature in which we must seek the connection and order of occurrences in the world. Freedom (independence) from the laws of nature is indeed a liberation from coercion, but also from the guidance of all rules. For one cannot say that in place of the laws of nature, laws of freedom enter into the course of the world, because if freedom were determined according to laws, it would not be freedom, but

⁹⁹ Kant, “Critique of Pure Reason”, 485 (A447/ B 475)

nothing other than nature. Thus, nature and transcendental freedom are as different as lawfulness and lawlessness.¹⁰⁰

The deterministic laws of nature and the freedom attributed to the intelligible character of the mind could be perceived contradictory only if they are to be considered both existing in the same dimension of the phenomena. However, it is Kant's central argument that the intelligible character of the mind is part of the noumena and the noumenal dimension underpins all the appearances in the phenomenal world. For this reason, the intelligible character of the mind is secluded from the effects of the causalities of the laws of nature. The intelligible character, as it is presupposed to be in the noumena, causes all the voluntary actions in the phenomena. Thus, the intelligible character has freedom which is not subjected to any phenomenal determinations or causalities. Transcendental Idealism provides the type of "Freedom" which is a condition of all voluntary actions and it also acknowledges the truth of "Determinism" caused by a series of actions in the past that determine the present and in the present that determine the future, as well as the chain of causalities brought forth by the laws of nature.

1.9. Interpretations of Kant's Position

"The Noumena and The Phenomena", "Analytic and Synthetic", "A Priori and A Posteriori", "Space and Time", "Intuitions and Concepts", "Three Faculties of the Mind", "Transcendental Idealism" and "Transcendental Freedom": From these fundamental concepts which constitute Kant's Philosophy, three assertions can be deduced in relation to the Free Will debate. First, Kant argues for the existence of a necessary freedom as a condition of all voluntary actions. An interpretation from this argument means that there is free will. Second, Kant argues that the noumenal freedom causes phenomenal actions and these actions cause chains of causalities which establish the deterministic laws of nature. An interpretation for this argument implies that determinism is true. Third, Kant argues that there is a uni-directional noumenal causality towards the phenomena as in the case of the freedom of the intelligible character that determines actions: Noumenal freedom-based actions produce causali-

¹⁰⁰ Ibid 485 (A447/ B 475)

ty in the phenomena. An interpretation for this is that there is compatibility between Free Will and Determinism. Thus, Kant's Transcendental Idealism which is the foundation of his Transcendental Freedom conveys that there is Free Will, Determinism is true, and both are compatible.

Among the many scholars who have studied Kant's Philosophy, those who argue within the views of Libertarianism and Compatibilism have relied on Kant's position to advance their arguments. If it is to be understood that the Transcendental Freedom advocates for the compatibility of Free Will and Determinism with regards to Moral Responsibility, then Kant's position could be linked to the claims of contemporary scholars who contend for Compatibilism. A compatibilist view is in agreement with this passage wherein Kant characterized his Transcendental Freedom:

...transcendental freedom, which must be thought as independence from everything empirical and so from nature generally, whether it is regarded as an object of inner sense in time only or also of outer sense in both space and time; without this freedom (in the latter and proper sense), which alone is practical a priori, no moral law is possible and no imputation in accordance with it.¹⁰¹

The Libertarian view that a person's freedom with regards to his chosen actions are not subject to determinism can also be accommodated in the above quoted passage. In some passages, Kant has provided detailed examples of cases when a person is to be held morally responsible for his actions. Within these cases, Kant has emphasized the freedom attributed to the intelligible character of the mind and that determining causes have effect only on the empirical character but none on the intelligible. These detailed examples of cases are often taken to support both views in Compatibilism and Libertarianism. Among these cited examples is this:

one may take a voluntary action, e.g. a malicious lie, through which a person has brought about a certain confusion in society" when "one may first investigate its causes... and its consequences... one goes into the sources of the person's empirical character.. one proceeds as with any investigation in the series of determining causes for a given natural effect.. blame is grounded on the law of reason, which regards reason as a cause that... could have and ought to have determined the conduct of the per-

¹⁰¹ Immanuel Kant, Immanuel Kant: Critique of Practical Reason, ed. Mary J. Gregor and Andrews Reath (Cambridge: Cambridge University Press, 1997), 63(5:97) <https://doi.org/10.1017/CBO9780511809576>.

son... one regards the causality of reason not as a mere concurrence with other causes, but as complete in itself.; the action is ascribed to the agent's intelligible character: now, in the moment when he lies, it is entirely his fault; hence reason, regardless of all empirical conditions of the deed, is fully free, and this deed is to be attributed entirely to its failure to act.¹⁰²

It is important to note that when Kant individually defines or separately describes the terms “empirical character”, “intelligible character”, “pure reason”, and “freedom”, each of their segregated meanings could seem to adhere either only for Libertarianism or Compatibilism. However, it is the unity of the meanings of all these concepts that Kant truly intend to convey and that is the holistic claim that Freedom and determinism are compatible, and that the truth of their compatibility satisfies the demand of moral responsibility.

¹⁰² Kant, “Critique of Pure Reason”, 544 (A555/ B583)

CHAPTER 2: AL-GHAZALI ON HUMAN WILL AND ACTION

How can it be that a slave be free? If humans are God's slaves, then how can freedom be attributed to them? As the condition of being a slave is contradictory to the state of being free. Perhaps, the notion of being a slave of God and being a slave of fellow humans are views that have to be understood differently. The same approach has to be considered in the context of freedom.

In the beginning, humans were created by God. They were fashioned through God's spirit.¹⁰³ From clay, a series of process that lead to the formation of sperms among men and ova among women, which through marriage, consequently resulted to the union of these reproductive cellular units that become the biological template for the creation of a foetus which after on average 9 months lead to the birth of a new born. The basis by which humans give birth has been mentioned in the Quran long before sciences have provided a clear biological pathway regarding foetal conception. It is this Quranic verse which Al-Ghazali have relied upon to advance his understanding of the nature of man.

Ghazali's expositions on the Nature of Man in the perspectives of Islam is fundamental to his conception of the human will. In this chapter, to describe Ghazali's position on the Human Will, first, I present his concepts on what constitutes a human based on his concept of the "Latifah Rabbaniyah" from which he established that humans have free will. In the second section, I discuss Ghazali's arguments about causality from which it could be deduced that Ghazali has two approaches to determinism. In the last section, I link Ghazali's views on causality to his description of the Latifah Rabbaniyah which incorporates the concepts of knowledge acquisition, will and power to act.

2.1. The Latifa Rabbaniyah: The Human Self

For Al-Ghazali, a human is made up of a body and a soul. The body is the physical matter which is constituted by blood, tissues, and organs. The soul which is also referred to as the heart is the Latifah Rabbaniyah is the immaterial aspect which controls all activities of the human body. As Ghazali says:

¹⁰³ al Qur'an 15: 24, 38: 72.

The first step to self-knowledge is to know that thou art composed of an outward shape, called the body, and an inward entity called the heart, or soul. By "heart" I do not mean the piece of flesh situated in the left of our bodies, but that which uses all the other faculties as its instruments and servants.¹⁰⁴

In the body, the Latifah Rabbaniyah has several manifestations with regards to the activities that it performs. Four terms are used to describe these activities. These are the “Qalb”-heart, the “Ruh”-spirit, the “Nafs”-self, and the “Aql”-intellect. Each term has two corresponding connotations in relation to specific functions which are attributed to them. It is important to note that these terms and their ascribed functions are complimentary to each other and the complementarity of their interactions enables the dynamics between the soul and the body.

The “Qalb” has two meanings. First, it refers to the myocardium, the physical heart, which is a hollow muscular organ that pumps blood throughout the body. Second, the Qalb is the immaterial soul when it is inside the body and it is located in the physical heart. According to Al-Ghazali:

By the soul, I don't mean heart made up of flesh but it is a subtle Sir or secret essence which the bodily senses fail to perceive. It is a spiritual substance from God and has been described sometimes by Nafs, sometimes by Qalb. The material heart is the vehicle for the spiritual essence.¹⁰⁵

The soul as the immaterial, formless latifa is linked to heart so as to control movements of the bodily limbs and this connection with the physical heart is made possible through acquiring “spiritual knowledge” (Ulume Mokashafa) and “knowledge of worldly usages (Ulume Muamalah).¹⁰⁶

The “Ruh” which also resides in the heart has two denotations. It is regarded as both material and immaterial. It is called “Life” as a material thing in a manner that it “vibrates the whole body like the current of electricity and which runs through the veins

¹⁰⁴ Al-Ghazali, *The Alchemy of Happiness*, trans. Claud Field, 1910, 2.

¹⁰⁵ Al-Ghazali, *The Revival of the Religious Sciences*, trans. Mawlana Fazil Karim, Vol I, 56, <http://ghazali.org/ihya/english/index.html>.

¹⁰⁶ *Ibid*, Vol III, 8.

of the body” and thus allows sensations and physical movements.¹⁰⁷ The second attribute of the Ruh is “an immaterial subtle thing which is called soul” and, invoking a verse from the Quran, Ghazali says that the Ruh is the “command of God”.¹⁰⁸ As it the command of God, the Ruh undergoes five states.¹⁰⁹ It begins with the state of nonexistence. Then it comes to the world of souls when it is in the state of existence. Subsequently the Ruh is linked to the material body at the state of connection. Then, the state of separation occurs. The last is the state of returning that happens when the material body dies. According to Al-Ghazali, the Ruh is commanded to pass through these five states for the following reasons:

State of nonexistence	To attain knowledge of the creation of his soul (nafs) and the eternity of his creator
State of existence	To know Allah most high through the essential attributes such as being omnipotent, omniscient, living, all-hearing, all-seeing, all-speaking and all-willing.
State of connection	:to acquire perfect knowledge concerning the world of the unseen and to become aware of particulars and universal : to obtain knowledge through the active attributes such as being provident, ever-repenting, all-forgiving, gracious, merciful, beneficent, charitable and bestowing.
State of separation	To remove wickedness, which was acquired by the ruh through the companionship of bodies and drinking and tasting in the station of nearness.
State of return	To obtain the bounties of the hereafter

Table 1: Five States of Ruh.¹¹⁰

The Nafs which can be referred to as the self has two characterizations. A nafs that has evil attributes such as greed and anger is a passionate, lower self. The opposite of this is a nafs which is divine and inclined towards good virtues. The nafs undergoes three stages.¹¹¹ It is called “nafs amarah” when it is in a state of doing evils. It is termed” nafs lawammah” when it is the state of trying to subdue its wrong deeds. When it has completely overcome anger, greed and other bad qualities, it is called “nafs mutmaina”.

¹⁰⁷ Al-Ghazali, *The Revival of the Religious Sciences*, trans. Mawlana Fazil Karim, Vol III, 8.

¹⁰⁸ Al-Ghazali, *The Revival of the Religious Sciences*, Vol III, 8.

¹⁰⁹ Che Zarinna Saari, ‘The Purification of the Soul According to Sufis: A Study of Al-Ghazali’s Theory’, *Afkar-Bill*, no. 3 (2002): 109.

¹¹⁰ Data obtained from Che Zarinna Saari, ‘The Purification of the Soul According to Sufis: A Study of Al-Ghazali’s Theory’, *Afkar-Bill*, no. 3 (2002): 111.

¹¹¹ Al-Ghazali, *The Revival*, Vol III, 8-9.

The Aql has been attributed with two descriptions by Al-Ghazali. First, Aql refers to the intellect. Through intellect, “nature of things of this material world is known”.¹¹² Second, Aql refers to knowledge which pertains to a “power to understand the secrets of different learnings”. Referring to a hadith, Al-Ghazali says “Knowledge is the content of the intellect”. Thus, it means that Aql has both immaterial and material attributes. Knowledge is the immaterial and it could be said that the other aspect of the Aql is the material wherein knowledge is perceived and stored.

The Qalb, the Ruh, the Nafs and the Aql are the features of the latifa which is the soul in the human body. Though there are variations of the characteristics by Al-Ghazali, which were all based on the teachings of the Quran and the hadith, but all these features refer to the functions of the soul which allow the body to be alive, perceiving and comprehending. If Ghazali’s characterisations of the soul are to be related to the contemporary common views. Perhaps, it could be the same understood as the ordinary understanding of the self, as the consciousness, as the awareness, as the mind and as the thing which makes a person a person.

2.2. The Armies of the Soul: Mental and Physical Faculties

Ghazali calls it the soul’s armies which can be visually known or hidden from sight. These refer to the manner the soul functions within the body in this physical world. Ghazali likens the soul to as king who has three divisions of armies. These divisions are related to (1) the Will referred to as greed, (2) Power or Strength to move labelled as anger and (3) the regulation of sensations such that of smell, touch, hearing, taste and sight which could be pertinent to the intellect. The third division is categorised into two. First relates to the extremities. The second pertains to non-movement related abilities or mental activities such that of “(1) power of idea (2) power of thought (3) power of memory, (4) power of retention (5) and power of consolidation”.¹¹³

¹¹² Al-Ghazali, *The Revival*, Vol III, 8-9.

¹¹³ *Ibid* 10.

The soul has total control over all these mental and physical faculties.¹¹⁴ In Ghazali's own words:

In the empire of soul, hands, feet and other organs are like different businessmen and industrialists in town. Greed is a collector of revenue in that town, anger is its police and the intellect is its minister. The collector of greed is like one who collects food, anger is like a police who keeps guard over it. The collector of greed is a downright liar and a deceiver. It ostensibly wishes good but there is destructive poison in it. The reign of soul over the region of body is similar. It goes on well if all organs and attributes are under the rule of soul. When soul takes the help of its minister intellect, it rules over greed keeping anger in control. In order to bring anger under control, sometimes it seeks the help of greed and then its character and conduct become good.¹¹⁵

The soul is like a guard or that of a horse rider. In these depictions, Ghazali intends to emphasize that there must be a harmonious or balanced relationship between the various aspects of the human faculties of which the soul has the sole responsibility of obtaining and sustaining such a state of moderation. As a guard, the soul with its attribution as the intellect which directs the abilities of the senses must protect the body from the excesses of anger and sexual desires. As a horseman, the soul must ensure that greed (will) as a horse and anger (power) as a dog must be appropriately disciplined through knowledge.

2.3. The Categories of Human Actions

When the soul moves the body, the various actions it produces are categorized into three. Al-Ghazali classified these actions as (1) natural, (2) natural wilful act and (3) action of strength.¹¹⁶ The degree of control that a person has over his actions was the basis for these classifications.

Natural actions include processes in his body which he has no control over as these sorts of actions occur automatically. Natural wilful actions are those that a person has to do to ensure his survival. One class of these includes food intake, breathing, urinating and defecating of which a person has control but cannot totally abstain from such acts as his biological body demands these actions. Another class of natural wilful actions are those in which one has to act to protect himself from what he perceives as

¹¹⁴ Al-Ghazali, *The Revival*, Vol III, 10-11.

¹¹⁵ *Ibid* 11-12.

¹¹⁶ Al-Ghazali, *The Revival*, Vol IV, 206-207.

threats to him. Ghazali gave the act of a person who points a needle to another person's eye. In this scenario, the person to whom the needle is being aimed at as, soon as he becomes aware of the threat, would have his eye lids close to protect his eyes. In this class of actions, one has control and he has no choice from abstaining from an action as it is necessitated by self-preservation. The third category of actions pertain to actions which a person has total control and has options to choose from. Ghazali calls these "actions of power" which are voluntary actions. As Ghazali says:

The third kind of work in connection with power has got some controversy. Writing, walking, talking etc. are acts requiring strength. It is said of these actions that a man do these things if he wills and does not do them if he does not will.¹¹⁷

It is through these voluntary actions that the 4 natures of man are manifested. These natures are of beastly, animal, devilish and angelic.¹¹⁸ A beastly nature becomes evident when a person inflicts physical harm or insult to others with his feelings of hatred, enmity and anger. An animal nature is manifested when a person is gluttonous or when there is a manifestation of excessive sexual passion. A devilish nature is demonstrated through deception, betrayal and other acts to lead others into a state of agony. An angelic nature is revealed through his good acts such that of kindness, honesty, and other virtuous behaviours as well as adherence to God's divine laws. As the soul controls over the body, these 4 natures are centred on to the soul. The degree of manifestations of these natures depends on how much control the soul has over expressions of bodily actions. It is by the acquisition of knowledge that the soul becomes able to control his natures through his chosen actions.

2.4. Knowledge and the Soul

Human souls have varying abilities in acquiring knowledge.¹¹⁹ Ghazali says that the soul can receive information through his basic senses and this way obtaining knowledge is an attribute of the soul's animal nature. Adults, infants and animals are capable to this cognition via the sensory sense. The soul has the ability to retain in-

¹¹⁷ Ibid

¹¹⁸ Ibid Vol III, 14-15.

¹¹⁹ Ibid 12-16.

formation it has received via the senses and this sensed information allows the soul to have the ability of imagination based on the memory it has from the senses. However, this retention and imaginative capacity is not unique to humans as some animals possess this too. Another cognitive ability of the soul is to conceive ideas that are beyond the information that are derived from memory and senses. Further, the soul is also discursive as it has the ability to construct premises from his ideas to form knowledge. This ability is exclusive to humans and not found among animals. Ghazali says that the highest among these cognitive abilities of the human soul is the capacity to gain knowledge from the unseen world and this ability has been exclusively manifested by the prophets. This is a transcendental cognition of the soul.

The knowledge that soul utilizes to determine its preferred course of voluntary actions are of two categories. Ghazali calls these (1) knowledge concerning intellect and (2) knowledge concerning religion.¹²⁰ Intellect-related knowledge can be classed into two as acquired knowledge and natural knowledge. Acquired Knowledge which gained by learning can be grouped into two: (1) knowledge of the physical world and (2) spiritual knowledge about the hereafter. In contrast, natural knowledge is not attained by blind faith, but it is gained, though as to how and where this type of knowledge came from are not known. This could mean that natural knowledges are those that are in the soul which it uses to understand other forms of knowledge. Ghazali cites examples of natural knowledge that are grounded on the concepts of time and space:

...for instance, the knowledge that the same person cannot stay in two different places at the same time and that the same thing cannot be at the same time old and new. This preliminary knowledge is imprinted in a boy's mind in his earliest years. He does not know where from this knowledge comes.¹²¹

Knowledge concerning religion could be obtained through blind faith according to Ghazali. Such form of knowledge can be obtained through the study of the Quran and the traditions of the Prophet. For Ghazali, the soul can only be truly saved if knowledge concerning religion are learnt to complement the soul's knowledge con-

¹²⁰ Al-Ghazali, *The Revival*, Vol III, 20.

¹²¹ *Ibid*

cerning intellect. The knowledge of sciences has been based on the concepts of ‘ilm and Ma’rifah and the systemic prioritization of what ought to be Fard ‘Ayn and Fard Kifayah. There are no dichotomies of these concepts rather there is a complimentary framework of these criteria of the knowledge.¹²² In the Islamic worldview, knowledge is of two classifications.¹²³ First is the knowledge (Ma’rifah) bestowed by God to mankind through revelation which is deemed as the highest knowledge as it provides man’s understanding relating to his soul and his relation to his Creator. This can only be understood by means of wilful submission and service to God. Whereas the second kind pertains to knowledge (‘ilm) obtained by man through his endeavour to rationalize his experiences and observations. These knowledges belonging to the second criterion pertain to meanings that can be derived by modes of argumentative, discursive or deductive reasoning whose values are of pragmatic importance. It is obligatorily pre-requisite for all human souls to seek and embed in their minds the understanding of the first kind of knowledge (Ma’rifa) as it pertains to their souls and their acknowledgement of their Creator (Fard ‘ayn). However, the second variance of knowledge (‘ilm) is not obligatory to all human souls but it is a must for the few to seek this type of knowledge (Fard kifayah). Scholars who belong to Muslim communities have also stressed that all knowledge that pertains to the first kind is good for man but those knowledges belonging to the second kind do not necessarily mean beneficial to him.

2.5. From Knowledge to Action

Ghazali’s conception of knowledge could be re-stated as ““knowledge is both the arrival of meaning in the soul as well as the soul’s arrival at meaning””.¹²⁴ The understanding of the term “meaning” is perceived by the soul when it recognizes the proper place of anything in a system. To do so, the soul should recognize the existence of an established system and acknowledge the relations of things within that system. This network of relations within the system is the standard for the soul to determine the proper place of each thing that comprises it. In reference to the term “place”, it denotes both spatial-temporal dimension in pertinent to what can be seen, touched or heard and those which are abstract, imaginary and transcendental. Meanings com-

¹²² Al-Attas, *Islam and Secularism*: 156-159

¹²³ Al-Attas, *Prolegomena to the Metaphysics of Islam*: 68-69.

¹²⁴ *Ibid* 14.

prehensible to the soul which are manifested as objects of knowledge seems to be limitless from the viewpoint of human cognition, however there are limits to the human imaginary faculties as well as in his internal and external senses which demarcate the meanings derived from what he perceived as objects of knowledge. From this assertion, “true knowledge is then knowledge that recognizes the limit of truth in its every object” as the meanings of these objects of knowledge are firmly grounded on their respective places within the system of relations and that their proper places within this network of relations signify the limits of their significance.¹²⁵ Man’s need to understand this limit of truth in every object of knowledge can be actualized by common sense or through wisdom. The former implies when the object of knowledge is obvious to his understanding and the latter is necessitated when the object of knowledge is obscure to his comprehension.

When the “ruh” recognizes which among actions it deems congruent with the knowledge it has in memory, then the “ruh” is in the domain of the “Aql”. The Aql, which is the intellect, upon determining which course of action is beneficial causes the “will” to gather the needed bodily strength to cause action. From Ghazali’s description of the nature of man, it is precise to state that knowledge determines action. All voluntary actions which require “thinking and deliberation” are grounded on the knowledge that a person has.

By analysing Ghazali’s explanations on the concepts of (1) the *latifa rabbaniyah* which encompasses the domains of the Qalb, the Ruh, the Nafs and the Aql, (2) the dynamics of the armies of the soul, (3) the categories of actions, and (4) the acquisition of different classes of knowledge, when these concepts are linked together, it is evident that central to Ghazali’s arguments is that a person has the deliberative ability to choose among possible actions. Due to this ability to deliberate, it could be asserted that Ghazali believes that a person has the necessary knowledge-based will to act voluntarily. If acting voluntarily is to be equated with what is generally conveyed by the terms “Free Will”, then Ghazali’s views could be that humans have the capacity to act freely.

¹²⁵ Al-Attas, *Prolegomena to the Metaphysics of Islam*; 15.

This interpretation stands correct if and only if the above-mentioned concepts are to be entirely and particularly applied to humans as to what constitutes them, without linking the basic deductions from these concepts to the issue of the Creator's control over the creations. The next section will outline Ghazali's arguments about causality in order to establish clearer qualifications for the conclusion that "humans have the capacity to act freely".

2.6. Ghazali on Causality

As it has been implied from Ghazali's descriptions on how the soul and the body work, humans are free to act as they have the abilities to do so. However, these abilities are not theirs. These are given to them by a supreme Being. Ghazali believes that God created humans, the entire universe and existence itself. Ghazali argues that all knowledges that raise all wills which cause all actions are of God's Will of which all humans are compelled upon and even though humans are obliged, this do not contradict to their freedom to choose and act.

Any act which is compelled to someone means that the action occurs due a causative factor whose source is external and not from within the person. Ghazali argues that God is the prime, absolute source of all actions. The external power which causes all actions is from God. God's Will and Power flow through humans. Thus, humans are the object of God's Will and Power. God alone creates the will and power. Humans acquired these as they serve as the intermediary of the God's Will and Power. Among humans, an order compelled by the intellect to the will causes the power to act. This order of the mind is based on the acquired knowledge which sets the determination of what is beneficial or harmful to the self. The knowledge perceived, the will formed, and ensued power of action are all caused by God. This means that the sort of will which humans have is not absolute. Ghazali has described the type of will that humans have in comparison to other creations of God:

Fire has got the strength of burning and fire compulsorily burns. So, the action of fire is guided by an external agency, but God's action is the result of absolute will. Man's action lie between these two. It means that his

action is not entirely guided by others nor absolute like the action of God.¹²⁶

Humans being objects of God's Will and Power implies that their capacity to will and to act are guided by God. All actions done by humans are connected to God's Will. Ghazali explains this with the term "acquisition" by stating that:

A man is the object or intermediary of God's will and power flow. He gives birth to power and will within man. For this reason, man is not completely guided by another like a tree. Hence the action of man cannot be called completely controlled. This is what is called acquisition as man is the medium of the flow of God's power or intermediary path. This power flows through him according to the law of God. Hence man's action is not opposite to man's freedom or dependence. God's action is absolutely free and wilful with power. But His will and power are not subject to thinking and efforts like us.¹²⁷

From these arguments, Ghazali affirms that all human actions are determined by God. In the context of the contemporary Free Will debate, Ghazali's views support determinism. In the earlier sections, Ghazali's expositions on the nature of man argues that humans have the capacity to act freely. Considering these two inferences, it is evident that Ghazali finds human capacity to act freely compatible with determinism. However, though Ghazali seems to argue for compatibilism, his notion of determinism is not similar to the cause-and-effect relationship being implied by naturalistic views on determinism.

The difference between logical necessity and nomological necessity is invoked by Ghazali to question the validity of implied inevitability of the relationship between causes and effects.¹²⁸ Ghazali claims that the connection between causes and effects are not necessary. His assertion about this causal unnecessaryness does not mean that he rejects the causal efficiency of the laws of physics because Ghazali recognises that "there should be causes from which flow the temporal events which are observed to be connected with each other".¹²⁹ From these observable temporal events, wherein

¹²⁶ Al-Ghazali, *The Revival*, Vol IV, 208-209.

¹²⁷ Al-Ghazali, *The Revival*, Vol IV, 208-209.

¹²⁸ Al-Ghazali, "Refutation of Their Belief in the Impossibility of a Departure from the Natural Course of Events" in *Incoherence of the Philosophers*, trans. Sabih Ahmad Kamali (Lahore: Pakistan Philosophical Congress, 1963), 185-196.

¹²⁹ Al-Ghazali, "Refutation of Their Belief in the Impossibility of a Departure from the Natural Course of Events", 187.

properties of event 1 become the perceived cause of changes in the properties of event 2, the ascription of necessary causal relationship is derived. Ghazali argues that “knowledge of this kind can only tell us of the existence of one of the two possible things”.¹³⁰ If this sort of knowledge is to be accepted, it limits possibility of other alternatives explanations of sources or causes that could have produced the succeeding event. Ghazali believes that accepting the nomological necessity between causes and effects tantamount to the denial of the truth of miracles narrated in the Quran and undermines the scope of God’s will and power. He further argues that there are other possible explanations about causes of events that are beyond what have been observed in the natural course of those events. He says that explanations of causes that are based solely on the natural succession of events are inadmissible because “it does not prove the impossibility of the other alternative”.¹³¹ Thus, it is not necessarily true to state that conditions or properties of event 1 causes conditions or properties of event 2, as Ghazali asserts that:

The affirmation of one does not imply the affirmation of the other; nor does its denial imply the denial of the other. The existence of one is not necessitated by the existence of the other; nor its non-existence by the non-existence of the other.¹³²

For Ghazali, God’s will and power over all actions and events are denied by the limitation of possible explanations imposed by physical laws on what causes an effect. Rationalisation of physical causes over effects are not really the only true explanations as these perceived cause-and-effect mechanism are based on perception of “accidents and events which occur at the time of contact between bodies” that are merely normative because these sort of understanding is supposed “when something possible is repeated over and over again (so as to form the norm), that its pursuance of a uniform course in accordance with the norm in the past is indelibly impressed upon our minds”.¹³³

For Ghazali, causality and determinism are ultimately directed by God. All animate and inanimate beings are object of God’s will and power. The explanations put for-

¹³⁰ Al-Ghazali, “Refutation of Their Belief in the Impossibility of a Departure from the Natural Course of Events”, 196.

¹³¹ Ibid

¹³² Ibid

¹³³ Ibid 189.

ward by the laws of physics are not contradictory to the assertion that God is the true source of all causes, rather scientific explanations of causes are manifestations of God's power, as Ghazali says:

He who observes the wonders which are revealed by sciences will never hesitate to admit the possibility of God's power extending to those things which have been related as prophets' miracles.¹³⁴

From all of these arguments, Ghazali's position on the issue of Free Will could be interpreted as (1) the affirmation that humans have the capacity to act freely,(2) human actions are determined as they are the objects of God's will and power, (3) perceived causal necessity through the laws of nature are true with the qualifications that all these causes are extensions of God's power as well as the acceptance of the assertion that causes and effects perceived as impossible are possible through God's will and power. Thus, Ghazali could be arguing for relative determinism or compatibilism in relation to the free will debate.

¹³⁴ Al-Ghazali, "Refutation of Their Belief in the Impossibility of a Departure from the Natural Course of Events", 193

CHAPTER 3: FROM THE PERSPECTIVES OF NEUROSCIENCE

Are all metaphysical claims immune to empirical findings?

Free Will, as understood from Kant and Al-Ghazali's perspectives and in agreement with the contemporary delineations, could be defined as a person's (1) "ability to do otherwise" (2) responsiveness to reasons", (3) and "control over one's choices". The conception of Human Will as deduced from the conceptions of Immanuel Kant and Al-Ghazali could accommodate the outcomes of the Neuroscientific experiments which have analysed the mechanisms of human intention, decision and action. In the field of Neuroscience, this mechanism is determined within the anatomy and physiology of the brain.

In this chapter, I present the outcomes of selected neuroscientific studies which tend to suppose that humans do not have "Free Will". The first section of this chapter deals with a succinct introduction of the anatomy and physiology of the brain and its neurons. This is followed by the presentation of the common biomedical technologies which have been utilized in the study of the human brain. The third section of this chapter enumerates the methodologies, samples and results of numerous brain experiments that have focused on the issue of human action and decision-making. At the end of this chapter, I discuss the concept of Free Will as defined by neuroscientists and proceed by expounding on the rejection of Free Will as attested in the results of Neuroscientific research.

3.1. The Anatomy and Physiology of the Brain and its Neurons

The Brain is a complex organ whose anatomy and physiology are the primary focus of Neuroscience. The Human Nervous System is categorized into two. These are the central nervous system (CNS) and the peripheral nervous system (PNS). The CNS includes the brain and the spinal cord whereas nerve cells and nerve fibres within the other tissues and organs constitute the PNS. Within the CNS, two main categories of

cells are localized. These are the Neurons and the Neuroglial cells. The Neuroglial cells are further classified into Oligodendrocytes, Astrocytes, Microglia and Ependymal cells whose main functions are to support and protect the Neurons. The Neurons are the functional units of the brain. These neurons enable the brain to be the physiological core of the human nervous systems.

3.2. The Neurons

An average of 100 billion Neurons in the brain initiate and coordinate all the basic and complex internal processes as well as the movements which are manifested by the human body. The neurons are the fundamental structural and functional building blocks of the brain.¹³⁵ These diverse functions are realized on the basis of the structural and physiological features of each single neurons that are interlinked by networks of synapses wherein electrical signals known as action potentials are relied from one neuron to the others which consequently lead to initiation and modification of a particular molecular process that could then effect a cellular action which could then actuate into a physical bodily movement.

A single neuron has three main components. These are the Soma, the Dendrites and the Axons. The Soma is the body of a Neuron and it contains several organelles and the nucleus which regulate molecular processes in which among these is the production of “action potentials” which are also referred as electrical signals or nerve impulses. The Axon which is a long extension that protrudes from the soma carries these electric impulses toward adjacent neurons through a junction called neuronal synapse. These signals are then received by a nearby neuron through the Dendrites which are thick processes that project outward from the Soma. This is the basic pathway in which the action potentials or nerve impulses are transmitted from a single neuron which can thousands of linkages with other neurons via points of connection called synapses. If each of the 100-billion neurons form thousands of linkages to other neurons, multitudes of synapses with estimates ranging from 1 trillion to 1000 trillion are formed in the brain. These synapses enable continuous transmission of impulses which is the utmost significance of neural physiology for the brain to fulfil its biological functions.

¹³⁵Sandra Ackerman, *Discovering the Brain*. (Washington: National Academies Press, 1900):29.

3.3. How Do Neurons Communicate?

Neurons communicate by producing and transferring impulses to each other. The production of action potential is based on the intracellular and extracellular dynamics of positively and negatively charged chemicals and molecules such as proteins and ions. These ions which are involved in the production of action potential primarily include potassium (K⁺), sodium (Na⁺), Calcium (Ca⁺) and Chloride (Cl⁻). Changes in the concentrations of these charged ions inside the neuron, which is the intracellular concentration, and outside the neuro, which is the extracellular concentration, create a mechanism that lead to the production of electric impulses known as action potential. The bi-directional movements of ions within the intracellular and extracellular spaces are modulated by the selective permeability of the neural membrane. This selective property of the neural membrane pertinent to which substance comes in and goes out of a neuron is based on the general impermeability of the hydrophobic interior of the neural plasma membrane and the presence of selective intramembrane protein structures that regulate the flow of specific ions. Active Transporters and Ion Channels are the two categories of neural intra-membrane structures. The Active Transporters move ions from a region of low concentration to a high concentration region which subsequently create ions concentration gradient. The Ions channels allow specific ions to move from high concentration areas to regions with low concentration. These channels are highly selective to ions. There are those channels that only allow potassium ions to pass through or those that are only designated for sodium ions.

Functional neurons transient from two stages in relation to the production of impulses. These are the conditions of Resting Potential and Action Potential. When a neuron is at rest, (1) theoretically, all of the potassium, sodium and chloride channels are closed, (2) intracellularly, potassium concentration is higher and sodium concentration is lower and (3) extracellularly, sodium concentration is higher and potassium concentration is lower.¹³⁶ Taking into consideration the effects of gradient concentration and electric force, which depends on the attraction between positively and

¹³⁶ Dale Purves et al., 'The Ionic Basis of the Resting Membrane Potential', in Neuroscience. 2nd Edition (Sinauer Associates-Oxford University Press, 2001), <https://www.ncbi.nlm.nih.gov/books/NBK10931/>.

negatively charged ions, then, (1) from lower to higher concentration, transporters move sodium to the extracellular area, and (2) From higher to lower concentration, voltage-gated channels move potassium ions to the intracellular space. In the resting potential phase, membrane permeability to potassium is higher compared to sodium and chloride. Thus, as more positively charged ions are released, the inside of the neuron has more negatively charged ions and molecules. The regulated flow of these positively charged ions, primarily potassium ions, in relation to the negatively charged ions and molecules inside the neurons, creates an electrochemical equilibrium of the intracellular and extracellular regions and maintains the determined resting membrane potential of a neuron. The difference between the “negatively charged inside of a neuron” and the “positively charged outer region” establishes the resting membrane potential. When a neuron is at rest, it is negatively charged, and its membrane potential is within the range of -60 to -80 mV.¹³⁷

When a neuron is excited by stimuli, changes in the movements and regulation of charged ions lead to the production of the Action Potential. This means that the negatively charged inner region of the neuron becomes abruptly more positive compared to the external space. The basis of the Action Potential is the ionic dynamics regulated through the abovementioned mechanism of neural membrane permeability as in the case of the Resting Potential. The ionic changes which cause Action Potential include (1) increased in the permeability of sodium-specific channels, (2) the high concentration of sodium in the extracellular region diffuses to intracellular space thereby causing the inside of a neuron to be positively charged, (3) concurrent to the opening of the sodium ion channels, the potassium ion channels are closed to prevent the outward movement of positively charged potassium ions which then result to the accumulation of more positively charged intracellular area, (4) once the peak level of depolarization of intracellular negative charges is reached and in response to the extracellular depletion of positive charges, the sodium channels are inactivated and consequently closed while the initially closed potassium channels are opened to allow potassium to gradually move out from the intracellular space thereby decreasing the degree of the positive charge inside a neuron and restores the resting membrane

¹³⁷ Steven M. Chrysaftides and Sandeep Sharma, ‘Physiology of Resting Potential’, in NCBI Bookshelf (Treasure Island (FL): StatPearls Publishing, 2019), <http://www.ncbi.nlm.nih.gov/books/NBK538338/>.

potential. The production of neural signals or electric impulses mainly through the altering concentrations of intracellular and extracellular potassium and sodium ions depend on changes in the neural membrane permeability which are influenced by membrane potential.¹³⁸

Two primary mechanisms are involved in the transmission of neural impulses. These are the chemical and the electrical signalling pathways through the synapses. Hence, synapses are generally classed into electrical synapse and chemical synapse. Transmitted impulses from the upstream neuron are termed the presynaptic potentials while a receiving downstream neuron is called postsynaptic.¹³⁹

In the electrical synapse, transmission of generated action potential from one neuron to another is carried out through gap junctions between closely apposed neural membranes.¹⁴⁰ These gap junctions are formed by the alignment of protein structures called connexons which are embedded at the neural plasma membranes which consequently establish channels to allow unidirectional or bidirectional currents of ions. Movements of these charged ions from the presynaptic to the postsynaptic junctions lead to altering concentrations of ions that enable continuous transmission of action potential. Impulse transmission via electric synapses is very rapid with just less than 0.1 millisecond of synaptic delay and has 100% probability that presynaptic action potential induces postsynaptic potential.

In the chemical synapse, presynaptic signals can only induce postsynaptic action potentials through the production of neurotransmitters. In contrast to electrical synapses, charged ions and other molecules do not enter the cytoplasm of communicating neurons.¹⁴¹ Instead of having connexon-based channels, there is a distinct space that separates the membranes of upstream and downstream neurons. This area of separation is called synaptic cleft. Via the synaptic cleft, Upstream neurons produce vesicles that contain neurotransmitters which are released and bind to specific receptors at the membrane of the downstream neuron. The result of the binding of neurotransmitters to the receptors of the receiving neuron can lead to changes in the permeability of the neural membrane, thereby causing changes in the flow of charged

¹³⁸ Dale Purves et al., eds., *Neuroscience*, 6 Edition (New York: Sinauer Associates-Oxford University Press, 2017), 33-65

¹³⁹ *Ibid* 85.

¹⁴⁰ *Ibid* 86-87.

¹⁴¹ *Ibid* 87-88.

ions and molecules which could lead to the production of action potential or inhibition of such. At the chemical synapse, neural signal transmission occurs in a unidirectional flow only. Synaptic delay is approximately 0.5 milliseconds and the probability of inducing an action potential is within 20 to 90 %.

Among infants and children, most neural transmissions occur through electrical synapses. While among adults with mature nervous system, chemical synapses are the main pathways for neural impulse transmission.¹⁴²

3.3.1. The Anatomy of the Brain

The brain has several regions. Each of these regions have further sub-regions which are known to have specialized set of biological functions in relation to the multitudes of internal molecular processes and physical activities of the human body.¹⁴³¹⁴⁴ Anatomically, the brain is divided into three main regions. These are the Cerebrum, the Cerebellum and the Brain Stem.

The Cerebrum is the largest region of the brain and it has two hemispheres which are further divided into 4 lobes which are demarcated by distinct fissures. The left and right hemispheres are symmetrically divided which are connected by nerve fibres called corpus callosum. Their respective lobes are termed frontal, temporal, parietal and occipital.

Below the occipital and temporal lobes of the Cerebrum is another region of the brain called the “Cerebellum”. A layer called “tentorium cerebelli” which is a dura matter separates the Cerebellum from the Cerebrum region. The Cerebellum is adjacent to another structure called the “Pons”. The Cerebrum has also two hemispheres linked by narrow area termed as vermis. It has also lobes. These are the anterior lobe, the posterior lobe and the flocculonodular lobe. These lobes are further stratified in

¹⁴² Adrienne L. Tierney and Charles A. Nelson, ‘Brain Development and the Role of Experience in the Early Years’, *Zero to Three* 30, no. 2 (1 November 2009): 9–13, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3722610/>.

¹⁴³ Steven M. Chrysafides and Sandeep Sharma, ‘Physiology of Resting Potential’, in *NCBI Bookshelve* (Treasure Island (FL): StatPearls Publishing, 2019), <http://www.ncbi.nlm.nih.gov/books/NBK538338/>.

¹⁴⁴ John C. Marshall and Gillian M. Morriss- Kay, ‘Functional Anatomy of the Brain’, *Journal of Anatomy* 207, no. 1 (2005): 1–2, <https://doi.org/10.1111/j.1469-7580.2005.00429.x>.

to primary fissures and posterolateral fissure. Another method of classifying the structure of the Cerebrum is by zoning. These are the zone of the midline Vermis, the intermediate zones and the Lateral hemispheres.

The third region of the brain is the “Brainstem”. It has three main components. These are the Midbrain, the Pons and the Medulla. Structurally, the Brainstem is located within the inner zone of the brain between the inner bases of the left and right hemispheres of the cerebrum and it is directly connected to the cervical spinal cord. Thus, the Brainstem connects the Cerebrum and Cerebellum to the Spinal Cord.

3.4. Localization of Brain Functions

Studies have established that these linked divisions of the hemispheres and that of their lobes represent localization of specific functions.¹⁴⁵ The left hemisphere of the brain controls language and logic whereas the right hemisphere is attributed for creativity and intuition. The functions of the left and right hemispheres are demarcated but complementary to each other. Though not all functions are equally shared rather there are asymmetries in the physiologies of the Brain Hemispheres.¹⁴⁶ The Cerebrum initiates higher mental functions related to interpretation of audio-visual senses, communication, and emotion as well as movements of the extremities that require certain degree of precision and reasoning. The region of the cerebellum could be stratified into three areas based on functions.¹⁴⁷ These are the Cerebrocerebellum, the Spinocerebellum and the Vestibulocerebellum. Composed by the lateral hemispheres, involves in planning movements, visually guided actions and motor learning through the regulation of coordinated muscle activation is designated to the area of Cerebrocerebellum. The Spinocerebellum has been determined to be responsible in body movement regulations which enable and compensate for error correction.¹⁴⁸

¹⁴⁵ Sandra Ackerman, *Discovering the Brain* (Washington, D.C.: National Academy Press, 1993), 13-31.

¹⁴⁶ Michael C. Corballis, ‘Left Brain, Right Brain: Facts and Fantasies’, *PLOS Biology* 12, no. 1 (21 January 2014): e1001767, <https://doi.org/10.1371/journal.pbio.1001767>.

¹⁴⁷ Enricomaria Mormina et al., ‘Cerebellum and Neurodegenerative Diseases: Beyond Conventional Magnetic Resonance Imaging’, *World Journal of Radiology* 9, no. 10 (28 October 2017): 371–88, <https://doi.org/10.4329/wjr.v9.i10.371>.

¹⁴⁸ Léa A. S. Chauvigné, Kevin M. Gitau, and Steven Brown, ‘The Neural Basis of Audiomotor Entrainment: An ALE Meta-Analysis’, *Frontiers in Human Neuroscience* 8 (2014), <https://doi.org/10.3389/fnhum.2014.00776>.

This region also receives proprioceptive information which pertain to one's sense of body movements and body orientation or position.¹⁴⁹ To balance one's bodily movements in relation to ocular perception is managed by the area of vestibulo-cerebellum.¹⁵⁰ Closer to the spinal cord is the brainstem region which handles vital communication from the other parts of the human body to the brain and it regulates basic vital functions that include, among many others, sleep cycle, response to painful stimuli, consciousness, respiration, swallowing, cardiac contraction and regulation of one's blood pressure.¹⁵¹

As succinctly enumerated in the aforementioned paragraph, these localization of functions in the human brain are determined on the basis of three major approaches that have been utilized in the dissection and understanding of the correlation and causation of the anatomical structures and perceived or established functions of the different regions of the brain. These approaches that have established these localization of brain functions include post-mortem studies, the use of EEG which focuses on electrical brain activity and most recently the use of biomedical scanning technologies that primarily employ positron emission tomography (PET), computerized tomography scan (CT) and magnetic resonance imaging (MRI).

Among those post-mortem studies was the one pioneered by Paul Broca in 1861 which found that a certain region in the brain is directly linked to one's ability to speak. The size of the lesions inflicted in that region of the brain which was determined after a post-mortem study of the deceased brain corresponded to degree by which the deceased person's speaking impairment whilst he was living. That region of the brain is now known as the Broca's Area.¹⁵² As for the utilization of the EEG, an example of this is the correlation between an exposure of one's retina to flashes of light and the subsequent changes in the detected electrical activities in the visual cortex of the brain which is due to the excitation of a certain groups of neurons that are deemed to be in control of the retinal exposure to varied degrees of light intensi-

¹⁴⁹ G. Bosco and R. E. Poppele, 'Proprioception From a Spinocerebellar Perspective', *Physiological Reviews* 81, no. 2 (1 April 2001): 539–68, <https://doi.org/10.1152/physrev.2001.81.2.539>.

¹⁵⁰ Amir Kheradmand and David S. Zee, 'Cerebellum and Ocular Motor Control', *Frontiers in Neurology* 2 (2011), <https://doi.org/10.3389/fneur.2011.00053>.

¹⁵¹ Anant Dhanwate, 'Brainstem Death: A Comprehensive Review in Indian Perspective', *Indian Journal of Critical Care Medicine* 18, no. 9 (September 2014): 596–605, <https://doi.org/10.4103/0972-5229.140151>.

¹⁵² Adeen Flinker et al., 'Redefining the Role of Broca's Area in Speech', *Proceedings of the National Academy of Sciences* 112, no. 9 (3 March 2015): 2871–75, <https://doi.org/10.1073/pnas.1414491112>.

ties.¹⁵³ The PET scan in conjunction with CT scan has been used to study glucose consumption in different brain regions. The idea that higher glucose consumption in a particular brain region corresponds to a particular function.¹⁵⁴ An example of this is the discovery of the Wernicke's area of the brain which is delegated to the function of language comprehension and development. The MRI Technology is the most advance among the contemporary brain imaging technologies. Wide ranges of brain functions have been established and verified with the aid of this technology.¹⁵⁵

3.5. Technologies in Neuroscience

How do Neuroscientists study the brain? In contrast to Philosophers who mainly rely on their mental thoughts within the confine of their own preferred environment to expressed and imprint their reasoning, Neuroscientists can only express their theories and the validities of their claims within the spectra of objectivity which could only be realized within the meticulous environment of a controlled laboratory that is designed to validate a specific research. Within these types of laboratories, two main categories of equipment are used in the study of the human brain. These are the Electro-Encephalo-Gram (EEG) and the Magnetic Resonance Imaging (MRI).

¹⁵³ K. J. Mullinger et al., 'Post-Stimulus fMRI and EEG Responses: Evidence for a Neuronal Origin Hypothesised to Be Inhibitory', *NeuroImage* 157 (15 August 2017): 388–99, <https://doi.org/10.1016/j.neuroimage.2017.06.020>.

¹⁵⁴ Nina F. Dronkers, Maria V. Ivanova, and Juliana V. Baldo, 'What Do Language Disorders Reveal about Brain–Language Relationships? From Classic Models to Network Approaches', *Journal of the International Neuropsychological Society* 23, no. 9–10 (October 2017): 741–54 <https://doi.org/10.1017/S1355617717001126>.

¹⁵⁵ Catie Chang, Erika P. Raven, and Jeff H. Duyn, 'Brainheart Interactions: Challenges and Opportunities with Functional Magnetic Resonance Imaging at Ultra-High Field', *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, 13 May 2016, <https://doi.org/10.1098/rsta.2015.0188>.

3.5.1. Mechanism of Action: The Electroencephalogram

The EEG which was first used in the study of the human brain in 1924 by the German psychiatrist Hans Berger in Jena. This has still been being utilized in the analysis of brain activity.¹⁵⁶ The mechanism of action of this technology primarily involves the detection, amplification and recording of electric impulses which are im-mitted by the neurons of the brain.¹⁵⁷ This detected electric fluctuations are produced by neurons that are excited. Excitations of neurons are manifestation of neural activities. When a neuron functions, there are changes in the movement and distribution of intracellular molecules. Among these molecules are the ions. These are primarily sodium (Na+), potassium (K+), calcium (Ca+) and chloride (Cl-) ions. The changes in the flow of these ions in the membrane of a neuron produce electrical current in a neuron. The EEG detects the electric impulses that are produced by networks of multitude of neurons. These cascades of electric impulses are relied through the neural synapses from one neuron to other neurons are strong enough to be detected by the sensitive electrodes which are attached to the various scalp areas of a human subject. The detection of these electric flow is correlated to specific physical and mental activities. An increase in the detection of these electric impulses implies increase neural activities in a particular region of the brain. An increase in neural activity necessitates increase in blood flow in that region to sustain neural metabolism such as glucose consumption for the neurons to continue its physiologic functions. Hence, EEG detects electrical impulses that corresponds to neural activities in the brain that correspond to any given physical movements and mental activities.

As these neural electric signals are detected by 10 to 20 electrodes with the aid of conductive media that are attached on the scalp, an amplifier device is used to intensify microvolt signals into levels in which these minute signals could be detected and accurately digitized. An A/D Converter is also used to obtain digital form of data

¹⁵⁶ Hans H. Kornhuber and Lüder Deecke, 'Hirnpotentialänderungen bei Willkürbewegungen und passiven Bewegungen des Menschen: Bereitschaftspotential und reafferente Potentiale', *Pflüger's Archiv für die gesamte Physiologie des Menschen und der Tiere* 284, no. 1 (1 March 1965): 1–17, <https://doi.org/10.1007/BF00412364>.

¹⁵⁷ Ernst Niedermeyer and Fernando Lopes da Silva MD PhD, eds., *Electroencephalography: Basic Principles, Clinical Applications, and Related Fields*, Fifth edition (Philadelphia: LWW, 2004)

from the initial analogue output. These amplified and converted electric impulses are either printed out on paper as patterns of waves using a galvanometer or saved on a hard drive and then displayed on a computer screen for analysis.

The analysis and interpretation of these detected neural electric signals are based on the patterns of recorded brain waves. These brain waves with varying frequencies are classified as Beta (>13 Hz), Alpha (8-13 Hz), theta (4-8 Hz) and Delta (0.5-4 Hz). Each of these brain waves represent corresponding brain activities and in the event of death, these projected waves ceased to exist. Different states of one's mind reflect changes in these waves. In the states of resting, sleeping, dreaming and alertness, a remarkable dominance in one of these brain waves is notable. This distinct variations in the degree by which these electrical impulses become evident are also significant and correlative to other physical and mental functions. Therefore, since the discovery of the EEG, it has been relied upon to further establish and understand the mind and its brain correlates.

3.5.2. Mechanism of Action: The Magnetic Resonance Imaging

The Magnetic Resonance Imaging (MRI) is another great technological leap in the study of the human brain. The mechanism of action of an MRI is based on measuring energy levels emitted by the protons of hydrogen atoms when strong magnetic forces are applied with varying frequencies to these protons. The 70 % of the human body is composed of water (H₂O). By targeting these hydrogen atoms in the human body, MRI is able to produce detailed contrasted images of all the regions of the different organ systems.

The basic working principles of magnetic resonance imaging can be explained by the functions of its primary components. These components are the Primary Magnets, the Gradient Coils, the Radio Frequency Coils and the Computer system.¹⁵⁸ The human subject is placed inside the designated compartment of the MRI System and is instructed to hold still until the scanning procedure finishes. First, the Primary Magnets are activated to create an environment that has static longitudinal primary mag-

¹⁵⁸Arnold Bakker, 'Basics of MRI - Principles and Methods of Neuroimaging', Coursera-Johns Hopkins University, accessed 17 July 2019, <https://www.coursera.org/lecture/neuroscience-neuroimaging/basics-of-mri-suCIB>.

netic field. The Hydrogen protons of the human body are subjected to these static and altering magnetic fields. These protons have their own opposing magnetic poles as such as having a south pole and a north pole.¹⁵⁹ These protons may react in two ways to the longitudinal magnetic field directed by the primary magnets. Some protons could be aligned parallel to the direction of primary magnetization while other protons may be perpendicular or anti-parallel to the directed field of magnetization. As the scanning procedure of the MRI machine proceeds, the gradient coils also emit magnetic pulses to alter the degree of magnetization of the primary magnets in order to localize the direction of the magnetic fields to the desired regions of the human body. As these protons are held static in the directions where they are forced to face by the effect of the primary magnets, these protons tend to move in a circular motion within the axis of the primary longitudinal magnetic field. This state of proton's movement is termed "Precession". This Precession Motion is the result of the interaction between the forced directional alignment produced by the primary magnets and the intrinsic magnetic momentum of hydrogen protons. The rate of precession, that is the cycle of oscillation of a spinning proton around the axis of the longitudinal magnetic field, is directly proportional to the strength of the magnetic field of the primary magnets. The gradient coils emit magnetic impulses of varying strengths that are capable of inducing slow to fast precession reactions of the aligned protons within the target local tissue regions. By this mechanism of altering waves of magnetic forces, varying degree of precession frequencies among the target protons are detected by the MR coils and are fundamental in the differentiation of tissue types.

As these protons are spinning in their own axis and at the same time are oscillating within the longitudinal static magnetic field, a series of controlled RF pulses are directed to these protons using the radiofrequency coils. These RF energies are magnetic pulses that force the aligned protons to flip 90 to 180 degrees to the transverse plane of the primary magnetic field. The use of RF pulses triggers the "Excitation" of protons as manifested by the enhanced spinning of these protons around the axis of the primary magnetic field within a certain period of time. When the radiofrequency coils stop from emitting RF pulses, the misaligned spinning protons are pulled by the

¹⁵⁹Vijay P.B. Grover et al., 'Magnetic Resonance Imaging: Principles and Techniques: Lessons for Clinicians', *Journal of Clinical and Experimental Hepatology* 5, no. 3 (September 2015): 246–55, <https://doi.org/10.1016/j.jceh.2015.08.001>.

strength of the primary longitudinal magnetic field back to their initial positions prior to the emission of the RF pulses. The resulting realignment of these excited protons to their previous positions is termed “Relaxation” phase.¹⁶⁰ The number of rotations that a proton does around the axis of the primary magnetic field is measured and is regarded as “precession frequency rate”. Resonance which is the basis of the Magnetic Resonance Imaging pertains to the condition in which the magnet-induced precessions enable the protons to be tuned to Radiofrequency energy which has a frequency equal to the precession frequency of a particular proton or groups of protons. The abbreviations “T1” and “T2” denote two important measurements of the duration of time by which a proton excites and relaxes into two focal points. “T1” refers to the time it takes a precessing proton to return from the 90 degree-dealignment to the longitudinal directions of the primary static field. “T2” refers to the recorded amount of time that it takes a realigned proton to relax as it spins while it is in the traverse plane 90 degrees away from the axis of the primary static field. The measurements of these moments of excitation and relaxation at these two points as well as their calculated differences in the form of resonant frequencies are significant in the formation of tissue images.

The phenomena within the time of Excitation and the point of Relaxation of the hydrogen protons are the fundamental basis for the formation of images of human tissues.¹⁶¹ During the excitation phase, as the protons spin around the axis of the primary magnetic field, their spinning motion generates RF frequencies which are emitted back to the coils and these captured signals from the protons are collected and transformed to create the MR image. These resonant frequencies of the protons are affected by the structural features of the bigger molecules wherein these protons are located. Molecular structure is defined by chemical composition, hence depending on the chemical properties of the enclosing molecule, protons are variably shielded from the aligning force of the primary magnetic field. Due to this varying strength of magnetic fields, protons located in different tissue regions resonate at different frequencies. Following the excitation phase, the length of time that it takes a proton to return to its relaxation phase depends on the degree by which the spinning proton is able to trans-

¹⁶⁰ Perry Sprawls, *Magnetic Resonance Imaging: Principles, Methods, and Techniques*, 1 edition (United States: Medical Physics Pub Corp, 2000).

¹⁶¹ Ibid

fer its excess energy. The duration of transferring of excess energy out of the spinning protons depends on the physical characteristics of the tissue. The variations in the relaxation time of excited protons enable the MRI system to identify different tissue types in its outputs of static images of the human body.

3.5.3. The Functional Magnetic Resonance Imaging

In studying brain activities, static images obtained from conventional MRI do not address the need for a real time correlation between the moment when an action or task is implemented by the human subject and the time to detect the its corresponding neural firing in the brain. Hence, the development of the Functional Magnetic Resonance Imaging (fMRI) has paved the way to better ascertain the brain correlates of human actions.

The basic principle of the fMRI is similar to the manner by which conventional MRI aligns, excites, relaxes and detects signals of hydrogen protons in human tissues. The main difference between an MRI and fMRI is the latter's focus on the circulation of the blood in the brain. The main fact in Neuroscience is that any human actions have corresponding neural activities in the brain. These activities of the neurons which are also referred as neural firing or action potentials require consistent supply of energy. These energies which are required by the neurons to perform their biological functions are deduced from the metabolism of glucose and the replenishment of oxygen molecules. Through the "Astrocytes", which are cell types that are adjacently located to neurons, glucose is supplied by the blood.¹⁶² As for the oxygen supply mechanisms to the brain, several models have been proposed and validated. Though further studies are being done to fully understand these regulations of oxygen flow in the brain. The movement of oxygen molecules from the highly concentrated blood vessels by diffusion towards the low oxygen concentration areas of the brain tissue as

¹⁶² Mireille Bélanger, Igor Allaman, and Pierre J. Magistretti, 'Brain Energy Metabolism: Focus on Astrocyte-Neuron Metabolic Cooperation', *Cell Metabolism* 14, no. 6 (7 December 2011): 724–38, <https://doi.org/10.1016/j.cmet.2011.08.016>.

triggered by varying degrees of neuronal activities is the fundamental correlation of the cerebral blood flow and oxygen supply.¹⁶³

In fMRI, the patterns of proton frequencies due to changes in the properties of cerebral blood flow are detected and transformed into observable visual data. The main focus of the fMRI is to identify changes in the concentration of oxygen in the blood. This is based on the principle that different brain regions require different levels of oxygen depending on their respective neural activities. At the molecular level, the neurons which are more active than the other neurons require more supply of oxygen. These required oxygens which are attached to a molecule in the blood known as the haemoglobin. The structure of a haemoglobin is composed of four iron (Fe⁺) in which 1 oxygen atom attaches. Prior to the diffusion of oxygen to the lower concentrated area of the brain, the erythrocytes have oxygenated haemoglobin in which case the fMRI detects stronger signal. When oxygen atoms are released the erythrocytes have de-oxygenated haemoglobin and the four atoms of iron are directly exposed to the force of magnetic field. The exposure of the iron atoms results in the disruption of magnetic field and faster de-synchronization of proton spins. Thus, as the red blood cells deliver oxygens by diffusion to neurons, the blood's resonant frequencies are altered and it results to weaker signal detection. These variations in the detection of the emitted signals of the quality of haemoglobin-containing red blood cells are correlated with neural functions. Increased in blood flow in a particular region of the brain is linked to increased neural activities. Functional Magnetic Resonance Imaging is not a direct measurement of neural activities rather it is a correlative tool that measures blood flow variations in relation to neural activities in different brain regions. Studies using fMRI have established that when a brain region increases neuronal activities, stronger signals are detected. The compensatory mechanism of the human body causes the detection of stronger signals in regions where there are increased neural activities. Indeed, increased in neural activities lead to de-oxygenation of haemoglobin and direct exposure of iron atoms that are carried by erythrocytes which advertently result to weaker signal detection. However, instead of using weaker signal detection as a marker for increased neural activities, the overcompensation

¹⁶³Kazuto Masamoto and Kazuo Tanishita, 'Oxygen Transport in Brain Tissue', *Journal of Biomechanical Engineering* 131, no. 7 (27 July 2009): 074002-074002-6, <https://doi.org/10.1115/1.3184694>.

of blood flow in the regions of the brain where there are low oxygen concentration cause concentration of more oxygenated blood in those regions. This mechanism of overcompensation lead to stronger signal detection as a hallmark for increased neural activity in any brain regions.

3.6. The Neuroscientific Experiments on Free Will

Humans, monkeys and rats have been used to study the concept of Free Will in the laboratories of Neuroscientists. These Neuroscientific studies have aimed to understand and to map the correlation between certain human actions and brain activities. Initially, it was the Electroencephalogram that were used in the detection of signals from the different brain regions that were deemed linked to physical tasks which human subjects were instructed to perform. Technological developments in the past decades have enabled neuroscientists to use highly sophisticated systems to not merely detect signals but most significantly to visually assess in real-time the specific brain regions where group of neurons manifest activities that consequently cause physical actions. In the succeeding paragraphs, representative studies concerning the relationship between neural activities and human actions are succinctly described.¹⁶⁴ Analysis of the outcomes of these studies reveals that the Free Will-related claim that has been established by the earlier brain experiments which have used the basic EEG system has been confirmed by recent neuronal studies that have employed more sophisticated technologies. This claim states that a neural signal is detected prior to one's awareness of having the urge or intention to perform an action.

3.6.1. The Template: Libet's Experiment

Benjamin Libet et al. (1983) performed series of experiments which used primarily used the electroencephalogram to determine the relationship between the onset of detectable signal of brain activity with the time of inception of one's conscious inten-

¹⁶⁴ There are several reviews that have been published that have collated plethora of studies which have pertained to the role of Neuroscience in understanding the concept of Free Will. The work of Andrea Lavazza entitled "Free Will and Neuroscience: From Explaining Freedom Away to New Ways of Operationalizing and Measuring It" has been of great aid to me in finding the most relevant primary articles to further my thesis on the role of Neuroscience in the Philosophical debate on Free Will.

tion to perform a certain action.¹⁶⁵ 6 human subjects participated in these series of experiments. These 6 participants were grouped into two. The completions of the experiments for these two groups were done a few months apart. In Libet's experimental set-up, participants sat on a lounge chair which was in partially reclined position. A modified clock was placed 1.95 m in front of the subject. This clock was designed to complete a revolution of 2560 milliseconds instead of 60. Participants were instructed to use their right arms and were tasked to flex their fingers or twist their wrists whenever they want to. Participants were also asked to look at the clock and report the time when they felt the urge to perform the instructed tasks or the time when they performed the required action. The actual time when they flexed their fingers or twisted their wrists were recorded using an Electromyogram which were attached in their arms and which functions to detect signals from muscle movements. Before the performance of the actual experiments, participants were given time to practice and feel acquainted with these instructions to remove any stressful tendencies in monitoring the clock and subsequently performing the tasks. Libet's research used the detection of a brain signal called Readiness Potential which originates in the region of the brain termed Supplementary Motor Area that is involved in movement preparations and it is absent in involuntary and automatic movements.¹⁶⁶ This brain signal was first detected in an earlier study which focused on the onset of cerebral activity in relation to self-paced actions.¹⁶⁷ The main findings of Libet's experiments stated that readiness potentials which are cerebral activity markers were detected 350 to 150 milliseconds before the participants became aware of their intentions to flex their fingers or twist their wrists and 550 milliseconds prior to the participants' actual movements. In addition to these results, readiness potential appears from 800 milliseconds to up to 1000 milliseconds before the reported time of the urge to move among participants who were instructed to pre-plan their actions.¹⁶⁸ Libet also suggested that based on their studies that an intention could be vetoed, that is, an intended action could be changed to do another action within 150 millisecond before the

¹⁶⁵ Benjamin Libet et al., 'Time of Conscious Intention to Act in Relation to Onset of Cerebral Activity (Readiness-Potential) The Unconscious Initiation of a Freely Voluntary Act', *Brain* 106, no. 3 (1 September 1983): 623-42, <https://doi.org/10.1093/brain/106.3.623>.

¹⁶⁶ Ivan Rektor, 'Parallel Information Processing in Motor Systems: Intracerebral Recordings of Readiness Potential and CNV in Human Subjects', Research article, *Neural Plasticity*, 2000, <https://doi.org/10.1155/NP.2000.65>.

¹⁶⁷ Kornhuber, "Bereitschaftspotential Und Reafferente Potentiale"

¹⁶⁸ Benjamin Libet et al., "Time Of Conscious Intention", 636.

actual movement. However, within 50 milliseconds before the actual movement, no possible change of action could be done.

3.6.2. Recent Neuroscientific Studies on Free Will

The Libet's experiment has become a template for the succeeding researchers to prove or disprove the findings that it had asserted whose relevance has ignited the debate on Human Action and Decision-making in relation to the concept of Free Will. From the Libet's results, it could be plainly stated as there are evident brain signals that appear before a person becomes aware of his intention to act. The significance of these pre-awareness-to-act brain signal, whether it causes the intention to act or it is merely a correlative factor, has been the focus of most recent studies in neuroscience.

Haggard and Eimer (1999) verified the presence of the Readiness Potential Signal that was reported by the Libet's research. The primary results of their laboratory trials asserted that another type of brain signal which is termed Lateral Readiness Potential could be the causative factor to one's urge to act that leads to actual movement.¹⁶⁹ Almost similar to Libet's, 8 right-handed participants were asked to perform two categories of tasks. Required actions from the participants were classified as Fixed Movement and Free Movement. In the former, participants were instructed to use the same hand, either left or right, in pressing assigned keys in a computer keyboard throughout the 20 trials. In the latter category, participants were instructed to use whichever hands they prefer in performing the task. In contrast to Libet's which has used a fixed movement on, Haggard and Eimer (1999) modified the choices of actions for the participants to elicit an environment where participants could freely and voluntarily implement their preferred actions. Though there were differences in the recorded onset in which Readiness Potentials and Lateral Readiness Potentials appeared prior to the advent of the participants' wanting to act which the authors have used to question the specificity of Libet's Readiness Potential, nevertheless it has affirmed the validity of the previous claim that before a person becomes aware of

¹⁶⁹ Patrick Haggard and Martin Eimer, 'On the Relation between Brain Potentials and the Awareness of Voluntary Movements', *Experimental Brain Research* 126, no. 1 (15 April 1999): 128–33, <https://doi.org/10.1007/s002210050722>.

his intention to act, a cerebral correlate appears within 1000 milliseconds to at least 795 milliseconds.¹⁷⁰

The validity of the presence of a brain signal that corresponds and appears prior to one's urge to act has been established, among many other studies, by Libet et al.(1983) and Haggard and Eimer(1999). However, as to which particular region in the brain is linked to one's intention to act? The answer to this enquiry which clearly relates to one's agency could be established, in the methodologies of biomedical sciences, by comparing individuals who are deemed healthy with those patients with brain-related conditions. Sirigu et al.(2004) compared three groups of participants who were subjected to similar experimental set-up with the Libet study has done. In this research, 15 individuals were recruited. 5 of them were screened to have no brain-related illnesses. 5 patients were found to disease conditions localised within the cerebellum region while the other 5 participants had specific lesions confined at the area of the brain called parietal cortex which is part of the cerebrum region of the brain. These groups of participants were instructed to perform similar tasked with of the Libet's experiments. Similar method of analysis, except for the use of contemporary statistical tests, was implemented. Participants were instructed to perform a set of tasked while an EEG system recorded brain activities. They were asked to report the time when they felt the urge to act or the time when they actually performed the required task which was to push a button voluntarily whenever they wanted to do so as they monitored a 2560 millisecond-clock which was placed in front of them. In this study, it was established that (1) Detection of Readiness Potential precedes participants' reported time of awareness to act, and in relation to the temporal difference between wanting to act and actually acting, (2) Participants with no brain lesions were able to distinguish the time they felt the urge to act, (3) Participants with brain lesions at the region of cerebellum were also able to differentiate the time when they had the intention to act and lastly (4) participants who had lesions within the parietal region were not able to differentiate the time when they felt the urge to act and actual time when they actually acted on the instructed task.¹⁷¹ Using the same EEG tech-

¹⁷⁰ Haggard, "On the Relation between Brain Potentials", 130.

¹⁷¹ Angela Sirigu et al., 'Altered Awareness of Voluntary Action after Damage to the Parietal Cortex', *Nature Neuroscience* 7, no. 1 (January 2004): 80–84, <https://doi.org/10.1038/nn1160>.

nology which resembles that of Libet's, this research, while confirming the reliability of the readiness potential and its correlative relationship with one's urge to act, has also established the particular region of the brain is linked to one's urge or intention to act upon a certain physical movement by comparing cerebral signals from three different groups of participants.

The use of the EEG relies upon the brain signal which has to pass through several layers of other tissues before it is detected by the electrodes which are attached in the subject's scalp. Though it seems to be an indirect measurement of brain signals, the EEG technology has established the presence of a brain activity that could be correlated, if not entirely causative, of one's intention to implement an action. Desmurget et al.(2009) studied seven patients with brain tumours and electrically stimulated a certain brain region of these patients who were undergoing open brain surgery while they were awake and responsive. Direct Electrical stimulation (DES) with varying frequencies were delivered to the parietal region of these patients at the same time electromyogram for the detection of movements and high resolution neuro-magnetic resonance images for monitoring of cerebral activities were obtained using a peri-operative navigation system.¹⁷² This experiment has concluded that (1) administering varying degrees of direct electric stimulation in the parietal regions of the brain evoked intentional awareness of the participants. DES in the right inferior parietal area resulted to patients having the urge to move the contralateral extremities while DES administered on the on left inferior parietal area caused patients to have the intention to move their lips or wanting to speak, (2) stimulation of these regions have also resulted to some of the patients to verbally utter that they have moved their hands or feet whereas none of their perceived actions actually occurred. This rare experiment has established that the parietal regions of the brain, when stimulated with electric potential, are responsible for the one's having the urge to act as well as the feeling of having acted upon an intended action.

Having identified the specific regions in the brain that when directly stimulated by electricity lead to having an intention to act, feeling of having acted and having actu-

¹⁷² Michel Desmurget et al., 'Movement Intention After Parietal Cortex Stimulation in Humans', *Science* 324, no. 5928 (8 May 2009): 811, <https://doi.org/10.1126/science.1169896>.

al bodily movements, Neuroscientists have advanced their studies by identifying the particular number of neurons that are involved in the process of having intentions and movements. Fried et al.(2011) recruited 12 patients who had chronic depth electrodes implanted in the surface of their brains. As these electrodes were directly on the surface of the different brain regions, detected signals are highly specific and stronger compared to conventional EEG electrodes which are attached in the scalp. Experimental procedure in this study was similar to Libet's. 28 recording sessions were conducted wherein patients were instructed to press a key in a laptop keyboard using either their left or right index fingers. 6 cerebral regions were monitored including the pre-Supplementary Motor Area, the Supplementary Motor Area and areas in the frontal and temporal lobes. In total, activities of 1019 neurons were recorded and analysed as patients performed self-initiated movements of their index finger. This research concluded that (1) 1500 milliseconds before patients reported having the intention or making the decision to move, progressive neuronal recruitments were detected, (2) it also noted that in the supplementary motor area, there were progressive increase or decrease in the rate of neuronal firing as the patients moved their preferred indexes, and (3) with an accuracy of 80 %, the researchers have asserted that monitoring the electrical impulses of 256 neurons in the Supplementary Motor Area predicted the impending intentions to move 700 milliseconds before the patients became aware of their decisions.¹⁷³

The use of the Electroencephalogram system has established facts with regards to the consistent detection of brain signals that precedes one's awareness to have the intention to act and it has also established specific regions that are sources of these brain signals. The use of the Functional Magnetic Resonance Imaging(fMRI) in the study of the cerebral correlate of human decision-making and volition has further advanced these previous EEG-based findings. Soon et al.(2008) aimed to identify other brain regions that could be involved in predicting conscious intentions and the duration of time by which signals in these regions could appear before actions are implemented. 34 participants were initially screened for this fMRI-based study. Based on the participants' efficiency to follow a more rigorous set of tasks, 14 were chosen. In this

¹⁷³ Itzhak Fried, Roy Mukamel, and Gabriel Kreiman, 'Internally Generated Preactivation of Single Neurons in Human Medial Frontal Cortex Predicts Volition', *Neuron* 69, no. 3 (10 February 2011): 548–62, <https://doi.org/10.1016/j.neuron.2010.11.045>.

experiment, compared to Libet's and other previous studies, a more stringent experimental design involving several stages was implemented.¹⁷⁴ Another modification was the use of a continuous stream of consonants letters in a screen instead of a rotating clock was utilised. Participants were instructed to press a left or right button. While looking at the stream of letters, they were told to remember which letter was on the screen when they had the urge to press a button. The analysis of this experiment has revealed that (1) brain activities which are long-term determinants of human intentions are detected earlier in the regions of prefrontal and parietal cortex with higher specificity than the supplementary motor area reported in EEG-based studies, (1) patterns of signals in prefrontal and parietal regions precede the participants' awareness of intention up to 10 seconds and (3) these signals are able to be decoded to predict the outcome the participants' intentions.¹⁷⁵

Moving one's right or left hand, twisting a wrist, pressing a key or a button using the left or right index finger seem to be very simple, limited physical options that for some critics are not representative of the actual free choice scenario in which one has utilise series of mental deliberation before the implementation of an intention to an action. Hence, Soon et al.(2013) pursued another experiment which dealt on one's covert mental decision, that is, a research to establish the brain correlates of abstract decisions. In the experimental set-up, recruited participants were first screen based on a behavioural selection protocol that was based on their ability to correctly perform the required tasks. In this study, while participants were undergoing fMRI scanning, they were asked to decide whether to add or to subtract two numbers from a set of five single digits that was presented to them through a screen. At the middle of each set of 5 digits that were presented, an accompanying stream of consonant letters appear. They were asked to remember which letter was present when they first had the urge to sum up or find the difference of the 2 digits indicated above the letter. The third frame that appeared consisted of 4 possible answers; two digits corresponded for either addition or subtraction while the other two were wrong answers. Then, participants had to press a button to indicate their choices. This study has es-

¹⁷⁴ Chun Siong Soon et al., 'Supplementary Information: Unconscious Determinants of Free Decisions in the Human Brain', *Nature Neuroscience* 11, no. 5 (May 2008): 543–45, <https://doi.org/10.1038/nn.2112>.

¹⁷⁵ Chun Siong Soon et al., 'Unconscious Determinants of Free Decisions in the Human Brain', *Nature Neuroscience* 11, no. 5 (May 2008): 543–45, <https://doi.org/10.1038/nn.2112>.

established that (1) 4 seconds before the participants had reported the time when they made the intention to subtract or to add the digits, their intended actions had been determined based on the patterns of detected brain activities, (2) predictive brain signals were emanating from the medial cortex and parietal cortex regions, (3) the occurrences of these predictive signals overlapped with certain area of the “default mode network” in the brain which had been previously reported, and as to the specificity of the functions of brain regions this research has determined that the pre-Supplementary Motor Area predicted the timing of the intention but was not able to decode the intended action whereas the frontopolar and precuneus-posterior cingulate decoded the content of the intended decision but not the timing.¹⁷⁶ Significant deduction from this experiment also suggested that the aforementioned brain regions do not exclusively relate to motor functions but those areas of the brain could also be signified as regions in which determinant signals predictive of non-motor intentions originate.

Claims made in empirical sciences could be further verified, enhanced or entirely nullified as technological devices and research methodologies rapidly evolve. Readiness potential was first discovered to precede self-paced movement.¹⁷⁷ This signal was then established to be predictive of intentions to implement actions.¹⁷⁸ Succeeding studies have determined the regions from which these intention-predictive signals originated.^{179 180 181} Alexander et al.(2016) studied 17 participants who underwent a modified version of the Libet experimental procedure. EEG-monitored Subjects sat in front of screen in which a stream of letters were presented with a transition pace of

¹⁷⁶Chun Siong Soon et al., ‘Predicting Free Choices for Abstract Intentions’, *Proceedings of the National Academy of Sciences* 110, no. 15 (9 April 2013): 6217–22, <https://doi.org/10.1073/pnas.1212218110>.

¹⁷⁷Hans H. Kornhuber and Lüder Deecke, ‘Hirnpotentialänderungen bei Willkürbewegungen und passiven Bewegungen des Menschen: Bereitschaftspotential und reafferente Potentiale’, *Pflüger’s Archiv für die gesamte Physiologie des Menschen und der Tiere* 284, no. 1 (1 March 1965): 1–17, <https://doi.org/10.1007/BF00412364>.

¹⁷⁸ Benjamin Libet et al., ‘Time of Conscious Intention to Act in Relation to Onset of Cerebral Activity (Readiness-Potential) The Unconscious Initiation of a Freely Voluntary Act’, *Brain* 106, no. 3 (1 September 1983): 623–42, <https://doi.org/10.1093/brain/106.3.623>.

¹⁷⁹ Itzhak Fried, Roy Mukamel, and Gabriel Kreiman, ‘Internally Generated Preactivation of Single Neurons in Human Medial Frontal Cortex Predicts Volition’, *Neuron* 69, no. 3 (10 February 2011): 548–62, <https://doi.org/10.1016/j.neuron.2010.11.045>.

¹⁸⁰ Angela Sirigu et al., ‘Altered Awareness of Voluntary Action after Damage to the Parietal Cortex’, *Nature Neuroscience* 7, no. 1 (January 2004): 80–84, <https://doi.org/10.1038/nm1160>.

¹⁸¹ Michel Desmurget et al., ‘Movement Intention After Parietal Cortex Stimulation in Humans’, *Science* 324, no. 5928 (8 May 2009): 811–13, <https://doi.org/10.1126/science.1169896>.

150 millisecond. Subjects were tasked to perform simple cognitive decisions by choosing one among 4 letters whenever they want to select. Onsets of decision to choose were noted by the participants. Two options were given to them after choosing a letter either to press a button as soon as they selected a letter or to make no explicit response. In congruent with the findings from fMRI studies, the outcome of this EEG-based experiment has revealed that (1) readiness potentials were detected both when the participants pressed buttons to reflect their chosen letters (decision-plus-movement) and when they did not do any overt response (decision only), (2) there were robust readiness potentials with decision-only trials, (3) trials with motor responses did not significantly modulate the readiness potentials. Hence, the researchers concluded that since Readiness Potentials were detected in the absence of movements and the motor-oriented responses did not lead to any modification of the detected signals, then Readiness Potentials measured in their experiment did not mainly represent preconscious motor planning, instead these signals correlatively reflect intention-related processes with the absence of movements.¹⁸²

In most recent studies, the very nature of the Readiness Potential which has been the basis of the claim that unconscious brain activities precede one's awareness of an intention or decision to act has been questioned. Researchers have aimed to clarify if the Readiness Potential is actually the causative factor of intentions or decisions that lead to spontaneous voluntary actions. Schurger et al.(2016) asserted that the detection of neural activities or the neural fluctuations prior to the 200 to 150 millisecond-point in which one becomes aware of his intention or decision to act does not have correlative nor causative relation to the process of intending or deciding to act, rather these continuous build-up of neural excitations could be attributed to the "ebb and flow of background neuronal noise".¹⁸³ In their experimental design, 13 to 15 participants were tasked to perform 50 trials based on the classical Libet set-up, after then, another 150 trials using a modified procedure of the Libet's with the use a sound of a "click" that when introduced to the participants, they had to press a button as fast as

¹⁸² Prescott Alexander et al., 'Readiness Potentials Driven by Non-Motoric Processes', *Consciousness and Cognition* 39 (January 2016):38–47 <https://doi.org/10.1016/j.concog.2015.11.011>.

¹⁸³ Aaron Schurger, Myrto Mylopoulos, and David Rosenthal, 'Neural Antecedents of Spontaneous Voluntary Movement: A New Perspective', *Trends in Cognitive Sciences* 20, no. 2 (February 2016): 77–79, <https://doi.org/10.1016/j.tics.2015.11.003>.

possible. A “click” sound was used to elicit an uncued action which intends to interrupt or to have abrupt effect on the early onset of the Readiness potential, that is area of the ERP recordings that contain neural fluctuations that precede the 150 millisecond-point in which a participant became aware of his intention or decision to act. By analysing data that were obtained from the EEG recordings while the participants performed the instructed tasks, by using these data in a Neural Accumulator Model and by using a stringent statistical techniques, trials from this study asserted that (1) the Readiness Potential can have two nonlinear components which consist of an early pre-commitment stage marked by stochastic patterns and a late post-commitment motor-execution stage that encompasses the 150 millisecond prior to actual movement, (2) the conventional correlation of the RP signal is refuted by their statistical model which suggested that build-up of neuronal prior to one’s awareness to decide represent “stochastic fluctuations rather than an intentional decision process”, (3) the initial onset of the readiness potential is not indicative of “one’s decision to act now” but rather it is within the later section of the RP in which one’s commitment to act is represented. This latter part of the RP corresponds to the reported time in which one is aware of his decision to act. Libet’s claim on the causative relation of the Readiness Potential to intentions or decisions to implement actions are unfounded. The researchers asserted that “The reason we do not experience the urge to move as having happened earlier than about 200 milliseconds before movement onset is simply because, at that time, the neural decision to move has not yet been made”.¹⁸⁴

Jo et al.(2014) supported the assertion that Readiness potential is not related to intention-related preparatory processes. Their study was based on the assumption that “if the average Readiness Potential reflects the spontaneous fluctuation of neural activity rather than movement of preparation, then, the same components of the Readiness Potential would be observed not only in a self-initiated movement condition but also in a no-movement condition”.¹⁸⁵ In this experiment, each of the 13 participants performed 40 trials for each two conditions of task. The first condition is similar to Libet’s design wherein Readiness Potential of the participants were recorded as they

¹⁸⁴ Schurger et al., “Neural Antecedents” 2016, p 6.

¹⁸⁵ Han-Gue Jo et al., ‘Spontaneous EEG Fluctuations Determine the Readiness Potential: Is Preconscious Brain Activation a Preparation Process to Move?’, *Experimental Brain Research* 231, no. 4 (December 2013): 495–500, <https://doi.org/10.1007/s00221-013-3713-z>.

performed self-initiated movements. The second condition of task involved an auditory stimulus wherein a tone was randomly played, and participants were instructed to note the time when they heard the sound without pressing any buttons nor any movements. This condition was aimed to detect and analyse Readiness Potential that could have been produced as participants were stimulated by the tone and perform the task of noting the time of its occurrence without any accompanying motor movement. By comparing the patterns of the Readiness Potentials in both conditions, the researchers have found out that (1) slow cortical potential shifts constituted the electrical patterns in the longer early part of the readiness potential which were observed both in the no-movement and movement-oriented task conditions, (2) in both task conditions, analyses of the early section of the readiness potential revealed that readiness potential emerges from a continued build-up of “unequal ration of negative and positive potential shifts” due to these findings, the researchers concluded that based on the origination and detected patterns of the early section of the readiness potential, that is, “the ongoing negative shifts of the Slow Cortical Potentials”, it could be asserted that this early section of the Readiness Potential “facilitate self-initiated movement but are not related to processes underlying preparation or decision to act”.¹⁸⁶

Another EEG-based experiment, which has questioned the relevance of the readiness potential to an intention or decision to act, tackled the degree by which the readiness potential represents actual movement preparation in contrast to perceptual judgement and the impact of the participants’ required monitoring of a fast-moving clock (to denote the time when they felt the urge to act) to the detected patterns of the readiness potential. To study the impact of the clock, Miller et al.(2011) recorded the EEG activities of 12 participants, each session lasting for 150 minutes, as they were instructed to perform two categories of actions. The instructions in the first category was similar to the Libet Experiment wherein the participants were tasked to press a key while they monitor the time when they had the urge to press. In the second category, the clock was removed as the task for the participants to monitor the time of wanting to move was not required. This set-up was aimed to isolate the impact of a participant’s time monitoring task with the output RP signals of the EEG recording.

¹⁸⁶ Jo et al., ‘Spontaneous EEG Fluctuations’, 500.

In the experimental design which was aimed to differentiate readiness potential patterns in motor movement preparation and perceptual judgment-only process, participants listened to a varying intensity of a sound and were instructed to identify which among those two randomly introduced brief tones had higher and lower pitches. Then, in trials with clock display, they were to note the time when they heard the sound while in the other set of trials, clock monitoring was excluded. The results of this experiment showed that (1) the amplitude of the RP from onset to action initiation was higher in trials with clock averaging to -3.8 microvolts and significantly lower in trials without clock-monitoring which had a mean amplitude of just -0.7 microvolts, (2) the mean EEG amplitude in the first 2 seconds immediately preceding participants' actions was -6.3 microvolts with the clock monitoring trials while -2.4 microvolts without the clock, and (3) more negative slopes were demonstrated with the Clock-oriented trials amounting to -2.02 microvolts in comparison to -0.65 microvolts in No-clock condition.¹⁸⁷ From these empirical data which evidently highlighted the significant differences in the strength of EEG-recorded readiness potential in the inclusion and exclusion of the task to monitor a clock in relation to a participant's urge to act, the researchers firmly concluded that the part of the readiness potential which preceded the time in which awareness to act occurred merely represent the neural excitations that were mainly due to the required degree of concentration that the participants had to exert to monitor the fast-moving clock and the early onset of the readiness potential unlikely to represent subconscious preparation to act.¹⁸⁸ Thus, this study in relation to the other experiments had challenged the common interpretations of Libet's experiment that the early onset of the Readiness Potential which precedes the time of awareness to act is indicative of unconscious action-specific brain activity.

¹⁸⁷ Jeff Miller, Peter Shepherdson, and Judy Trevena, 'Effects of Clock Monitoring on Electroencephalographic Activity: Is Unconscious Movement Initiation an Artifact of the Clock?', *Psychological Science* 22, no. 1 (1 January 2011): 103–9, <https://doi.org/10.1177/0956797610391100>.

¹⁸⁸ Miller, 'Effects of Clock', 103–109,

3.7. Deductions from the Findings of Neuroscientific Experiments

What could be deduced from these Neuroscientific studies that have spanned for 54 years to tackle the issue of human decision-making and action implementation? The elements of these experiments have projected trends that could be significant to the debate on Free Will. These elements are the technologies employed, the experimental designs and the results.

From the use of a simple EEG to the utilisation of a complex Functional MRI, the brain correlates of how humans decide and act have been dissected to a finer level of clarity in relation to the degree of specificity of these diagnostic devices. The EEG system have initially focused on indirectly measuring brain activities from the scalp. Then, an upgrade version which uses the EEG principle has been used by directly implanting EEG electrodes to the surface of the brain. Instead of just monitoring brain electrical impulses, another technique was used to further elaborate the cerebral correlates of human decision-making and action, this was the use of Direct Electrical Stimulation of the brain which was done while awake patients were undergoing brain surgery. The Magnetic Resonance Imaging with its ability to capture detailed anatomy of the brain has been modified with the capacity to measure almost real-time brain activities by focusing on cerebral blood circulation in addition to measuring other significant biological components. These trend of advancement in biomedical engineering which researchers have relied upon to establish, to improve and to validate their experiments have greatly determined the way the notion of Free Will has been approached in Neuroscience. The main deductions which can be synthesized from the technological progress in Neuroscience in its endeavour to analyse Human Decision and Action are (1) Brain correlates of Free Will can be approached through the emitted electrical impulses in the Brain, both indirectly and indirectly, by the use of EEG and (2) the physiological demand of neurons to have continuous rapid supply of oxygen, glucose and other vital molecules can be used to monitor neural activities that correspond to specific actions and this has been shown through the use of the functional magnetic resonance imaging which monitors varying degrees of changes in the level of blood oxygenation on the brain. Therefore, current technologies have enabled the use of two biological variables to measure “Free Will”, these the Action

Potential or Electrical impulses from neurons and the cerebral blood oxygenation being linked to neural activities.

From simple task of wrist twisting to performing mathematical activities, to ascertain the validity of previous findings that were concluded by the Libet's experiment, researchers have implemented several types of task which the recruited subjects were required to perform while they were being monitored by EEG and MRI systems. Modifications made were designed to increase the complexity of the tasks to induce and elucidate differences in neural activities. Variations of tasks were aimed to scrutinise the emergence of the detected "Action Potential". It was asserted that despite of changes in the required task, the "Readiness Potential", whose onset preceded one's awareness of an intention or decision to act was, was consistently detected with the EEG-based experiments. The MRI-oriented studies have clearly revealed the changes in the oxygenation level of blood which circulate in the brain correspond to the degree of region-specific neural activities. From the categories of experimental design used in Free Will-related experiments, it can be deduced that brain activities were detected prior to one's awareness to act despite of changes in the required tasks.

From monitoring a clock to identifying sound intensity, the impact of the participants' required task to monitor the time when they felt the urge to act was the primary factor that was considered to modify the Libet's classical clock. The typical pattern of the readiness potential was still detected despite of the use of the typical clock. However, the authors of the most recent studies have questions as to what constitute the early onset of the readiness potential prior to the point when participants reported that they had the urge to act. It was the assertion that the early onset of the detected neural action potential prior a participant's awareness to act was attributed to the task of monitoring the clock. The recorded continuous build-up of negative on-going action potential before the reported time of awareness of wanting to act was due the participants attention to the clock. This conclusion can be derived from newer studies and thus need further validation. This is not to deny the assertions made by the researchers of these studies, however considering that an EEG-based monitoring is an indirect assessment of brain signals, there could also be other factors which could be linked to the early section of the detected neural impulse in relation to decision to actuate a given task. This objection which has pertained to possi-

ble factors which would have caused the early onset of the readiness potential before awareness to act has indeed put the specificity of the nature of the early detection of what has been supposed as cerebral hallmarks of intention to act.

From 500 milliseconds to 10 seconds, researchers have established that distinct patterns corresponding neural activities are detectable prior to one's intention to act. The EEG system has established that this particular neural activity begins on average 500 milliseconds prior to one's awareness to act while the Functional Magnetic Resonance System can determine what the action would have been up to 10 seconds prior to one's implementation of an action. As some recent studies have questioned the correlative claims of the Readiness Potential as detected by EEG systems and have tarnished the accuracy of earlier studies, however the findings based on fMRI experiments stand unchallenged by any other studies. Thus, in parallel to the trend of technological progress in Neuroscience, the accuracy of predicting human intention or decision to act has become more accurate in terms of detecting patterns of neural activities prior to awareness to act and in anticipating what the actual action will be.

3.7.1. What Were Measured in These Experiments?

The phrases “having the urge”, “wanting to act”, “having intention”, “time of decision”, “awareness to act”, “being conscious to act” and “volition” were repeatedly and interchangeable used along the passages of these neuroscientific studies. As to what is being exactly implied by these most used phrases in connection to human action could be interpreted in an intermingled manner. Schurger (2017) clarified that intention should imply the “tendency or disposition towards performing a certain action in the near future” while Decision is the “final commitment to initiate a given action and is the proximal cause of an action”.¹⁸⁹ Though some of the researchers have attempted to clarify the connotations of the terms they have used, most of them have not. This has led philosophers of the Free Will Debate to comment on the confusion that could be derived from the studies of Neuroscientists due to lack of semantic clarity. Neurophilosophers have addressed this gap between Neuroscience and Philosophy.

¹⁸⁹ InteractingMindsAU, Aaron Schurger: Neural Antecedents of Spontaneous Voluntary Movement, 2017, <https://www.youtube.com/watch?v=3oGqEraG45c>.

All these experiments primarily aimed to identify brain correlates of human actions. Of all these categories of physical and perceptual actions, researchers were motivated to classify the regions of the brain that are involved in each particular non-movement and movement-oriented actions. From establishing the action-related functions of each region of the brain, researchers isolated neural activities which correspond to an intention to act. These patterns of neural activities were studied in relation to its correlative or causative impact on a person's awareness of having the intention to act. The main target of these neuroscientific experiments was to validate or rebuke the relevance of specific patterns of neural activities to the process of implementing an action.

These Neuroscientific studies were time-based analysis. The onset of the identified neural activities were measured in relation to the point of time when the action was implemented. Then, it compared the recorded time when these neural activities were first appeared to the reported time when a person became aware of having the intention to perform the required action. Thus, these experiments focused on the temporal analysis of (1) the onset of the neural activities, (2) the time when awareness of having an intention to act and (3) the time when an action is implemented.

These Neuroscientific experiments have demonstrated that the onset of neural activities happens before the reported time of one's awareness of having the urge to act. These experiments have evidently exhibited that the patterns of pre-awareness neural activities are sufficient to predict the outcome of an urge, intention or decision to implement an action.

CHAPTER 4: LINKING NEUROSCIENCE TO KANT AND AL-GHAZALI

Derived from the many definitions and arguments for and against the Concept Free Will, it is evident that “Free Will” could have three features based on the central intuitions that could be synthesized from nearly all the theories which have pertained to it.¹⁹⁰ These are Freedom, Volition and Agency. Freedom can be equated to a situation when one acts freely to select between or among options. This pertains to one’s ability to do otherwise. To have choices from which a person refers his decision to direct his intended action is to have freedom. Having Freedom in a sense that a person has the ability to choose by himself either of two or more options. The “Volition” aspect of Free Will is derived from the interconnected connotations of the concepts “voluntariness”, “intention” and “intentionality” which all could be attributed to one’s propensity towards a goal or purpose. The driving force of one’s propensity towards that goal is based on reasons. Whatever these reasons be that are the basis of intentions to decide to implement actions as well as the consequences of these actions must be fathomable to the doer of the action. Intelligibility, which means that purpose-oriented voluntary decisions and actions ensue due to understandable reasons, has to be the significance of the volitional aspect of Free Will.¹⁹¹ Agency means that the person is the originator of his actions.¹⁹² For a person to be the true source of an action, one must have total control of it. To have control of an action implies that the doer is aware of his actions and with this awareness an action is eventually implemented. The state of having awareness of one’s intended action is contingent on time: awareness precedes action. When a person is aware of an intention to act, he has control over the decision to cause an action. It follows then that pre-action awareness is required to have decisive control to cause an action.

Among these three conditions of Free Will, Agency could be the most significant as it is conjoined with both the “Freedom” and the “Volitional” aspects. To incorporate these three features, having “Agency” could be understood as “when a person is aware of his intention to decide, which is based on his own reasons, to act or not to

¹⁹⁰ Henrik Walter, *Neurophilosophy of Free Will: From Libertarian Illusions to a Concept of Natural Autonomy* (Bradford Book-MIT Press, 2001), 33.

¹⁹¹ *Ibid* 67-73.

¹⁹² *Ibid* 33.

act in a certain manner, then that person is the true causative source or originator of an implemented action”. In this instance, the “Will” in the concept “Free Will” could be equated to the notion of Agency.

If having a “will” which is to be considered “free” means having total control over one’s actions and having control implies having a sense of agency, that is, being aware of initiating and implementing an action, then, these neuroscientific studies could mean that there is “no free will”. This is because the onset of predictive patterns of neural activities precedes the time when one becomes aware of an intention to initiate and implement an action. Thus, if one is not actually aware of the onset of these predictive neural activities then one has no sense of agency nor control over the ensuing action. Thus, having free will could mean that the onset of this predictive, causative neural activities must exactly coincide with the time of one’s awareness of having the urge to act. If this judgement is to be accepted, then the main neuroscientific perspective that could be derived from the aforementioned experiments is that since pre-awareness neural activities determine the outcome of an intention to act, then between the two contrasting extremes in the philosophical debate on free will, most studies in neuroscience are inclined towards “determinism”.

4.1. On Determinism: Neuroscience, Kant and Al-Ghazali

Kant’s concepts of (1) noumena and phenomena, (2) space and time, (3) a priori and a posteriori knowledge and (4) synthetic and analytic propositions have provided explanations regarding the mind’s ability to perceive, analyse and produce information based on the complimentary relationship among the faculties of sensibility, understanding and reason. This process which explains the cognitive ability of the mind is Kant’s basis for his assertions about Transcendental Idealism and Transcendental Freedom. For determinism, both Kant and the neuroscientific studies that were considered in this research claim that human actions are determined. In Kant’s theory of cognition, determinism is clearly argued in his discussions about the relationship of the noumena and the phenomena as well as his descriptions relating to the interactions among the three faculties of the mind. The noumena as “the things as they are” determines the phenomena as “the things as they appear”. The faculty of reason determines the faculty of understanding which interacts with the faculty of

sensibility. All these concepts refer to how the mind apprehends pure reasons to make sense of experiences. Thus, Kant's position is that the nature of the processes of knowledge acquisition determines all voluntary actions. This also entails the acknowledgement of the domain of the noumena which Kant claims to be the prime causative factor on how the physical world appears. Interpretation of Kant's position about determination of human action is compatible with the neuroscientific findings which have asserted that actions are determined by predictive neural activities. Kant's descriptions about the workings of the three faculties of the mind have similarities with the basic biological mechanisms in the brain. The manner by which cognitions are produced by the three faculties have resemblances with neuronal physiology. The unidirectional outputs of the faculty of reason towards the faculty of understanding and the bi-directional relationship of outputs between the faculty of understanding and the faculty of sensibility can also be reflected in the selective permeability of the molecules and ions in neurons which is the biological mechanism that allows the production of patterns of electric signals which are transmitted from one neuron to other neurons in response to internal and external stimuli. The determinant factors in Kant's models of the origination and acquisition of pure reasons as basis of cognition that eventualises into actions are compatible with the neuronal basis of information which is primarily grounded on the transmission of electric signal by neurons that are activated by internal and external stimuli.

Al-Ghazali argues that God determines human actions. EEG-based neuroscientific studies demonstrate the onset of a predictive neural signal which precedes the time of awareness of having the urge to act. As to the chemical processes that lead to signal formation, it is well established. However, with regards to why there is an early onset of a predictive signal and what causes it to emerge prior to the time of awareness to act are unknown. As the why and what factors are unknown, Ghazali's claim that God determines human actions could probably be equated to this unknown spontaneous neural signal. Ghazali's discussion on the nature of man based on the different aspects of the soul can also be linked to neuroscience. The characterisations of "Qalb, Ruh, Nafs and Aql" as well as the concept of the "Armies of Soul" could be related and could have resemblances to the localisation of functions in the brain. For instance, the immaterial attributes of the qalb have resemblances with Spinocerebellum which has been determined to be responsible for body movement regulations by

enabling compensatory response for error correction.¹⁹³ For the Aql, the right hemisphere is attributed for creativity and intuition as well as the regions of the left hemisphere which controls logic and language. The Ruh that “vibrates in the whole body like the current of electricity and which runs through the veins of the body” and thus allows sensations and physical movements.¹⁹⁴ For this attribute, the Ruh has functions which could be in parallel with the brainstem region which handles vital communication from the other parts of the human body to the brain to regulate basic vital functions such as sleep cycle, response to painful stimuli, respiration, swallowing, cardiac contraction and blood pressure regulation.¹⁹⁵ The angry, greedy lower Nafs and the virtuous higher Nafs can be compared to the Cerebrum which initiates mental functions related to emotion, interpretation of audio-visual senses, and communication as well as voluntary movements of the extremities that require certain degree of precision. Physical and chemical anomalies in these regions of the brain which disrupt normal biological processes have detrimental effects to their functions. Similarly, imbalances among the domains of the soul lead to destructive human behaviours that negate from the path of righteousness.

Considering these comparisons, it could be argued that that the findings of neuroscientific studies that have been reflected in this research can be accommodated to the deterministic views of Kant and Al-Ghazali in pertinent to human will and action.

4.2. On Free Will: Neuroscience, Kant and Al-Ghazali

Kant argues for the existence of a necessary freedom as a condition of all voluntary actions. Kant’s Transcendental Freedom implies that due to the empirical and intelligible characters which the mind has, all voluntary actions signify freedom and at the same time congruent to the laws of nature. Kant emphasizes that freedom is grounded on the intelligible character of the mind. This intelligible character is based on his distinctions between the noumena and the phenomena as well as the differentiations

¹⁹³ Léa A. S. Chauvigné, Kevin M. Gitau, and Steven Brown, ‘The Neural Basis of Audiomotor Entrainment: An ALE Meta-Analysis’, *Frontiers in Human Neuroscience* 8 (2014), <https://doi.org/10.3389/fnhum.2014.00776>.

¹⁹⁴ Al-Ghazali, *The Revival of the Religious Sciences*, Vol III, 8.

¹⁹⁵ Anant Dhanwate, ‘Brainstem Death: A Comprehensive Review in Indian Perspective’, *Indian Journal of Critical Care Medicine* 18, no. 9 (September 2014): 596–605, <https://doi.org/10.4103/0972-5229.140151>.

of knowledge that the three faculties of the mind acquire and synthesize. Similarly, Al-Ghazali argues that humans have the capacity to act freely. Al-Ghazali's discussions about the nature of man through the various attributions, domains and stages which the soul undergoes imply that humans are capable of changing their behaviours and they have the capacity to freely act based upon their willed intentions. Ghazali stresses that the human will is grounded on the mind's ability to acquire knowledge. Thus, the freedom which Ghazali argues for is conditioned by knowledge acquisition.

Both Ghazali and Kant argue that freedom as being able to voluntarily choose one's action is founded on rationality that is dependent on the ability of the mind to conceive and synthesize knowledge. However, Kant and Ghazali differ with regards to the particular source or standard of knowledge that they have linked to the cognitive ability of the mind. Ghazali clearly says it is from God. Whereas, Kant says it is noumenal. If freedom implied in the Free Will concept means to have freedom to be rational and freedom away from irrationality, then Ghazali and Kant believe that humans have free will.

On the contrary, most neuroscientific studies are being interpreted to have nullified the assertion that humans have free will. This "No Free Will" interpretation could be unfounded and stands weak when confronted by the philosophical expositions of Kant and Al-Ghazali. Other than this, there are some reasons that can be provided as to why such interpretation is dispensable. First, the EEG-based studies which demonstrated that onset of predictive neural signal before a person becomes aware of having urge to act have only proven that there is a predictive, causative factor that causes something to occur. Thus, these studies have verified an aspect of causal determinism. Second reason: the parameters of their experiments could not be ascertained to have the sufficiency to be considered representations of the wide spectra of actions and situations that are intricately involved in the free will debate. The different types of tasks which the participants were instructed to perform are not significantly relevant to both mental and physical ascriptions of freedom. Third reason: to measure the notion of Freedom in a laboratory is nonsensical. Freedom is not an object that can be subjected to physical examination. Unlike diseases which are characterised, identified and defined based on specific alterations at the biological level and thus could easily be subjected to experiments, freedom is highly relativistic and it is difficult to

have a singular identifying feature. Hence, it is counterproductive to operationalise freedom for the purpose of controlled laboratory experiments. Fourth reason: even if it is to be assumed that freedom has corresponding measurable correlates in the brain, current technologies and methodologies in Neuroscience are not efficient enough to study such brain correlates. This is due to the limited theoretical and practical knowledge that contemporary science has about the brain. Among the organs of the human body, brain is the most complicated and least understood medically. Fifth reason: in cases of diseases, there is precision in identifying normal from pathologic. However, in the case of freedom, if it is to be a subject of brain studies, it is difficult to establish a criterion of normal brain that could be the standard for any given observable deviations of the brain correlates of freedom.

Neuroscience has not ruled out free will as it has no capacity to study the type freedom which philosophers like Kant and Ghazali have discoursed upon. Rather recent and contemporary neuroscientific studies have validated causal determinism in the brain. Thus, the philosophical views of Kant and Ghazali about determinism and causality are not only compatible with the findings of neuroscience, but their views have also been confirmed by these neuroscientific experiments.

4.3. The Limitation and Significance of Compatibility

The perceived compatibilities of the interpretations from the findings of the above-mentioned neuroscientific studies and from the concepts of Kant and Ghazali have both significance and limitation. Neuroscience has established the structural and functional mechanisms of the brain. It has undoubtedly deciphered most of the curiosities and misconceptions on the manner by which the brain was understood in the past. In relation to the Free Will issue, neuroscience has paved the way to identify a framework of tracing patterns in the brain that could be correlative, if not causative, to decisions and actions. The predictive ability of neuroscience with the implantation of intracranial electrodes and the scanning efficiency of varied types of imaging technologies have been of great aid in further advancing contemporary understanding of the brain. Indeed, all matters pertinent to the brain, Neuroscience is the authority together with the other relevant sciences under its realm.

However, in Philosophy, the brain is not the only domain that is being studied. Within the scope of this research, neuroscientific experiments have analysed the brain, Kant has discussed about the mind and Ghazali has dealt with the soul. From these, there is the brain, the mind and the soul. The perceived connections and relationships of the brain, mind and soul have been at issue among many scholars in the Western and Islamic Civilisations. Positions on this issue can be of three categories. First, those scientists who claim that there is only the brain and that there are no separate dimensions for the mind and the soul.¹⁹⁶ Second, there are those who argue for the existence of both the brain and the mind, and that the mind is also the soul. Third, those scholars who assert that the brain, the mind and the soul all exist and each has its own distinctive features and are interrelatedly linked.¹⁹⁷ It is with this third category that the findings of neuroscience about the brain become admissible for a constructive discourse in pertinent to the concepts of the mind and the soul. Derived from the imprints of Al-Ghazali, Şentürk(2019) argues that:

...human action is a joint production of soul, mind and body. The soul is the locus of meaning, intention and will. If a physical action is willed, then the will is communicated to the brain, which moves the body to produce a particular action. From this perspective the ultimate control center of a human being is the soul, which is also called the heart, the intellect (or reason) and the self. The soul is hidden in itself and thus it is beyond empirical study but it is manifested through its actions on the body which is subject to empirical research and observation.¹⁹⁸

As for the second category of scholars, there is this argument that if the transcendental soul is one as the mind, then the established functions of the various regions of the empirical brain must not be directly linked to the metaphysical status of the mind-soul. In the first category, as it denies the existence of a soul and doubts the distinctions between the mind and the brain, then it could be counterproductive to link neuroscience to issues with metaphysical connotations.

¹⁹⁶ Among these is Patricia Churchland's argument that there is only the brain and that there is no scientific basis for the distinction between the mind and the brain.

¹⁹⁷ Recep Şentürk, 'Multiplex Human Ontology and Multiplex Self: An Alternative Understanding of Human Behavior', *Ibn Haldun University*, 2019.

¹⁹⁸ Şentürk, *Multiplex Human Ontology*, 23.

Thus, the limitation and significance of finding compatibilities between Neuroscience and Philosophy on matters such that of Human Will varies depending to which category of thinkers are to be considered. Advocating for the inclusion of neuroscientific perspectives to issues with philosophical implications does not necessarily imply the denial of the metaphysical, rather it could be understood as way of bridging the gap between the ideals of the philosophers and the definiteness of the scientists.



CONCLUSION

The human Will has been the subject of discourse for centuries. Whether the will is free or determined. Whether the state of being free or being determined is compatible with moral responsibility. Philosophers have succeeded in significantly re-defining and re-shaping how the human Will has to be understood from generations to generations. At some point in the current century, it was thought that both public and academic interests on this issue have subsided as all the possible arguments for and against it have been exhausted. Then, the advent of neuroscience has led to the revival of interests on this topic. Fundamental concepts in philosophy such as freedom, self, judgment, and justice have been subjected to the analysis of neuroscience. The modern technologies of neuroscience have become a great leverage for some naturalist, empiricist, and reductionist scholars to advance their views that the mind-body duality is not true. For some of these scholars, there is no mind-body, there is even no mind, just the brain. The soul which the classical scholars have spoken about is now being confined within the skull and it is being solely designated as the brain. The opposing scholars who argue for idealism, rationalism and holism have not lost their grounds. They too have used both the established findings of neuroscience as well as their fallibilities to defend their views. In response to this, the emerging discipline of Neurophilosophy has become the new frontier of such discourses.

The scope of this MA Thesis has covered both philosophy and neuroscience. It has aimed to investigate the compatibility of these two disciplines on the issue of human will and action. This research endeavour has initially argued that the findings of neuroscientific studies can be accommodated in the philosophical perspectives of Immanuel Kant and Al-Ghazali. It has primarily examined the works of Kant and Al-Ghazali using the spectacles of libertarianism and compatibilism. It is for the reason that these two major positions in the Free Will discourse have features of determinism, compatibilism, fatalism, and scepticism. Thus, any arguments from the works of Kant and Ghazali would have been classified in reference to various positions in the free will discourse. The following are the summary of the main analyses of this research that have been used to support its central thesis:

1. “The Noumena and The Phenomena”, “Analytic and Synthetic”, “A Priori and A Posteriori”, “Space and Time”, “Intuitions and Concepts”, “Three Faculties of the Mind”, “Transcendental Idealism” and “Transcendental Freedom”: From these fundamental concepts which constitute Kant’s Philosophy, three assertions can be deduced in relation to the Free Will debate. First, Kant argues for the existence of a necessary freedom as a condition of all voluntary actions. An interpretation from this argument means that there is free will. Second, Kant argues that the noumenal freedom causes phenomenal actions and these actions cause chains of causalities which establish the deterministic laws of nature. An interpretation for this argument implies that determinism is true. Third, Kant argues that there is a uni-directional noumenal causality towards the phenomena as in the case of the freedom of the intelligible character that determines actions: Noumenal freedom-based actions produce causality in the phenomena. An interpretation for this is that there is compatibility between Free Will and Determinism. Thus, Kant’s Transcendental Idealism which is the foundation of his Transcendental Freedom conveys that there is Free Will, Determinism is true, and both are compatible.
2. By analysing Ghazali’s explanations on the concepts of (1) the *latifa rabbaniyah* which encompasses the domains of the *Qalb*, the *Ruh*, the *Nafs* and the *Aql*, (2) the dynamics of the armies of the soul, (3) the categories of actions, and (4) the acquisition of different classes of knowledge, when these concepts are linked together, it is evident that central to Ghazali’s arguments is that a person has the deliberative ability to choose among possible actions. Ghazali’s position on the issue of Free Will could be interpreted as (1) the affirmation that humans have the capacity to act freely, (2) human actions are determined as they are the objects of God’s will and power, (3) perceived causal necessity through the laws of nature are true with the qualifications that all these causes are extensions of God’s power as well as the acceptance of the assertion that causes and effects perceived as impossible are possible through God’s will and power. Thus, Ghazali could be arguing for relative determinism or compatibilism in relation to the free will debate.
3. Neuroscientific studies were time-based analysis. The onset of the identified neural activities was measured in relation to the point of time when the action was implemented. Then, it compared the recorded time when these neural activities first

appeared to the reported time when a person became aware of having the intention to perform the required action. Thus, these experiments focused on the temporal analysis of (1) the onset of the neural activities, (2) the time when awareness of having an intention to act and (3) the time when an action was implemented. These Neuroscientific experiments have demonstrated that the onset of neural activities happens before the reported time of one's awareness of having the urge to act. These experiments have exhibited that the patterns of pre-awareness neural activities are sufficient to predict the outcome of an urge, intention, or decision to implement an action. Thus, if one is not actually aware of the onset of these predictive neural activities then it could be supposed that one has no sense of agency nor control over the ensuing action. Having free will then could mean that the onset of this predictive, causative neural activities must exactly coincide with the time of one's awareness of having the urge to act. If this judgement is to be accepted, then the main neuroscientific perspective that could be derived from the aforementioned experiments is that since pre-awareness neural activities determine the outcome of an intention to act, then between the two contrasting extremes in the philosophical debate on free will, most studies in neuroscience are inclined towards "determinism".

From these analyses, the central thesis of this research which argues that "the findings of neuroscientific studies can be accommodated and are compatible with the philosophical perspectives of Immanuel Kant and Al-Ghazali on the issue of human will and action" has been affirmed.

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PUBLICATION:

Ramos, Yusoph. 'The Fundamental Thought of Syed Muhammad Naquib Al-Attas'. In *The Religion, the Man and the World*, 253–74. Cairo, Egypt: Al-Maraya, 2017.