ORIGINAL ARTICLE

Recognition of Aristotle's View of "Heart as a Controller" in the Modern Era

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Abstract
In the Modern Era, the heart as a controller of the human body is a flourishing topic of medical science. About five decades ago, in the modern medical fraternity, no one was known to the supremacy of the heart over the brain. But in BC, Aristotle placed the heart above all other organs. This study aims to understand Aristotle's thoughts regarding the importance of the heart in a contemporary rational world. All the relevant literature on Unani medicine has been evaluated, assessed, and analyzed based on classical texts. Several papers on this topic were also retrieved using search engines such as PubMed, Google Scholar, ResearchGate, and ScienceDirect. At present, molecular studies are proving Aristotle's assertions. Some research has confirmed that the heart has its own "brain" and communicates with the cranial brain and the whole body via hormones, electromagnetic fields, pressure waves, and nerve impulses. It is concluded here that Aristotle's writings on the heart brain connection merit further research in the modern era.

Key words: Aristotle, Heart, Controller, Heart brain, Atrial Peptide, Action Potentials, Electromagnetic Fields, Human Body

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Introduction

The role of the heart in the vital functions of the human body, particularly in blood circulation, has always been a subject of interest for scholars and philosophers throughout history. (Mahlooji, et al., 2021)

Aristotle (384–322 B.C.E.) is regarded as one of the most influential philosophers in history. In terms of philosophical impact, only Plato stands as his equal. His writings have influenced centuries of philosophy from Late Antiquity to the Renaissance and continue to be studied today with great interest. (Shields, 2008) He was born in Stagira, Thrace. His father, Nicomachus, and his mother, Phaestis, were members of the Asclepiad family. His father was a physician in the court of the Macedon king. (Modell, 2010) Aristotle argued that the heart is the center of sensation and movement, but his predecessors attributed these functions to the brain. (Shoja et al., 2008) All sanguine animals have a heart that controls both locomotion and dominant sense perception. The heart is the supreme organ of the sense faculties in all sanguine animals. (Abdoli et al., 2017) According to Greek medicine, three parts denote different capacities or functions, rather than different substances: a vegetative function, linked to nutrition and reproduction and found in all living things, including plants; a sensitive function, linked to sensation and movement and found in all animals; and an intellectual function, linked to cognition and deliberation and found only in humans. (Santoro et al., 2009) Aristotle says these functions start in the heart, and considered the heart as a source of blood and blood vessels, as well as the source of body heat and the life principle. (Oleksowicz, 2018; Crivellato and Ribatti, 2007)

The idea that the heart is the wellspring of emotions and thoughts was widely accepted in ancient times, particularly in Egypt and Mesopotamia, and mentioned in Homeric writings. (Finger, 2001; Bremmer, 1983) The heart houses all of the soul's powers. The heart is known as a central organ in the body, the source of life, and the first organ to develop in the embryo. Therefore, Aristotle put the heart at the top of his psychological and physiological echelons. (Crivellato and Ribatti, 2007)

Aristotle's View about the Supremacy of the Heart

Aristotle was a strong proponent of the heart as the most important organ of the body. He disagreed with the idea that the brain is mainly responsible for consciousness and movement of the body and suggested this role to the heart. (Gross, 1995) Before Aristotle, Greek philosophers held diverse views regarding the role of the brain. However, Aristotle stated that the brain is not the center of sensation or the experience of pain and pleasure; rather, he argued that these are the functions of the heart. His arguments favoring the heart as a controller were based on the following observations and reasoning: (Rahman and Hassan, 2013; Longrigg, 1993)

• Aristotle noted that all animals possess heart-like organs, but only vertebrates and cephalopods have brains. Despite the absence of a brain in certain animals, these creatures still exhibit sensations. In Aristotle's view, this indicated that sensation did not require a brain but was a function of the heart.

• The heart's primary function is to circulate blood throughout the body, which is essential for sensation. (Hashem-Dabaghian et al., 2018)

• He observed that the heart is warm and that warmth is a defining characteristic of life. He associated the warmth of the heart with vitality, interpreting it as evidence that the heart serves as the center of life.

• The fact that the heart is the first organ to develop in the embryo, followed by the brain, and that it is the last organ to cease functioning at the time of death, further reinforces its status as a superior and central organ. (Mahlooji and Abdoli, 2018)

• Aristotle contended that the heart is connected to all the sensory organs and muscles of the body through blood vessels. This connection strengthened his argument that the heart, rather than the brain, is the primary organ.

• Aristotle believed that the heart's central position in the body made it the most important organ. In his view, the centrality of the heart suggested that it was the primary organ, responsible for controlling life and the body's functions.

Heart as a super-controller in the present era

In the Heart Math Institute of the USA, it was observed that the heart acts as if it has its own mind and can significantly influence the perception and responses from daily public interactions. The heart acts as a highly complex information-processing center with the help of its functional brain, usually called the "heart brain". This "heart brain" communicates information to the cranial brain through the nervous system, biochemically, and through other pathways. Moreover, the heart is designed to send meaningful signals to the brain, and the brain not only understands the information but also responds to it.

Research has shown that the heart communicates with the brain in four major ways:

1) Ttransmission of nerve impulses.
2) Hhormones and neurotransmitters.
3) Preassure waves.
4) Eelectromagnetic field interactions.(McCraty, 2015)

1- Transmission of Nerve Impulses (The Brain on the Heart)

Dr. J. Andrew Armour introduced the idea of a "heart brain" in 1991. The heart contains about 40,000 neurons that create its compound circuitry, which enables it to sense, regulate, and remember. (Rahman and Hassan, 2013)

The "heart brain," or intrinsic cardiac nervous system, is an intricate network of ganglia, neurotransmitters, proteins, and supporting cells, similar to the cranial brain. The appropriate information or signals from the heart's intrinsic nervous system are sent to the sinoatrial node and other tissues in the heart. The neural circuitry within the "heart brain" enables it to function independently of the cranial brain, allowing it to learn, retain information, make decisions, and experience sensations and emotions (McCraty, 2015; McCraty et al., 2009; Kukanova and Mravec, 2006; Horackova, and Armour, 1995, pp. 326-335).

2- Hormones and Neurotransmitters

The heart not only communicates with the brain through neurological pathways but also interacts with the body biochemically through its hormones. In 1983, the heart was reclassified as part of the hormonal system when a new hormone produced and released by the atria of the heart was discovered. This hormone is known as Atrial Natriuretic Factor (ANF) or Atrial Natriuretic Peptide (ANP) or Atrial Peptide. ANF plays an important role in balancing fluid and electrolytes and helps to adjust the blood vessels. It also regulates the kidneys, adrenal glands, and many regulatory centers in the brain. (Cantin and Genest, 1988) Increased ANF inhibits the secretion of stress hormones, reduces sympathetic outflow, and interacts with the immune system. (Ströhle et al., 1998; Butler, Senn and Floras, 1994; Vollmar et al., 1990) Even some experiments suggested that ANF can influence the motivation and behavior of an individual. (Telegdy, 1994) It has recently been discovered that the heart contains cells capable of synthesizing and releasing neurotransmitters such as norepinephrine, epinephrine, and dopamine. These neurotransmitters were previously thought to be produced solely by nerve cells in the brain and ganglia.(Huang et al., 1995) More recently, it was found that the heart also synthesizes and secretes the same concentrations of oxytocin hormone as produced in the brain. (Gutkowska et al., 2000)

3- Pressure Waves

The heart generates energy and transmits it to the body via blood flow in the form of a pressure wave. The pressure wave is experienced as a pulse on the wrist or neck. This pressure is also a source of communication and information in the body. Research has demonstrated that variations in the electrical activity of brain cells coincide with fluctuations in this pressure wave. This suggests that the cardiovascular and nervous systems are intricately connected, with the pulse wave serving as a potential signal or form of communication between them. Pulse pressure can be measured by any pulse sensor, and even large electrical voltages can be observed occurring in the cardiovascular system, and brain cells responding to that blood pressure wave.(Harris, G, 1999)

4- Electro-Magnetic Field Interactions

Rollin McCraty's study explains that emotional states are related to the heart. The heart produces an electromagnetic field that is 5000 times stronger than the magnetic field generated by the brain. (McCraty et al., 1995) It also expands in all directions into the space surrounding the body, which can be perceived nearby the individual. The heart communicates with the body's organs by using its magnetic fields. The heart gives the strongest magnetic field, which influences the inner emotional states of the body. (McCraty, Bradley and Tomasino, 2004)

Discussion

This study has aimed to explore Aristotle's view of the heart as the central controller

and its relevance in modern scientific understanding. In the context of contemporary research, discoveries have shed light on how Aristotle's beliefs about the heart are increasingly supported by molecular studies, and we can now appreciate the heart's role beyond merely being a blood-pumping organ for the body. (McCraty, 2015) The heart's involvement in emotional and cognitive processes, its independent nervous system, and its ability to influence the brain suggest that the heart indeed has a significant role as a "controller" in the modern era, validating Aristotle's theory with empirical evidence. (Kukanova and Mravec, 2006; Horackova, and Armour, 1995, pp. 326-335)

Aristotle's philosophical stance that the heart is the seat of sensation and movement, rather than the brain, was way ahead of its time. His observations, such as the development of the heart in the embryo before the brain, its central position in the body, and its connection to all body organs through blood vessels, painted a picture of the heart as the most vital organ. (Rahman and Hassan, 2013; Longrigg, 1993)

One of the most striking parallels between Aristotle's ideas and modern findings is the concept of the heart's intrinsic nervous system, commonly referred to as the "heart brain." Recent studies have demonstrated that the heart contains approximately 40,000 neurons, and its intrinsic nervous system is capable of processing information independently from the brain. (McCraty, 2015; Horackova, and Armour, 1995, pp. 326-335; Kukanova and Mravec, 2006; McCraty et al., 2009). This affirms Aristotle's belief that the heart has its intelligence, allowing it to regulate functions such as blood flow and even learn, remember, and experience emotions. Through its neural pathways, the heart sends significant signals to the brain, influencing mood, cognitive processes, and behavior. This new understanding underscores Aristotle's view that the heart plays a critical role in the body's control systems.

Additionally, the heart's biochemical communication with the brain, through the release of hormones like atrial natriuretic peptide (ANP) and neurotransmitters such as norepinephrine, epinephrine, and dopamine, challenges the long-standing view that these chemicals are produced only by the brain. (Ströhle et al., 1998; Butler, Senn and Floras, 1994; Vollmar et al., 1990) Every heartbeat transmits a complex pattern of neurological, pressure wave, hormonal, and electromagnetic signals to the brain, contributing to both physiological and emotional experiences. (McCraty, Bradley and Tomasino, 2004)

Modern research highlights the heart's role in regulating sensation, emotions, decision-making, and even consciousness, alongside its role in blood circulation. The heart's electromagnetic field synchronizes with that of the brain, and its rhythmic patterns help stimulate brain activity, further supporting Aristotle's view of the heart as a key controller in the body. (Rahman and Hassan, 2013)

Conclusion

In conclusion, the evidence reviewed throughout this study confirms that Aristotle's

concept of the heart as the central organ of sensation and movement remains relevant in the modern era. Contemporary research validates the heart's critical role in regulating emotions, decision-making, and psychological well-being, as well as its communication with the brain through complex neural, hormonal, and electromagnetic signals. It is evident that, while the loss of various organs may be survivable, the heart's role as a vital and irreplaceable organ remains fundamental to life and health. Therefore, continued research into heart-brain interactions holds great promise for advancing medical science and improving our understanding of the interconnectedness of the heart and brain.

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Authors' Contribution

Farukh Hasan: Design of the work; acquisition, analysis, and interpretation of data; drafting. Azizur Rahman: Conception and design of the work; interpretation of data; critical revision of the manuscript. Sanila Adil Zafar: Acquisition and analysis of data; interpretation of data. Shabina Khatoon: Acquisition and analysis of data. All authors read and approved the final version of the work.

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Conflict of Interest

None.

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