

# A Study on Information Processing by Human Brain

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## Abstract

**Background:** Information gathering and processing by human brain has always perplexed the scientific world. Few evidenced it to be in an analog form while a second school of thought showed it to be digital. There were also a third group who believed it was neither analog nor digital but followed a special signal processing paradigm<sup>[1]</sup>. A small attempt has been made in this study to assess the mode of information grasping by human brain.

**Materials and Method:** Two hundred and fifty undergraduate students studying first year of MBBS (Bachelor of Medicine and Bachelor of Surgery) at Osmania Medical College, Hyderabad were selected for the study after taking consent from institutional ethics committee. An article consisting of 110 words written in jumbled alphabets was selected for the study. As the average reading speed of human beings is 200 to 250 words per minute, the students were instructed to read the article within half a minute and to jot down the words not understood by them on a white sheet. At the end white sheets of all 250 students were collected.

## Conclusions:

1. The study concludes that on a time scale human brain tries to grasp maximum information in minimum time possible, i.e. it takes and processes the information in an analog form
2. Later if needed only it digitalises the information and learns the details.
3. On a temporal framework grasping the information in an analog form gives advantage to the biological system

**Keywords:** *Analog, biological system, digital, signal processing paradigm, temporal framework.*

## Introduction

Biological systems are complex macromolecular systems which acquire, store, process and use information to organise their activities. How the brain represents information has real world impact on how capable we are of dealing with the complexity of reality<sup>[2]</sup>. Neural systems have evolved to maximise their information transmission rate. For this, different parts of the brain may process the signals in different ways<sup>[3]</sup>. Information in humans is stored in two places, the genes and the brain. It is stored as digital information in genes whereas in brain it is still a mystery. Processing of information by the brain can be both digital and analog. Analog deals with continuous signal representing physical measurements relating to the whole form. Digital deals

with time separated signals represented by sequence of discrete variables. For example, Long Playing(LP) record is analog, whereas Compact Disc(CD) record is digital. The human brain processes the information in either form(analog or digital)<sup>[4]</sup>, to the advantage of the biological system appropriate to the time, place, person and need. On a temporal framework, it tries to grasp maximum information in minimum time possible. For this to be achieved it may overlook the details or finer aspects. That is to say it grasps the information in an analog form to get an overall picture. Whereas when it is given adequate time, it tries to grasp the details and the finer aspects i.e. information grasping in digital form. A small attempt has been made in this study to account for this temporal processing.

**Materials and Method**

Two hundred and fifty undergraduate students studying first year of MBBS (Bachelor of Medicine and Bachelor of Surgery) at Osmania Medical College, Hyderabad were selected for the study after taking consent from institutional ethics committee. An article consisting of 110 words written in jumbled alphabets was selected for the study. As the average reading speed of human beings is 200 to 250 words per minute, the students were instructed to read the article within half a minute and to jot down the words not understood by them on a white sheet. At the end white sheets of all 250 students were collected.

**Article:**

fi yuo cna raed tihs, yuo hvae a sgtrane mnid too. I cdnuolt blveiee taht I cluod aulacilty uesdnatnrd waht I was rdanieg. The phaonmneal pweor of the hmuan mnid, aoccdnrig to a rscheearch at Cmabrigde Uinervtisy, it dseno't mtaetr in waht oerdr the lttteres in a wrod are, the olny iproamntn thng is taht the frsrit and lsat ltteer be in the rghit pclae. The rset can be a taotl mses and you can sitll raed it whotuit a pboerlm. Tihs is bcuseae the huamn mnid deos not raed ervey lteter by istlef, but the wrod as a wlohe. Azanmig huh? Yaeh and I awlyas tghuhot slpeling was ipmoranttl!

**Results**

2 out of 250 students(0.8%) could grasp every word **100% of the article.**

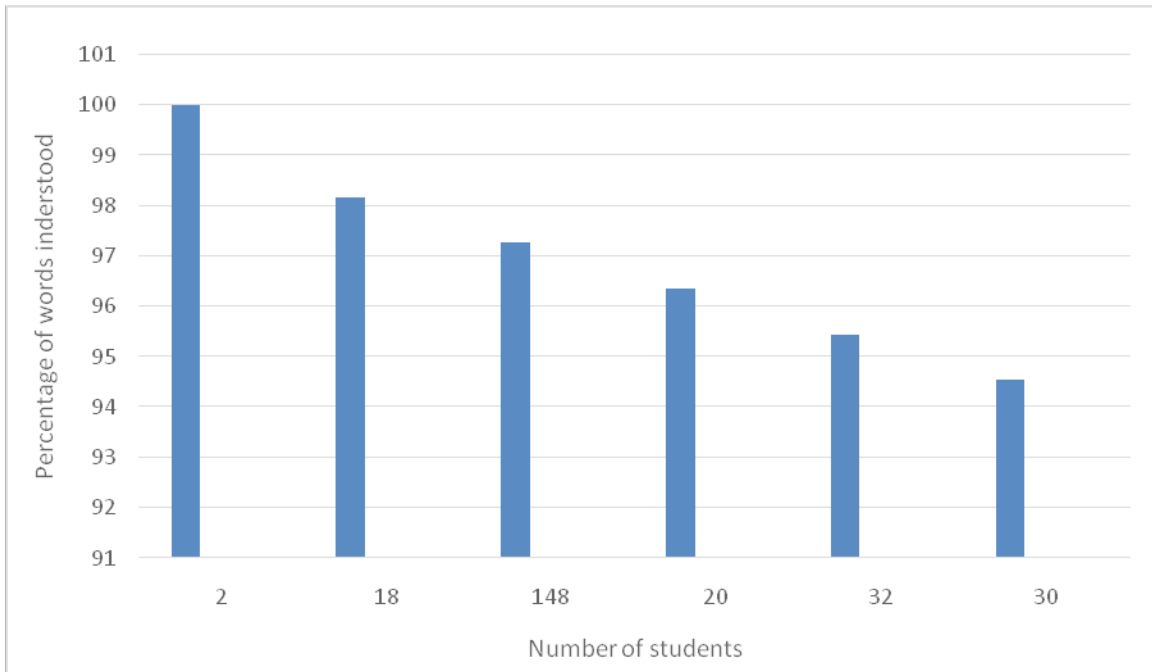
18 students (7.2%) could make out 108 words out of 110 i.e. **98.18% of the article.** They could not make out onlytwo words.

148 students (59.2%) could make out 107 words out of 110 i.e. **97.27% of the article.** They could not make out only three words.

20 students (8%) could make out 106 words out of 110 i.e. **96.36% of the article.** They could not make out four words.

32 students (12.8%) could make out 105 words out of 110 i.e. **95.45% of the article.** They could not make out five words.

30 students (12%) could make out 104 words out of 110 i.e. **94.54% of the article.** They could not make out six words.



**The words which the students could not make out were:**

- i. Cdnuolt (couldn't)
- ii. Aulacly (actually)
- iii. Taht (that)
- iv. waht (what)
- v. taotl (total)
- vi. tghuhot (thought)
- vii. whotuit (without)
- viii. bcuseae (because)
- ix. mtaetr (matter)
- x. rdanieg (reading)

**Discussion**

All two hundred and fifty students could identify the maximum number of words and the information conveyed in the article. They grasped each word as a whole and not each letter or spelling of the word. They concentrated on the spellings only when they could not make out the word. The context also helped them in identification of the words in the article. They grasped the information in analog form and digitalised the words only when they did not understand. This proves that the human brain always tries to accumulate maximum information in minimum time possible to use it when the need arises.

**Conclusions**

1. The study concludes that on a time scale human brain tries to grasp maximum information in minimum time possible, i.e. it takes and processes the information in an analog form.
2. Later if needed only it digitalises the information

and learns the details.

3. On a temporal framework grasping the information in an analog form gives advantage to the biological system

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**Conflict of Interest:** Nil

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