

# Intelligence Stamina

## – A reservoir of intelligence –

YAMAMOTO, Akio

### Abstract

Stamina is indispensable in human behavior when we achieve our daily tasks in our lives like reading as well as in running or playing sports. Stamina is the infrastructure of human actions. However, stamina in the cognitive activities has been far from the limelight of academic research. This paper aims to introduce Intelligence Stamina as a reservoir of intelligence or a storage of intelligence like a computer's byte for memory. Intelligence Stamina will also be a help for understanding Reading Stamina, which is a subordinate concept of Intelligence Stamina, and will give us some educational implications.

Keywords: Intelligence Stamina, Reading stamina, ER in EFL

### 1. Introduction

A great number of people have been involved in giving a definition of intelligence through long history of humankind. Philosophers like Plato and Aristotle have also discussed what intelligence is since thousands of years ago, and psychologists have argued about what intelligence is for over one hundred years. Plato likened people's intelligence to blocks of wax, differing in size, hardness, moistness, and purity and the eighteenth-century philosopher Immanuel Kant believed that there are different kinds of intelligence or different facets of intelligence, and that people clearly differed in the degree to which they possessed them (Cianciolo and Sternberg, 2004). In 1921 a symposium entitled "Intelligence and Measurement" was convened by the editors of the *Journal of Educational Psychology* (Sternberg and Detterman, 1986) to find out what intelligence was. Sixty-five years after that, Sternberg and Detterman (1986) collected two dozen brief essays by the experts in the field of intelligence, who were asked to respond to the same question that was posed to the experts in the 1921 symposium. The definition of intelligence has been a perennial pursuit of human beings. This paper has an aim not to seek a way of defining intelligence but to propose one of the important factors that sustain human intelligence. We will introduce a new concept of infrastructure for human intelligence. First we will overview the framework of intelligence by Sternberg. Next we will review Reading Stamina (Yamamoto, 2008), and then will introduce Intelligence Stamina as

a broader concept of Reading Stamina. We also propose that Reading Stamina is a reservoir of language knowledge and Intelligence Stamina is a reservoir of intelligence. We hope Intelligence Stamina will play an important role in explaining Reading Stamina and the importance of extensive reading educationally.

## 2. Framework of intelligence

Some people who have a good command of English as a foreign language may say that learning English is just like playing sports (Yamamoto, 2005). Ryle, who was the Waynflete Professor of Metaphysical philosophy at Oxford University, (1949) distinguishes two different types of knowledge: knowing *that* and knowing *how*. The former is just knowing what is knife in German (*'Messer'*) or knowing the counties of England. Knowing *how* is to know the way of doing. For example, knowing *how* is playing one of the musical instruments or fishing. You are to master these types of activities. Knowing *how* is quite important in EFL as long as one of the goals is to use English properly, but it has seemed quite difficult to master knowing *how* in a lecture-type class and it has been avoided in EFL classes of Japanese high schools because many learners and teachers consider English as a school subject of learning by heart (Yamamoto, 2009). Those learners and teachers seem to believe René Descartes, an intellectual giant in the seventeenth century, who has inspired his subsequent philosophers by his famous thesis called mind-body dualism. Ryle (1949) thought the thesis the absurdity of the official doctrine, or the dogma of the Ghost in the Machine because it was a category-mistake, using an episode of the question "Where is the University?" asked by a foreigner visiting Oxford or Cambridge (Ryle, 1949).

### 2.1. Sternberg's framework

Sternberg (1986, pp. 1–18) proposes a framework in order to understand conceptions of intelligence (Table 1). He proposes the two main loci of intelligence and their interaction; Individual, Environment, and Individual-environment interaction. In the individual locus, there are three main levels and their interaction: Biological level, Molar level, Motivational level, and the three levels interaction. The biological level can be set up either across or within organisms. Within organisms, intelligence can be viewed in terms of structural aspects of the organisms or in terms of process aspects. The example of structural aspects is hemispheres of the brain and the example of process ones is the neuronal processes that give rise to evoked potentials. Therefore, the brain work is considered the integration of neuron activities and needs energy just like physical exercises.

The framework of Sternberg implies that intelligence is biologically a part of work related to the organisms in our body. If you are "good" at something, reading for example, few brain regions are active, and neurons need less glucose to do it. If you are bad at something, huge areas of the brain

Table 1. Loci of Intelligence (excerpted version 1) (Sternberg, 1986, p. 4)

I . In Individual
A. Biological Level
1. Across Organisms
2. Within Organisms
a. Structure
b. Process
c. Structure-Process Interaction
3. Across-Within Interaction
B. Molar Level
C. Behavioral Level
D. Biological-Molar-Behavioral Interaction
II . In Environment
III . Individual-Environment Interaction

gobble glucose. The brain lights up like a Christmas tree (McGuinness, 1997: p. 154). We need to save energy to keep reading just as we keep running. How much energy we consume to read a book may depend on how long we can keep reading it.

If intelligence has a framework that Sternberg (1986) proposes, intelligence is a part of physical behavior just as muscle movements are. We may find some hints for developing reading stamina through the observation of physical exercises.

## 2.2. Enhancing stamina

How can we enhance our stamina? Takahashi (2007, p. 18) says that low-impact, moderate, and daily aerobic exercise will enable us to build up our physical strength. One of the best ways to build up your strength for running a marathon is walking or light jogging. Too much burden is just painful and will lead to poor continuity. Exercises without oxygen like 100 m dash do not enhance stamina but increase lactic acid in the muscles. We do not seem to consume a lot of energy while reading, but brain activities consume more energy than we imagine. Ikuta says (2002, pp. 117–118) that the brain uses about 20% of bodily energy consumption in static conditions, and the amount of energy is as large as that of all the muscles in the body.

## 3. Reading Stamina

Have you ever experienced how hard it is to keep thinking about something or keep using a foreign language as well as to keep running, going up and down the stairs, or swimming? Yamamoto (2008) introduces Reading Stamina as a new skill for reading activities. Reading Stamina enables you to keep reading a book for a long time.

Many EFL learners tend to lose concentration easily somewhere along the way when they try to

keep reading some pages of an English book for an hour because they have not experienced reading for that length of time in their regular English reading class.

Reading stamina is a new concept of reading skill that has not been perceived and discussed well in the first and second language acquisition fields. The tentative definition (Yamamoto, 2008) is that reading stamina enables us to read a whole book or a number of passages continuously in one block of time, not a few paragraphs or a few passages. The target length of reading time would be half an hour or more.

A good amount of vocabulary and grammar knowledge for the reading materials would be necessary without doubt. Quantity of knowledge is necessary, but it is not enough. The quality of knowledge should be taken into consideration. It is knowing *how* that we need to have in order to read long. Knowing *how* is quite important in EFL as long as one of the goals is to use English properly.

### **3.1. Light Reading**

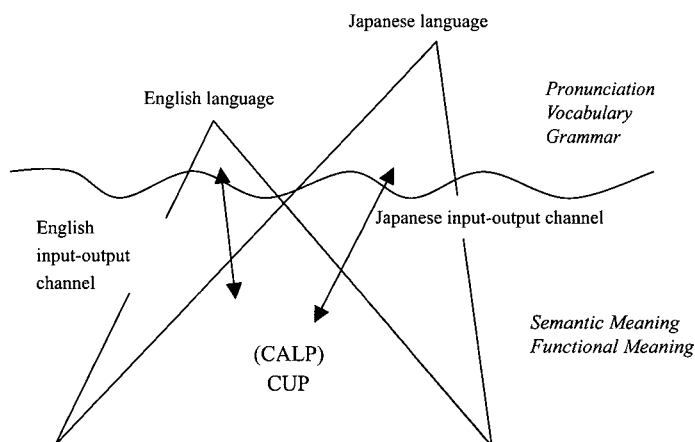
Stamina is required in any human action. Stamina needs persistence and efficiency. Simply stated, having stamina means using the energy that we possess economically and efficiently in order to keep doing certain actions. Stamina is essential in the workings of the brain like reading books as well as in those of the muscles.

What is low-impact, moderate, and daily aerobic exercise in reading will be light reading. Light reading utilizes attractive and interesting materials and has few unfamiliar words and structures. Therefore it does not require us to use a lot of energy consumption of the brain of the reader. Pictures may also help the readers grasp the content of the book and lure them into the story of the book. Accordingly they can keep reading it.

What will light reading provide the reader? Light reading may not guarantee the chance to learn a lot of new words or grammar. However, some skills will be developed so that the learners will improve their proficiency of the target language. Yamamoto (2008) hypothesizes that it is reading stamina that will be developed through extensive reading like light reading. If it is true, what part of proficiency of the target language will extensive reading develop?

### **3.2. Input-output channel**

A bridge between Common Underlying Proficiency (CUP) and the surface features in English as a foreign language (EFL) could be developed through extensive reading (Yamamoto, 2009). CUP is proficiency hypothesized by Jim Cummins in 1980, which underlies the first and second languages and is developed by experience with either language (Cummins, 1980 as cited in Baker, Colin and Hornberger, 2001). CUP, which was created against a model of bilingualism called the Separate Underlying Proficiency (SUP) where L1 proficiency and L2 proficiency are separated and



**Figure 1** An iceberg analogy of bilingual of Japanese and English languages 2  
(Modified and translated model of Yamada's (2006))

differentiate each other, is almost the same as Cognitive/academic language proficiency, which is considered to manipulate language in decontextualized academic situations.

Figure 1 shows the English input-output channel as well as the Japanese input-output channel. The English input-output channel would be considered the product of numerous repetition of the transformation of the forms and their meanings in different contexts as we have done to build the Japanese input-output channel since we were born.

Repetition in learning a foreign language is indispensable. In EFL learning, drills of writing the spelling of words and sentences are typical ways of practicing through repetition. Reading a story aloud hundreds of times is more effective for learning the words and expressions in the story as well as reading skills than reading it just a few times.

### 3.3. Repetition

Yamamoto (2007) claims that those acts that seem different from each other could be considered the same and the action of these acts could be considered "repetition." There are a lot of variables surrounding us that will give us different contexts every moment. He claims that learners should consider every act that seems the same as different in repetition and should recognize that every act is done in a context. Simple physical exercises like walking and running seem like numerous repetitions of stepping the ground, but in actuality, every step is different from each other. It is almost impossible to step in the same way as before while walking and running. You can find those above aspects of repetition in ER. ER has a dimension of repetition though it doesn't look as if it has this portion. That dimension of 'repetition' is to transfer the forms of English to their meanings on every line in ER in EFL and keep the reader reading a book. This repetition will enhance the rea

ders' English abilities and may enable us to develop the English input-output channel. It is true that we can develop the channel by reading the same passages hundreds of times. However, such a way of learning requires the learners to stick out the monotonous repetition. In addition, just reading the same passage hundreds of times has few different contexts, which will not build the capacities of using English in real life. By contrast, ER will attract the readers and guide them to the world of the books to the end as long as the readers follow the three rules of ER: Do not use dictionaries, skip the line you don't understand, and stop reading if you get bored (Sakai, Kanda, 2005).

### **3.4. Three factors of Reading Stamina**

There are three factors that will enable us to keep reading English for a long time in addition to English knowledge (Yamamoto, 2009). The first one is a skill to transfer textual information into semantic information automatically. The automatic transformation between form and meaning will be built through a great number of repetition practices done while reading. Such repetition practices in reading will develop the input-output channel between CUP and the surface feature of English. CUP is almost the same as CALP in the context of this paper and CALP will be developed through extensive reading as Cummins mentions (Cummins, 2000).

The second factor will be the amount of background knowledge including visual aids that will support the readers to understand the content of the book. Those skillful at English may not be able to read English well in a certain field if they do not know much about that field. An article on genetics in English will be difficult to read if you are not familiar with biology. Moreover, the attractiveness of the reading texts is crucial. As long as the content of the book attracts the readers, even when it is a little difficult to understand, they want to or have to keep reading it.

The third factor will be concentration, by which you can keep working on one thing for a long time. On the surface, reading has just one route of receiving information, which is different from daily conversation, which involves various kinds of non-verbal information, such as gestures and facial expressions. Environmental settings are full of clues that will give us hints to understand what will be appropriate for the situation where we talk. On the other hand, we have to concentrate on the single way of receiving information from a book while reading. Unfortunately, however, it is difficult to focus on one single source among the sea of information. We human beings are curious about everything happening around them and tend to pay meaningless attention to every change in the atmosphere. We have to avoid such stimulus from the environment around us or to ignore those noises; some undesired sound outside, people talking, even some clattery noise of desks and chairs, others' sneezing, coughing, or yawning will prevent the reader from sustaining reading.

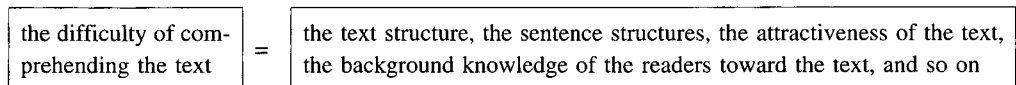
People are surrounded by many stimuli that disturb their concentration. In order to devote their attention to reading a book, they need to avoid those noises and unnecessary stimulus.

### 3.5. Assimilation

An expert skier may make his or her ski tools parts of his or her body and use them like his or her hand naturally. We may apply this idea to knowing *how*. An expert reader may enter himself or herself into the story of the book while reading it and become part of the book. It is as if the reader is always becoming the last piece of the jigsaw puzzle in each scene of the story while he or she reads the book. Comprehension is completed when the last piece is put in successfully. A skilled person makes the tools part of his or her body or mind and assimilates it as if it was part of the body. Ichikawa (1975, as cited in Nomura, 1989, pp. 157–179.) calls it ‘kumikomi,’ or assimilation.

### 3.6. The amount of Reading Stamina

How do we measure the amount of Reading Stamina? It will be derived from the amount of reading time and the difficulty of comprehending the text. The difficulty of comprehending the text will be composed of several factors such as the text structure, the sentence structures, the attractiveness of the text, the background knowledge of the readers toward the text (Figure 2).



**Figure 2** The difficulty of comprehending the text

On the condition that we assume that the relationship between the amount of reading time ( $= x$ ,  $x > 0$ ) and the difficulty of comprehending the text for the reader ( $= y$ ,  $y > 0$ ) is a linear function, the amount of reading stamina will be the area of the triangle in the Figure 3 ( $a < 0$ ). The amount of reading stamina ( $= b$ ,  $b > 0$ ) will be derived from the formula,  $b = xy/2$ .

The reading stamina may decrease due to the reader’s health or mood problem, differing from day to day, but it will not increase dramatically and suddenly. If the text the reader reads is difficult, the reading time will be short. If we want to keep reading for a long time, it will be better to choose books easier to read. The easier the text for the reader is, the longer the reading time becomes.

## 4. Intelligence Stamina

Babies feel it difficult to keep standing, walking, or changing their clothes. We need stamina in cognitive activities like reading a book as well as in physical activities. However, the stamina used in the brain has been far from the limelight of academic study. The stamina could be discussed in the field of intelligence as long as intelligence plays a significant role in the physical activities as

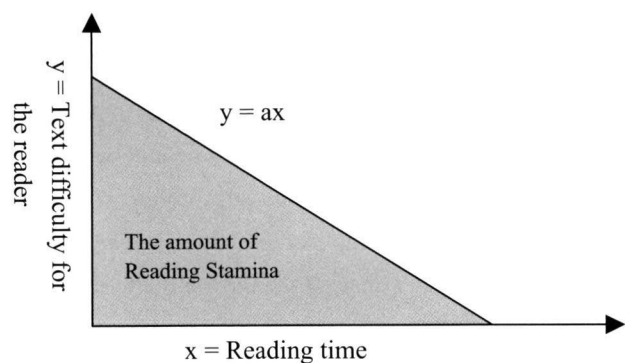


Figure 3 The amount of Reading Stamina

well as in the brain work.

Listening and thinking are thought to be intelligent activities just like reading. If we have Reading Stamina, there would be Listening Stamina and Thinking Stamina. It is also possible to create Chess Stamina and Rubik’s Cube Stamina as subordinate concepts of Thinking Stamina.

4.1. Reservoir of Intelligence

Suppose a tennis player serves powerfully but does not have stamina. The player may get service points in the first phase of the game, but cannot get a point after a long rally or will lose his or her concentration during the match and lose the match. Lack of stamina will cause undesirable consequences on performance. Even when you have bright intelligence, scanty intelligence stamina may affect the use of the intelligence. The computer memory can be a metaphor. The computer works smoothly when it has plenty of memory available. When the computer has a lack of memory, it works less effectively.

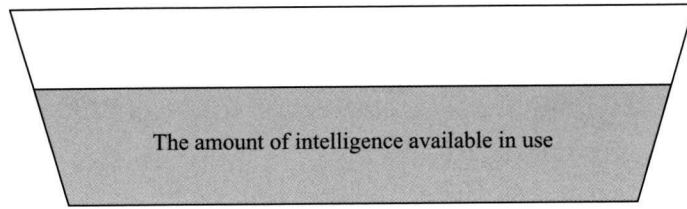
Figure 4 is a model of reservoir for intelligence in use. The space of the reservoir is very important because we cannot put intelligence into the reservoir if the space is smaller compared with the amount of intelligence. However, it will take a lot of time and effort to enlarge the space.

How much we can fill this reservoir with intelligence? The amount of intelligence available to use will depend on our motivation. Even when the tennis player still has some physical stamina, the player cannot win the game if he or she does not have a strong will to win the game. Going back to Sternberg’s framework, we can find a motivational factor in the Molar Level in Individual Aspect (Table 2).

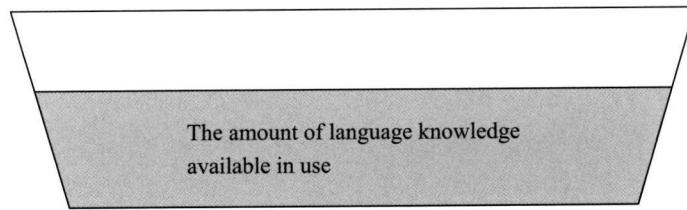
4.2. Reservoir of language knowledge

When your reading stamina is rich, you will be able to read a book longer just as you can keep running when your physical stamina is rich. Reading Stamina is expected to play a role of a





**Figure 4** Reservoir of Intelligence



**Figure 5** Reservoir of Language Use

Table 2. Loci of Intelligence (excerpted version 2) (Sternberg, 1986, p. 4)

- |                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>I . In Individual             <ul style="list-style-type: none"> <li>A. Biological Level</li> <li>B. Molar Level                 <ul style="list-style-type: none"> <li>1. Cognitive</li> <li>2. Motivational</li> </ul> </li> <li>C. Behavioral Level</li> <li>D. Biological-Molar-Behavioral Interaction</li> </ul> </li> <li>II . In Environment</li> <li>III . Individual-Environment Interaction</li> </ul> |
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reservoir for language knowledge in use, or knowing how. How large the reservoir will decide how long you can keep reading a book (Figure 5). Extensive reading will be one of the best ways to enlarge the space of the reservoir.

The amount of language knowledge available for use will depend on our motivation, too. Even when the reader has a lot of knowledge of English grammar and much vocabulary, the reader cannot read the book if he or she is not interested in the book. That is why graded readers have a wide variety of in different levels of difficulties.

## 5. Conclusion

This paper has reexamined Reading Stamina and introduced the concept of Intelligence Stamina and its characteristics, which contribute to the visualization of the amount of Reading Stamina. The

relationship between the language knowledge we possess and Reading Stamina is also visualized as a metaphor of a reservoir in the same way to describe the relationship between intelligence we possess and Intelligence Stamina. Those visualizations will help us seek the characteristics of reading and that of its dominant concept, intelligence.

There are some limitations of this paper. The formula of the linear function for describing the amount of Reading Stamina may help us understand the relationship between the reading time and the text difficulty for the reader. However, it is just an assumption and should be examined in the future. The reservoir of Reading Stamina and the reservoir of Intelligence Stamina are also just an assumption. We need to investigate it empirically. We are also not sure whether the shape of the area is like a triangle or other types of shapes like a square. Or it may not be linear function. The research of investigating stamina in intelligence is to be continued.

## References

- Baker, Colin and Hornberger, Nancy H. (Eds.) (2001). *An Introductory Reader to the Writings of Jim Cummins*. Multilingual Matters. Clevedon.
- Cianciolo, Anna T. and Sternberg, Robert J. (2004). *Intelligence – Brief history*. Brackwell Publishing. Malden. p. 1.
- Cummins, Jim. (1980 April). 'The Entry and Exit Fallacy in Bilingual Education.' A keynote address at the Workshop on 'Comparative Review of Identified District Continua.' At the 9th Annual Bilingual Education Conference, Anaheim, California.
- Cummins, Jim. (2000). *Language, Power and Pedagogy - Bilingual Children in the Crossfire*. Multilingual Matters Ltd.
- Ichikawa, Hiroshi. (1975). *Seishin Toshiteno Shintai. [A Body as a Mind.]* Keisoshobo. Tokyo.
- Ikuta S. (2002). *No no kenko. [Brain Health]*. Tokyo: Kodansha.
- McGuinness, Diane. (1997). *Why Our Children Can't Read And What We Can Do About It*. Touchstone. 155.]
- Ryle, Gilbert. (1949). *The Concept of Mind*. Hutchinson. London.
- Sakai, Kunihide & Kanda, Minami ed. (2005). *Reading English Books of one million words – Extensive Reading File [Kyoshitsu de yomu eigo 100 mango – tadoku no susume]*. Taishukan Shoten. p. 46. Tokyo.
- Sternberg, Robert J. A Framework for Understanding Conceptions of Intelligence.
- Sternberg, Robert. J. and Detterman, Douglas K. (Eds.) (1986). *What Is Intelligence?* Ablex Publishing Corporation. Norwood. pp. 3–18.
- Yamada, Yuichiro. (2006). *What Is English Proficiency? [Eigo Ryokutoha Nanika.]* Taishukan Shoten. Tokyo.
- Yamamoto, Akio. (2005). Dexterity and Its Development in EFL –Beyond input-output paradigm–. *The Gakushuin Boys' Senior High School Bulletin* 3.
- Yamamoto, Akio. (2007). 'Repetition Practice in Learning English as a Foreign Language – From the view point of the Affordance theory and the expert theory –.' *The bulletin of the Research Institute for Humanities*. Vol. 5, 2006: 81–100.
- Yamamoto, Akio. (2008). 'Reading Stamina – A new reading skill for extensive reading –' *Gembagata Research to Jissen heno Approach. [Hands-on Approach for Research and Approach to Education in Practice.]* Kanatani Ken Kyoju Kanreki Kinen Ronbunshu Kanko linkai Ed. [Committee of Anniversary Issue for Prof. Kanatani Ken's 60th Birthday.] Tokyo: Kiriharashoten. 50–59.
- Yamamoto, Akio. (2009). Can the Cheetah Catch the Warthog? – Reading stamina in EFL –. *The Gakushuin Boys' Senior High School Bulletin* 7: 1–10.