

A Study on Activity in Reading of Men in terms of Brain Science

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ABSTRACT

This study attempts to seek a solution, in terms of brain science, to stimulate reading activities of men to whom no attention has been given from the field of reading. In order to do so, brain pattern, reading tendency, reading preference, reading effectiveness and influence of reading were analyzed. As a result of the analysis, first, it showed that respondents' characteristics did not affect brain patterns, but school and social influences on reading were found to affect brain patterns. Second, reading propensity according to gender was observed to be different in terms of personal health, personal self - esteem, and cultural artistry. On the other hand, reading effectiveness was found to be different in terms of reading engagement and the willingness to continue reading whereas reading propensity according to the brain pattern was different in books related to humor and family matters. Third, reading satisfaction, reading engagement and willingness to continue reading all were observed to affect the reading activities of men. Suggesting measures to stimulate reading activities of men based on such findings, first, implementing dynamic reading education programs and finding reading models for men are needed. Second, when selecting books for reading program operations, books should be recommended according to gender rather than being selected en bloc by libraries. Third, since reading education at home shows high influences on both male and male-type brain pattern, the starting point of reading education should be made at homes. In particular, fathers, who can become a role model for men, need a reading role model, and reading education programs for fathers are also required.

1. Introduction

With the development of science and technology, the amount of information needed for human life has increased exponentially. In such a rapidly changing society, reading is the most basic and important means of obtaining information. Through reading, humans can acquire the information and academic details necessary for everyday or social life and obtain high level of intellectual abilities such as logical thinking, creative thinking, and decision-making skills that are fundamental

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to the production and use of necessary knowledge for life. By dint of going through such a series of processes, humans can effectively perform their roles as a member of a society, and further contribute to the development of civilization and the creation of culture.

Wide land, large population, and abundant resources were at the center of national competitiveness in the past agricultural and industrial societies. However, as Toffler and Toffler (2006) advocated in his book *Revolutionary Wealth*, the notion of the power of modern society lies in knowledge and information, and society with knowledge and information can own wealth and seize the initiative of the world. This can be confirmed in the statistics of reading rates and national competitiveness of major countries announced by the World Economic Forum (2015) which shows a larger difference compared to the top national competitiveness group of Sweden, Finland, the US and Germany. This suggests that a country's competitiveness is closely related to the reading rate of its people. Although reading is an important factor in determining the future of a country, the reading rate of Korean adults still falls short. According to the National Survey on the Status of Reading conducted by the Ministry of Culture, Sports and Tourism (2018), the annual reading rate of Korean adults was 59.9%, signifying that 4 out of 10 adults do not read even one book a year. In fact, the number was reduced by as much as 11.5% compared to the 71.4% in 2013. In addition, according to the social survey conducted by the National Statistical Office in 2015, the reading population ratio also showed a steady decrease of 62.4% in 2013 down to 56.2% in 2015.

Though, the encouraging aspect is that the reading rate is rising mainly in elementary school students, and because the importance of reading comes to the fore, the reading movement is expanding to a national level. The reading ability of Korean students can be viewed as a basis for supporting this. And in the OECD's International Academic Performance Assessment, conducted every three years for 15-year-old students, Korean students are included in the top one to two groups of OECD countries for reading. On this basis, it can be argued that sufficient baselines for national competitiveness have already been secured. However, what should be carefully reviewed regarding this is the gender differences in the reading area. The results of the 2009 Programme for International Student Assessment (PISA) show that men are dominant in mathematics and science but women continue to be strong in comprehension area, which involves reading, since the beginning of PISA in 2009. Examining the comprehension area score differences between genders, Korea showed -35 points in 2009 and -23 points in 2012, indicating a large difference between different genders. Such difference is not only a matter of Korea but also a global trend, and the OECD national average is -38 points, showing that there is a big difference between men and women in reading. The difference can be also found in other studies. According to the study conducted by Jeong (2014), significant differences between male and female students in reading propensity, reading engagement, reading satisfaction, and willingness to continue reading were identified. Compared to male students, female students showed 0.1~0.3 higher points and the difference was statistically significant. Although there is a clear difference between men and women in reading and comprehension, in reality, there is no actual reading education considering gender differences nor specific alternatives to solve this problem. Therefore, preparing a countermeasure through careful analysis of the cause of the difference in reading ability between men and women is in immediate need.

Many studies on the developmental stages of human reported that there are big differences between

men and women and gender differences in the reading area begin from an early age. Girls develop small muscles and thinking/language area first, whereas large muscles and behavioral area develop first in boys. In other words, when a girl learns to read and write and receives many compliments from her parents, a boy is more committed to movements developing large muscles. In a way, boys might have been scolded more than praised because of reasonable grounds innate to the process of growth.

Matters pertinent to such difference have been analyzed in depth by many researchers studying brain science. A study conducted in the field of neurobiology suggests that there are big differences between brains of male and female. In the Purpose of Boys written by Gurian (2009), it was argued that because men's brain has fewer language-emotion central nerves compared to women, boys spend more time to "act" something rather than "say" it from a very early age. Because of this, boys are physically more active, but they find verbally expressing feelings and emotions more difficult. As men's brain, especially in the right brain, has more spread-out central nerves focusing on how objects move in the physical space than those of women, boys spend more time playing and trying cubes, soccer balls, baseball balls and etc. compared to girls. Also, when a boy starts a relationship with another person, he often uses a ball, a rod, a dart, or a toy gun as the "relationship mediator" and he feels more comfortable when making relationships using such objects. (EBS "Children's Private Life" Production Team, 2016)

Significant difference between boys and girls was observed in language intelligence as mentioned earlier. Young girls, who use both brains in relation to language intelligence, has excellent language intelligence compared to young boys who only use the left brain. This can be confirmed by comparing the corpus callosum which is thicker by more than 10% in young girls compared to that of boys. In addition, young girls have about 11% more neurons in the temporal lobe which are responsible for listening, remembering and speaking, compared to those of young boys (Gurian, 2009). Such differences in language ability show a close relationship with reading ability and appear as the difference in reading according to gender. Nevertheless, alternative measures to customize education to reflect the educational differences between genders, including schools, are not yet secured in Korea.

The importance of reading has been addressed by numerous studies and through the mass media in various ways. Also, national-level attention has been given to reading. However, not enough consideration has been made in terms of gender difference in reading and almost no reading education reflecting such difference has been made available. Therefore, in this study, measures to raise public awareness of gender differences in reading and stimulate reading activities among men who have relatively low reading ability have been sought.

2. Literature Review

Reading is a tool connecting the past and present, and it is the manifestation of creativity and imagination which are the core competitiveness needed for the future society. Because of such importance, research on reading has been actively conducted in a wide variety of fields. For an

academic discipline pertinent to reading, there is a psychological aspect which perceives reading as the subject of information to be read by counselors and therapists, as a process of solving psychological problems. From the standpoint of brain science, reading refers to the process of delivering information read by visual, auditory or tactile agency to the cerebrum via nerves and storing the information as short-term or long-term memory. From the linguistic point of view, reading is the process of reading and understanding the language symbols whereas reading refers to all means of education from the pedagogical point of view. From this pedagogical point of view, instructors and students conduct strategic readings, using intended textbooks based on the needs while instructors encourage students to become a lifetime reader through repeatedly learning the process of decrypting and comprehending. Reading from the publishing science point of view is serving the role of a supplier other than a producer or consumer, and it is the process of enjoyment by the consumers through production and distribution which is the process of reaching the goal of reading as a reader. Lastly, from the viewpoint of library and Information science, reading is the process of helping users solve problems, and reading can be considered as the process in which librarians and users, as the principle agents, use data sources to solve problems (Nam & Ryu, 2012, p. 318-325). Among such various perspectives of reading, reading in this study is the most basic information recognition method for learning as derived by Ostrov (2002) and is based on the research results emphasizing that reading is an activity directly influencing highly sophisticated thinking capabilities of the brain. Consequently, the study focuses on the correlation between reading and human brain. In particular, this study aims to understand the effects of gender difference between men and women in terms of brain development on reading and find plans and measures to solve the problems.

It is a global trend to incorporate brain science into the field of education, such as reading, and many studies have been already conducted (Jensen, 1995; Williams, 1983; Wittrock, 1978). Also, in Korea various studies combining brain science and education have been conducted by Kang (1991), Koh (1982, 1989), Kim (2002, 2009), Yang (2011) and etc. Especially in the studies of reading and brain science, reading, as a language activity, tends to mainly activate the left brain, according to the brain hemisphere dominance theory. And it was argued that right-brained children are placed in a disadvantageous position in reading due to such reading activities dominated by the left brain. (Kang, 1991). Lee (2009) expressed that reading is not only important as a preparation for regular classes, but it is the basis for all school education. Also, Cho (2005) stated that because about 85% of our knowledge and information is obtained from reading, it is the main pathway to acquire knowledge at learning sites. As such, there is a close relationship between the human brain and reading. Examining various research results studying the human brain, it can be found that the human brain is a specialized organ of which each hemisphere serves independent functions and has different characteristics. (Springer & Deutsch, 1985). The study conducted by Lee (1983) showed that more underachievement children are found among children with right-brain dominance who show no signs of shortcomings in visual and non-verbal information processing but have limitations in auditory and linguistic information processing. Considering that left brain is the part primarily responsible for language functions closely related to reading, it can be understood that a significant difference in reading ability can be found between those with left brain dominance and right brain

dominance. On top of this, the second key point of this study is the gender-specific differences. People can be distinguished into right-brained and left-brained regardless of their gender; however, various brain science studies according to gender found a close relationship between the gender and brain functions.

The first systematic investigation on the difference between men and women was conducted in 1882 by Francis Garton, who worked at the South Kensington Museum in London during that time. In 1892, American psychologists Dr. Geray and Shinefeld reported in their study that women use more standardized vocabularies compared to men. This type of study on the brain then started in the 1960s to investigate the difference between men and women in terms of brain science. Through continuous research, it was found that, compared to their gender counterpart, girls begin to speak earlier, speak more fluently during their school-age, learn to read earlier, and better understand grammar, punctuation and spelling, which are the foundation of a language. The ratio of boys and girls participating in reading correction classes was about 4 to 1 among whom girls more easily learned and became fluent in foreign languages afterwards. Also, stuttering and other language disorders were observed almost only among the boys (Moir & Jessel, 2009). This signifies that there is a big difference between the brains of men and women. In fact, men suffer from language impairment when they are injured in their left brain, whereas women only suffer from language impairment when they are injured in both frontal lobes. With this, more limited capabilities of men compared to women to speak and communicate can be identified. For the brain use during speaking, men use the left brain whereas woman uses both of the left and right brain, and the left brain of girls develop much faster than that of boys. Such facts indicate the differences between male and female. In addition, there is a bundle of nerve fibers called a corpus callosum connecting the right and left brains which is confirmed to be more than 30 % better in women. (Pease & Pease, 2006). This can be reflected in Shaywitz et al. (1995)'s language study in which the localization of cerebral hemispheres of men and women while processing the same phonemes was compared to observe that women activate both left and right hemispheres whereas men heavily localize the left hemisphere, indicating a clear gender difference in terms of language. Likewise, from the standpoint of brain science, the left-brain which is a core part of reading and controlling language, is stronger in women than men. In addition, because women have a higher utilization rate of the left brain compared to men, the gender difference grows even bigger.

In spite of such differences between men and women, most school curriculum and education methods give rise to an imbalance of brain functions by promoting left-brain-oriented education without considering the characteristics of right-brain functions (Williams, 1983). Especially, reading education at schools is a left-brain-oriented education centering on written language incapable of increasing children's innate potentials, leading to unharmonious use of cerebral hemispheres in reading education (Woo, 2007). Such left-brain-oriented education brings more disadvantages to men who are relatively more right-brained, resulting in a high likelihood of experiencing frustrations as they fail to master the written and spoken language required in readings and schools. In fact, continuous frustrations from childhood can exacerbate difficulties and requirements in learning. Despite such obvious outcomes, no recognition of differences between men and women has been made in the

modern society and no alternative measures for reading activities of men have been taken.

3. Method

3.1 Research Question

In this study, the measures to stimulate reading activities of men by identifying characteristics of men in terms of brain science were sought. In order to identify the characteristics of reading activities of men, this study derived reading propensity, reading preference, reading effectiveness (willingness to continue reading, reading satisfaction, reading engagement) and influence on reading through previous research and theoretical analysis to determine the differences per gender, occupation, age, academic background and amount of reading. In addition, influential factors were derived by analyzing users' brain patterns in terms of brain science to identify the difference among the factors. In order to do so, the following research questions were established.

- *Research Question 1. Do the user's characteristics and influences on reading affect brain patterns?*

In general, brain patterns are considered to be inherently determined. In particular, the influence of male hormones in the fetal period has been reported to determine masculine and feminine brains, which are the genders of the brain (Pease & Pease, 2016; Moir & Jessel, 2009). Therefore, in this study, the research question of "Do the characteristics of respondents affect brain patterns?" was established and verified. In addition, this study investigated whether reading education at homes, schools, and societies affect the reading life of respondents and examined to identify the impacts of such reading education on brain patterns that were reported to be inherently determined. For this purpose, this study set the research question of "Does reading education at homes, schools, and societies affect the brain pattern?" and verified it.

- *Research Question 2. Are there differences in reading propensity and reading effectiveness depending on gender and brain pattern?*

This study sought to examine whether there are differences in reading propensity and reading effectiveness according to gender of the respondents. Also, this study investigated whether there are differences in reading propensity and reading effectiveness according to the brain pattern of the respondents identified through a brain pattern test. In addition, this study observed whether there are differences in reading propensity and reading effectiveness according to brain gender identified through biological gender and brain pattern.

- *Research Questions 3. Do influences on reading have any impacts on reading effectiveness?*

This study verified whether reading education received at homes, schools, and societies

affects reading effectiveness such as reading satisfaction, reading engagement and willingness to continue reading. In particular, this study analyzed the effects of reading influence factors of male and male brain pattern, among the biological genders and brain genders, on reading effectiveness.

3.2 Subject and Method of Analysis

In this study, brain gender was identified not only by biologically but also by confirming brain patterns in terms of brain science in order to stimulate the reading activities of men in the effort of finding measures to activate reading activities of users who have a masculine brain.

For this purpose, this study surveyed many and unspecified persons. The subjects and contents of survey are as shown in below Table 1.

Table 1. Subjects and Contents of Survey

Survey Subject	Random Distribution
Survey Period	2017.12.10. ~ 2018. 01. 28.
Survey Method	Online survey (online cafes, online blogs, researcher networks, etc.)
Survey Respondents	Total 148 persons

The items of questionnaire included in this study are shown in below Table 2. A total of 134 items were composed under 6 domains. Two reading effectiveness items were deleted through factor analysis and a total of 132 items were used for the analysis.

For brain patterns, the brain pattern test questionnaire developed by Moir and screened by Pease & Pease was used. (Pease & Pease, 2006, p.96~107). This test identifies whether the brain pattern is feminine or masculine using various situations encountered in everyday life.

For reading propensity, the reading propensity questionnaire used in the study of the relationship between personality type and reading propensity by Han and Cho (2011) was used. In order to understand the reading propensity, a total of 55 books were listed and classified into books on personal adaptation, books on social adaptation and books on cultural adaptation. In addition, a survey on preferred genres and preference types was conducted in parallel.

For reading effectiveness, willingness to continue reading, reading engagement and reading satisfaction were investigated and the questionnaire used in the study of Jeong (2014) was used. For reading influences, questions about the effects of reading education at homes, schools and societies and overall questions about reading were composed and the questionnaires used in the study of Jeong and Hong (2013) was used. As for the general characteristics of the respondents, amount of reading, method of book purchase, gender, age, educational background, occupation, etc. were investigated.

Table 2. Composition of Questionnaire Items

Domain	Questionnaire Items		Number of Questions		Reference
Brain Pattern	Questions to check brain patterns		30		Pease & Pease (2006)
Reading Propensity	People	Health, humor/cheerfulness, self-esteem, independence, patience, self-discipline, self-reflection, individuality, self-improvement	19	55	Han & Cho (2011)
	Society	Family love, love for neighbors, respect for others, self-discipline, democracy consciousness, local patriotism, patriotism, global sense	20		
	Culture	Respect for human, historicity, academic orientation, environmental preservation, artistry, religious sentiment, self development	16		
Reading Preference	Preferred Genres	Poetry, essay, meditation, novel, humor, satire, memoirs, biography, historical biography, hobby, practical, history, geography, computer information, arts and physical education, philosophy·religion·thought	17		Han et al. (2012)
Reading Effectiveness	Willingness to Continue Reading	Reading value, reading positiveness (deleted), reading recommendation (deleted), reading award, reading activity, sustained reading, willingness to read more, lifetime reading	8	17 (15)	Jeoung (2014)
	Reading Engagement	Reading frequency, reading identification, imparting meaning, effort, sacrifice	5		
	Reading Satisfaction	Reading life, overall reading satisfaction, current reading satisfaction, reading adequacy	4		
Influence on reading	Reading education at home, reading education at school, reading education at society, overall reading education		4		Jeong & Hong (2013)
General	Amount of reading, book purchase, gender, age, educational background, occupation		5		-
Total Number of Questions			127(125)		-

4. Research Results

4.1 General

4.1.1 Characteristics of Respondents

In this study, a total of 148 respondents were surveyed. The general status of respondents is as shown in Table 3. In terms of gender, 95 (64.5%) were males and 53 (35.8%) were females. Considering the research goal of finding the measures to stimulate reading activities of men, having a higher male rate can be thought as positive. As for the age, 59 (39.9%) were in their forties, showing the highest number, followed by those in their thirties (53, 35.8%). 12 were those who were in their fifties, which is equivalent to 8.1% of the total number. As for the level of education, 66.2% (98 persons) were university students or graduates and those who were educated in graduate schools and beyond were 28.4% (42 persons) of the total respondents. On the other hand, only 5.4% (8 persons) received high school or lower level education only. In terms of occupation, specialized occupations such as doctors, pharmacists, and professors showed the highest participation of 46 (31.3%) followed by office workers of 30 (20.4%). 19 students (12.9%) also participated in the survey.

Table 3. General Characteristics of Respondents

Category		Frequency	Percent	Category		Frequency	Percent
Gender	Male	95	64.2	Occupation	Management	10	6.8
	Female	53	35.8		Specialized Job	46	31.3
Age	20 or Younger	24	16.2		Office Worker	30	20.4
	30~39	53	35.8		Service	4	2.7
	40~49	59	39.9		Sales	7	4.8
Educational Level	50 or older	12	8.1		Engineering	4	2.8
	High School	8	5.4		Self-employed	3	2.0
	University	98	66.2		Farmer/Fisher	2	1.4
	Graduate school or beyond	42	28.4		Student	19	12.9
Total					House Wife	7	4.8
				Retired or Unemployed	3	2.0	
				Others	12	8.3	
				Total	147	100.0	

Table 4 shows a brief survey results of reading status of the respondents' reading. Looking at the number of books read in a month, it can be found that 60.8% (90 persons) responded as they read about 1-3 books in a month, and 14.2% (21 persons) said they read 4-6 books in a month. On the other hand, 18.2%(27 persons) said that they do not read even 1 book in a month

Table 4. Number of Books Read in a Month and Method of Book Purchase

Category		Frequency	Percent	Category		Frequency	Percent
Number of Books Read in a Month	0	27	18.2	Method of Book Purchase	Small Bookstore	9	6.1
	1-3	90	60.8		Large Bookstore	27	18.2
	4-6	21	14.2		Internet	95	64.2
	7-9	4	2.7		Used Bookstore	4	2.7
	More than 10	6	4.1		Others	13	11.5
Total	148	100.0	Total	148	100.0		

4.1.2 Verification of Brain Pattern

In this study, brain patterns were identified by biological gender and brain science aspects and the characteristics of each brain pattern were investigated in order to explore potential measures to stimulate reading activities of men in terms of brain science. Male type and female type brain patterns were determined through questionnaire items on various situations encountered in daily life. Adding the scores from the corresponding questions, those who scored less than 150 were determined to have a male type brain pattern, and those who scored between 150 and 180 and those who scored 180 or higher were determined to have a neutral type and a female type brain pattern, respectively.

50.7% (75 persons) had a male type brain pattern and 43.2% (64 persons) were identified as to have a neutral type brain pattern. Only 6.1% (9 persons) had a female type brain pattern, much fewer than the others.

Table 5. Results of Brain Pattern Verification

Category	Frequency	Percent
Male Type	75	50.7
Female Type	9	6.1
Neutral Type	64	43.2
Total	148	100.0

4.2 Descriptive Statistics Analysis

4.2.1 Reading Propensity

In this study, the topics of reading preference were selected as the three major categories of reading for personal development, social adaptation, and cultural adaptation in order to understand personal reading propensity and each category was investigated using the 5-point Likert scale

As for the reading preferences for books about personal development and independence were most preferred with 3.677 points, in tune with the current era referred to as the era of one-person. Among them books making the readers to have their own thoughts showed the highest score of 3.966 points. On the other hand, books making the readers to express their own masculinity or femininity had the lowest score of 2.649, being represented as a sexual discrimination.

Table 6. Reading Preference for Self-Development

Category	Reading Area	Number of People	Average	Std. Deviation	Category Average
Health	Books with habits of hygiene	148	2.791	1.138	3.020
	Books making workout and sports interesting	148	3.047	1.168	
	Books with knowledge of physical health in relation to social relationship development	148	3.223	1.042	
Humor/ Cheerfulness	Books making the readers cheerful and ingenuous	148	3.189	1.046	3.206
	Books about humor	148	3.223	1.124	
Self-esteem	Books for self-esteem and emotional stability	148	3.676	0.905	3.574
	Books helpful in overcoming sense of inferiority and frustration	148	3.473	1.072	
Independence	Books making the readers to do things that he/she can do by himself.	148	3.588	1.069	3.677
	Books making the readers to have their own thoughts	148	3.966	0.972	
	Books encouraging the readers to carry out their plans	148	3.757	1.001	
	Books about mental independence without depending on the parents	148	3.399	1.002	
Patience, Self-Control	Books about enduring selfishness, complaints and dissatisfaction	148	3.115	1.169	3.105
	Books about refraining oneself from emotional outburst (hot temper, anger)	148	3.095	1.157	
Self-discipline	Books about leading a disciplined life	148	2.824	1.035	3.030
	Books about making a correct judgment with strong mind	148	3.236	1.059	
Self-Reflection	Books making the readers to always self-reflect their behaviors	148	3.128	1.145	3.358
	Books making the readers aware of own strength and weakness	148	3.588	0.996	
Individuality Self-improvement	Books making the readers to express one's own masculinity and femininity	148	2.649	1.087	3.155
	Books motivating the readers for self-improvement	148	3.662	1.066	

As a result of analyzing the reading preferences of books about social adaptation, it was found that books about understanding and having trust and tolerance for others and books about treating others fairly and equally scored highest with the points of 3.723. As for the reading preference for social adaptation, it was observed that books about respecting others were generally preferred, indicating the attitude of having consideration for others while having one's own thoughts. On the other hand, books about allegiance to and sacrifice for a nation had the lowest score of 2.811 points.

Table 7. Reading Preference for Social Adaptation

Category	Reading Ares	Number of People	Average	Std. Deviation	Category Average
Family Love	A book about harmonizing and loving family members	148	3.574	1.063	3.574
Love and Care for Neighbors	Books about getting along well with friends in schools and academies	148	3.176	0.988	3.086
	Books about understanding and helping those in need	148	3.264	0.999	
	Books encouraging the readers to love animals, plants and objects	148	2.818	1.030	
Respect for Others	Books about respecting others (refraining from mockery and jeers)	148	3.588	0.903	3.669
	Books about understanding and having trust and tolerance for others	148	3.723	0.902	
	Books about treating others fairly and equally	148	3.723	0.879	
	Books about having respect and thanking others	148	3.642	0.933	
Self-Discipline	Books about keeping promises and honesty	148	3.520	0.892	3.409
	Books about understanding and adhering to rules and regulations	148	3.351	0.932	
	Books about correctly discerning good and bad and acting accordingly	148	3.446	0.935	
	Books making the readers to have correct moral beliefs	148	3.318	0.969	
Democracy Consciousness	Books about the meaning and system of democratic society	148	3.372	1.052	3.459
	Books making the readers to understand the relationships between freedom and responsibility as well as right and responsibility	148	3.514	1.000	
	Books about promoting the improvement and stability of society with cooperative attitudes	148	3.493	0.986	
Local patriotism, Patriotism	Books making the readers to love the local area they are living	148	3.061	1.045	3.000
	Books about instilling patriotism and teaching about our people	148	3.128	0.985	
	Books about allegiance to and sacrifice for a nation	148	2.811	1.026	
Global Sense	Books making the readers to understand the meaning of international cooperation	148	3.034	1.046	3.111
	Books making the readers to understand the world peace and happiness of the mankind	148	3.189	0.992	

Lastly, the reading preferences for books about cultural adaptation, books about respecting human had the highest score of 3.753 points. As for the detailed items, books about understanding the meaning of life scored the highest with 3.878 points and books making the readers to enjoy unrestricted imagination and thoughts also scored high with 3.791 points. On the other hand, books about understanding religious events, which have religious sentiment, scored 2.865 points, resulting in the only type of books preferred below the average in the reading preference for books about cultural adaptation.

Table 8. Reading Preference for Cultural Adaptation

Category	Reading Area	Number of People	Average	Std. Deviation	Category Average
Respect for Human	Books making the readers to understand the meaning of life	148	3.878	0.888	3.753
	Books about respecting oneself and others	148	3.628	0.883	
Historicity	Books making the readers to acquire knowledge about the life attitude of ancestors	148	3.345	1.035	3.623
	Books making the readers to set a high goal	148	3.703	0.979	
	Books making the readers to enjoy unrestricted imagination	148	3.791	0.913	
	Books arousing interest about unknown worlds	148	3.655	1.008	
Academy-oriented attitude	Books about respecting objectivity and rationality	148	3.615	0.900	3.655
	Books encouraging creativity and researching mindset	148	3.696	0.974	
Environmental Preservation	Books about loving and protecting beautiful nature	148	3.405	0.902	3.405
Artistry	Books about enjoying arts	148	3.500	1.059	3.446
	Books arousing interest about aesthetic creations	148	3.392	1.086	
Religious Sentiment	Books making the readers to understand religious events	148	2.865	1.188	2.865
Pursuit of Purpose	Books about career, occupation which help the readers to understand their aptitude	148	3.500	0.937	3.606
	Books helping the readers set their own goals	148	3.703	0.861	
	Books about endeavoring to reach goals	148	3.608	0.923	
	Books about perseverance and not giving up even in difficult situations	148	3.615	0.900	

In this study, preferred genres were also analyzed in addition to reading topics. Korean novel received the highest score of 3.682 as the most preferred genre and overseas novel also scored high with 3.655 points. Historical novel also scored high with 3.635 compared to other genres. However, martial art novel (2.419) and romance novel (2.676) showed low preference.

Table 9. Preferred Reading Genres

Category	Genre	Number of People	Average	Std. Deviation	
Preferred Genre	Poetry	148	3.108	1.089	
	Essay, Meditation	148	3.176	1.001	
	Novel	Korean Novel	148	3.682	0.976
		Overseas Novel	148	3.655	0.995
		Detective Novel	148	3.432	1.044
		Martial Art Novel	148	2.419	1.235
		Science Fiction Novel	148	2.953	1.225
		Romance Novel	148	2.676	1.138
		Historical Novel	148	3.635	1.038
	Humor, Satire	148	3.128	1.064	
	Memoirs, Biography, Historical Biography	148	3.101	1.067	
	Hobby, Practical	148	3.480	0.972	
	History, Geography	148	3.162	1.113	
	Computer, Information	148	3.169	1.180	
	Science, Technology	148	3.345	1.147	
	Arts and Physical Education (Painting, Music, PE)	148	3.264	1.225	
	Philosophy, Religion, Thought	148	2.872	1.342	

4.2.2 Reading Effectiveness

In order to evaluate the effectiveness of reading, reading satisfaction, reading engagement and willingness to continue reading were investigated and analyzed. Within the reading effectiveness domain, the questionnaire respondents showed high willingness to continue reading with 4.068 points, and they were analyzed to have high willingness to continuing reading. Reading satisfaction (3.314 points) and reading engagement (3.188 points) were observed to be slightly above the average. As for the detailed items, reading value which granting values to reading was found to have the highest score of 4.311. Also, positiveness about reading (4.169 points) and continuity of reading (4.142 points) were also observed to be highly evaluated. On the other hand, from the reading engagement questions, the question of “If I stop reading books, I will have a significant loss” received the lowest score of 2.743 points. This can be interpreted as the respondents consider reading as an important activity and continuing the activity is necessary, but they don’t think they will have any disadvantageous when they don’t read books.

Table 10. Evaluation of Reading Effectiveness

Category	Detailed Question	Number of People	Average	Std. Deviation	Category Average
Reading Satisfaction	Reading is a part of my life.	148	3.135	1.041	3.314
	I feel satisfied with the reading I do now.	148	3.203	1.119	
	I am very satisfied the fact that I am reading	148	3.399	1.123	
	I think the reading I do is suitable to me.	148	3.520	1.007	
Reading Engagement	If I decide not to read books, I will lose many parts in my life.	148	3.500	1.158	3.188
	I don’t think I can get more from anything else than what I get from reading	148	3.358	1.178	
	When I read a book, I feel that everything in the book is written fro me.	148	3.162	1.050	
	I tend to put more efforts to read books than average	148	3.176	1.092	
	The reason I read books is that I will have a significant loss if I stop reading	148	2.743	1.089	
Willingness to continue reading	I think reading books is a valuable activity	148	4.311	0.781	4.068
	I feel rewarded when I read books	148	3.919	0.907	
	I think reading is a good activity.	148	4.169	0.828	
	I will continue reading books	148	3.858	1.010	
	I will read more books than now	148	4.007	0.944	
	I think there should be no end to reading books.	148	4.142	0.904	

4.2.3 Influence on Reading

In this study, questions were asked to identify how influential various reading education conducted at homes, schools and the societies has been over the current reading life of the respondents. Reading education at homes, including parents, was found to have the highest impact with the score of 3.492, followed by the 3.257 points of reading education at societies. The positiveness of reading education at schools scored the lowest with 3.209 points. Overall impacts of homes, schools and societies on reading scored 3.277 points, indicative of a slightly higher impact than the average.

Table 11. Influence on Reading

Influence on Reading	Number of People	Average	Std. deviation
Reading education at homes (parents) has positive impacts on my reading life.	148	3.493	1.158
Reading education at schools (teachers) has positive impacts on my reading life.	148	3.209	1.058
Reading education at societies (public libraries or the nation) has positive impacts on my reading life.	148	3.257	1.057
Reading education at homes, schools and societies has turned me into an active reader.	148	3.277	1.099

4.3 Research Question Verification

4.3.1 Impacts of the characteristics of respondents and influences on reading on brain patterns

A. Respondent Characteristic Factor

In order to understand whether personal characteristics of respondents affect brain patterns or not, the hypothesis of ‘Personal characteristics of respondents will have impacts on brain patterns’ was established and verified in this study.

For respondents’ personal characteristics, a simple regression analysis was performed per gender, age, education, occupation, and the number of books read. The result from the regression analysis on respondents’ characteristics showed no impacts of the personal characteristics of respondents on the brain patterns. Especially gender, which was found to have impacts on the brain patterns in previous studies, was observed to have no influence. In addition to gender, age, educational level, occupation and the number of books read all showed no influence over the brain patterns.

Table 12. Impacts of Characteristics of Respondents on Brain Patterns

Category	Non-Standardized Coefficient		Standardized Coefficient	t	R	R ²	Significance Probability
	B	Std. Error	Beta				
Gender	-.237	.166	-.118	-1.430	.118	.014	.155
Age	-.025	.085	-.025	-.297	.025	.001	.767
Educational Background	.084	.150	.046	.559	.046	.002	.577
Occupation	.004	.017	.018	.221	.018	.000	.826
Number of Books Read	-.074	.090	-.067	-.817	.067	.005	.415

*p<0.05, **p<0.01

B. Impacts on Reading Influences

As found in previous studies, it is reported that, in general, the brain pattern is inherently determined by the influence of hormones. However, in this study, the research question of ‘Do influences on reading affect the brain patterns?’ was established, and it was sought to verify whether reading education at homes, schools and societies has impacts on the brain patterns.

In the present study, the effect of reading influences on brain patterns was examined by multiple

regression analysis and the results showed that the reading influences of homes and societies have impacts on the brain pattern. However, their impact on the brain pattern was only 7.9%, without carrying much weight.

Table 13. Impacts of Reading Influences on Brain Patterns

Category	Non-Standardized Coefficient		Standardized Coefficient	t	Significance Probability	R	R ²	Significance Probability
	B	Std. Error	Beta					
Home Reading Influence	-.112	.083	-.134	-1.348	.180	.282	.079	.008**
School Reading Influence	.342	.104	.373	3.287	.001**			
Society Reading Influence	-.255	.100	-.278	-2.558	.012*			

*p<0.05, **p<0.01

4.3.2 Analysis of differences in reading propensity and reading effectiveness per gender and brain pattern

A. Gender Factor

The respondents verified the differences in reading propensity and reading effectiveness according to respondents' characteristics. Differences in reading propensity by gender was observed to be personal health, self-esteem and cultural artistry.

It was found that men prefer books related to personal health more than women whereas women prefer books related to self-esteem and cultural artistry more than men. And, for all other remaining items, no difference in reading propensity between male and female was found.

Table 14. Analysis of Reading Propensity by Gender

Category	Sub-Category	Gender	N	Average	Std. Deviation	t	p
Personal Development	Health	Male	95	3.158	0.999	2.391	.018*
		Female	53	2.774	0.816		
	Humor/Cheerfulness	Male	95	3.263	0.978	.985	.326
		Female	53	3.104	0.879		
	Self-Esteem	Male	95	3.426	0.850	-2.748	.007**
		Female	53	3.840	0.924		
	Independence	Male	95	3.616	0.874	-1.147	.253
		Female	53	3.788	0.876		
	Patience, Self-Control	Male	95	3.037	1.077	-1.010	.314
		Female	53	3.226	1.125		
	Self-Discipline	Male	95	3.026	0.897	-.072	.943
		Female	53	3.038	0.980		
	Self-Reflection	Male	95	3.358	0.942	-.004	.997
		Female	53	3.359	1.026		
	Individuality, Self-Improvement	Male	95	3.195	0.882	.730	.467
		Female	53	3.085	0.870		

Category	Sub-Category	Gender	N	Average	Std. Deviation	t	p
Social Adaptation	Family Love	Male	95	3.516	1.061	-.896	.372
		Female	53	3.679	1.070		
	Love for Neighbors	Male	95	3.098	0.857	.241	.810
		Female	53	3.063	0.850		
	Respect for Others	Male	95	3.624	0.857	-.904	.368
		Female	53	3.750	0.732		
	Self-Discipline	Male	95	3.392	0.794	-.323	.747
		Female	53	3.439	0.918		
	Democracy Consciousness	Male	95	3.491	0.875	.587	.558
		Female	53	3.403	0.895		
	Local/National Patriotism	Male	95	3.042	0.939	.748	.456
		Female	53	2.925	0.874		
	Global Sense	Male	95	3.137	0.972	.424	.672
		Female	53	3.066	0.976		
Cultural Adaptation	Respect for Human	Male	95	3.726	0.808	-.546	.586
		Female	53	3.802	0.805		
	Historicity	Male	95	3.645	0.765	.476	.634
		Female	53	3.585	0.669		
	Academy-oriented Attitude	Male	95	3.700	0.817	.859	.392
		Female	53	3.576	0.895		
	Environment Preservation	Male	95	3.463	0.932	1.043	.299
		Female	53	3.302	0.845		
	Artistry	Male	95	3.311	0.963	-2.204	.029*
		Female	53	3.689	1.066		
	Religious Sentiment	Male	95	2.895	1.144	.409	.683
		Female	53	2.811	1.272		
	Pursuit of Purpose	Male	95	3.640	0.792	.684	.495
		Female	53	3.547	0.777		

*p<0.05, **p<0.01

Gender difference in reading effectiveness was found in the willingness to continue reading. Women demonstrated higher reading engagement and willingness to continue reading compared to men.

Table 15. Analysis on Reading Effectiveness per Gender

Sub-Category	Gender	N	Average	Std. Deviation	t	p
Reading Satisfaction	Male	95	3.276	0.906	-.670	.504
	Female	53	3.382	0.945		
Reading Engagement	Male	95	3.072	0.913	-2.124	.035*
	Female	53	3.396	0.851		
Willingness to Continue Reading	Male	95	3.961	0.732	-2.404	.017*
	Female	53	4.258	0.696		

*p<0.05, **p<0.01

B. Brain Pattern Factor

The results of analysis on reading propensity difference by brain pattern are as shown in below Table 18. Substantial comparison was made only for male type and female type brains. For reading propensity which was found to be different by the brain pattern, books about humor showed significant

differences in the personal development area, Also, books about family love and respect for others were significantly different among the books related to social adaptation. Books about personal humor were found to be more preferred by those who have a female type brain than their counterpart. Books about family love were also observed to be more preferred by those who have a female type brain.

Table 16. Difference Analysis of Reading Propensity by Brin Pattern

Category	Sub-Category	Brain Pattern	N	Average	Std. Deviation	t	p
Personal Development	Health	Male Type	75	3.080	0.913	-1.518	.133
		Female Type	9	3.556	0.601		
	Humor, Cheerfulness	Male Type	75	3.247	0.956	-2.311	.032*
		Female Type	9	3.667	0.433		
	Self-Esteem	Male Type	75	3.707	0.878	1.232	.222
		Female Type	9	3.333	0.661		
	Independence	Male Type	75	3.783	0.896	.384	.702
		Female Type	9	3.667	0.433		
	Patience, Self-Control	Male Type	75	3.200	1.112	-.349	.728
		Female Type	9	3.333	0.750		
Self-Discipline	Male Type	75	3.113	0.943	-.331	.742	
	Female Type	9	3.222	0.833			
Self-Reflection	Male Type	75	3.413	0.906	-.613	.542	
	Female Type	9	3.611	0.993			
Individuality, Self-Improvement	Male Type	75	3.207	0.826	-.814	.418	
	Female Type	9	3.444	0.846			
Social Adaptation	Family Love	Male Type	75	3.600	1.000	-2.159	.034*
		Female Type	9	4.333	0.500		
	Love for Neighbors	Male Type	75	3.080	0.818	-1.423	.158
		Female Type	9	3.482	0.603		
	Respect for Others	Male Type	75	3.723	0.780	-1.791	.087
		Female Type	9	3.972	0.317		
	Self-Discipline	Male Type	75	3.473	0.854	.098	.923
		Female Type	9	3.444	0.693		
	Democracy Consciousness	Male Type	75	3.547	0.847	.097	.923
		Female Type	9	3.519	0.603		
Local, National Patriotism	Male Type	75	3.080	0.822	.278	.781	
	Female Type	9	3.000	0.745			
Global Sense	Male Type	75	3.153	0.941	-.206	.837	
	Female Type	9	3.222	1.003			
Cultural Adaptation	Respect for Human	Male Type	75	3.773	0.815	-1.559	.140
		Female Type	9	4.056	0.464		
	Historicity	Male Type	75	3.710	0.678	.761	.449
		Female Type	9	3.528	0.690		
	Academy-Oriented Attitude	Male Type	75	3.760	0.883	1.025	.308
		Female Type	9	3.444	0.768		
	Environment Preservation	Male Type	75	3.453	0.905	.383	.702
		Female Type	9	3.333	0.707		
	Artistry	Male Type	75	3.393	1.050	.462	.645
		Female Type	9	3.222	1.034		
Religious Sentiment	Male Type	75	2.960	1.168	.441	.660	
	Female Type	9	2.778	1.202			
Pursuit of Purpose	Male Type	75	3.673	0.783	-.888	.377	
	Female Type	9	3.917	0.718			

*p<0.05, **p<0.01

The results obtained from analyzing reading effectiveness difference between different brain patterns are as shown in below Table 17. Though the study results showed that those who have a female typ brain have higher reading satisfaction, reading engagement and willingness to continue reading than those with a male type brain, no statistically significant difference was observed.

Table 17. Differences in Reading Effectiveness by Brain Pattern

Sub-Category	Brain Pattern	N	Average	Std. Deviation	t	Significance Probability
Reading Satisfaction	Male Type	75	3.317	0.918	-.212	.833
	Female Type	9	3.583	0.395		
Reading Engagement	Male Type	75	3.312	0.868	-1.242	.218
	Female Type	9	3.378	0.977		
Willingness to Continue Reading	Male Type	75	4.058	0.717	-.992	.324
	Female Type	9	4.370	0.676		

*p<0.05, **p<0.01

4.3.3 Reading Influence Factor

In this study how much impacts the reading education received from homes through parents and siblings, reading education at schools via teachers and classes and reading education from societies such as public libraries have on people’s reading life were investigated and how much effects such reading education have on their reading satisfaction, reading engagement and willingness to continue reading were analyzed. In particular, in order to stimulate reading activities of men, a simple regression analysis was performed only on those who have a biological male brain or male type brain pattern among the respondents and the analysis results are as shown in below Table 18.

As for males, all aspects of reading education at homes, schools, and societies were found to affect reading effectiveness. In particular, reading satisfaction was found to be most affected by reading education from parents and siblings at homes, making up 15.2% of the total. In addition, reading education at societies such as education at public libraries showed the highest impact on reading engagement and the willingness to continue reading. On the other hand, reading education at schools showed relatively low influence compared to the reading education carried out at homes and societies.

Examining the influential factors of brain patterns, it was found that education at homes, schools and societies all have no impact on reading satisfaction. In other words, it was found that for those who have a male type brain pattern, reading education has no effects on reading effectiveness. However, impacts of reading education at homes on reading engagement and willingness to continue reading were found to be 11.6 % and 13.6% for reading engagement and willingness to continue reading, respectively. Reading education at schools (6.5%, 6.0%) and societies (6.9%, 8.6%) was found to have some impacts with a lesser degree.

Table 18. Impacts of Reading Influences on Reading Effectiveness

Category			Non-Standardized Coefficient		Standardized Coefficient	t	R ²	Significance Probability
			B	Std. Error	Beta			
Biological Gender (Male)	Home	Reading Satisfaction	.323	.079	.389	4.078	.152	.000**
		Reading Engagement	.327	.080	.392	4.105	.153	.000**
		Willingness to Continue Reading	.228	.065	.341	3.497	.116	.001**
	School	Reading Satisfaction	.245	.089	.276	2.764	.076	.007**
		Reading Engagement	.305	.087	.340	3.492	.116	.001**
		Willingness to Continue Reading	.204	.071	.284	2.856	.081	.005**
	Society	Reading Satisfaction	.286	.087	.324	3.304	.105	.001**
		Reading Engagement	.446	.080	.501	5.587	.251	.000**
		Willingness to Continue Reading	.290	.068	.406	4.288	.165	.000**
Brin Gender (Male Type)	Home	Reading Satisfaction	.165	.091	.207	1.811	.043	.074
		Reading Engagement	.256	.083	.340	3.091	.116	.003**
		Willingness to Continue Reading	.230	.068	.369	3.396	.136	.001**
	School	Reading Satisfaction	.165	.106	.179	1.551	.032	.125
		Reading Engagement	.222	.099	.255	2.255	.065	.027*
		Willingness to Continue Reading	.177	.082	.245	2.163	.060	.034*
	Society	Reading Satisfaction	.122	.102	.139	1.196	.019	.236
		Reading Engagement	.218	.094	.263	2.325	.069	.023*
		Willingness to Continue Reading	.201	.077	.293	2.615	.086	.011*

*p<0.05, **p<0.01

5. Discussion

This study confirmed the difference in reading capability between different genders by analyzing previous studies and sought to deduce measures to solve the problem of men having relatively low reading capability compared to women by approaching the problem from brain science aspect.

Summarizing the results deduced from this study, personal characteristics of respondents were found to have no impacts on the brain pattern and biological gender also was found to have no impacts on the brain pattern. On the other hand, reading education at homes, schools and societies showed impacts, though not too significant, on the brain pattern. Considering that the gender of mothers and majority gender makeup of teachers at kindergartens, elementary schools and librarians at public libraries are female, it can be regarded as women have some impacts on the findings. This indicates the need of finding a reading model for men in the vicinity of women-oriented reading education in order to stimulate the reading activities of men.

Examining the results of reading effectiveness according to gender and brain pattern, it was found that, as for the biological gender, women showed higher performances in all areas of reading engagement and willingness to continue reading, except reading satisfaction compared to men. However, no differences were observed in reading satisfaction, reading engagement and willingness to continue reading by brain type. Additional research is deemed necessary for this finding; however, from the aspect of biological gender and considering the similar results from previous studies showing that women have higher reading engagement and willingness to continue reading compared to men, it can be concluded that measures to increase the degree of reading engagement and willingness to continue reading among men should be taken. The investigation on reading propensity by gender and brain pattern signified that men have a high level of interest in books about personal independence, respecting others, respecting human, having historicity, satisfying academic needs and pursuit of purpose. In fact, those who have a male type brain demonstrated the same pattern of reading propensity, except the books for self-esteem. In other words, in order to activate reading activities of men, books that are pursued by men should be recommended, and books for men should be selected rather than choosing books en bloc for school education and books suitable for men's preference need to be secured by implementing a separate reading corner for men in places such as public libraries.

Observing the impacts of reading education at homes, schools and societies on male and those who have a male type brain, it was found that all reading education from homes, schools and societies has effects on reading satisfaction, reading engagement and willingness to continue reading of men. In particular, reading education at homes with parents and siblings showed the highest influence on reading satisfaction, accounting for 15.2% of the total. Also, for reading engagement and willingness to continue reading were found to be mostly affected by reading education at societies such as education at public libraries. On the contrary, reading education at schools demonstrated relatively low influence. Also, reading engagement and willingness to continue reading of those who have a male type brain were observed to be affected and the impacts on reading engagement and willingness to continue reading were found to be as much as 11.6% and 13.6%, respectively. Reading education at schools (6.5%, 6.0%) and societies (6.9%, 8.6%) was found to have some impacts with a lesser degree.

Investigating the research results, reading education at homes with parents and siblings was found to be a crucial influential factor of reading activities of men. The study conducted by Jeong (2013) demonstrated that reading influence of fathers is greater than that of mothers. Also, considering the masculine roles, reading education at homes as well as reading education designed for fathers should be implemented for reading activities of men from an early age.

Another finding not to be neglected is the reading education at schools. Examining the research results, it can be found that reading education at schools has a lesser degree of influence over the reading education of men compared to that of home education or society education. Considering that schools are responsible for a significant part of reading education from the elementary school in general, reading program designated for male students must be implemented first when conducting reading education at schools. In fact, reading education program should be made available based on the fact that men have more interest in areas where health and activities are highly involved.

6. Conclusion and Suggestion

Gender difference can be undoubtedly observed in reading activities. However, the actual factors causing such difference have not yet been clearly identified. Thus, this study focused on the reading activities of men who are placed in the blind spot where no interest is given by the field of reading and began with the efforts of solving a social problem by finding measures to stimulate reading activities of men. In order to do so, the research hypothesis of in addition to the biological gender difference, the differences in brain pattern can cause the problem was established to find practical solutions.

This study examined brain patterns to achieve the research goals and investigated/analyzed overall domains of reading propensity, reading preference, reading effectiveness and reading influence. As a result, first, it was found that the characteristics of respondents, including gender, do not affect the brain pattern. Second, it was observed that among the reading influential factors of homes, schools and societies, schools and societies have impacts on the brain pattern. Third, reading propensity by gender showed differences in personal health, self-esteem and cultural artistry whereas reading effectiveness was different in reading engagement and willingness to continue reading. Fourth, differences in reading propensity according to brain pattern were observed in books about humors and families. Also, those who have a female type brain pattern showed higher level of reading satisfaction, reading engagement and willingness to continue reading, but this finding was not statistically significant. Fifth, examining reading influences affecting the reading effectiveness of men revealed that they have impacts on reading satisfaction, reading engagement and willingness to continue reading. Also, willingness to continue reading of those who have a male type brain pattern was found to be affected by homes, schools and societies, though not too significant.

Based on the research results, the following activation measures are suggested. First, considering the impact of reading education at homes, schools and societies, a dynamic reading education program for men, instead of the quite reading programs centering around women, is needed and finding a reading model for men in order to achieve this is also needed. Second, gender difference was found for reading propensity. Hence, when selecting books for reading programs, books should be recommended for each gender, rather than being selected en bloc. In particular, because the influence of public libraries over men was identified, there is a need for libraries to have and provide a list of recommended books for each gender. Third, observing the influence factors of reading effectiveness of men, reading education at homes was found to have a significant impact on both men and male type brains. Thus, the start point of reading education should be made at homes. In particular, fathers, who can become a role model for men, need a reading role model. In order to do so reading education programs for fathers are also required.

In this study, an approach to find measures to stimulate reading activities of men by biological gender and brain patterns in terms of brain science was attempted. This study carries a great significance in that it approaches the problem in terms of brain science, going beyond the simple biological gender. Nonetheless, differences between brain patterns from the standpoint of brain science were not found. This can be due to the characteristics of the respondents who have a specialized job. Therefore, it is necessary to conduct additional studies by expanding the survey respondents and categories in the future.

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