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A Study on Visual Perception Differences between Hot Media and Cool Media ——Focusing on Image News and Text News Reading

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Abstract | **Original Research Article**

The study attempted to investigate the visual perception differences between image news and text news using an eye-tracking device, the Tobii, to verify Marshall McLuhan's hot media and cool media theory. Experimental stimuli were four: two news items were edited as image news and text news, respectively. In order to analyze the subjects' visual responses to the actual viewing of the news content, we selected two parameters, Fixation Count and Total of Fixation Duration, from the multiple parameters recorded by the Tobii device. Then we used the AOI tool to divide the stimulus into two regions, the literal part and the whole material, analyzed these two parameters separately. The subjects in this study consisted of 22 people, and they were divided into two groups, each reading one text news item and one image news item. The experimental results showed significant visual perception differences in the Fixation Count between the subjects of the two media. This finding is consistent with McLuhan's hot and cool media theory, suggesting a significant difference between these media on human visual perception. For another parameter of total fixation time, however, although subjects spent more average time on text news relative to image news, this difference was not found to be statistically supported. This section is also discussed in this paper. The present paper discusses McLuhan's concept of hot and cool media and the distinction between the two concepts, the extension of the senses, the sensory ratio, and other important views. Through the vision data collected, this study explores the possibility of using an experimental approach to study McLuhan's theory of hot media and cool media from a sensory perspective. We hope that this research will provide ahelpful addition to understanding the more complex technical and cultural concepts underpinned by hot and cool media.

Keywords: McLuhan; Hot media; Cool media; Eye-tracking.

I. INTRODUCTION

Marshall McLuhan was a well-known communication scholar in Canada and was known as the "thinker," "prophet," and "saint" of the 20th century (He, 2016:158). He is widely known for his famous opinion that "The medium is the message," "Media is the extensions of man," "The global village," and "hot media and cool media." McLuhan's theory opened up the perspective of observing the development of human society from the form of media technology and emphasized the media's social and historical role. Of all of McLuhan's probes, his 'hot–cool' distinction remains among the most contentious and confusing (Anton, 2014：343-348). Many people criticize McLuhan for his vague definition of concepts and fail to understand his unusual writing style and advanced thinking. However, as we inhabit an increasingly volatile climate, and the language of hot and cold filters ever more extensively into descriptions of media and culture, it is not surprising that temperature has been used so often to conceptualize media and communication (Nicole, 2014:2504-2508).

In terms of research methodology, McLuhan preferred exploration to explanation and, in addition, expressed complex views and metaphors through numerous references to Shakespeare, Dryden, Eliot, Pound, Allenby, Joyce, and other significant literary figures. To the degree that McLuhan's media taxonomy was cast in such a language, it was also a wall in the unintended sense of being an obstacle to understanding (Levinson, 2004:2). These pose a significant challenge for proof-of-principle studies by subsequent

researchers. McLuhan's forward-thinking insights and academic view have enabled his followers to continually explicate his theory and find fresh evidence for his prophecies in new media contexts. In this, his heuristic probes regarding the hot and cool media also have focused much attention.

However, efforts at empirical: validation have been largely disappointing (Balance, Coughlin, and Bringmann, 1972:793–794). The reason is that McLuhan's theories were always macro and exploratory, which are tough to verify and research through quantitative studies. Besides, Boulding has suggested that the demandingness of a medium is perhaps more a function of the social context of the medium than the actual physical front of the medium itself. He argued that McLuhan often makes the mistake of supposing that it is the physical form of the medium rather than its context (Boulding, 1967:56-64). Therefore, whether the media provides contextual information or a mediated entity is where some scholars diverge, and this also inadvertently poses an undesirable obstacle for scholars who want to use empirical research to prove McLuhan's theories. In a previous study, attempting to explain the differences in effectiveness in inducing unpleasant emotional reactions between hot and cool media, researchers set up four sets of experiments to present the same highway accident film, "Signal 30, "which has been highly effective in inducing strong unpleasant emotions (Bringmann, Balance, and Krichev, 1969:447-451E). According to McLuhan, who was shown the accident film by a "hot" medium (movie), was expected to score significantly higher on the anxiety, depression, and hostility sub-scales of the MAACL than those who were exposed to the cool medium (television). However, the result in this paper showed no significant differences in effectiveness in inducing unpleasant emotional reactions between the various presentation methods. Thus, in contrast to McLuhan and his followers, it was concluded that hot media are not more effective than cool media in inducing unpleasant emotions. Likewise, another previous study indicated no significant relationship between attitude change and emotional arousal using hot and cool media (Boniferro, 1971). In this study, the same anti-drug film was broadcast on different media, and scholars empirically tested the differential media effect of hot(film) and cool(television) on attitude. The implications of these results in the context of McLuhan's hot-cold media distinction and Shaw and Wright's conception of attitude change theory are also discussed. Our search of papers related to hot and cool media found very few studies on this subject using empirical research methods, and their hypotheses were challenging to confirm.

Thus, we still do not know the other aspects of the differences between cool and hot media, except for a small part of the study about media effects. To verify the hot and cool media theory, we need a concise and effective research strategy. When a person receives any stimulus from the outside world, receiving external information begins by detecting the external physical information and translating it into the form of information within the body. This process is physical so that it could be measured, and also individual differences could be measured. Therefore, focusing on the human senses and the central nervous system, we considered visual cognitive research to investigate the differences in subjects' visual attention when confronted with these two media. The reason is that humans rely heavily on vision to receive and process information, with 80-90% of external information being obtained through the eyes. Furthermore, now, it is clear that major advances have been made concerning understanding eye movements in reading, scene perception, and visual search (Rayner, 2009:1457-1506). Similarly, eye movements might provide an excellent and precise index of message reception and perception in studying hot and cool media tasks.

II. BACKGROUND TO THE RESEARCH

1. Explaining Hot media and Cool media

McLuhan first proposed hot and cool media in his book "Understanding Media" published in 1964. In McLuhan's theory, hot media is represented by newspapers, movies, radio, photos, speeches. He uses the term "definition" to describe visual forms. Letters, numbers, photos, and maps are all considered high definition. The high message definition itself is a data-filled state that does not require much imagination on the part of the people. McLuhan's viewpoint is that "A hot medium is one that extends a single sense in 'high definition (Mielo, 2004:215). In contrast to hot media, cool media has a low definition of Information and requires a high level of people involvement, filling in the gaps through their imagination. Television, telephone, cartoons, lectures, and seminars are considered cool media. Starosielski argued that in this view of McLuhan, a medium or society appears as an organism unto itself, one whose momentum, affect, and relationships can be charted using the indices of temperature (Starosielski, 2014:2504-2508), which can help us to understand better how media both enfolds and gives rise to a set of broader environmental relations and conditions for life.

Regarding " involvement, "Paul Levinson believes that McLuhan's division of hot and cool has a psychological logic: We are obliged and seduced to work harder—get more involved—to fill in the gaps with the lower profile, less complete media. Compared to hot media, we tend to invest more engagement when using cool media due to its low definition. Thus, we might pore over a few lines of poetry more than a few lines of prose, study a political cartoon for meaning more than a crystal-clear photograph, get hooked on the shimmering images of the little screen of television more than the big bold images in the movie theater

(Levinson, 2004:9). It is worth noting that the contrast between hot and cool media is based on the special meaning of "definition" and "involvement." The hotness or coldness of a medium lies in its invitation to let people complement the details, which comes not from the number of people's senses it engages but from the intensity of its involvement. Therefore, hot and cool media are relative concepts and only make sense by comparing them because there is no such thing as a cool or hot medium in an absolute sense in real life.

Furthermore, McLuhan clearly states in the first part of the Understanding Media that hot media are exclusionary and cool media are inclusionary (McLuhan, 1964). The high definition of the hot media itself extends one of the human senses enough to perceive external Information without mobilizing other senses to participate; that is to say, it is exclusive. Cool media is low definition or ambiguous. The low definition of cool media is not a matter of "omitting" something, but rather the media doing less extended to "A certain human sensory" in this process. In other words, it depends on the other senses of the human being to play an active role together to accomplish a task together. That is why cool media are inclusive. For example, in Marshall Duchamp's "Fountain," if the observer does not actively participate, it is just a urinal instead of a profound piece of art.

Based on the above discussion, the hot and cool media have the characteristics described in Table 1, respectively.

Table 1: Characteristics of hot and cool media

Characteristics	**McLuhan' s Hot and Cool Theory**	
	Hot media	Cool media
Definition	High	low
Extension	One single sense	Multiple senses
Involvement	Low	High
Exclusion and Inclusion	Exclusion	Inclusion

2. Hot and Cool in the electronic age

However, what consequences ensued when visual text—an archetypal hot medium—becomes the content of a cool telephone? Various electronic products serve as information carriers in the electronic age. We will probably read the same article through print publications, Kindle, iPad, iPhone, and computer. Away from the content they contain, the distinction between these carriers becomes more apparent when we consider them in terms of hot and cool media themselves. It is this stripping away of meaning which allows us to X-ray the form itself (Culkin, 1967:51-53, 70-72.). About computers and networks, McLuhan's followers had many discussions on this issue:

- Neil Bozeman thinks computers were a kind of souped-up television screen;
- Paul Levinson sees computers as a new type of printed book;
- Furthermore, after being connected to the glob al telephone network, it can also become a part icular telephone in the opinion of Paul Levinso n.

In "Digital McLuhan: A Guide to the Millennium of Information," Paul Levinson wrote that computers have three parents—books, phones, and TVs. To connect text to the Internet is to put the hot printed matter into the cold environment of the global telephone network that has a screen. It looks like that it has become the coldest medium so far. Levinson explained that if the text appears on the screen, on the surface, it seems that the result is an almost 50/50 hybrid of hot text and cool TV, and their characteristics will cancel each other out. But in fact, the characteristics and attributes of the dominant position depend on the overall factors of this new media. (Levinson, 2004:109). In other words, the "temperature" of a medium depends on how it acts on different mediums. McLuhan's opinion is that the content of any media is another media; words are content of the text, the text is content of printing, and printing is content of the telegraph. The content of the spoken language is the thinking process, which is a non-verbal phenomenon. And what medium serves as content for the Web? Actually, the answer is not one medium, but many media, for the Web has taken as its content the written word in forms ranging from love letters to newspapers, plus telephone, radio ("RealAudio" on the Web), and moving images with sound which can be considered a version of television (Levinson, 2004:38).

In the use and continuous innovation of human beings, the boundary of the media is constantly evolving. But neither should we conclude from this that television or any given medium has some sort of eternal, unchanging, metaphysical claim on coolness or hotness (Levinson, 2004:108). On the contrary, media can at any time register a profound change of temperature. In the electronic age, the distinction between hot and cool media remains dependent on the media's definition, extension, involvement, exclusivity, and, most importantly, how they attract attention to the content they contain.

3. Visual extension

Print media such as books and newspapers mobilize people's visual senses, and reader involvement is low. Coupled with the fact that "the printing process itself was hot in an era when the printing process still relied on lead and fire" (Liu, 2008:439), there is no doubt that print media are considered hot media. Then

what has been changed in the process of written word and print media extending human vision?

First, Levinson writes in his Digital McLuhan about the detachment of vision from other senses in the process of developing a phonetic alphabet as a medium (Miroshnichenko, 2016:170-189). Symbolic simplification is present in all media evolutionary processes. As humanity crossed from the era of the oral language into the era of writing, the alphabetic script also transformed any spoken language into a consistently visual form (McLuhan, 2016:4). And then, Gutenberg's printing revolution accelerated this complex process. However, the dialectic of the oral language and the multi-layered textual discourse are the natural result of oral communication (McLuhan, 2016:23). The oral language itself contains many relationships: the intricate textual structure and the sender's tone suggest many implicit relationships. Technology is a tool for explicit expression (Bryson, 1952:41), and convoluted auditory forms and complex relations are simplified or lost when they cannot be clearly expressed through the visual form of print (McLuhan, 2016:27). For the ears, the simultaneous appearance of multiple semantics, such as puns and ambiguities, is the life of the oral language, and the convoluted form disappears once it is translated into words. This is why McLuhan considered visual space to be flat instead of acoustic space, which is spherical.

Second, the original sensory ratio was broken. As an intensification and extension of the visual function, the phonetic alphabet diminishes the role of the other senses of sound and touch and taste in any literate culture (McLuhan, 1995:96). A peculiar human power of translating is one kind of experience of one sense into all the senses and presenting the result continuously as a unified image to the mind. Like radio affecting the visual, photos affecting the auditory, each new impact shifts the ratios among all the senses. So that the extension of visual also demands new ratios or new equilibriums among the other organs and extensions of the body.

Third, the process of vision expansion was also a diminishing involvement of human beings. McLuhan believes that the man who uses written culture is accustomed to mentally converting vision to audio and audio to vision. In this complex process, the perception of humans deteriorates (McLuhan, 2016:4). Written language, starting with hieroglyphs, boosted by the alphabet and then the printing press, has shaped visual space, where all things are linear, organized by means of text, and can be perceived sequentially (Miroshnichenko, 2016:170-189). It means that, with the extension of vision, humans separated the vision from the other senses, and as a result, "static reality" became a by-product of writing and printing (McLuhan, 2016:14). In the face of this static character provided by text and print, humans are accustomed to dealing with everything in constant motion and change through static fragments.

McLuhan is partial to the electronic age because, unlike the print media, it is mythic, holistic, and coherent. It has a more advanced way of thinking and rhetoric that can take humans back to the oral age. Thus, opposing the audile-tactile space inherent to the oral, preliterate age, and the visual space shaped in the literate age, we enter the territory of the longest philosophical discussion about the cognition of the ideal and the material, a tradition that can be traced down through the millennia to Plato s famous Cave metaphor (Miroshnichenko, 2016:170-189).

III. Research Methods and Data Analysis

1. Methods

Humans rely heavily on vision for information reception and processing, with 80-90% of external information being obtained through the Eyes. The central eye movements include fixation and saccade. Fixation is characterized by tiny eye movements (Duchowski, 2017), which means that the eye stops moving and begins to acquire information. A saccade is a follow-through movement involved in visually tracking a target (Duchowski, 2017). In addition, skip fixation is a fast eye movement used to move the central concavity to a new position in the visual environment. Human visual attention is closely related to eye movements. Researchers can obtain accurate visual attention information if experimental subjects' eye movements are analyzed when visually stimulated. Eye-tracking is a representative method for scientifically measuring visual attention, which is a trusted method for measuring the effects of visual stimuli. Currently, Eye-tracking techniques are used to record eye movements over visual stimuli (e.g., text, images, video, etc.), providing information related to apparent visual attention, including the object being attended to, the duration of gaze, and the order of gaze. This study will measure subjects' visible differences when using hot and cool media through eye-tracking.

Vision is a dynamic process and is composed of both foveal and peripheral modes of seeing (Hilgard *et al*., 1975). The eye-tracker used in this study is the T60 XL of Tobii, which is a system environment that consists of a high-resolution 24-inch wide-screen monitor with TFT integrated into Windows XP, Pentium 4, and 4Gb computers. The subjects can adjust the position and height of the eye through calibration and validation while maintaining a proper interval (60–70 cm) from the monitor through the Tobii program. And then, subjects can see the experimental stimulation through the eye tracker. This experiment used Tobii to measure the subjects' visual attention to the cool media and hot media contents. Moreover, Tobii can record subjects' exact sight spots and the attention information of user recognition toward visual stimuli.

2. Measures

This experimental analysis first defined the Area of Interest (AOI). The AOI definition tool determines the scope of the research on frequency and time spent looking. Following the experimental procedure in this paper, subjects were exposed to text news and image news stimuli. And two analysis regions (Area of Interest) are divided for each stimulus: the literal parts (AOI1) and the whole region containing all the literal elements and other content (AOI2). Then, we collected visual data such as Fixation Count (FC) and Total Fixation Duration (TFD) for each region, which could provide a valid indication of the subjects' visual attention. Finally, we analyzed the data results through SPSS 25.0.

Fixation Count measures the number of fixations within an AOI or AOI group. Each fixation is defined as the interval of time between the first fixation on the AOI and the next fixation outside the AOI. This metric measures the number of fixation points where the participant's line of sight is fixed on each AOI area.

Total of Fixation Duration measures the sum of the duration of all fixation within an AOI (or within all AOIs belonging to an AOI group). This metric measured the sum time that subjects' eyes were fixed on each AOI.

3. Hypotheses

The previous section discussed how to distinguish between cool media and hot media in the context of the electronic age under continuing McLuhan's view. In his theory, concepts regularly appeared in pairs. For example, in the notions of cool and hot, movies versus television and telephones versus radio. Of course, comparisons of media temperature, like comparisons of any individual factor, are easier to ascertain to the extent that other factors are the same (Levinson, 2004:108). Two popular ways of reading news in Korea correspond to hot and cool media: written-driven text news and picture-driven image news. While text news is the most common news genre that has continued along with the creation of printing, image news is a news genre that has been picture-driven in recent years with the development of mobile apps to accommodate the size of phone screens. Under the premise of ensuring the same news content and the same carrier, text news and image news on phones have the comparability of coldness and hotness. As the text itself is clear, it is comparatively a type of hot media, while image news is comparatively a cool media due to cartoons, caricatures, and other factors.

In this way, we transformed a macro concept into an operational micro subject and studied what visual differences the subjects had in the actual reading of a relatively cool and hot media.

We start with the assumption that hot medium extends one single sense in "high definition." High definition is the state of being well filled with data (McLuhan). This perspective suggests that hot media such as text provides more visual information and extends the visual senses of humans. That is, when reading a text news, the subjects' visual senses were extended. Correspondingly, subjects' visual attentional responses might be higher in this procession because the text news only mobilized subjects' visual senses. In contrast, for image news, subjects' visual attentional responses during reading might be lower because subjects' multiple senses were mobilized then they had lower responses in the visual senses. Accordingly, the following hypotheses are advanced.

Hypothesis H1(0) There was no significant difference in fixation count visual attention between subjects reading AOI 1 for text news and AOI 1 for image news.

Hypothesis H1(1) A significant difference in subjects' fixation count visual attention between subjects reading AOI 1 for text news and AOI 1 for image news. And the number of fixations was higher for subjects reading text news.

Hypothesis H2(0) There was no significant difference in fixation count visual attention between subjects reading AOI 2 for text news and AOI 2 for image news.

Hypothesis H2(1) A significant difference in subjects' fixation count visual attention between subjects reading AOI 2 for text news and AOI 2 for image news. And the number of fixations was higher for subjects reading text news.

The above hypothesis was the first research purpose of this study: whether subjects showed significant differences in visual fixation points when reading the same content on different media. Suppose the difference between cool and hot media is the basis for influencing the number of fixations, and Image news is more of an extension of the visual, and subjects are expected to have a higher attentional response to the visual. In that case, it can be expected that subjects have a higher number of visual fixation points when using Image news. In contrast, there was no significant difference in visual fixations when viewing two media.

Hypothesis H3(0) There was no significant difference in total fixation duration visual attention between subjects reading AOI 1 for text news and AOI 1 for image news.

Hypothesis H3(1) There was a significant difference in total fixation duration visual attention between subjects reading AOI 1 for text news and AOI

1 for image news. And subjects spent more time reading text news.

Hypothesis H4(0) There was no significant difference in total fixation duration visual attention between subjects reading AOI 2 for text news and AOI 2 for image news.

Hypothesis H4(1) There was a significant difference in total fixation duration visual attention between subjects reading AOI 2 for text news and AOI 2 for image news. And subjects spent more time reading text news.

The above hypothesis was the second research objective of this study. Whether subjects show a significant difference in reading time when they read the same content on different media, if the difference between cool and hot media is the basis for influencing reading time, it can be expected that subjects will spend longer time using hot media. On the contrary, there was no significant difference in the length of reading time subjects spent using two different media.

4. Stimulus materials

To study the visual attention to hot media and cool media, two news (from http://www.molit.go.kr/portal.do) were selected and edited as the raw materials for this experiment. For the selection and editing, we followed the principles below: first, we chosen neutral news topics for the experimental raw materials intending to minimize the possibility of influencing visual attentional behavior due to subjects' personal preferences. Second, the number of clicks on these two news raw materials is between 300-400, which is lower than the number of clicks on most news on the site. In addition, the news material was originally published in October 2020 and December 2020 and was considered "old news" to avoid the probability that subjects had recently read other material associated with the news or the subjects to be potentially interested in the news. Third, in editing, the news stimuli used in the experiments were extracted from the raw materials and then edited. Two experimental news had a similar content structure, with both featuring an "introduction + purpose + measures" article structure, and the word count is 249 and 257, respectively.

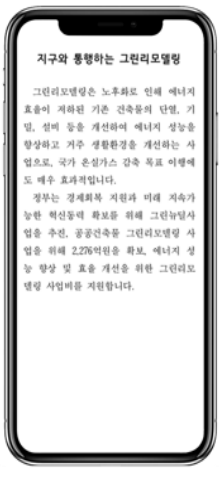
Finally, the two experimental news content were edited in text news and image news, respectively. The text news contained only the title and literal content; the image news contained the title, literal content, and picture background. Among them, the image text background comes from the background of the original website raw materials, and only the color and text of the literal content have been processed. Since the machine used in this experiment was Tobii T60 XL, the four stimuli were edited in the same simulated phone picture, respectively.

5. Design and Procedure

An experiment tested the hypotheses by adopted the following procedure. Subjects were divided into two groups randomly (Group 1 and Group 2), and each group was showed a text news item and a image news item. The contents of the two kinds of news items were different. At the end of the experiment, a questionnaire was administered to obtain the subjects' habit information of news reading. The specific information is as follows:

Table 2: Experimental materials and grouping

	Experimental stimulation materials				
	Text news	Image news		Text news	Image news
Group 1	news A	news B	Group 2	news B	news A



6. Participants

The subjects in the experiment consisted of 22 people (13 Females; Mage=21.59, SDage=2.48) divided equally into two groups.

Moreover, the sample recognition rate is calculated using the number of eye-tracking samples that were correctly identified. 100% means that both eyes were found throughout the recording; 50% of that one eye was found for the full recording or both eyes during half the time. In the present study, the quality of the recording below 40% were excluded.

Eventually, the actual 17 sample data used for analysis came from 10 students in Group 1 (6 female; Mage=21.40, SDage=2.55) and 7 students in Group 2 (3 female; Mage=21.71, SDage=2.63).

IV. RESULTS

The Tobii device recorded information parameters about the vision to examine the visual differences between subjects reading image news and text news. SPSS then performed t-tests for independent samples with Fixation Count and Total of Fixation Duration as variables. The results showed statistical significance at the 95% level.

The Fixation Count of subjects in both groups was first submitted to a Student's T-test using the media's hot and cool properties as the independent variable. Of these, image news is the cool media, and text news is the hot media. Our hypotheses were tested by comparing the fixation Count differences of the two media conditions (image news vs. text news) for each area of interest: the literal part (AOI 1) and the whole region containing all the literal and other content (AOI 2). Moreover, this analysis revealed detailed information about subjects' visual attention.

Table 3: Visual differences in Fixation Count of AOI 1 between group 1 and group 2 for image news and text News

Division		Descriptive statistics			*t*	*p*
		N	M	SD		
Group 1	Image news A	10	27.80	6.96	-3.127	0.006
	Text news B	10	40.50	10.80		
Group 2	Image news B	7	25.29	8.16	-2.540	0.026
	Text news A	7	34.86	5.73		
news A	Group 1 Image news	10	27.80	6.96	-2.205	0.043
	Group 2 Text news	7	34.86	5.73		
news B	Group 2 Image news	7	25.29	8.16	-3.142	0.007
	Group 1 Text news	10	40.50	10.79		
Image news	Group 1+ Group 2	17	26.76	7.34	-3.979	0.000
Text news	Group 1+ Group 2	17	38.18	9.28		

As shown in Table 3, for AOI 1, if only image news and text news are analyzed without considering the content of the information used in the two experimental, the results showed that Fixation Count of subjects who read image news (M = 26.76, SD = 7.34), and Fixation Count of subjects who read text news (M = 38.18, SD = 9.28). The difference for fixation Count between the two media conditions was significant, indicates that for the same subjects, the number of Fixation Count for reading text news is higher than that for image news, t=-3.979, p=0.000372, p<0.05, supporting Hypothesis 1(1) and rejecting Hypothesis 1(0).

Specifically, the analyses separately for group 1 and group 2 also confirmed Hypothesis 1(1). For group 1, the Fixation Count of subjects read image news (M = 27.80, SD = 6.96) and text news (M = 40.50, SD = 10.80), the difference between the two media conditions was significant, t=-3.127, p=0.006, p<0.05. For group 2, the Fixation Count of subjects read image news (M = 25.29, SD = 8.16) and text news (M =38.86, SD = 5.73), the difference between the two media conditions was significant, t=-3.127, p=0.006, p<0.05.

Moreover, an analysis was also conducted to investigate the same news content, whether there is a difference in the visual Fixation Count between the two groups when reading image news and text news. For news A, the Fixation Count of subjects of group 1 read image news (M = 27.80, SD = 6.96), and the Fixation Count of subjects of group 2 read text news (M = 34.86, SD = 5.73), the difference of Fixation Count between the two media conditions was significant, t=-2.205, p=0.043, p<0.05. For news B, the Fixation Count of subjects of group 2 read image news (M = 25.29, SD = 8.16) and the Fixation Count of subjects of group 1 read text news (M = 40.50, SD = 10.79), the difference of Fixation Count between the two media conditions was significant, t=-3.142, p=0.007, p<0.05. Hypothesis 1(1) is supported.

The visual data acquisition range of AOI 1 is the main body of the two media, i.e., the literal part of the experimental stimulus content. In order to investigate the visual information of the whole media, we were turning to the experimental evidence on AOI 2.

Table 4: Visual differences in Fixation Count of AOI 2 between group 1 and group 2 for image news and text news

Division		**Descriptive statistics**			***t***	***p***
		N	**M**	**SD**		
Group 1	Image news A	10	31.10	5.84	-3.00	0.008
	Text news B	10	41.80	9.67		
Group 2	Image news B	7	29.71	9.30	-1.415	0.182
	Text news A	7	35.71	6.26		
news A	Group 1 Image news	10	31.10	5.84	-1.557	0.140
	Group 2 Text news	7	35.71	6.26		
news B	Group 2 Image news	7	29.71	9.30	-2.575	0.021
	Group 1 Text news	10	41.80	9.67		
Image news	Group 1+ Group 2	17	30.53	7.22	-3.182	0.003
Text news	Group 1+ Group 2	17	39.30	8.77		

As shown in Table 4, regarding AOI 2, from an overall perspective, the results showed that Fixation Count of 17 subjects during reading image news (M = 30.53, SD = 7.22), and Fixation Count of same subjects during reading text news (M = 39.30, SD =8.77). The difference for fixation Count between the two media conditions was significant, indicates that for the AOI 2, the subjects' number of Fixation Count for reading text news is higher than that for image news, t=-3.182, p=0.003, p<0.05, confirming Hypothesis 2(1) and rejecting Hypothesis 2(0).

Specifically, the analyses for group 1 supported Hypothesis 2(1). For group 1, the Fixation Count of subjects read image news (M = 31.10, SD =5.84) and text news (M = 41.80, SD = 9.67), the difference between the two media conditions was significant, t=-3.00, p=0.008, p<0.05. When group 2 was stimulated with image news and text news, no significant difference in the Fixation Count of subjects was detected. The subjects read image news (M = 29.71, SD = 9.30) and text news (M =35.71, SD = 6.26), t=-1.415, p=0.182, rejecting Hypothesis 2(1).

Likewise, analysis was also conducted to investigate two groups of subjects who read the same news content. For news A, the Fixation Count of subjects of group 1 read image news (M = 31.10, SD = 5.84), and the Fixation Count of subjects of group 2 read text news (M = 35.71, SD = 6.62), the difference of Fixation Count between the two media conditions was significant, t=-1.557, p=0.140, rejecting Hypothesis 2(1). For news B, the Fixation Count of subjects of group 2 read image news (M = 29.71, SD = 9.30) and the Fixation Count of subjects of group 1 read text news (M = 41.80, SD = 9.67), the difference of Fixation Count between the two media conditions was significant, t=-2.575, p=0.021, p<0.05. Hypothesis 2(1) is supported.

Another significant aspect of investigating the visual difference between cool and hot media was to examine the reading time (seconds) of subjects in both groups and submitted recordings to a Student's T-test using the hot and cool properties of media as the independent variable. Detailed visual information was obtained by examining the Total of Fixation Duration parameter differences for each AOI.

Table 5: Visual differences in Total of Fixation Duration of AOI 1 between group 1 and group 2 for image news and text news

Division		**Descriptive statistics**			***t***	***p***
		N	**M**	**SD**		
Group 1	Image news A	10	12.81	3.95	-0.424	0.676
	Text news B	10	13.55	3.88		
Group 2	Image news B	7	10.54	4.97	-0.668	0.517
	Text news A	7	12.16	4.02		
news A	Group 1 Image news	10	12.81	3.95	0.336	0.742
	Group 2 Text news	7	12.16	4.02		
news B	Group 2 Image news	7	10.54	4.97	-1.408	0.180
	Group 1 Text news	10	13.56	3.88		
Image news	Group 1+ Group 2	17	11.88	4.40	-0.774	0.444
Text news	Group 1+ Group 2	17	12.98	3.87		

It can be shown from the data in Table 5 that the Total of Fixation Duration of subjects on AOI 1 who read image news (M = 11.88, SD = 4.40), and the Total of Fixation Duration of Subjects who read text news (M = 12.98, SD =3.87). Although subjects spent more time on average reading text news, this difference was not statistically supported, t=-0.774, p=0.444, rejecting Hypothesis 3(1). Similarly, in the analysis of the classification by group and news content, T-tests found no significant differences in results on the Total of Fixation Duration of subjects reading image news and text news.

Table 6: Visual differences in Total of Fixation Duration of AOI 2 between group 1 and group 2 for image news and text news

Division		**Descriptive statistics**			***t***	***p***
		N	**M**	**SD**		
Group 1	Image news A	10	13.91	3.60	0.030	0.976
	Text news B	10	13.86	3.40		
Group 2	Image news B	7	11.89	4.48	-0.249	0.808
	Text news A	7	12.46	4.07		
news A	Group 1 Image news	10	13.91	3.61	0.777	0.449
	Group 2 Text news	7	12.46	4.07		
news B	Group 2 Image news	7	11.89	4.48	-1.036	0.317
	Group 1 Text news	10	13.86	3.40		
Image news	Group 1+ Group 2	17	13.08	3.99	-0.158	0.876
Text news	Group 1+ Group 2	17	13.28	3.64		

As Table 6 was that in the analysis of AOI 2, the Total of Fixation Duration of subjects who read image news (M = 13.08, SD =3.99), and Total of Fixation Duration of Subjects who read text news (M = 13.28, SD =3.64). t=-0.158, p=0.876, rejecting Hypothesis 4(1). This result has been unable to demonstrate the significant difference of Total of Fixation Duration between image news and text news. As for the analysis of the classification by group and news content, respectively, the T-tests founding is similar.

V. DISCUSSION

This present study was set out to investigate the visual perception differences between hot media and cool media. We set up laboratory conditions for subjects to read stimulus materials with the same content in hot and cool media conditions and collected data recordings of two parameters that reflected the subjects' visual performance. Eventually, a direct comparison of image news and text news using the fixation counts and total fixation times would answer the core question of whether any difference is visible. The results indicate that when subjects read image news belonging to cool media and text news belonging to hot media, there was a visual difference in the parameters of the fixation counts. Furthermore, the findings were the same in the literal part of the stimulus material and the whole material. Experimental results of visual perception supported McLuhan's hot and cool media theory. In the case of the parameter of total fixation time, however, although subjects spent more average time on text news relative to image news, this difference was not found to be statistically supported.

Previous studies of hot and cool media mainly adopted attitudinal changes to measure the effectiveness difference between these two media. The disadvantage of the effect study is that once it concerns a change in a person's attitude toward a matter, it is a complicated process of information reception and psychological process, which contains many interiors and external factors. If this method is adopted to research hot and cool media, the findings might not be intuitive. In present study, we proposed that visual perception during reading or viewing is the valid indicator to examine the dynamic characteristics of hot media versus cool media, and we hypothesized that under two kinds of media conditions, the subjects' visual responses are likely to perform differently. Based on the fact that "text is an extension of vision," the temperature differences in media would most likely be reflected in the visual indicators above all. Under the premise that text news includes only literal elements, while image news contains both literal elements and comic backgrounds, the same literal content receives more visual attention from viewers of text news when we consider only the literal parts on hot and cool media.

The approach to in-depth research about McLuhan required a better understanding of the relation between humans and media and how media is processed and represented in the visual, acoustic, tactile, and central nervous systems. A consequence of a specific sense being highly extended like text news extended vision is that people could adequately process information with just this sensation, which may come at the cost of crowding or repurposing other sensory capabilities. media as extensions of our senses institute new ratios, not only among our private senses but among themselves, when they interact among themselves (McLuhan, 1995:66). This might be what happens with hot media, specifically for letters or prints, where a single extension of vision is sufficient to make information perceived and transmitted, so that

cooperative work of the other senses might not be necessary. Conversely, when people were faced with cool media, they do not have a high level of extension of a particular sense because of low definition, so they needed to involve multiple senses to perceive and process the information. According to McLuhan, cool media extend the multi-sensory or central nervous system and evoked a particular sensory - haptic to bringing the senses into contact with each other.

By viewing the media as an environment, McLuhan and his successors unlocked the foundations of medium study, which how the media processing in the sensorium and nervous system of humans and the extent to which the medium modifies human perception. Further, how the media build their relationship with society and the world by the new cognitive model, Stuart argued that McLuhan and Foucault offer largely complementary theories; each account fulfills the other (Stuart, 2012:123-141). He considered McLuhan's understanding of the medium resonates powerfully with the nineteenth-century paradigm shift that Foucault discusses, as the west shifted from a political power organized around sovereignty toward a power understood as biopolitical. The present paper has taken an experimental approach that provides a helpful addition to understanding the theory of cold and hot media and McLuhan's more complex technical and cultural concepts underpinned by these.

VI. LIMITATION

McLuhan's pioneering thoughts, the obscure language of his writing, and the style of exploration without explanation in research methods make his theories is more criticized-prone than Other mass communication scholars. Although the empirical studies were limited and difficult in proving McLuhan's grandiose theories, it took an important role in providing robust evidence for understanding McLuhan's prophetic ideology and statements, enabling the human to develop a deeper insight into the relationship between themselves and the medium.

In the present study, subjects did not show visual differences on the parameter of total reading time. This might be due to the fact that in the present study, the time at which each stimulus was presented was pre-set during the experimental procedure setup. Perhaps more visual differences could be observed between subjects if a more liberal and relaxed reading condition was applied. Moreover, this paper only verified the different situations in visual perception between hot media, represented by literal-driven text news, after the extension of vision, and cool media, represented by picture-driven image news. In the case of cool media, the details of the multiple senses after being extended have not got empirical descriptions in this research. Future studies should further underpin the foundation of our study with empirical evidence and explore another avenue in the research for an answer to this problem of cool media.

REFERENCES

- Anton, C. (2014). "'Heating up' and 'Cooling down': R e-Appraising McLuhan' s Hot–Cool Distinction, "*Expl orations in Media Ecology*, 13, pp. 343-348.
- Balance, W. D. G., Coughlin, D., &Bringmann, W. G. (1972), "Examination of Social Context Effects upon Affectipe Responses to 'Hot' and 'Cool' Communicatio ns Media, "*Psychological Reports*, 31(3), pp. 793–79 4.
- Boulding, K. (1967). "The medium and the message," In G. E. Stearn, Ed., *McLuhan: hot and cool*. New Yo rk: Dial, pp. 56-64.
- Bringmann, W. G., Balance, W. D. G.. & Krichev, A. (1969), "Experimental Investigation of Mc Luhan's Id eas concerning Effects of 'Hot' and 'Cool' Communica tions Media," *Psychological Reports*, 25(2), pp. 447-4 51E.
- Boniferro, T. J. (1971). "The experimental modificatio n of attitudes towards the non-medical use of drugs by hot and cool communications media," *Electronic Thes es and Dissertations*.
- Bryson, L. (1952). *The Next American*. New York: Ha rper & Bros Press.
- Duchowski, A. T. (2017). *Eye Tracking Methodology: Theory and Practice.* Springer International Publishin g.
- Culkin, J. M. (1967). "A schoolman's guide to Marsha ll McLuhan," *The Saturday Review*, pp. 51-53, 70-72.
- He, D. (Trans.). (2016), *McLuhan Bound: Essays in U nderstanding Media.* China Machine Press.
- Hilgard, E.R., Atkinson, R.C., Atkinson, R.L. (1975), *Introduction to Psychology*, 6th Edition. Harcourt Bra ce Jovanovich, New York.
- Levinson, P. (2004). *Digital McLuhan A Guide to the Information Millennium.* Routledge press.
- Liu, H. (2008). *Mass Communication Theory: Paradi gms and Schools*. People's University of China Press.
- Mielo, G. (2004). "Why McLuhan's still hot and cool, " ETC.: A Review of *General Semantics*, 61(2), pp. 2 15.
- McLuhan, M. (1995), *Understanding Media: The Exte nsions of Man.* Cambridge, MA: The MIT Press.
- Miroshnichenko, A. (2016). "Extrapolating on McLuh an: How Media Environments of the Given, the Repre sented, and the Induced Shape and Reshape Our Sens orium," *Philosophies*, 1, pp. 170-189.
- McLuhan, M. (2016), *Marshall McLuhan Unbound.* (D. He, Trans., T. Gorden, Ed.). China Machine Press
- Nicole, S. (2014). "The Materiality of Media Heat," I*n ternational Journal of Communication*, 8, pp. 2504.
- Rayner, K. (2009). "Eye movements and attention in r eading, scene perception, and visual search," *The Qua rterly Journal of Experimental Psychology*, 62:8, pp. 1457-1506.
- Starosielski, N. (2014). "Media, Hot & Cold The Mate riality of Media Heat," *International Journal Of Com munication*, 8, pp. 2504-2508.