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# LPWAN Technologies: Emerging Application Characteristics, Requirements, and Design Considerations

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 Javier E. Garay is a professor in the department of Mechanical and Aerospace Engineering and the Materials Science and Engineering Program at the Jacobs School

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As the director of the Advanced Material Processing and Synthesis (AMPS) Lab at UCSD, Professor Garay focuses his research on materials property measurements, the integration of materials in devices with application in optical devices, magnetic devices, thermal energy storage/ management, and materials synthesis and processing with an emphasis on designing the micro/nanostructure of bulk materials/thin films for property optimization. He is also particularly interested in understanding the role of the length scale of nano-/ micro-structural features on light, heat and magnetism.



**A. T. Charlie Johnson Jr.**

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A.T. Charlie Johnson is a professor of physics in the Department of Physics and Astronomy at the University of Pennsylvania. He received his B.S. in physics from Stanford University and his Ph.D. in physics from Harvard University. He did postdoctoral fellowships at the Delft University of Technology (Applied Physics) and NIST (Cryoelectronic Metrology). His honors include the Christian R. and Mary F. Lindback Foundation Award for distinguished teaching at Penn, the Jack Raper Outstanding Technology Directions Paper Award of the International Solid State Circuit Conference, an Alfred P. Sloan Research Fellowship, and a Packard Fellowship for Science and Engineering.

Dr. Johnson's research is focused on the nano-scale transport properties (charge, energy, spin, etc.) of nanostructures and single molecules, including carbon nanotubes, graphene, DNA, synthetic proteins, and other biomolecules. He is particularly interested in the physical properties of hybrid nanostructures and their use in molecular sensing. Other research interests include the development of scanning probe techniques for electronic property measurement of nanomaterials and



nanodevices, molecular electronics and nanogaps, local probes of nanoscale systems, and nanotube and nanowire electronics.

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### Ben Slater

University College London (UCL),  
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Ben Slater is a reader at UCL Chemistry. He received his BSc in chemistry from the University of Nottingham and was awarded his PhD at the University of Reading. He did postdoctoral work at the Royal Institution of Great Britain (Ri) and became an assistant director of the Davy Faraday Research Laboratory at the Ri in 1999. He joined UCL Chemistry in 2007 and was awarded the Royal Society of Chemistry Barrer prize in 2008.

Dr. Slater's research is focused on using atomistic computer simulation to understand and predict the structure and properties of materials. He has published extensively in the area of porous materials (including zeolites and metal-organic frameworks) and water ices. He has a particular interest in defects in materials and surface mediated processes, such as crystal growth.

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### Masaaki Tanaka

The University of Tokyo,  
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Masaaki Tanaka is a professor at the Department of Electrical Engineering & Information Systems Graduate School of Engineering, University of Tokyo. He received his Ph.D. in electronic engineering from the University of Tokyo in 1989. In 1992, he joined Bell Communications Research (Bellcore) at Red Bank, New Jersey, as a visiting research scientist. Since 1994, he has been at the University of Tokyo as an associate professor and professor.

Dr. Tanaka's main research field is spin electronics ("spintronics"), in which the spin degrees of freedom are used in artificially synthesized materials. Among the areas of his specific research are epitaxial growth, structural characterizations, electronic/optical/magnetic/spin-related properties (in particular, spin-dependent transport and magneto-optical properties), and device applications of various new structures. His research on structures and devices includes ferromagnetic metal / semiconductor hybrid structures, III-V-based magnetic semiconductors and their

heterostructures, group-IV-based magnetic semiconductors, ferromagnetic nanoparticles and semiconductor hybrid heterostructures, delta doping of magnetic impurities in semiconductor heterostructures, and new spin transistors (e.g., spin-MOSFET) and reconfigurable logic devices.

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**Enge G. Wang**  
Peking University,  
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Professor Enge G. Wang is a professor of physics at Peking University and an academician at the Chinese Academy of Sciences.

Dr. Wang's research focuses on surface physics; the approach is a combination of atomistic simulation of nonequilibrium growth, chemical vapor deposition of light-element nanomaterials, and water behaviors in confinement system. He and his coworkers also predicted a three-dimensional Ehrlich-Schwoebel barrier, which attracted News and Views in Nature (June 2002). Another contribution is the model proposal and experimental validation of a true upward atomic diffusion. This was reported in Physics News Update in June 2003 and News and Views in Nature as well as Science Week in June 2004.

His work on water-surface coupling and the strength of hydrogen bonds at the interfaces provides a fundamental understanding of water on surface at the molecular level.

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# Considered Factors of Online News Based on Respondents' Eye Activity Using Eye-Tracker Analysis

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**Abstract:** Development of the internet as a source of information has penetrated many aspects of human life, which is shown in the increasingly diverse substance of news in online news sources. Previous studies have stated that the presentation of the substance of online news information can have negative impacts, especially the emergence of anxiety in users; thus, managing the presentation of information becomes important. This study intends to explore factors that should be considered as possible anxiety-inducers for readers of news sites. Analyses of areas of interest (AOIs), fixation, and heat maps from respondents' eye activity obtained from eye-tracker data have been compiled with Beck Anxiety Inventory (BAI) measurement results to analyze anxiety among newsreaders. The results show that text is the dominant center of attention in various types of news. The reason for the higher anxiety that arises from text on online news sites is twofold. First, there are the respondents' experiences. Second, text usage allows for boundless possibilities in respondents' imaginations as a response to the news that has occurred.

**Keywords:** human-computer interaction; online news; anxiety; eye-tracking; Beck Anxiety Inventory

## 1. Introduction

The internet, as one of the most widely used information exchange media today, is essential. Moreover, it has become crucial for communication and interactions between humans [1]. With the advancement of electronic information media, people are being bombarded with large amounts of information daily and must process different types of information simultaneously [2]. Moreover, consumption of online news has become increasingly social and interactive; it is also generally associated with capabilities to share and comment directly on news articles or through social media networks such as Twitter and Facebook [3]. In the spread of information, there are several types of media dissemination forms on the internet, one of which is multimedia. Websites and multimedia support each other: the internet enhances multimedia by making it widely available, moreover multimedia increases access and extensive use of the internet [4]. Media information is disseminated in various forms on the internet, and several examples include news text, images, and videos. The most substantial aspect is through pictures, because a picture says a thousand words, and millions of new photos are uploaded every day to the internet, which can be accessed by a lot of people [5]. Videos combined with text can attract people's attention and make them believe the information conveyed. Multimedia adoption is based on the belief that implementing multimedia leads to positive impacts on "receiving messages by consumers". The use of multimedia to increase news information leads to more positive consumer attitudes towards the news, and the effect is not necessarily additive [6]. Positive impacts also influence the spread of information, which leads to free speech/public opinion

and accelerates the creation of news content [7]. News consumption by the public also increases with the growing number of available channels and news sources, which increases the possibility of interaction and consumer participation in spreading information. Consumers can also take part in managing news on their social networks, selecting and sharing information that requires more attention, and also capturing irrelevant information [8].

Information in online news has several common elements, including text, images, audio, and video. News with only text or text with pictures are the psychological favorites because the addition of images to text gives a positive effect overall [9]. Text–picture elements have a unique relationship in delivering news that can be described in many forms according to several factors [10]. News value is constructed by choices in language and image [11]. Today, online news is divided into two forms: official news websites and social media news. Social media news is low-cost, easy to access, and enables rapid dissemination of online news for more significant consumption, although with the negative impact of the wide spread of “fake news” [12]. On the other hand, readers strongly expect news websites to publish correct information and have little tolerance for error [13]. However, at present, most news and information sites on the internet have a few negative biases; one of them is digital misinformation. Digital misinformation has become so widespread in social networks that the World Economic Forum (WEF) has registered it as one of the main threats to human society [14]. Consumption of information with excessive negative bias can result in negative impacts on people; Johnston and Davey even found that brief exposure (approximately 14 min) to negative news coverage can result in feelings of sadness and a sense of anxiety [15]. For example, repeated information about warnings or prevention of illness by various people results in excessive strain. Moreover, the range of not-yet-known or fake news is increasingly diverse and quickly delivered by multiple parties to make the public anxious before ensuring the facts and truth.

Anxiety is defined as fear, panic, or expectations of discomfort that will occur [16]. Anxiety is characterized by Freud as something perceived, an emotional state that includes feelings of fear, tension, nervousness, and worry accompanied by physiological stimuli [17]. There are several methods for measuring a person’s anxiety, namely the State-Trait Anxiety Inventory (STAI), the Beck Anxiety Inventory (BAI), and Hospital Anxiety and Depression Scale Anxiety (HADS-A). Each method has its purpose and concept as a measure of one’s anxiety, and this study used the BAI method. The BAI is an anxiety measuring instrument used by respondents through self-report and also assesses symptoms such as nervousness, dizziness, inability to calm down, and so on. The nature of the BAI also supports cases of anxiety about news information because respondents indicate themselves how much they are disturbed by symptoms of anxiety that appeared in the last few weeks [18].

Since the relation between anxiety and visual consumption of online news is essential, this study uses eye-tracking for gaze data and the Beck Anxiety Inventory for anxiety. Eye-tracking technology provides unique response information, latency, and eye movements to show how someone visually observes an object, in this case online news. Vision is an essential part of our senses; even our behaviors and thoughts might likely be recognizable from our gaze [19]. Through eye-tracking, this research can understand and investigate cognitive processes that occur in visual activities, such as attention, selection, and discrimination [20]. This research focuses more on eye gaze because it acts as a basis to analyze user activities and performances due to its direct relationship with the concept of “attention” [21]. Automatic gaze tracking enables several applications in the fields of human–computer interaction (HCI) and human behavior analysis [22]. This study analyzed and evaluated eye-tracker measurements, including fixation time, total fixation, and gaze duration [23], of the respondents when viewing multimedia information, and analysis of eye-tracker measurements resulted in gaze data (gaze ratio and gaze duration). Furthermore, respondents filled out questionnaires for the BAI (Beck Anxiety Inventory) as a framework for assessing respondents’ anxiety levels. Data from eye-tracker measurements, including gaze data, were analyzed with the results of the BAI. Gaze data and anxiety level are not directly associated, but they are related to analyzing factors in news that cause low or



high levels of anxiety. Finally, we explored the sources and reasons for respondents' anxiety obtained from interviews with them.

## 2. Literature Review

There are several previous studies related to the topic of a person's anxiety in various areas [24–27], such as in Yanto's research [28], who conducted a study on students' anxiety by applying computational models of variable precision rough sets and the BAI (Beck Anxiety Inventory). The author found that there were many types of anxiety according to the triggers and then classified students into specific categories based on the anxiety they had. The anxiety categories included (1) exam anxiety, (2) presentation anxiety, (3) mathematic anxiety, (4) language anxiety, and (5) social anxiety.

The eye-tracker tool was created by the Gulf and Western series 1900 with the name "eye view monitoring system" [29]. This system determines the direction of the user's view through a television camera that digitizes the observer's eye image. The image processing subsystem detects the pupil limit of the observer and the infrared source image boundary reflected from the cornea. Humans direct their visual attention through eye movements; therefore, monitoring devices are the common for selecting objects that are visually presented on a monitor. Humans observe and pay attention to the objects they are interested in choosing. Because observers pay attention to the object by looking at it, it seems that the most natural choice from the users' point of view must be based on devices that detect their gaze. Many aspects are considered in tracking eye movements, and there are several ways to implement eye-trackers in several areas such as in Augmented Reality (AR) applications for cultural heritage [30], user support systems [31], gameplay methods in shooter games [32], and so forth.

Research in the eye-tracker area is not something new. Eye-tracker methods and concepts have been widely applied in several studies as a support tool for measuring one's eye activity data, as the eye directly shows one's attention in the visual environment and is challenging to engineer [33–35]. There is an example of research in the eye-tracker area conducted by Zhang [23]. This research was carried out by applying eye-tracker technology to assess elements related to the characteristics of eye movements to predict the effectiveness of a video advertisement. The determinants assessed were the response of the audience to the types of products, product brands, and supporting objects in an advertisement. Therefore, three critical areas were assessed as follows: (1) construction of advertisement recalls, (2) attitude towards advertisements and brands, and (3) purchasing intentions, based on the three determinants of fixation time, total fixation, and gaze duration. Yen's study [36] used the context of online reading to investigate whether students' reading skills could reduce the impact of reading news on websites related to controversial issues. Several things that were assessed included students' reading patterns, their construction of counterarguments, and their changing attitudes. This study used an eye-tracker to analyze the attention of respondents to words contained in the issues displayed. The research conducted by Liu [37] used eye-tracking technology to measure the impact of text information contained in multimedia form on the cognitive process of the audience. Results showed the attitudes and attention given by the audience to multimedia information, which varied among text, videos with verbal messages, information in the form of images, and knowledge in the form of sound recordings. This study prioritizes which content gets the most attention from the audience (gaze) in each form of multimedia information displayed.

Human-computer interaction (HCI) is a field of study that focuses on the design of computer technology and, in particular, interaction between humans (users) and computers. With the development of computer technology, human and computer interaction has constantly evolved towards human concepts and simplification. HCI emerged in the 1980s with the advent of personal computing, just as computers began to appear in homes and offices. Because computers are no longer room-sized, learning about human-computer interactions is easy and efficient for less experienced users. HCI has proliferated and settled for three decades, attracting professionals from many other disciplines with various concepts and approaches. Numerous theories of new interactions are emerging, such as hand gestures [38], body gestures [39], and eye-tracking/eye-movement [14]. By capturing the



movement of the user's activity, posture, and space, the system can analyze and conclude whether the user feels safe and comfortable [40].

According to the Barlow concept, anxiety is a state of feeling where orientations or expectations about the future are related to preparation for the possibility of adverse events to come, and fear is a response to current or future hazards (real or perceived). Anxiety has many impacts on one's life. For example, anxiety simultaneously exerts direct and negative influences on performance expectancy [41]. Various kinds of anxiety can arise in a person, and this depends on the environment that triggers anxiety, for example, in a student/teenager [28], cyber bullying [42,43] or anxiety that occurs because of one's social life [44]. There is also anxiety triggered by fear, lack of knowledge, and insecurity towards technology [45].

There are several previous studies regarding anxiety. Anxiety can occur due to various causes and reasons, for example, the research conducted by David [46] on earthquake victims in Athens in September 1999. The anxiety shown by the community was in line with the degree of impact the Athens earthquake. Locations with the greatest impact had the highest average anxiety in the community. Research by Mirón et al. [47] in Barcelona, according to anxiety and depression among undergraduate students, found that young adults may be more vulnerable to the development of stress and anxiety. They concluded that anxiety and depression in young adults need to be prevented and treated.

There are a lot of previous studies on the relationship between eye-tracking, anxiety, and online news. Firstly, the relationship between eye-tracking and online news is unique in its shapes and concepts. On the surface, there are many factors in online news including congruity [36], reading behavior [48,49], content selection [50,51], attention and learning content [52], public opinion [53], and media platforms [54]. Next, there are also previous studies on the relationship between eye-tracking and anxiety. A relationship between eye-tracking/gaze data with anxiety exists but does not directly affect each other. To be more precise, these two factors can be analyzed separately and result in different conclusions, then they can be discussed to connect them as one conclusion to answer a problem. For example, in this paper we tried to find a relationship between anxiety and gaze data on online news. By comparing the gaze ratio from one anxiety level to another, we can analyze how large the impact of texts or images are on certain anxiety levels. The relation between eye-tracking and anxiety describes more of the psychological state of a person because of certain impulses or tasks received. For example, studies by Amanda [55], Schofield [56], and Karin [57] show eye gaze direction from observers when looking at fearful or angry faces. Each of these studies give different results about gaze of emotional faces from observers with high to low anxiety levels, and it gives an interesting perspective about how unique the eye gaze is. Moreover, a study by Jonathan [58] about the effect of anxiety on eye gaze from pilots landing an aircraft shows an increase in anxiety by the randomness of scanning behavior. There are more examples on the unique relationship between eye-tracking and anxiety [58,59].

The relationship between anxiety and online news can be seen in research conducted by Leonore [60], which sought to uncover the relationship between anxiety and depressive disorders and the use of computers, the internet, and TV. The results obtained by Leonore showed that people with anxiety had easier access to the internet through computers. However, overall, respondents who had anxiety spent more time watching TV. Anxiety is even related to the respondent's political point of view, such as in the research conducted by Marcus [61]. The study by Simone et al. [62] evaluated the connection between adolescents's social anxiety social scenes and their interpretation of ambiguous visual social scenes. Results showed interpretation of an ambiguous social scene via a picture-based tool was suitable for measuring complex visual-social cues in adolescents with social anxiety. Research by Amandeep et al. [63] investigated the impact of social media on the user. Social media usage causes social media fatigue and possible anxiety with eventual depression. Their findings in an experiment in India indicated significant 'compulsive social media use', which later triggered social media fatigue and elevated anxiety and depression. Fear of missing out on the newest information causes excessive use of social media that increases social media fatigue.

### 3. Research Methodology

#### 3.1. Eye Tracker

Eye-tracking can be used to investigate eye movements and viewing of visible objects. Eye views and positions are captured and expressed in XY coordinates and stored as raw data; then, the data are visualized to interpret fixation and sight tracking. Eye measurements use the following metrics:

1. fixation of the user's eye on an object;
2. fixation of total eye values in certain areas;
3. fixation duration, measured as the length of time the user's eyes are in a specific position.

This metric can be visualized in the form of a gaze plot, which is a visualization of fixation on an object. In contrast, the duration of fixation at each Area Of Interest (AOI) is visualized in the form of a heat map. The fixation will show the behavior and eye movements of each user while in an AOI. The duration of fixation can indicate that users prefer to observe text or images of the news based on their duration. Measuring consumer interest in news is a measure of attractiveness divided into three measurements based on the Aga Bojko method [64], namely the Important Measurement Area, Interest Measurement Area, and Emotional Passion Measures. This study only used parts of the Aga Bojko method that were consistent with the research objectives. The following are the applied interest measurements.

- A. Measurable Area Measurement is an action to investigate the area of interest using the following metrics:
  - (a) Percentage of users who see the AOI (area of interest).
- B. Interest Field is a measure of user interest using the following metrics:
  - (a) number of fixations on the AOI;
  - (b) total stay time on the AOI;
  - (c) percentage of time viewing the AOI.

#### 3.2. Research Procedure

##### 3.2.1. Pre-experiment Procedure

The research started with a literature study from several previous related studies on eye-tracking and anxiety. We also consulted with experts in the field of psychology to understand more deeply about anxiety. Eye data recording devices used were in isolation rooms and included Tobii Eye Trackers, console recorders, desktops with screen displays (1920 × 1080), and Open Broadcaster Software (OBS). Data that is the news, were retrieved from Indonesian news websites from reliable sources. Selection of the respondent population followed random sampling in the age range of 18 to 60 years. In the stage of assessing the level of anxiety of respondents, the BAI (Beck Anxiety Inventory) instrument was used and converted to Indonesian following the method of "forward translation with testing" for research instruments so that the respondents felt more comfortable and were easier to understand [64].

The pilot test phase was carried out before actual data retrieval. This phase intended to assess and improve research tools and materials before collecting real data [65]. In the trial, we processed all collected data until the trial's conclusion. The aim was to assess whether the tools and materials at that stage could produce data and outcomes accordingly. All eye-tracking data in this study, both quantitative and qualitative, were susceptible and needed to be accurately collected.

After repeated trials, data collection took place in isolation to avoid unnecessary disturbances and factors when respondents read news content. By focusing respondent attention we hoped to minimize the possibility of invalid data, especially from eye-trackers. Respondents needed to sit still

while reading news in the same position from the beginning to the end of the process. Anxiety was evaluated after the respondent finished reading the news by filling in the BAI. Several questions were asked to obtain qualitative data from respondents about their opinions of news content, what factors influenced or encouraged their anxiety, and finally, their views about the news media in Indonesia. Qualitative data with BAI records were triangulated with eye-tracking data.

### 3.2.2. News Selection

All news information was original from the source; this way, any visual media in the news was not altered to avoid reader's confusion. Images in the news aim to invoke more significant emotional impulses of respondents and to make it clear whether they feel anxious or not from the news. Based on the experiment by Maier et al. [66], there are a few differences between a "straight news story" and "combined photography news." Results showed that news with photos rated significantly higher in credibility. "Straight news story" evoked the weakest emotional response and was not enough to arouse a strong response. Readers need to feel empathic connections to what is happening to people in the news. Below are the requirements or characteristics included in choosing news for our study:

- a. news chosen from trusted sources and well-known e-newspapers in Indonesia;
- b. chosen news tells about unfortunate events that are threatening or happened to one or more people;
- c. recently published news based on a newer event in Indonesia;
- d. viral stories across many news sources in Indonesia;
- e. news/stories accompanied by images from the source;
- f. few minor requirements for the best possible result for this experiment.

### 3.2.3. Respondent Preparation

In this experiment, all respondents were given informed consent and were willing to fully participate in the experiment from start to finish. Before signing the consent form, respondents received information about the process and aims of this experiment, including anxiety from reading online news. Every respondent was given time to relax and prepare for the experiment in a conditioned room. We aimed to create similar conditions for each respondent.

## 3.3. Data Processing and Analysis

In this study, there were two types of data: quantitative and qualitative. Quantitative data were obtained from the Eye-Tracker and Beck Anxiety Inventory experimental process. Raw fixation data were recorded in the form of XY coordinates, fixation duration, and timestamps of the respondent's eyes for each fixation at a time [67]. Raw data were filtered to find the ratio along with the duration of fixation on the predetermined AOI, namely news text and images. Processing fixation data produced detailed gaze characteristics of each respondent, which also showed the nature of each respondent's attention [68]. Then, data were compared with anxiety level data from the Beck Anxiety Inventory instrument. From these two areas, we were able to compare the ratio of each level of anxiety to the AOI text or image.

Qualitative data in this study were raw data recording respondents' answers to several of the questions asked. The questions posed came from a related research study and aimed to obtain appropriate qualitative data for this study [69]. The following three questions were asked to the respondents:

- A. Which news makes you the most anxious?
- B. What are the reasons for your anxiety?
- C. What is your opinion on the spread of news in the Indonesian news media today?



On Table 3, before finding the gaze ratio, we calculated how many XY coordinate points were included in text or image categories. Each row of XY coordinates was checked with Excel with the IF function, with a result of “1”, or true, if it was included in the text area or image area (AOI text and image included in computations in the form of a vertical coordinate range). Below is an example of the IF formula in Excel for AOI text.

$$= \text{COUNTIF}(B : B, "> 650") \tag{1}$$

**Table 3.** gaze ratio and gaze duration.

time	x	y	trial	Timestamp			
0	661.6834	670.3595	1	14.29.41.11	Text	=	5052
0.11	663.3296	668.5508	1	14.29.41.22	Image	=	710
0.2	667.1603	669.0439	1	14.29.41.31			
197.89	729.2287	665.2911	1	14.29.41.198			
212.89	727.9133	664.5798	1	14.29.41.213			
220.89	725.2825	663.1573	1	14.29.41.221			
.....							

In the formula (1), B is the column for coordinate Y, which is the horizontal coordinate, and 650 is the horizontal coordinate point where text started on the bottom of the screen. The gaze ratio of image or text is the percentage of text or image COUNTIF to the total of both COUNTIF, as seen at formula (2).

$$\text{GazeRatioTextPercentage} = \text{TextCOUNTIF} / (\text{TextCOUNTIF} + \text{ImageCOUNTIF}) \tag{2}$$

As for gaze duration, it was determined based on the gaze ratio percentage multiplied by the duration of reading time (in seconds). Reading time was counted manually from recorded videos of each of respondent when reading news.

$$\text{GazeDuration} = \text{GazeRatioTextPercentage} * \text{ReadingDuration} \tag{3}$$

## 4. Results

### 4.1. Demographic Data

Respondents in this study included 40 people from the population in Yogyakarta chosen by random sampling [71]. Table 1 details demographic information of the respondents obtained from filling out questionnaires and sorted by several categories such as gender, age, residence, occupation, frequency of consumption, type of media, popular media, news category, type of media, and quality of media. In terms of occupation, the majority of respondents were undergraduate and graduate students (77.5%), and in terms of residence, the majority were from Yogyakarta (87.5%). Respondents who preferred digital media rather than print media were as high as 95% Almost all of the respondents have more than two source of the news sources. From Table 4, it can be seen that Line Today’s digital media platform was the most preferred, with 27.9%, followed by Detik at 16.3%, Kompas at 14.0%, Instagram at 9.3%, and other platforms at 32.6%, which is a collection of media platforms selected once or twice by respondents.

Following their favorite media platform, respondents also had several options for news categories that are commonly enjoyed every day. Several of the favored categories were politics (22.6%), sci-tech (15.1%), sports (12.3%), entertainment (12.3%), lifestyle (11.3%), and others (26.4%). In terms of the type of information category, the majority was “text” with 18 respondents (45.0%), followed by 11 respondents choosing image information (27.5%), and 11 respondents choosing video information (27.5%). For the media quality category, respondents chose the characteristics of information to assess the quality of the information delivered. The first choice was the quantity of information provided

(40.0%), followed by “the characteristics of the media” (25.0%) in second place, then the “unambiguous characteristics of information that can describe whether or not the information is a hoax” (20.0%) in third place, and in last place was “most recently the other various characteristics from respondents” (15.0%).

**Table 4.** demographics.

<b>Gender</b>	Male	25	62.5%	<b>Favorite News Sources</b>	Line Today	12	27.9%			
	Female	15	37.5%		Detik	7	16.3%			
<b>Age</b>	<20	1	2.5%		Kompas	6	14.0%			
	20–25	31	77.5%		Instagram	4	9.3%			
	25–30	2	5.0%		Other	11	32.6%			
	>40	6	15.0%		Politics	24	22.6%			
<b>Residence</b>	Yogyakarta	35	87.5%		<b>News Categories</b>	Sci-Tech	16	15.1%		
	Outside	5	12.5%			Sports	13	12.3%		
<b>Profession</b>	Student	31	77.5%			Entertainment	13	12.3%		
	Private Employees	2	5.0%			Lifestyle	12	11.3%		
	Government Employees	1	2.5%	Other		28	26.4%			
	Businessman	3	7.5%	<b>Type of Information</b>	Text	18	45.0%			
	Other	3	7.5%		Images	11	27.5%			
<b>Media Quality</b>										
								Printed	2	5.0%
								Digital	38	95.0%
								Quantity of information	16	40.0%
								Supportive media (image or video)	10	25.0%
Fake or Real News	8	20.0%								
Other	6	15.0%								

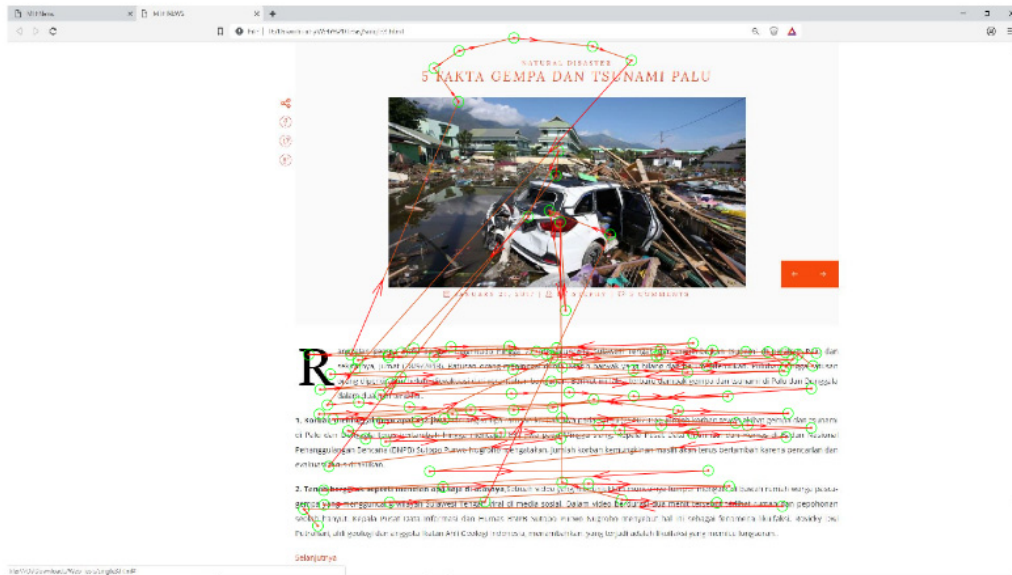
#### 4.2. Content Interest Measurement

Experiments were carried out in rooms with adjusted ergonomic conditions and meters at 293 lux. Experiments began by providing respondents a news website with a 50% ratio of text and image elements. News content was arranged in the same width, so the only difference was the Y coordinate for placement of text and news images on the screen. News was presented with content quoted from several official news websites in Indonesia. The news included several latest stories, namely the events of flight accidents, cases of conflict in Indonesia’s UU ITE (Constitution of Information and Electronic Transaction), and post-earthquake conditions in Palu and Lombok. Selection of news aimed to give an impulse of anxiety towards the respondent and to also trigger the memory of the respondent of anxiety experienced in the past month in order to be able to fill out the BAI questionnaire and engage in the interview. Forty respondents were included in the experiment, which had no age or professional limitations. The 40 respondents consisted of 26 (65%) undergraduate students, 10 (25%) graduate students, and 4 (10%) employees. The tools used for data retrieval were Tobii Eye-Tracker, Tobii Gaze Overlay, Open Broadcaster Software (OBS) for recording screen, and a console program to record the X and Y coordinates. When respondents explored and observed news content, the eye gaze and eye movements were recorded into CSV files, and in this experiment, the AOI used was part of text and images on the news page. CSV data are shown in Table 5. Eye-tracking data captured with Tobii were visualized as a heat map, and the scanned path is shown in Figure 1.



Table 5. Example of CSV eye-tracking data.

X	Y	Time
585.2921	723.4481	13.53.36.3
584.7035	723.6976	13.53.36.15
584.8232	723.7401	13.53.36.25
586.6572	723.4815	13.53.36.38



(a)



(b)

Figure 1. (a) Example of gaze plot; (b) Example of heat map.

Then, the raw data obtained were processed to measure content interest. Data classification was based on the following metrics:

- A. amount of fixation on AOI images for each news article;
- B. amount of fixation on AOI text in each news article;
- C. comparison ratio of fixation of images and text in each news article;



- D. duration of fixation on AOI images in each news article;
- E. duration of fixation on AOI text in each news article;
- F. percentage of time spent on AOI images and news (total fixed duration (FD) on AOI / total FD on the webpage; data shown in Table 5.

Then, the content interest data were processed to find correlation with data from the anxiety check process using the Beck Anxiety Inventory questionnaire. The correlation seen between the two data was arranged as follows:

- A. fixation ratio and interest in low-anxiety respondents;
- b. fixation ratio and interest in moderate-anxiety respondents;
- c. fixation ratio and interest in high-anxiety respondents;
- d. fixation ratio and interest in severe anxiety respondents.

Interest measurement data also existed in qualitative form obtained from in-depth interviews to find the following:

- A. which news triggers the most anxiety;
- B. factors that trigger anxiety;
- C. factors in delivering information in Indonesia and its relationship with triggering anxiety.

#### 4.3. Fixation and Heat Map from Eye-Tracking Data

The next step was to pre-process the raw eye-tracking data, which were still stored in the form of CSV. Pre-processing was done using three tools, namely Excel, Matlab, and RStudio. Excel was used as the CSV file processing tool, Matlab was used to clean and tidy up eye-tracking data, and R Studio was used to visualize heat maps. Examples of fixation and heat map results can be seen in Figure 1. Figure 1a shows the eye movement of respondents when consuming news had a random pattern while observing web pages and images. Still, there was a regular pattern in which the respondents read the text to get information about the news displayed. Figure 1b shows the gaze frequency using the heat map method.

#### 4.4. Result of the Content Interest Measurement Experiment

The next step was to calculate the user’s interest using the following metrics. Results from content interest measurements are in Table 6.

**Table 6.** Example of Eye-Tracker measurements per respondent.

No	IF			TF			Ratio		Duration IF			Duration TF		
	N1	N2	N3	N1	N2	N3	Image	Text	N1	N2	N3	N1	N2	N3
1	6.052	5.297	3.530	8.732	3.451	7.108	43.54%	56.46%	72	63	42	103	41	84
2	611	1.560	472	185	1.127	745	56.23%	43.77%	7	18	5	2	13	9
3	2.795	3.297	1.851	5.839	3.754	4.869	35.45%	64.55%	40	48	27	84	54	70
4	2.720	1.970	1.339	7.450	5.298	5.740	24.59%	75.41%	32	23	16	87	62	67
5	4.331	3.424	2.393	2.224	3.548	4.995	48.53%	51.47%	51	41	28	26	42	59

##### A. Amount of fixation on AOI images in each news article

News 1 = 115,864, News 2 = 140,680, News 3 = 95,279. B2 had the highest total fixation on image content, and B3 had the lowest.

##### B. Total fixations on AOI text for every news article

News 1 = 317,404, News 2 = 227,228, News 3 = 238,063. B1 had the highest total fixation on text content, and B2 had the lowest.

##### C. Fixation comparison ratio for each news article

Comparison of fixation on text and images in each news story (F. Image; F. Text). The results were as follows: News 1 = 26.74%: 73.26%, News 2 = 38.24%: 61.76%, and News 3 = 28.58%: 71.42%.

**D. Duration of fixation on AOI images in each news article**

B1 = 1586 s, B2 = 1925 s, and B3 = 1304 s. B2 had the most interaction time in the image content category in this study, while B3 had the shortest time.

**E. Fixation duration in AOI text in each news article**

B1 = 4133 s, B2 = 1925, B3 = 3100. B1 had the most interaction time for the text content category in this study, while B2 had the shortest.

**F. Percentage of time on AOI images and news**

Comparison of fixation duration on text and images in each news article (F. Picture; F. Text). Results were as follows: B1 = 27.73%: 72.27%, B2 = 39.42%: 60.58%, and B3 = 29.61%: 70.39%.

From Table 6, the most substantial image fixation ratio occurred in N2, while text content occurred in N1. When compared, the rate of text fixation was higher than the rate of image fixation in all three news types, with a significant difference between the data. With this result, it can be concluded that respondents were more likely to try to get news information from reading and observing text rather than images. Table 7 shows the duration of the respondents’ fixation on images (D) and text (E). For image content, N2 had the longest duration, which was 1925 s, and the shortest was N3 with 1304 s. For text content, N1 had the longest duration of 4133 s, and N2 had the shortest with 2959 s. When the durations of fixation were compared, the text fixation duration was greater than the duration of fixation on images. With this result, it can be concluded that respondents used more time to read the news compared to looking at images. After getting the data results from the measurement analysis tracker, in the next section we will discuss and process the respondents’ anxiety data based on the BAI questionnaire. Anxiety was not directly affected by nor resulted from eye-tracker measurement data.

**Table 7.** Results of Eye-Tracker measurements.

	A	B	C. Image	C. Text	D	E	F. Image	F. Text
N1	115.864	317.404	27%	73%	1586	4133	27%	72%
N2	140.680	227.228	38%	62%	1925	2959	39.42%	60.58%
N3	95.279	238.063	28.58%	71.42%	1304	3100	29.61%	70.39%

Description:

N1, N2, and N3 = News 1, News 2, and News 3;

IF = image fixation;

TF= text fixation;

A = total fixation on AOI images;

B = total fixation on AOI text;

C = fixation ratio of images and text;

D = gaze duration on AOI images (seconds);

E = gaze duration on AOI text (seconds);

F = percentage of time used to look at images and text.

**4.5. Anxiety Measurement**

Research conducted by the inventor of BAI concerning methods for measuring anxiety experienced by someone used a questionnaire which consisted of 20 questions. Memory and psychological conditions of the respondents influence the obtained results; therefore, accurate responses must be collected in a pre-questionnaire experiment. The BAI questionnaire assesses the level of respondents’ anxiety using a scale based on the respondents’ answers to the existing 20 questions. There are four scales in BAI, namely low (0–7), medium (8–15), high (16–25), and severe (26–63). In this experiment, the BAI questionnaire was filled out by respondents after reading the three news articles provided in the context of real news content, and this can provoke impulses and respondents’ memories to trigger anxiety. Impulses and anxieties can be the result of triggers from news content or from previous

activities and events experienced by respondents, and they are the cause of anxiety in the respondent’s daily life in various forms, which was captured in the BAI questionnaire.

Filling out the BAI questionnaire began with an introduction so respondents could understand what data will be collected by the study through the BAI questionnaire. Respondents filled in each question from the 20 items given. The first column in the BAI questionnaire shows the types of symptoms of anxiety in someone who might have experienced it, and the respondents were asked to mark the disturbance level of the symptoms according to the respondent’s own experience. The measuring scale was from 0 to 3, which indicated “Never”, “Light”, “Medium”, and “Heavy”. The results of the BAI were calculated using the rules and conditions described above, and categories of respondents can be seen in Table 8. An example from the results of the BAI questionnaire of a few respondents can be seen in Table 9.

**Table 8.** Categorization by anxiety level.

Anxiety Level	Number		Gaze Preference	
	X	%	Image	Text
LA (Low Anxiety)	18	45%	1	17
MA (Medium Anxiety)	8	20%	1	7
HA (High Anxiety)	10	25%	2	8
SA (Severe Anxiety)	4	10%	0	4

**Table 9.** User anxiety measurements (BAI).

Respondent	Score	BAI Scale	Respondent	Score	BAI Scale
1	19	High	10	12	Medium
2	17	High	11	27	Severe
3	7	Low	12	3	Low
4	8	Medium	13	20	High
5	25	High	14	9	Medium
6	0	Low	15	4	Low
7	21	High	16	8	Medium
8	21	High	17	6	Low
9	21	High	18	24	High

Table 8 contains information on the number (X) of respondents included in each category of high anxiety to low anxiety. In the far-right column is the total respondents included in the gaze preference (GP) category, one kind of AOI category that had the most fixation from respondents’ eye-activity, which are images or texts at each anxiety level. Data in Table 8 show that in each anxiety level, the majority of respondents leaned towards the text. Based on the data in Table 8, the majority of respondents had a low anxiety level, which was in 18 respondents (45%), and the lowest was severe anxiety with 4 respondents (10%). At all levels of anxiety, respondents were more inclined to text content, even at the level of severe anxiety, and all respondents were prone to text content.

#### 4.6. Anxiety Result and Eye-Tracker Measurement

After getting results of BAI data processing and categorizing respondents according to the existing scale, the next stage was to associate each respondent with each level of anxiety with the eye activity of the respondents that were recorded in the Eye-Tracker measurement results. Categorizing respondents based on anxiety level can be seen in Tables 10–13 in the low anxiety to severe anxiety order.

**Table 10.** Respondents with low anxiety.

Respondent	Image Ratio	Text Ratio	Preference
3	35.45%	64.55%	Text
6	41.78%	58.22%	Text
12	27.74%	72.26%	Text
15	33.05%	66.95%	Text
17	63.91%	36.09%	Image
19	31.22%	68.78%	Text
22	48.97%	51.03%	Text
23	29.75%	70.25%	Text
25	31.76%	68.24%	Text
29	22.44%	77.56%	Text
32	24.80%	75.20%	Text
33	25.37%	74.63%	Text
34	22.45%	77.55%	Text
36	13.98%	86.02%	Text
37	34.60%	65.40%	Text
38	27.61%	72.39%	Text
39	25.32%	74.68%	Text
40	14.74%	85.26%	Text

**Table 11.** Respondents with medium anxiety.

Respondent	Image Ratio	Text Ratio	Preference
4	24.59%	75.41%	Text
10	81.80%	18.20%	Image
14	23.22%	76.78%	Text
16	32.18%	67.82%	Text
20	24.93%	75.07%	Text
24	10.87%	89.13%	Text
26	42.59%	57.41%	Text
35	27.88%	72.12%	Text

**Table 12.** Respondents with high anxiety.

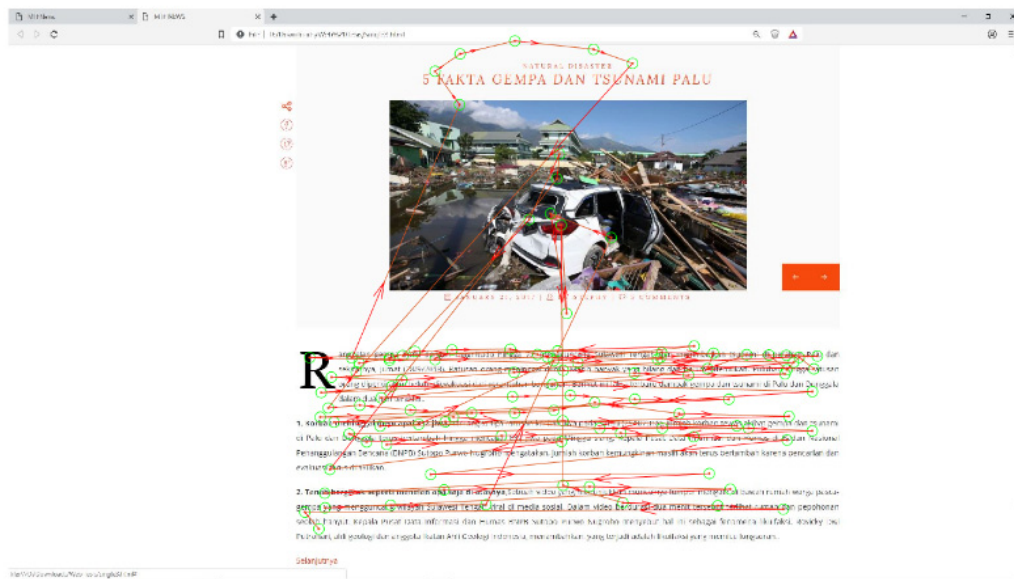
Respondent	Image Ratio	Text Ratio	Preference
1	43.54%	56.46%	Text
2	56.23%	43.77%	Image
5	48.52%	51.48%	Text
7	43.57%	56.43%	Text
8	29.62%	70.38%	Text
9	79.03%	20.97%	Image
13	29.13%	70.87%	Text
18	48.36%	51.64%	Text
21	40.80%	59.20%	Text
27	20.26%	79.74%	Text

**Table 13.** Respondents with severe anxiety.

Respondent	Image Ratio	Text Ratio	Preference
11	27.70%	72.30%	Text
28	21.21%	78.79%	Text
30	21.60%	78.40%	Text
31	9.16%	90.84%	Text

The majority of respondents fell into the low anxiety category/table, with a variety of comparison ratios of text and images. The majority of respondents had a higher text inclination ratio when consuming news information. There was one respondent who leaned towards images, namely respondent 17 who had an image ratio of 63.91% compared to a text ratio of only 36.09%. In the medium anxiety table, there was also one respondent, namely respondent 10, who leaned towards images with an image ratio inclination of 81.80% compared to the text ratio of 18.20%. For the high anxiety table, two respondents leaned towards images, namely respondent 2 with an image ratio

inclination of 56.23% compared to a text ratio of 43.77% and respondent 9 with an image ratio of 79.03% compared to a text ratio of 20.97%. For the severe anxiety category, all respondents leaned towards text and had a text ratio inclination higher than the image ratio. There were also “almost-tied” results that can be seen in Table 12, which included a group of respondents with high-level anxiety. These “almost-tied” results were the majority in Table 12, which means respondents with “High Anxiety” diverted their attention equally between text and images and also, strangely, paid less attention to text compared to other users in other groups. In Table 13, respondents with “Severe Anxiety” had the most significant differences in ratios compared to others, where the text ratio reached as high as 90% for respondent 31. This result shows that respondents with “Severe Anxiety” pay more attention to text, and that text has a greater impact on their mind to produce “Severe Anxiety”. Examples of gaze plots and heat maps can be seen in Figures 2 and 3.

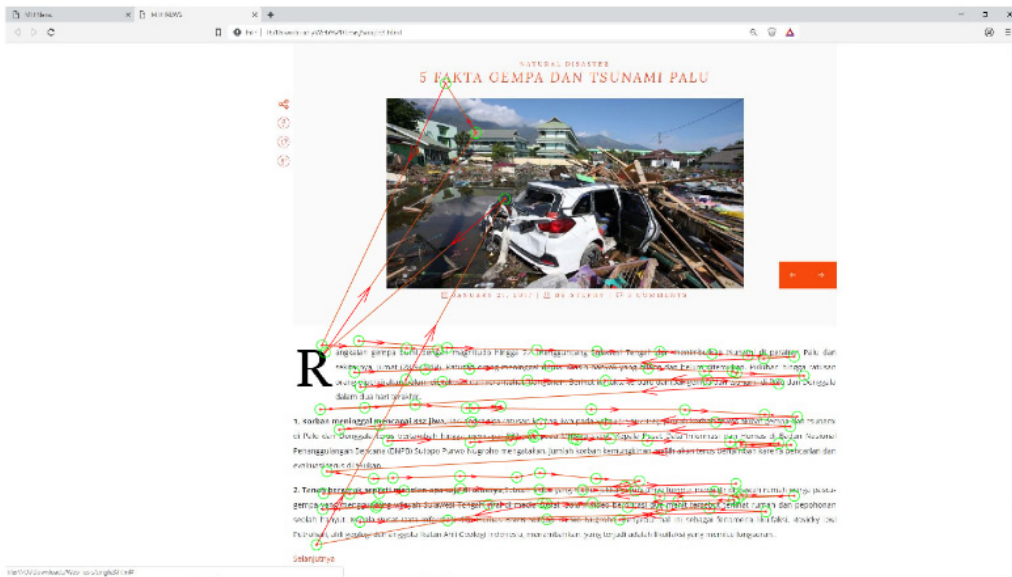


(a)

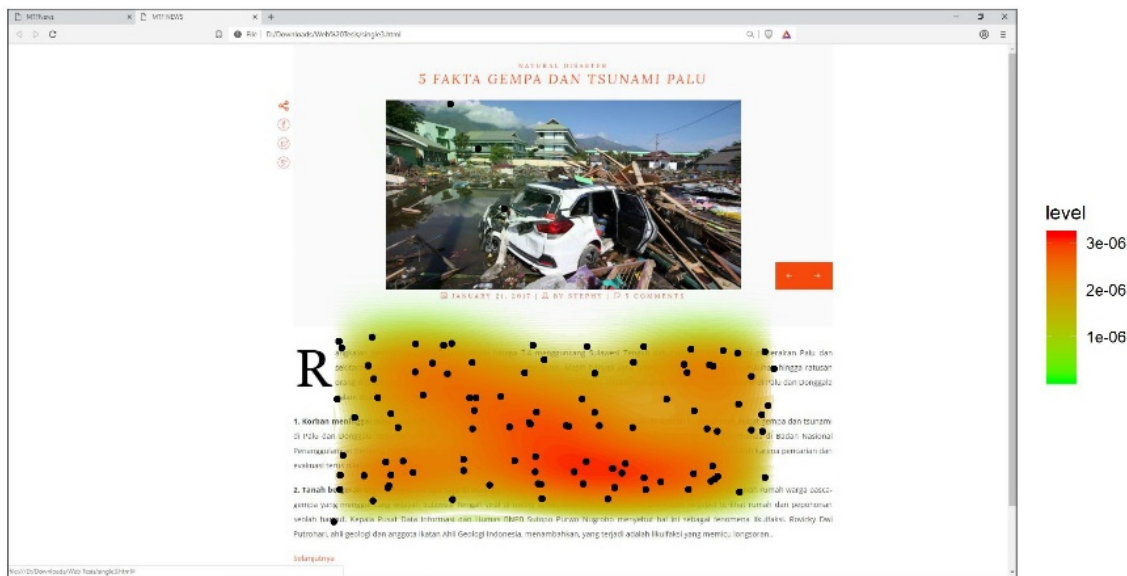


(b)

Figure 2. (a) Example of gaze plot; (b) example of heat map.



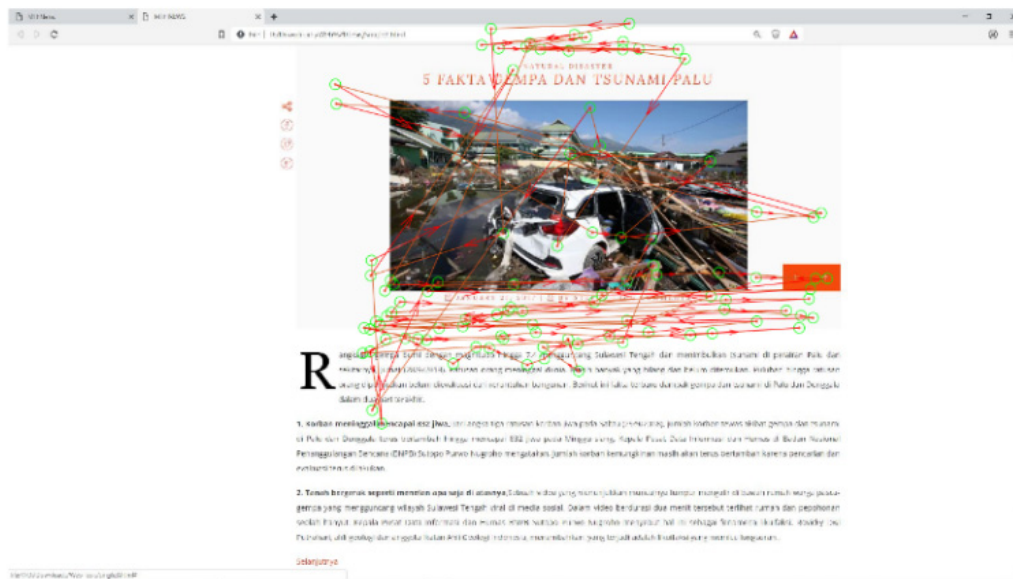
(a)



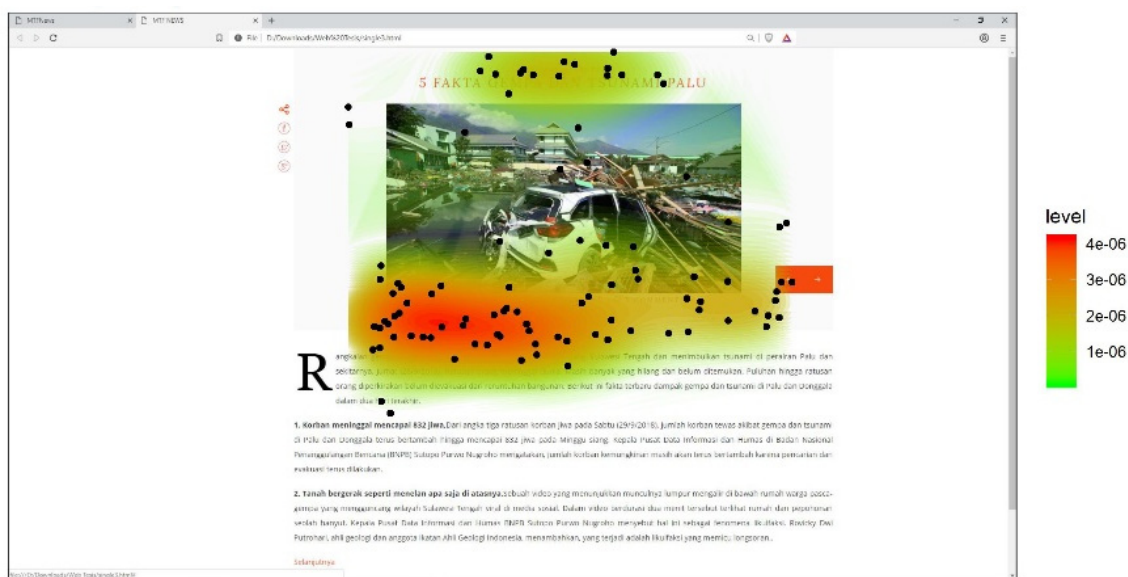
(b)

Figure 3. Cont.





(c)



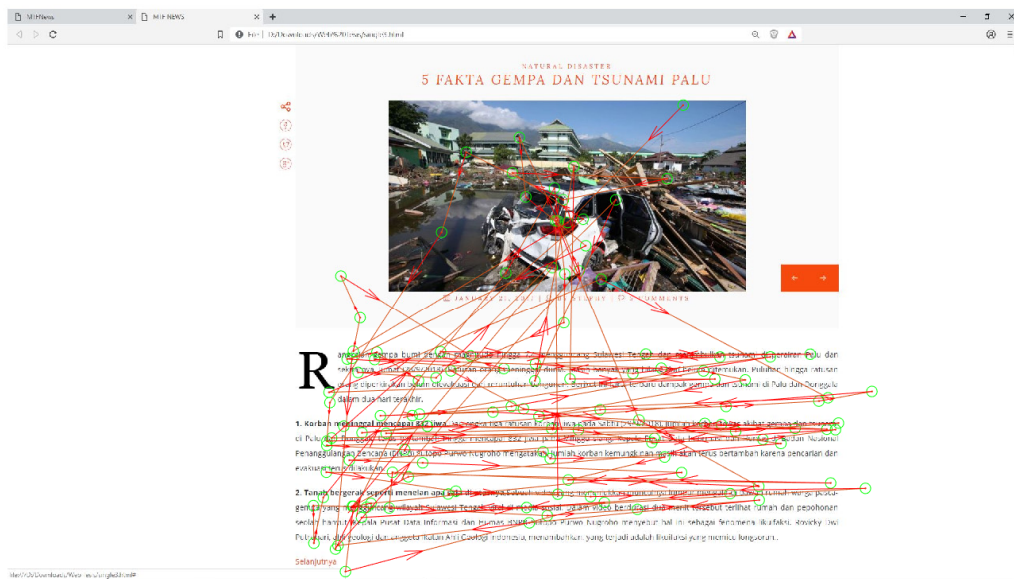
(d)

**Figure 3.** (a) Example of gaze plot text preference; (b) example of heat map text preference; (c) example of gaze plot image preference; (d) example of heat map image preference.

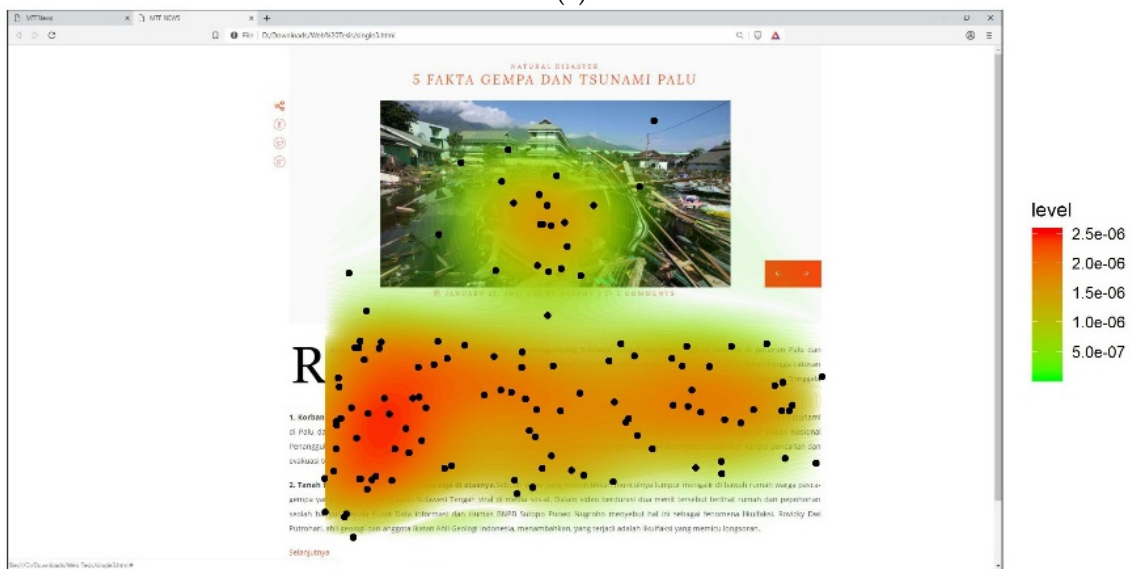
#### 4.7. Fixation and Heat Map by Anxiety Level

Results of tracking eye movements of respondents when fixation and heat maps were visualized can also be seen in Figures 4–7. Visualization included data from respondents with the highest number of fixations from each category of anxiety to illustrate the differences between each respondent with different anxiety levels. Raw CSV data were processed by MatLab to obtain raw fixation data. In the next step, raw fixation data were simplified using R studio to obtain simplified fixation visualization. Simplified fixation visualization more clearly shows the eye movements of respondents when reading news, and these data from R studio were then visualized in a heat map.



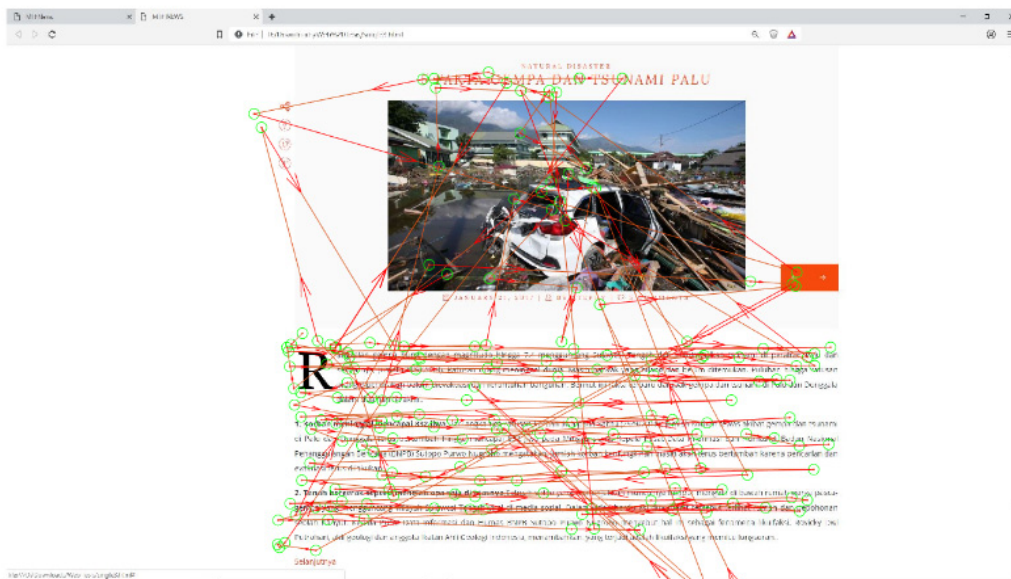


(a)



(b)

Figure 4. (a) Example of gaze plot of low anxiety; (b) example of heat map of low anxiety.

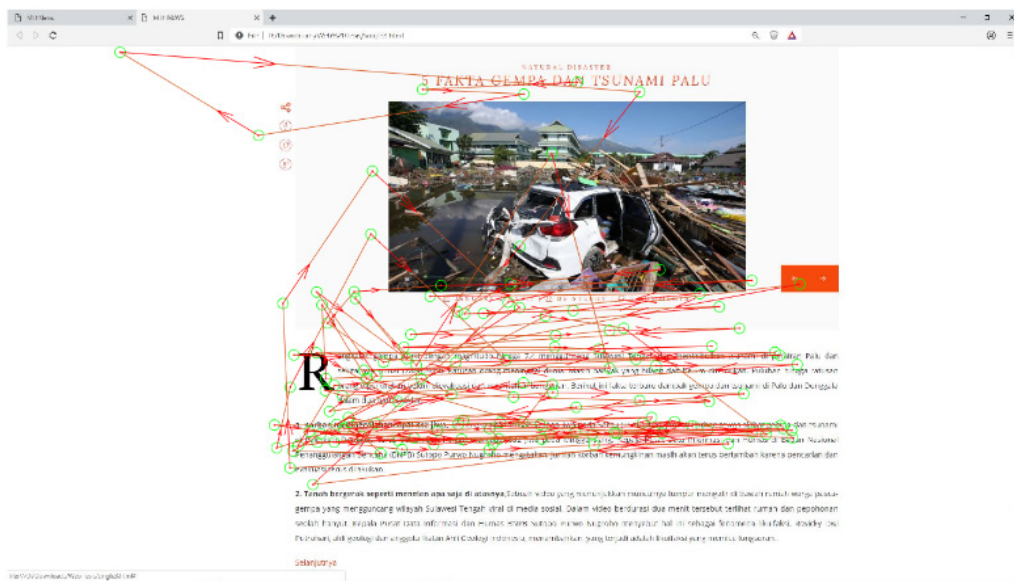


(a)

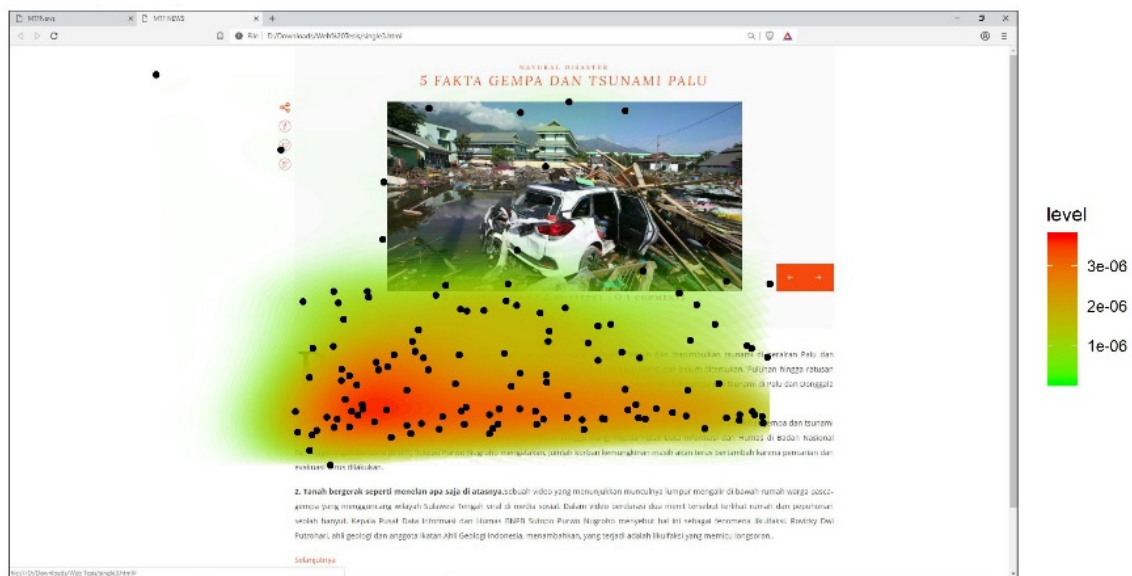


(b)

Figure 5. (a) Example of gaze plot of medium anxiety; (b) example of heat map of medium anxiety.

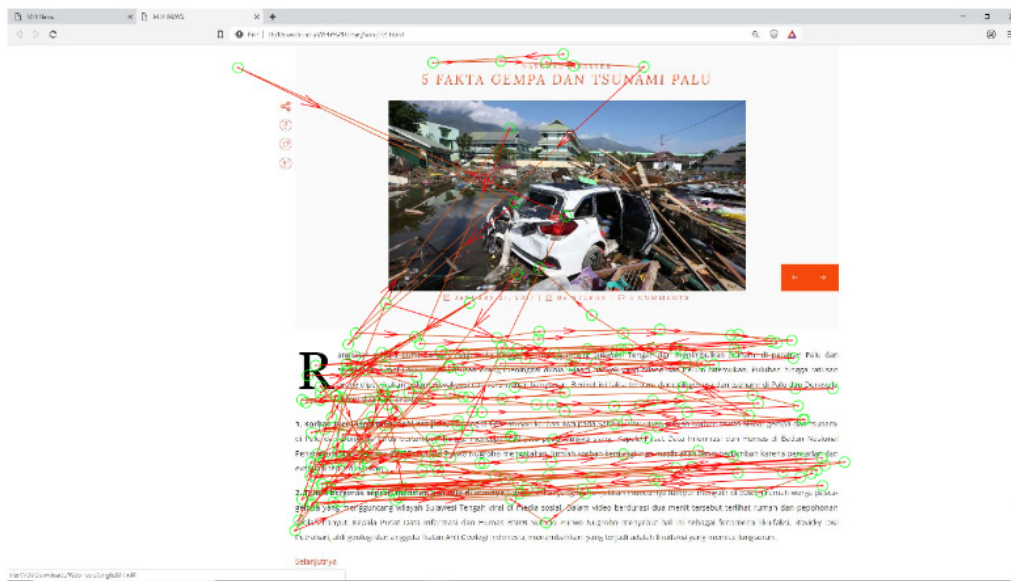


(a)

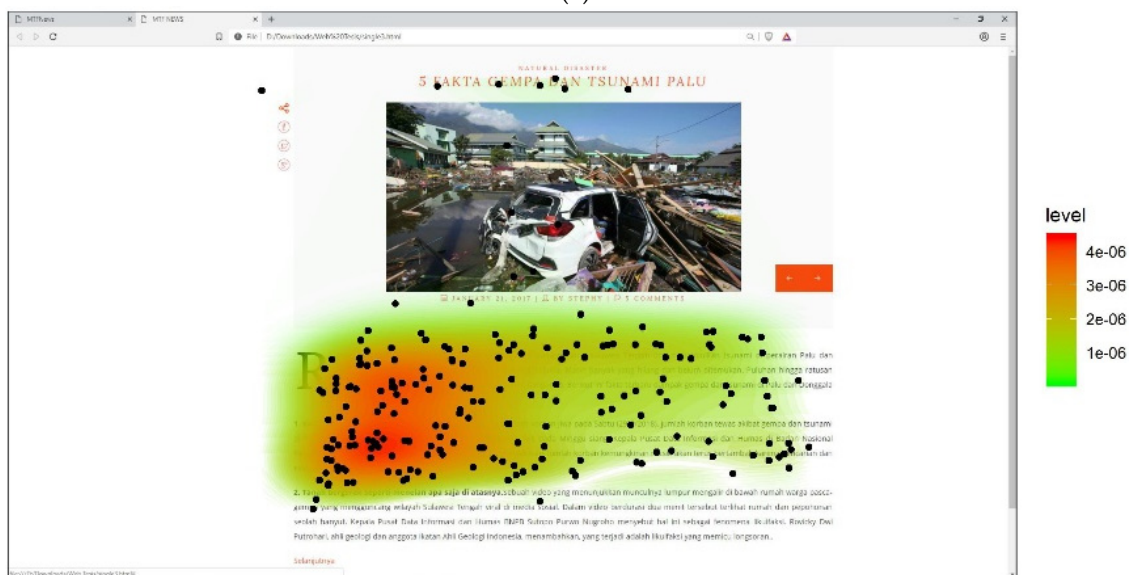


(b)

Figure 6. (a) Example of gaze plot of high anxiety; (b) example of heat map of high anxiety.



(a)



(b)

Figure 7. (a) Example of gaze plot of severe anxiety; (b) example of heat map of severe anxiety.

#### 4.8. Qualitative Data Result

After filling out the questionnaire, respondents went through an in-depth interview regarding the anxiety experienced or that arose due to the impulse from reading the given news. Several of the questions asked of respondents were as follows:

1. Which news gives rise to the most prominent anxiety?
2. What is the reason the respondent feels anxious about the news?
3. How does the respondent think about the delivery of news information in Indonesia at this time?

Qualitative data were obtained from each respondent with these three questions, which were then be processed to find keywords from each question. The first question was intended to find the news that caused the most anxiety from the three news articles provided. The second question looked for statistics for the personal reasons each respondent had regarding why the news selected caused



anxiety. The third question intended to find the opinions of respondents regarding the delivery of news in Indonesia today.

#### 4.8.1. Qualitative Data from Question 1

Table 14 shows the CC (C coefficient) and CO (co-occurrence) of the respondents' answers to the first question about what news caused the perceived anxiety. As seen in Table 14, news about earthquakes had the highest CC and CO from 40 respondents. Flight accidents were second with 11 CC, UU ITE was the third with 6 CC, "no sources" answer was the fourth with 4 CC, and "other" news was the fifth with 3 CC.

**Table 14.** Co-occurrences of Question 1.

<b>Q1: Which News Gives Rise to the Most Prominent Anxiety Feeling?</b>		
	<b>CC</b>	<b>CO</b>
Earthquake	16	0.4
Flight Accident	11	0.28
UU ITE	6	0.15
No Sources	4	0.1
Other	3	0.08

#### 4.8.2. Qualitative Data from Question 2

Table 15 shows the CC and CO of the respondents' answers to the second question about what the reason was behind the perceived anxiety. Table 15 shows the respondents' answers, with CC for the second question being second highest regarding the reason for the anxiety felt based on the news selected in the first question.

**Table 15.** Co-occurrences of Question 2.

<b>Q2: What is the Reason behind the Respondent's Anxiety?</b>		
	<b>CC</b>	<b>CO</b>
Afraid of experiencing	12	0.31
Have experience with sources of anxiety	11	0.28
Anxious because of the information	7	0.18
Anxious because of supporting media of news	5	0.13
No reason for anxiety	3	0.08

#### 4.8.3. Qualitative Data from Question 3

Tables 16–18 show the respondents' opinions for the third question, namely, the opinion on the delivery of news in Indonesia. Answers from respondents were divided into three categories: cons, neutral, and pros. Cons data show that the delivery of news in Indonesia still has many types of deficiencies. Neutral answers can be constructive for improving news delivery. For pros answers, respondents assessed the delivery of news in Indonesia. Judging from the overall context, the total CC and CO of cons was still more than that of the pros rating.

**Table 16.** Co-occurrences of Question 3, cons.

<b>Q3: What is the Respondent’s Assessment of News Media in Indonesia (cons answer)</b>	<b>CC</b>	<b>CO</b>
Hyperbole	8	0.2
Hoax	6	0.15
Beautified	5	0.13
Careless in spreading the news	3	0.08
Clickbait	3	0.08
Misused	3	0.08
News give benefit to a specific side	3	0.08
Lack of education	2	0.05
News deliver information in the wrong way	2	0.05
Not satisfied in information	2	0.05
Title and context of news, not sync	2	0.05

**Table 17.** Co-occurrences of Question 3, neutral.

<b>Q3: What is the Respondent’s Assessment of News Media in Indonesia (neutral answer)</b>	<b>CC</b>	<b>CO</b>
Assessments are not overall	2	0.05
Need to compare their source with others	1	0.03
Need to search for more references	1	0.03
News publisher should be neutral	1	0.03
News should minimize the negative fact	1	0.03
News should minimize negative statement	1	0.03
Opinion: important information sources	1	0.03
Opinion: Need to be more critical	1	0.03
Read news from trusted sources	1	0.03

**Table 18.** Co-occurrences of Question 3, pros.

<b>Q3: What is the Respondent’s Assessment of News Media in Indonesia (pros answer)</b>	<b>CC</b>	<b>CO</b>
Effective	4	0.1
Improving	4	0.1
Trustworthy	4	0.1
Accurate	3	0.08
Easier to be accessed	2	0.05
Fast	2	0.05
Good enough	2	0.05
Good packaging	2	0.05
Interesting	1	0.03
To the point	1	0.03
Updated	1	0.03

4.8.4. Qualitative Data Anxiety and Reasons for Anxiety

Table 19 shows the relationship between the respondents’ anxiety level and the reasons for the anxiety experienced by the respondents. As there were many variations of the reasons, not every reason appeared in the table. The variety of reasons for one respondent was also influenced by the total respondents in that category. The low-anxiety category, with the most respondents, had the most varied answers with the highest CC in one group, namely “fear of experiencing” being the trigger of respondents’ anxiety. However, the answer that had the highest CC was the option of “having experience with the source of the anxiety trigger”. For that answer, there were as many as eleven between the four categories of anxiety.

**Table 19.** Co-occurrences and reasons for anxiety.

Reasons for Anxiety	Low Anxiety		Medium Anxiety		High Anxiety		Severe Anxiety	
	CC	CO	CC	CO	CC	CO	CC	CO
Afraid it could happen to the family	0	0	0	0	1	0.1	0	0
Afraid of experiencing	5	0.2	3	0.18	3	0.16	1	0.07
Anxious about personal trouble	1	0.06	0	0	0	0	0	0
Anxious because of certain knowledge of the sources	0	0	1	0.13	0	0	0	0
Anxious because the information has a negative impact	1	0.05	0	0	2	0.18	0	0
Anxious because of lack of information	1	0.06	0	0	0	0	0	0
Anxious because of supporting media of news	4	0.21	0	0	1	0.07	0	0
Anxious because of other people’s actions	0	0	0	0	1	0.1	0	0
Anxious because of the information	2	0.08	2	0.14	3	0.2	1	0.09
Anxious on social media	0	0	0	0	1	0.1	0	0
Frequently interact with sources of anxiety	0	0	0	0	1	0.1	0	0
Have experience with sources of anxiety	3	0.12	3	0.19	3	0.17	2	0.15
More anxious about little things	1	0.06	0	0	0	0	0	0
No reason for anxiety	3	0.17	0	0	0	0	0	0
Sources of anxiety are part of the common experience	1	0.05	0	0	2	0.18	0	0
Succumb to “immediate death possibility” sources of anxiety	2	0.11	0	0	0	0	0	0
Worried about the source of anxiety	0	0	1	0.13	0	0	0	0

4.8.5. Qualitative Data and Sources of Anxiety

Table 20 shows the relationship between sources of anxiety and respondents’ anxiety levels. The source of anxiety was divided into earthquakes (News 3), flight accidents (News 1), no sources, other, and UU ITE (News 2). “No sources” was answered by respondents who did not feel any anxiety from the provided news or past events in their lives. It can be seen that, at each level of anxiety, earthquake news was the most significant cause of anxiety. “Other” was the answer by respondents who felt anxious because of past events in their life instead of the provided news, but they refused to explain the sources. For “No sources” answers there were four people, and it occurred in respondents in the low-anxiety category. With the existence of other answers, it was not possible to rule out the possibility that reading news could trigger anxiety due to other news related or not. From respondents who answered “other”, there were reasons such as terrorism, scandals, personal problems, and privacy.

**Table 20.** Co-occurrences and sources of anxiety.

Sources of Anxiety	High Anxiety		Low Anxiety		Medium Anxiety		Severe Anxiety	
	CC	CO	CC	CO	CC	CO	CC	CO
Earthquake	4	0.18	6	0.21	4	0.2	2	0.11
Flight Accident	3	0.17	3	0.12	3	0.19	2	0.15
No Sources	0	0	4	0.22	0	0	0	0
Other	1	0.08	2	0.11	0	0	0	0
UU ITE	2	0.14	3	0.14	1	0.08	0	0

4.8.6. Qualitative Data Sources and Reasons for Anxiety

Table 21 shows data on the relationship between “sources of anxiety” and “reasons of anxiety”. It shows that the reasons why news is a prominent source of anxiety are similar. With earthquake news, the main reason was “having experience with the source of anxiety”, with CC 8 in the earthquake news category. In the Flight Accident news, the reason of being “afraid to experience” was the biggest reason with CC 6. In the UU ITE news, the reason of “fear of experiencing” was also the most significant reason with CC 4. In the earthquake news, the reason “having experience with the source of anxiety” was dominant because the majority of respondents lived in Yogyakarta where the residents experienced fear caused by the earthquake in Yogyakarta in May 2006. In the FA news, the reason “afraid to experience” became the biggest because of students who routinely used airplane flight services. Similarly, with the UU ITE news, “afraid to experience” was also dominant because of the use of the internet and smartphones that have become routine in providing info or comments and statements in private or public settings. For “other”, there were three reasons with 1 CC, of which two



of them were information-based anxiety: (i) “anxious because information gives a negative impact” and (ii) “anxious because of supporting media of news”. Option “no sources” had two reasons for anxiety: “no reason for anxiety” and “more anxious about little things”. Those two reasons showed that respondents with these answers did not have anxious feelings for the provided news, nor did the mentioned experience happen in their life.

**Table 21.** Co-occurrence sources and reasons for anxiety.

	Earthquake		FA		No Sources		Other		UU ITE	
	CC	CO	CC	CO	CC	CO	CC	CO	CC	CO
Afraid it could happen to the family	1	0.06	0	0	0	0	0	0	0	0
Afraid of experiencing	1	0.04	6	0.35	0	0	0	0	4	0.29
Anxious about personal trouble	0	0	0	0	0	0	0	0	1	0.17
Anxious because of certain knowledge of the sources	1	0.06	0	0	0	0	0	0	0	0
Anxious because information has a negative impact	1	0.06	0	0	0	0	1	0.2	1	0.13
Anxious because of lack of information	0	0	0	0	0	0	0	0	1	0.17
Anxious because of supporting media of news	2	0.11	2	0.14	0	0	1	0.14	0	0
Anxious because of other people’s actions	0	0	0	0	0	0	0	0	1	0.17
Anxious because of the information	3	0.14	2	0.12	0	0	1	0.1	2	0.17
Anxious on social media	0	0	0	0	0	0	0	0	1	0.17
Frequently interact with sources of anxiety	0	0	1	0.09	0	0	0	0	0	0
Have experience with sources of anxiety	8	0.42	1	0.05	0	0	1	0.08	0	0
More anxious about little things	0	0	0	0	1	0.25	0	0	0	0
No reason for anxiety	0	0	0	0	3	0.75	0	0	0	0
Sources of anxiety are part of the common experience	0	0	2	0.17	0	0	0	0	1	0.13
Succumb to “immediate death possibility” sources of anxiety	0	0	0	0	0	0	0	0	2	0.33
Worried about the source of anxiety	0	0	1	0.09	0	0	0	0	0	0

4.8.7. Qualitative Data of Gaze Plot and Anxiety

Table 22 shows data on the relationship between the respondents’ gaze preference and the anxiety level. It can be seen that in the gaze image category, there were only 4 respondents, and the remaining 36 respondents were included in the gaze plot text category. However, in the Severe Anxiety category, there were no respondents included in the gaze plot image category.

**Table 22.** Co-occurrence of gaze preference (GP) category and anxiety.

	GP Image		GP Text	
	CC	CO	CC	CO
High Anxiety	2	0.17	8	0.21
Low Anxiety	1	0.05	17	0.46
Medium Anxiety	1	0.09	7	0.19
Severe Anxiety	0	0	4	0.11

4.8.8. Qualitative Data of Gaze Plot and Sources of Anxiety

Table 23 shows data on the relationship between the respondents’ gaze preference and the source of anxiety. In the image category there were four respondents, three of whom had sources of anxiety about earthquake news, and one had a source of FA news anxiety. In the earthquake news text category, between the 13 respondents, the majority (10) were also affected by the FA news.

**Table 23.** Co-occurrence of gaze preference (GP) category and sources of anxiety.

	GP Image		GP Text	
	CC	CO	CC	CO
Earthquake	3	0.18	13	0.33
Flight Accident	1	0.07	10	0.27
No Sources	0	0	4	0.11
Other	0	0	3	0.08
UU ITE	0	0	6	0.17

#### 4.8.9. Explanation of Predominant News

From the analysis of BAI anxiety and qualitative data, it can be concluded that from the three news sources presented, earthquake news was the most prominent trigger. Earthquake news was related to several other aspects including (i) being the source of anxiety for the majority of respondents, (ii) being the majority of cause of anxiety among respondents in each category of anxiety, (iii) having relationships with varied reasons for anxiety, and (iv) being the dominant type of news from the three news sources in both the gaze plot image category and the gaze text plot. Then, two further analyses were carried out for variable relations. The first was the ratio of relationship level of anxiety to the news gaze, and the second was the relationship level of anxiety to the news reason of anxiety from news. The primary analysis was a combination of data from Tables 23 and 24. The secondary analysis was a combination of data from Tables 20–22. These two further analyses showed the relationship between anxiety level, news sources, and GP categories. For example, the first analysis can answer the following questions: “Which specific news prompted certain anxiety levels?”, “Which anxiety level was the one most triggered from each news article?” and according to the GP category, “At a certain level of anxiety, which news had the highest text or image GP category?” The second analysis was able to answer “Which anxiety level had the most variety of reasons of anxiety based on certain news?” or “Which anxiety level had the highest CC for certain reasons?” These and other questions would give us more in-depth insight into this relationship and the possibilities of connecting impacts from one variable to another, or even connecting three variables at one time.

**Table 24.** Relationship between anxiety level, news, and gaze preference (GP).

Anxiety Level	News	GP Category	CC
Low Anxiety	News FA	Text	3
		Image	0
	News UU ITE	Text	3
		Image	0
	News Earthquake	Text	5
		Image	6
Medium Anxiety	News FA	Text	3
		Image	0
	News UU ITE	Text	1
		Image	0
	News Earthquake	Text	3
		Image	1
High Anxiety	News FA	Text	2
		Image	1
	News UU ITE	Text	2
		Image	0
	News Earthquake	Text	3
		Image	1
Severe Anxiety	News FA	Text	2
		Image	0
	News UU ITE	Text	0
		Image	0
	News Earthquake	Text	2
		Image	0

#### 4.8.10. Relationship between Anxiety, News, and Gaze Plot

Table 24 shows the fundamental relationships between anxiety, news, and respondents' gaze preference. It can be seen that earthquake news had respondents in three categories (low, medium, and high) who had both gaze plot categories (text and image). The highest CC was found in the low anxiety–news earthquake–gaze image category, with six CC, followed by gaze text in the same category, with five CC.

#### 4.8.11. Relationship between Anxiety, News, and Reason of Anxiety

Table 25 shows the relationship between anxiety, news, and reasons for the anxiety experienced by respondents. From these data, it can be seen that there were various perceptions of respondents regarding the reasons for their anxiety. When viewed from the aspect of anxiety level, the low-anxiety category had the highest variety of reasons (13 reasons). The high-anxiety category had nine different reasons, and the low-anxiety category had only eight different reasons. Of the various reasons that emerged from respondents, there were several included in the types of “text influence”, “media influence”, and “experience influence”. The “text influence” category was based on the text information provided to the reader, and it can be seen that there were four variations with nine occurrences. The type “media influence” was based on media images in the news, and there was only one variation with four occurrences.

**Table 25.** Relationship between anxiety level, news, and reason for anxiety.

Anxiety Level	News	Reason for Anxiety	CC
Low Anxiety	Flight Accident	Anxious because of supporting media of news	1
		Afraid of experiencing	1
		Anxious because of supporting media of news	1
	UU ITE	Afraid of experiencing	1
		Anxious about personal trouble	1
		Afraid of experiencing	1
		Anxious because of lack of information	1
		Succumb to “immediate death possibility” sources of anxiety	1
		Anxious because information has a negative impact	1
		Anxious because of the information	2
	Earthquake	Have experience with sources of anxiety	2
		Afraid of experiencing	1
		Anxious because of supporting media of news	1
Anxiety Level	News	Reason for Anxiety	CC
Medium Anxiety	Flight Accident	Afraid of experiencing	3
		Worried about the source of anxiety	1
		Have experience with sources of anxiety	1
	UU ITE	Anxious because of the information	1
		Anxious because of specific knowledge of the sources	1
	Earthquake	Have experience with sources of anxiety	2
		Anxious because of the information	1
		Afraid of experiencing	2
High Anxiety	Flight Accident	Frequently interact with sources of anxiety	1
		Sources of anxiety are part of the everyday experience	1
		Afraid of experiencing	1
	UU ITE	Anxious because of other people’s actions	1
		Anxious because information has a negative impact	1
		Anxious because of the information	1
	Earthquake	Afraid it could happen to the family	1
		Have experience with sources of anxiety	3
		Anxious because of supporting media of news	1
Severe Anxiety	Flight Accident	Afraid of experiencing	1
		Anxious because of the information	1
	Earthquake	Have experience with sources of anxiety	1
		Have experience with sources of anxiety	1

The “experience influence” category was based on the elements of experience that have happened or will be experienced. There were 3 variations with 21 occurrences. In terms of news elements, namely text and images, these data show that text elements were still a big trigger than images.

Information read by respondents gave several impressions such as “the news has a lack of information”, “information gives negative impact”, and “information gives an anxious feeling”. The image element only had one variation, namely “anxious because of supporting media of news”, but it remained an influence because it occurred in four respondents. “Experience” of respondents also affected the anxiety that arose due to the news. This result was affected because several respondents had experienced an earthquake, that is, the impact of the May 2006 Yogyakarta earthquake on respondents who resided in Yogyakarta. The news sources in this experiment were taken from national news media. It is in line with Liu’s research [38] that news media should publish news with the concept of conveying information and facts as well as positive attitudes of disaster victims in facing the impacts that arise to reduce psychological effects such as depression or anxiety.

#### 4.9. Analyzing Text and Images from Predominant News

Earthquake news, just like online news, generally has text and image elements that will provoke respondents’ emotional impulses when reading, including anxiety. In the next section, the text and image elements in news source three will be analyzed in detail and compared to the other two sources.

##### 4.9.1. Characteristic Image Analysis

Research conducted by Jianying Hu [72] distributed images on the online web in several categories such as story images (S), preview images (P), commercial images (C), host images (A), heading images (H), icons and logos (I), formatting images (F), and miscellaneous images (M). These three news items in this experiment, especially number three, put emphasis on the use of story images (S), which are images associated with stories on the same page. The type of pictures given in the three news articles were photos taken directly by the journalist. It was presented after the news, and it was directly related to the individual/actor in the news story or the scene of the news case. Examples of the images can be seen in Figure 8.

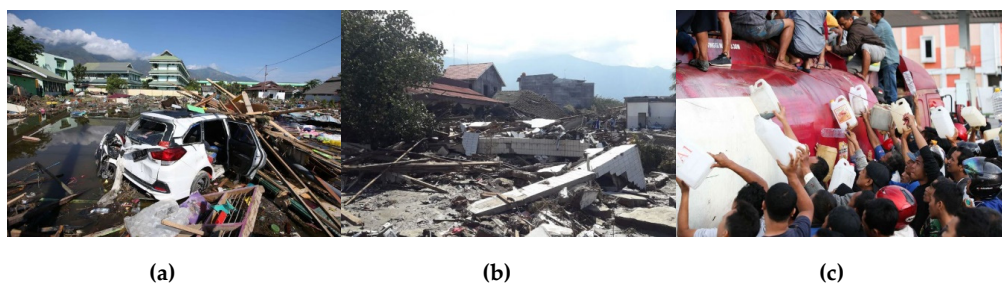


Figure 8. (a–c) Images from an earthquake (News 3).

The three figures above (Figure 8a–c) are examples of images/illustrations given to respondents when reading news from source three, namely regarding the earthquake in Palu and Lombok. The images were included in the story images (S) category, and each image individually gives an impulse of anxiety towards the respondent who reads it. When viewed from the eye-tracker, the eye activity of the respondent in viewing images from source three can be compared with the eye activity form viewing pictures in the other two news sources.

Table 26 shows the gazing ratios for images of the three news sources. Comparisons were divided into four categories: LA respondents (low anxiety), MA respondents (moderate anxiety), HA respondents (high anxiety), and SA respondents (severe anxiety). In each category, there were data from three respondents, namely respondents who had the highest image ratio for each source (flight accident, UU ITE, and earthquake) compared to other respondents. The ratio was obtained from

Formula (4) below, which is the total of gaze point images in the news divided by the whole image ratios of the entire news.

$$ImageGazeRatioX = GazePointX / \sum_{x=news\ 1}^{news\ 3} GazePoint \tag{4}$$

**Table 26.** Comparison of image gaze ratio from respondents with highest image gaze ratio on each news grouped by anxiety level.

Respondent Anxiety Level	News as Source Of Anxiety for Respondent (Self-Assessment)	Gaze Ratio On Image FA	Gaze Ratio On Image UU ITE	Gaze Ratio On Image EARTHQUAKE
Low Anxiety	FA	55.19% *	30.04%	14.77%
	UU ITE	2.80%	79.23% *	17.97%
	Earthquake	31.67%	14.45%	53.87% *
Medium Anxiety	FA	58.19% *	31.29%	10.52%
	UU ITE	10.85%	72.16% *	16.99%
	Earthquake	17.30%	41.57% *	41.13%
High Anxiety	FA	42.68% *	33.74%	23.58%
	UU ITE	23.12%	59.02% *	17.86%
	Earthquake	20.57%	44.12% *	35.31%
Severe Anxiety	FA	40.23% *	47.19% *	12.58%
	UU ITE	14.58%	69.95% *	15.47%
	Earthquake	29.34%	39.70% *	30.96%

\* Highest gaze ratio of each respondent

From the data obtained, it can be seen that the highest ratio of one news item from respondents in certain anxiety categories did not mean that it was the highest ratio in the respondents themselves. As with the MA, HA, and SA respondents in the earthquake category, they respectively had ratios of 41.13%, 35.31%, and 30.96%, and they become the highest among the other respondents in their respective categories. However, when compared with the ratio of other news images for the respondents themselves, the three earthquake image ratios were not the highest compared to FA and UU ITE. Therefore, it can be concluded that a large gaze point ratio of a news item does not necessarily lead to high anxiety about the news. The next section will analyze the text elements for priority news and the other two news items.

#### 4.9.2. Text Characteristics Analysis

Sources of digital text have spread substantially in the last decades in various forms, and one form is via web pages [73]. In this experiment, these three news sources, including news about earthquakes that was prioritized, had text elements providing information and facts about the news. Images on the web are usually accompanied by text, and such text often contains useful information about the nature and content of images. The information provided included facts quoted directly from trusted online news websites in Indonesia and was not altered or edited in such a way for research purposes. News information for these experiments comprised pure facts from Indonesian online news media. Just like the image element, from an eye-tracker perspective, respondents with the highest text ratio were seen by comparing the gaze points of each respondent in the four anxiety categories.

Based on research by Liu [38] regarding news after the earthquake in Sichuan, China, in 2008, submission of reports and information on disasters that occurred could vary depending on the perspective, position, and role of the journalists or the news media. According to Liu [38], there were three sources of information and news classifications in the delivery based on news writers. First, it was from China itself from those who experienced the occurrence, then it was Australia from observers who did not experience the earthquake directly, and later it was the Australian Chinese who positioned themselves as responding to the Sichuan earthquake. The news and information

presented by the Chinese side was more directed at encouraging and inspiring local readers by giving a positive assessment of China’s ability to deal with the earthquake. From the Australian side, the information submitted was more directed at delivering information to attract the attention of readers. The Australian Chinese conveyed information to their readers. National news media was used in this experiment that delivered news of the earthquake in Palu and Lombok. Slightly different from Liu’s research, even though the news media was still included in Indonesia, the information submitted was included to classify outsiders, namely to convey information that interested readers. The information expressed tells the impact of the earthquake in Palu and Lombok, which affected the lives of people there. The following are examples of information submitted.

Example 1

The series of earthquakes with magnitude up to 7.4 rocked Central Sulawesi and caused a tsunami in the waters of Palu and its surroundings on Friday (28/9/2018).

Example 2

Hundreds of people have died. There are still many missing and undiscovered. Tens of hundreds of people are thought to have not been evacuated from the rubble of the building.

Example 3

Public facilities collapsed. The biggest shopping center in Palu City, Tatura Mall on Jalan Emy Saelan, was destroyed and partially collapsed. There are still dozens of hundreds of people trapped inside a four-story shopping center built in 2006.

Table 27 shows the gaze ratio. Comparisons were divided into four categories: LA respondents (low anxiety), MA respondents (moderate anxiety), HA respondents (high anxiety), and SA respondents (severe anxiety). In each category, there were data from three respondents, namely respondents who had the highest image ratio in each FA category (News 1), UU ITE (News 2), and EARTHQUAKE (News 3) compared to the other respondents. The ratio was obtained from the formula below, which is the amount of gazing at text in the news divided by the total of text ratios from the whole news.

$$TextGazeRatioX = GazePointX / \sum_{x=news\ 1}^{news\ 3} GazePoint \tag{5}$$

**Table 27.** Comparison of text gaze ratio from respondents with highest text gaze ratio on each news grouped by anxiety level.

Respondent Anxiety Level	News as Source Of Anxiety for Respondent (Self-Assessment)	Gaze Ratio On Text FA	Gaze Ratio On Text UU ITE	Gaze Ratio On Text EARTHQUAKE
Low Anxiety	FA	<b>59.78% *</b>	26.45%	13.77%
	UU ITE	15.65%	<b>55.33% *</b>	29.02%
	Earthquake	27.83%	20.52%	<b>51.65% *</b>
Medium Anxiety	FA	<b>53.04% *</b>	35.72%	11.24%
	UU ITE	31.17%	<b>41.37% *</b>	27.46%
	Earthquake	26.97%	32.34%	<b>40.69% *</b>
High Anxiety	FA	<b>47.96% *</b>	32.37%	19.68%
	UU ITE	8.99%	<b>54.79% *</b>	36.22%
	Earthquake	24.10%	26.21%	<b>49.70% *</b>
Severe Anxiety	FA	<b>39.59% *</b>	26.72%	33.69%
	UU ITE	39.43%	<b>39.78% *</b>	20.79%
	Earthquake	30.44%	33.11%	<b>36.45% *</b>

\* Highest gaze ratio for each respondent



Different from the data about images, the highest text ratios were for one news source in one anxiety level in the respondents themselves. With respondent low anxiety, medium anxiety, high anxiety, and severe anxiety in the earthquake category, it can be seen that they had ratios of 51.65%, 40.69%, 49.70%, and 36.45% respectively. The gaze point ratio on text for the earthquake news was the highest among respondents in the earthquake category, and it was the highest ratio in the respondents themselves compared to the ratio in the other two news sources. Based on the results, in contrast to images, a high gaze point text ratio determines high anxiety.

#### 4.9.3. Detailed Analysis about Anxiety with News 3

From research by Takebayashi [74], in events and cases of disasters, anxiety is related to the perception of risk. In the concept made by Takebayashi, the risk of a disaster can cause several forms of anxiety such as severe stress, the desire to stay and not return to the scene, and there are still other dimensions of risk perception. Similar to the earthquake in Palu, respondents who said they had anxious feelings after reading the news of the quake had mostly experienced a massive earthquake themselves. For example, several respondents who lived in Yogyakarta experienced an earthquake in May 2006. The answers “afraid of experiencing”, and “media visualization” were included in the respondent’s risk requirements for the consequences of the disaster that might be experienced. Other respondent answers, namely “experience”, is a strong factor for respondents to feel the perception of risk and the desire to manage risks that might be experienced again. As an example, Wind’s research [75] states that disasters affect a person’s mental health by triggering a stressful model of the person in responding to the consequences of a disaster. Then one’s own experience, including whether severe or not, will also affect people’s estimates of the extent to which they can cope. Anxiety that is based on feelings of stress can also be experienced and even increase when influenced by interactions in social networks that are affected by specified disasters, in other words, “contagion of fear”.

## 5. Discussion

As the popularity of the internet increases, it is increasingly being used for various purposes of community activities. Its variety covers “needs of work” to “processes of social interaction between individuals”. The variety of tasks can be performed anywhere and anytime. Interactions are increasingly easier, and this is accomplished over various communication forms such as telephone, chat, meet-ups, and even exchanging of information on things that are happening. Information is one of the essential elements of human life and cannot be separated from daily activities. Initially starting with newspapers, information exchange has now evolved thanks to the internet, and information spreads faster and more massively in the form of online news. Various information topics are shared and distributed daily, such as social and economic topics, until tense events occur.

In disseminating information, several previous studies have found that the substance of information has not been well managed, specifically information disclosure with negative bias such as in legal cases, accidents, and natural disasters. On news topics such as these, the substance of unmanaged information can invoke a variety of adverse psychological effects on the reader, and one of them is anxiety. News delivery often results in wild thoughts for the reader, either positive or negative [76,77]. The primary purpose of delivering news to readers is to convey information that can be absorbed as a warning or lesson in dealing with similar things. However, when the news media does not consider the current atmosphere in human societies, the substance of information that is not good can be a trigger for worry, anxiety, and panic. In this study, we experimented with readers regarding three tense news stories, namely airplane accident, UU ITE, and earthquake news, which all took place in Indonesia. This experiment intended to explore elements of online news and delivering news media information in Indonesia with the aspect of anxiety for the reader.

The eye-tracker acts as a tool to track and record the coordinates of the respondent’s eye activity when reading the news. These coordinates were then used to obtain AOI, fixation, and heat map data. From the results obtained, text in online news was more influential than images. From the calculation

of AOI, gaze ratio, and gaze duration, text was the most dominant in all 40 respondents, with 36 respondents leaning towards text and four respondents leaning towards pictures. In this case, text elements are dominant because it shows how the story was originally told. The “reader” reads the text to learn about the event details such as “What is it about?”, “When did it happen?”, “Where is the location?”, “Why did it happen?”, and “How did it happen?” Images give a glimpse of information for the reader, and information delivery depends on the reader’s attention to it. The role of images is different from text in the news. News images give the reader visual information about the story and results in more emotional impulses from the reader. For news to be credible, the reader needs to feel strong and emotional impulses from the news to understand what happened to the victims [66]. Four respondents had a higher image ratio, and these are readers who prefer to receive information from images and pay more attention to them.

From 40 respondents, there were four categories of anxiety level with different amounts, namely low anxiety with 18 respondents, medium anxiety with 8 respondents, high anxiety with 10 respondents, and severe anxiety with 4 respondents. When data on eye activity and BAI were compiled, it was seen that the majority of respondents in each category were more active in the text element. Moreover, only four people were more active in the image element, namely one person in the medium anxiety category, one in the low anxiety category, and two in the high anxiety category. For respondents in the severe anxiety category, there was no active preference for images, and all were more active in the news text element.

To analyze in more detail, the anxiety experienced by the respondent, qualitative data from the interview were analyzed to uncover sources of and reasons for anxiety. The results obtained showed that the cause of anxiety was divided into five categories, namely three related to news presentation and two related to other news, or there was no source of anxiety. Based on the quantity, news about earthquakes was the most dominant source of anxiety with the highest total respondents in each category of anxiety level, followed by news of a flight accident, then news about the UU ITE. Several respondents felt anxious because of things other than our three news stories, and several others did not think they had a source of anxiety when interviewed. Then, from the interviews, the reasons for anxiety varied by respondent but could be categorized as “text influence”, “media influence”, and “experience influence”.

After analyzing the quantity and quality of data, analysis continued by compiling categories, namely (i) compilation of anxiety–news–gaze ratio categories and (ii) compiling data on anxiety–news–reasons for anxiety categories. From the first compilation (i), we found three groups having the most varied respondents on the three levels of anxiety, which were low, medium, and high, with responses tending to images and text. This compilation showed that earthquake news led to different impulses for respondents regarding the information they obtained from news text and pictures. From the second compilation (ii), the category of anxiety that had the most variety was “text influence”, with four variations of nine assurances, while “media influence” had only one variation and four occurrences. This compilation showed that, when compared to image elements, text elements were more dominant from the gaze plot side and the reason for anxiety. The category with the highest quantity was “experience influence”, with three variations and 21 assurances. Based on these data, it can be concluded that the respondent’s experience can be significant factor that influences their assessment of news information, which also strongly influences respondents’ perceptions and anxiety.

The most dominant source of anxiety with the most “text gaze ratio” and the highest level of “experience influence” was news about earthquakes. The reason for this came from the second answer on the second question, which showed the majority of respondents experienced earthquakes, particularly respondents residing in Yogyakarta that experienced the earthquake in 2006. A few respondents who had experienced an earthquake at a smaller scale (smaller than the earthquake in Palu and Lombok) became anxious because they compared their experience to the facts and information about the size and magnitude of the impact of the earthquake on news. The other news that triggered anxiety was an air transportation accident, which came from reason number 1 on the

second question and was the fear of experiencing. Most respondents were students who often used airplane transportation facilities as the primary choice for returning to their hometown or vacation due to it saving time and energy. These facts about airplane accidents scattered across several news platforms gave an image or led to negative thinking and anxiety in some of these respondents.

This experiment is based on the hypothesis that online news multimedia information has an impact on the anxiety that arises in research respondents. There was previous research on this matter conducted by McNaughton and Mary in 2001 [78], explaining that there was no relationship and significant link between anxiety and exposure to news media. However, several respondents in our study who were anxious because of visuals from the media (six respondents in the low anxiety category and one in the high anxiety category) showed contradictions to McNaughton's research. During the interview session, these seven respondents stated that exposure to news media in the form of images and videos also influenced their anxiety. This contradiction may have occurred due to significant respondent factors, including being in generation Y. According to research by Soussan [79], generation Y is more interested in web pages that have high characteristic scores, and one of them is images.

From inter-disaster linkages, none of the dominant respondents felt anxious about more than one news article. All respondents only had one story that predominantly gave them anxiety in their daily lives, and they did not respond too much to the other two news stories. This finding is consistent with Gadarian's research [80], which states anxious people direct their attention to the topic of their anxiety, and their focus is on threatening information about the subject. Relevant non-threatening stories and irrelevant news received little attention. Moreover, Nakayachi's research [81] also states that residents who suffered severe damage due to significant disasters have increased levels of anxiety related to the disaster, but they have reduced overall levels of anxiety about various other hazards.

## 6. Conclusions

This research explored the fundamental link between anxiety and news media through respondents' eye activity while reading. We studied how readers consume news in different ways and from different points of view. The eye-tracker captured the reader's eye movement and showed how they read news combined with visual media. The impact of the reader's gaze ratio between text and images is clearly shown in the groups of "high anxiety" and "severe anxiety." Respondents with "high anxiety" mostly had "almost-tie" ratios between text and images, while the "severe anxiety" group had a larger-text preference, even reaching 90% for one respondent. In this experiment, the text ratio tended to be bigger due to the use of text-based news. In the future, this research area can be developed by comparing it to visual-based news such as slideshows or videos. These are shown by providers on their e-newspapers by delivering more visual elements than in their newspapers about the same news/event. Visual news delivery, either images or video, is already becoming the major way to tell short news stories.

Anxiety levels from readers with a similar experience to that in the news article were higher compared to people with no experience. This research shows that one's level of anxiety can be determined with BAI, but more research is needed in understanding reasons for their anxiety, such as qualitative data from the interview. Qualitative data show that many factors can be the source of anxious feelings, and also anxious feelings can be described in many forms of words, sentences, and even stories. News stories that affect many people cause more anxiety than a story about one person. Extended information on bad/negative post-events also makes respondents more anxious, such as in News 3 about the earthquake.

This research gives insights on anxiety from online news and one way to understand it. For future research, news delivery in Indonesia can be explored more for information for better in-depth analyses of text and images that purely cause anxiety. In the future, research needs to avoid respondents' pre-assessment influencing their "judgment" that causes anxiety. Future research should explore more areas, possibilities, and factors to be able to analyze online news-anxiety relationships in-depth and increase understanding of the behavior and nature of news. Understanding how news can become

misused and negatively biased will give insight on how news delivery should be a “messenger of information” to the reader instead of a source of anxiety.

By combining research with advanced technology, news providers should be able to effectively filter the bad parts of news before being published. This will make news more positive and motivating instead of making readers anxious. Furthermore, this concept can be autonomous by combining it with Artificial Intelligence (AI), Machine Learning (ML), or Smart Design Systems to cover the fast spread of news today. Understanding the relationship between online news and anxiety can help news providers avoid unintentionally causing anxiety in readers when delivering news.

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