Cognitive Differences Between Online and Virtual Reality News in the Context of Recall and Comprehension*

Hatırlama ve Anlama Bağlamında Online Haberler ve Sanal Gerçeklik Haberleri Arasındaki Bilişsel Farklılıklar

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Abstract

This paper aims to identify immersive journalism as a new type of journalism, analyze the impact of immersive news on recall and comprehension in the context of media psychology. This study is a quantitative research consisting of two stages. In the research, the model of manipulating the independent variable and comparing groups was used. Virtual reality news and online news has been presented to a participant group consisting of 30 people with a post-test design (N=30). Research has been designed to investigate participants' levels of r recall and comprehension news. The main results from this initial phase of research showed that the news watched with virtual reality is better understood and slightly better remembered than online news. Likewise, it has been found that immersive journalism has an important potential in terms of cognitive effects.

Öz

Bu araştırma sürükleyici gazeteciliği yeni bir gazetecilik türü olarak tanımlamayı, sürükleyici haberlerin hatırlanma ve anlama üzerindeki etkisini medya psikolojisi bağlamında analiz etmeyi amaçlamaktadır. Farklı medyaların anlama ve hatırlama üzerindeki etkilerini inceleyen bu araştırma, iki aşamadan oluşan nicel bir çalışmadır. Araştırmada bağımsız değişkeni manipüle etme ve grupları karşılaştırma modeli kullanılmıştır. Sanal gerçeklik haberleri ve online haberler, son test tasarımı ile 30 kişiden oluşan bir katılımcı grubuna sunulmuştur (N=30). Araştırma, katılımcıların haberleri hatırlama ve anlama düzeylerini araştırmak için tasarlanmıştır. Araştırmanın bu ilk aşamasından elde edilen ana sonuçlar, sanal gerçeklikle izlenen haberlerin çevrimiçi haberlere göre daha iyi anlaşıldığını ve kısmen daha iyi hatırlandığını göstermiştir. Aynı şekilde, sürükleyici gazeteciliğin bilişsel etkiler açısından önemli bir potansiyele sahip olduğu bulunmuştur.

Anahtar Kelimeler   Keywords

Introduction

The application and the use Virtual Reality (VR) technologies have shown great development recently. These technologies are used extensively as the intersection point of many fields today. The combination of high-resolution virtual reality glass provide users with a high sense of presence in a virtual environment.

Although virtual reality is largely a technology developed in laboratories for military and industrial applications, it is rapidly spreading around the world today with the power to provide intense perceptual experiences. The acquisition of Oculus Rift by Facebook in March 2014, followed by investments in VR by other technology giants, allowed the awareness and use of this new technology to accelerate on a mass scale. The media sector has participated in the use of this new technological tool, with movie, game and journalism applications. Besides, content creation, production and distribution for virtual reality technologies have been commenced in the field of journalism.

Since 2016 virtual mobile glasses which were previously purchased by game enthusiasts, are now easily accessible to all mobile and computer users (Brautovic & Potrebica, 2017). Virtual reality devices have reached a wide range of professional use today in such professional groups as architecture, design, marketing, education, and medicine. The year 2010 is shown as the first application of the virtual reality experience with the intense participation of the visual and audio senses. In that year, the immersive journalism conceptualization has made with the research conducted by Nonny de la Pena and his team, who is considered to be the pioneer of this new journalism type (Pena et al., 2010; Seijo, 2017). De la Pena revealed that the news watched with virtual reality glasses allowed the user to discover the place where the event took place, the sights, sounds and emotions that accompany the news. With Pena's research, it has been observed that the bodily self-consciousness of VR news viewers is largely manipulated. Following this pioneering research, VR journalism technique, has been gradually moved from research fields to news centers. Today, leading international newspapers such as CNN, Euronews, BBC, produce VR news and encourage the spread of this new journalism technique. If a new technique arises in the newsrooms, new media effects will also be likely to emerge. Based on this idea some psychological effects have been investigated in previous studies, such as the increase of VR empathy. But a very important point such as understanding the news in the field of journalism and its retention has not been investigated. In this context, the effect of news created with virtual reality technologies on recall and comprehension was analyzed in this study. By analyzing the memory measurement methods by the researcher, the most appropriate analysis unit was compiled. The effect of the news being read/watched in VR and Online news formats to the participant group created on memory and comprehension has been investigated.

What Is Immersive Journalism?

In the literature, concepts defined as "immersive journalism", "VR Journalism", "360 News" are used interchangeably (Rath et al., 2015). Nonny de la Pena is known as the first researcher to name the VR news format. Many projects carried out by her inspired the world's leading newspapers to create content in VR journalism. This new digital journalism model includes narrative, cognition, and new journalistic practice. Previous studies pointed out that VR news have more immersive effect than the traditional media tools. The VR phenomenon allows the user to feel as if an event is taking place through the images recorded in all aspects. When

journalism is defined as "telling an event in the closest way to reality", VR Journalism gains a critical position (Hardee, 2016).

Although some earlier studies mentioned that VR journalism did not become widespread, with the launch of Google Cardboard in 2014, VR content has been accessible to a wider audience. In November 2015, The New York Times (NYT) newspaper added a VR platform to its news production and publishing. NYT published the first VR news collectively with this application. In addition, by distributing more than one million cardboard VR headset, it has enabled subscribers to meet this technology. As the first example of this, a 10-minute movie called "The Displaced" was released, telling about the lives of three children who lost their homes due to the war. [1] Subsequently NYT launched the VR mobile app. It was seen that this application had a lot more downloads in a few days than other New York Times applications. And today, the same newspaper offers its readers a different experience with its "Immersive (AR / VR)" page, with its multimedia-intensive news content.[2]

Later, both companies like RYOT and more traditional news providers such as ABC News (USA) started producing VR content. A short movie named "Inside North Korea" from ABC about North Korea was published as a 360-degree movie. The video was viewed on YouTube (as of March 2018) by more than 100,000. "Despite all these developments, immersive journalism also targets a difficult audience, as it has been experienced in the development process of online journalism in the past" (Livingstone, 2004: 75). However, current research has shown that today's younger audience is more adaptive in embracing the new media technologies (Jorgensen et al., 2010). As a matter of fact, the number of mobile applications supporting VR videos that directly respond to this new audience has increased since 2015. The main feature of VR is that it aims to be closer to the event (Seijo, 2017). In fact, Virtual Reality is the evolution of news culture that enables witnessing from news narration to the center of the event. Therefore, this can encourage viewers to seek more information and content on the topic after the experience. Thus, it is thought that learning through news can be achieved more effectively (Biocca, Delaney, 1995).

First Experimental Studies

It appears that VR news has the potential to provide conditions that enable us to witness and empathize with others' emotions. As a matter of fact, different projects such as "Hunger in Los Angeles" and "The Displaced" pointed to the approach of this goal (Laws, 2017: 11). Similarly, Ferguson's "The Suite Life" VR project provided an example of the application of virtual reality to journalism and psychological analysis (Seijo, 2017: 115). Banakou *et al.* (2018) analyzed the cognitive differences of the two different groups that embodied Albert Einstein's and their own bodies in a virtual environment. As a result of this immersive experience, it has been understood that the "body ownership illusion" can cause changes in cognitive processing along with perceptual, attitudinal, and behavioral changes. The findings obtained at the end of the study showed that subjects in a virtual body associated with high cognitive abilities, such as Albert Einstein, performed better in the cognitive task assigned to them (Banakou et al., 2018).

Nony de la Pena and her team, who conducted the first experiments with immersive journalism, carried out another important study in 2018 **See Image 1**. In this study, a robotic representation of a human being was positioned at a distance and an interview was conducted

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1   https://www.youtube.com/watch?v=ecavbpCuvkI
2   https://www.nytimes.com/spotlight/augmented-reality

via VR. Conceptually, in the experiment based on two basic ideas, the illusion of "being out of place" of the body and "virtual body ownership" was experienced through virtual reality glasses and humanoid robots (Kishore et al., 2016).

Image 1

Beaming into the News: A System for and Case Study of Tele-Immersive Journalism
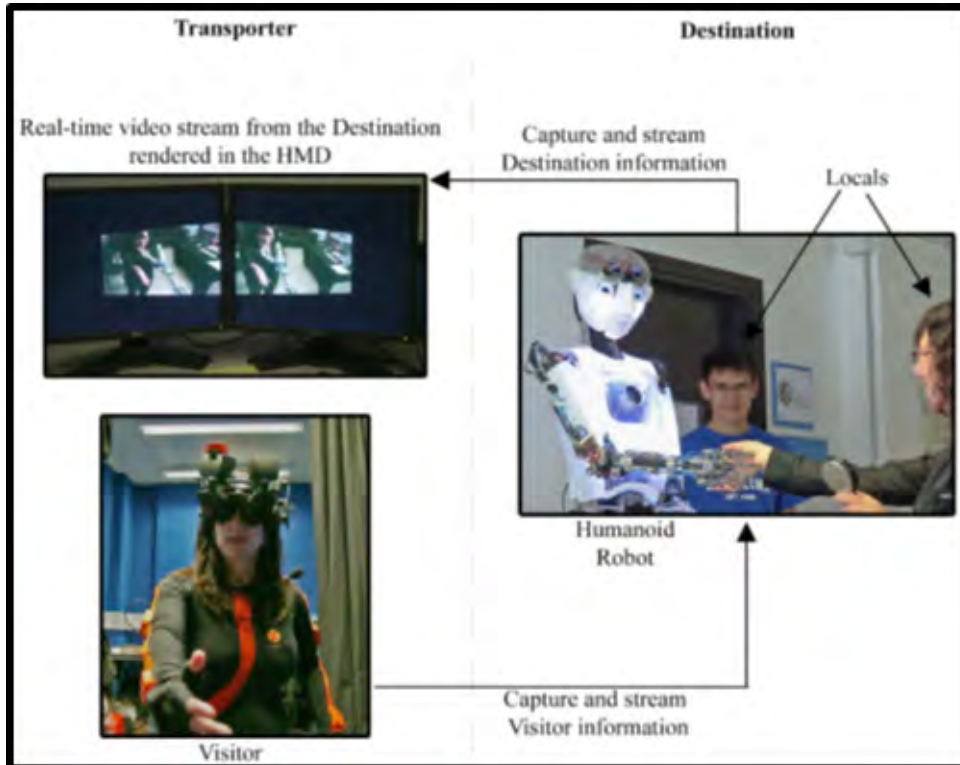
With the virtual reality project named "We Wait", carried out jointly by the BBC and Oculus; the difficulty of waiting for a boat to land in Turkey to bring the refugees were transferred to Europe with an immersive experience. With this work, BBC News made the audience experience the hopes and fears of a terrified Syrian family while crossing a dangerous sea (**See Image 2**). In the animation, refugees are deliberately depicted with cartoon-like characters representing them. At the same time, the participant was given the opportunity to enter into dialogue with virtual characters. After the experiment, the latest news that the participants searched on the web pages were examined. As a result of the investigation, it was determined that the participants were looking at the news about the refugee crisis. With this result, it was concluded that VR news increased the interest in the subject.

Image 2

Partial Visual of The Script[3]
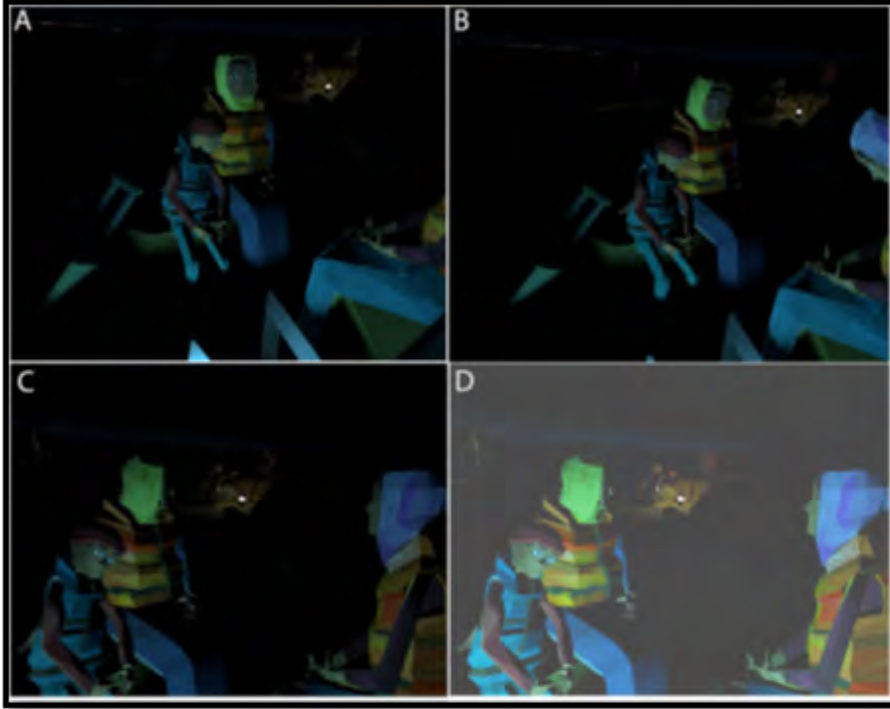
Virtual reality journalism is experiencing a similar situation to cinema after about 120 years. Today, newspapers such as the New York Times and the BBC have developed early examples of "immersive journalism" practices. The common point of the research and projects conducted so far has been that the VR experience creates an emotional connection between the viewer and the news and increases the level of empathy. In addition, users stated that they watched the news longer than the traditional form and that this experience was more enjoyable. This new type of journalism is little known or under trial in developing countries. In Turkey, the practice of VR journalism is unprecedented until the second half of 2019. Therefore, this study will provide guidance in the advancement of "Immersive Journalism" academically as well as professionally.

Method

The purpose of this research is to examine the effects of VR news on recall and comprehension. In the experimental study, based on previous studies focusing on the ability of virtual reality technologies to deliver a sensory-rich experience, we estimated that:

RQ1: Is there a difference between viewers reading online news and viewers watching VR news in terms of certain points of the news?

H1: News contents watched with virtual reality are recalled better than online news.

H1a: "Who question" recalled better in VR than online news.

H1b: "What" recalled better in VR than online news.

H1c: "Where question" recalled better in VR than online news.

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3 https://www.bbc.co.uk/taster/pilots/we-wait

H1d: "When question" recalled better in VR than online news.

H2: News contents watched by virtual reality are better comprehended than online news content.

H2a: "Why question" is better answered in VR news than Online news.

H2b: "How" question" is better answered in VR news than Online news.

For this purpose, answer was sought for the following basic research question:

In this study, the method of comparing groups by manipulating the argument was used. Studies that previously focused solely on reading comprehension have shown that the differences between print and computer screen reading tests are not significant. However, it has been found that the news presented on the screen is better remembered and understood than the news on radio (Barber, 1998).

In this research, which analyzed the effect of tools on comprehension and remembering, a posttest consisting of 6 questions was applied to participants consisting of 30 people **Appendix-1**. The dependent variables of the research constitute the degree of recall and understanding in the context of the answers given in the post-test. The independent variables of the research are VR news which published Euronews website titled "How the UNDP is helping save lives in Ukraine"[4] and "*From Camps to Classrooms*"[5] and the online versions of these news.

The research has the following findings regarding the factors influencing cognitive differences. The participants are shown as the levels of remembering and understanding the 5W-1H questions of the presented news. Questions that measure remembering; "who, what, when and where" are the definition items expressed in question sentences. The questions that measure the level of understanding are expressed as why and how questions, which are mostly interpretive items. These questions were created based on previous news recall experiments (Talbert, 2000). Understanding according to Barret Barrett's taxonomy; it is classified as simple comprehension, reorganization, inferential comprehension, evaluation and appreciation (Barrett, 1968; Yıldırım&Şimsek, 2005; Cerdan et al., 2009). According to him, simple comprehension involves recognizing and remembering cause and effect relationships of data whose answers are clearly stated (Talbert, 2000).

Sample Selection of Study Group

In this study, participants were selected with the homologous sampling technique, which is a type of purposive sampling method. Purposive sampling means that the sample is formed from a similar subgroup or situation in the universe related to the problem of the research and depending on the purpose (Büyüköztürk, et al., 2012). With the purposeful sampling method, the center of Muğla was determined considering its easy accessibility; In homologous sampling, participants similar in age and education level were selected from professional VR gamers in the VR game studio. The research was conducted in a virtual reality game studio. The participants of the research were selected among e-sports players aged 18-30 with VR experience. In this framework, similar to the number of subjects used in previous studies, 30 participants were conducted (Slater et al., 2018). The fact that subjects had previously experienced or had little experience in VR has been the reason for preference. The gender distributions of the 30 participants in the study can be seen in **Figure 3.** Accordingly, 24% of the participants are female
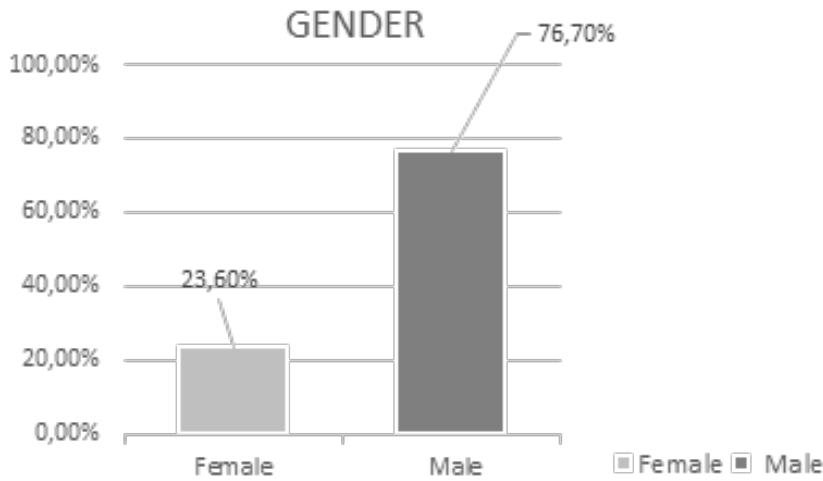
4 https://www.euronews.com/2016/11/23/360-video-how-the-undp-is-helping-save-lives-in-ukraine
5 https://www.euronews.com/2017/06/27/360-video-from-camps-to-classrooms
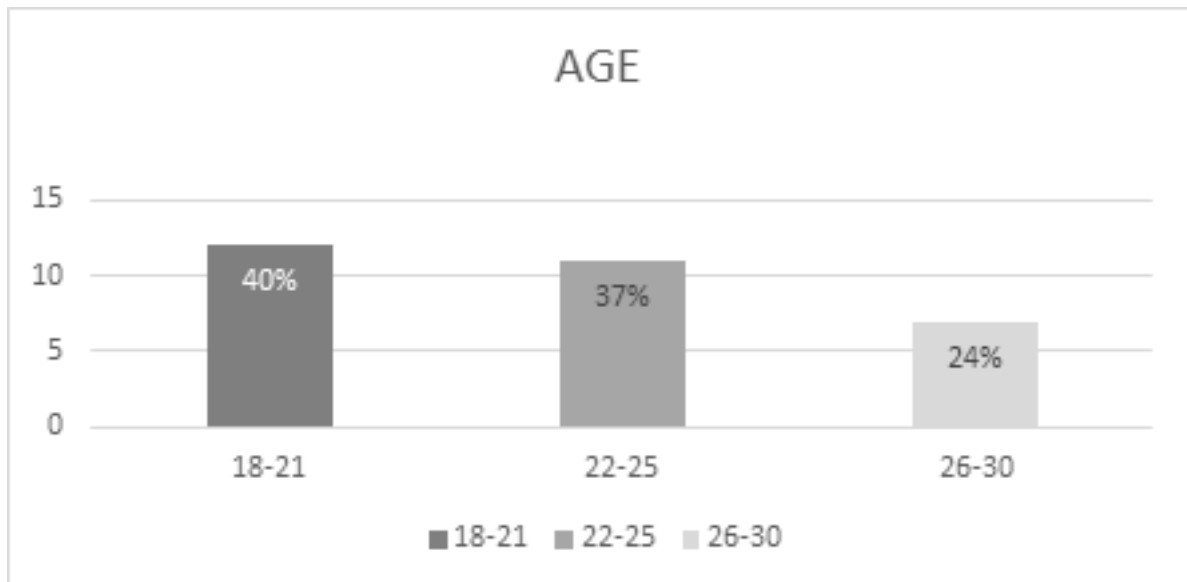
and 76% are male.

Figure 3

Gender of the participants

The age distribution of the participants selected among the e-sports players aged 18-30 can be seen in **Figure 4.** Accordingly, 24% of the participants are between the ages of 26-30, 37% are between the ages of 22-25 and 40% are between the ages of 18-21.
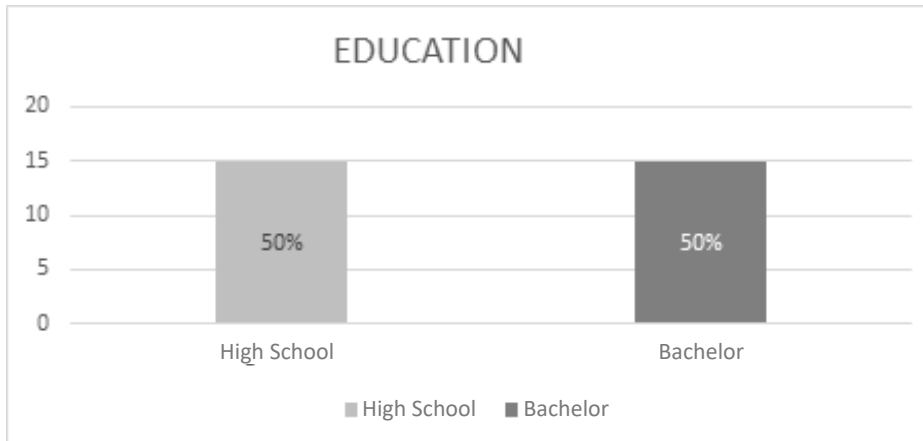
Figure 4

Age range distribution of the participants

Educational status distributions of 30 participants in the study can be seen in **Figure 5.** Accordingly, 50% of the participants are undergraduate and 50% are high school graduates.

Figure 5

Education status of the participants

Before starting the experiment, the "Volunteer Information Form" was signed by the participants. Before the research, Montreal Cognitive Assessment (MoCA) test was applied by the researcher to see if there was any problem in the cognitive performance of the subjects (Annex-4). The MoCA test was developed as a rapid screening test for mild cognitive impairment. The test evaluates different cognitive functions. These; attention and concentration, executive functions, memory, language, visual structuring skills, abstract thinking, computation and orientation. The implementation of MoCA takes about 10 minutes. The highest total score that can be obtained from the test is 30. Accordingly, the score of 21 points and above is considered normal. As a matter of fact, the participants who scored below 21 were not included in the study, considering that they had impaired cognitive performance. This part of the test was used briefly and mainly as a control tool. Previous studies have shown that gender does not affect the total score of memory tests (Güngen, et al., 2002). Again in another research that measures the effect of demographic data on memory, it was understood that gender distribution had no effect on the results in the subject groups (Evlice, 2016). Therefore, gender equality has no bearings in this study.

Experiment Plan

In this study, the effect of independent variables on dependent variables was made by making systematic changes in controlled conditions and monitoring the results (Karasar, 2008). Participants who separated unbiased selection groups have watched the news in VR format with the "HTC Vive Pro" headset. Online News was also read from Samsung 43 "RU7090 4K UHD Smart TV connected to the computer. By answering the questions, the levels of recall and understanding of the subjects were analyzed. After the news on the same subject created in the online news format by the researcher was read to the control group in the computer environment, and post-test was applied. By comparing the results, the effects of two news formats on remembering and understanding were analyzed. Two different news items were selected to measure comprehension and recall performance according to the subject independent variable.

Firstly, *Group A* was exposed to the news in VR format. *Group B* was simultaneously exposed to online formatted news. **Visual 2**. Participants were warned to read the news only once. In the experiment, the participants were randomly divided into two groups of 15. The aim is to prevent each participant from overlapping the news on the same subject by watching a topic in

just one format. It is aimed to prevent the situation of affecting memory by creating preliminary information about the subject.

Visual 2

The experiment process

The online version of the news was created by the researcher to be identical in terms of content and sequence in order to isolate any factors that may cause unintended recalls. In this process, every word in VR news has been completely transferred to the news text. During the experiment, the news was presented to the participants only once in VR format and once online.

While **Group A** watch the "Refugee news" in VR, the **Group B** read the "Refugee news" in online format. Then, post-test was applied to both groups.

While the **Group A** read the "Ukraine news" in online, **Group B** read "Ukraine news" in VR. Subsequently post-test was applied to both groups. In each variation, a group from the other groups was positioned as the control group. Thus, the effect of independent variables on dependent variables was examined.

Data Collection Tools and Data Analysis

The significance tests used to measure the "Recall" and "Understanding" are the methods used to test whether the values obtained or the results obtained in the research are statistically significant. Materiality tests are generally divided into two categories as parametric and nonparametric (Büyüköztürk et al., 2016). To use parametric tests, the following assumptions must be made. If any of these assumptions are not met, non-parametric tests are used. According to this; the sample size must be 30 and above.

In this study, arithmetic mean (X), percentage (%) and frequency values were calculated by using SPSS version 21 statistical analysis program to analyze the data collected from experiments performed with participants over 18 years old who have at least 10 hours of VR experience. The

criteria for "10 hours experience" is important because adapting to the use of VR technologies requires some experience and this has been confirmed to be a minimum of 10 hours in the pilot study within this research.

Independent groups T-test and Mann-Whitney U test were used to test the significance of the differences between the variables in the data obtained. The "Mann-Whitney U Test" is a nonparametric alternative to the parametric independent groups "T-Test" used to test whether the difference between the arithmetic means of the two sample groups is significant. For variables that cannot fulfill the parametric test assumptions, the Mann-Whitney U test is used instead of the T-test (Eymen, 2007). Since the number of subjects is 30, the "Independent Groups T-test" was used. In the tests performed according to the news type variable in the news watched by VR, the Mann-Whitney U test, which is the non-parametric alternative of the T-test, was used because the number of samples was 15 for each subgroup. The significance level in the tests was determined as $p < 0.05$ (95%). The evaluation scale applied in the questions of understanding comprehension and remembering (5W 1W) is shown in the table **Table 1**.

In this category, based on the evaluation scale in **Table 1**, *What? How?* and *Who?* questions are under the 5-point Likert scale. In these questions, we have an average of 5 different levels of information among the "news" under 5-point Likert. 3-point Likert was applied to the "Why?" question. The subjects were asked to give information about the reason of the event that developed in the news.

"Where and when?" their responses to the questions are coded as "remembered" and "not remembered".

Table 1

Coding scale

Questions	Very Low	Low	Medium	Good	Very Good
What? Who?	Remembered	Remembered	Remembered	Remembered	Remembered
	1 - 1,80	1,81 - 2,60	2,61 - 3,40	3,41-4,20	4,21-5,00
How?	Comprehended	Comprehended	Comprehended	Comprehended	Comprehended
	1 - 1,80	1,81 - 2,60	2,61 - 3,40	3,41-4,20	4,21-5,00
Why?	**Low** Understood	**Medium** Understood	**Good** Understood		
	1- 1,66	1,67 - 2,33	2,34 - 3,00		
Where? When?	**Low** Remembered	**Good** Remembered	**Low** Remembered		
	1 - 1,5	1,51- 2,00	1 - 1,5		

According to the experiment, independent groups T-test results according to the news environment (VR and Online) variable in the amount of recall of 5W 1H of the news are shown in **Table 2.**

Table 2

Independent Groups T-Test Results According to The News Environment (VR And Online) Variable in Remembering and Understanding The 5W 1H of the News

Questions	News Environment	N	$\overline{\text{X}}$	P
What?	VR	30	4,3333	,002
	ONLINE	30	3,5333	
Why?	VR	30	2,6333	,011
	ONLINE	30	2,1000	
How?	VR	30	4,3333	,000
	ONLINE	30	2,7333	
When?	VR	30	1,8000	,286
	ONLINE	30	1,9000	
Who?	VR	30	1,9333	,738
	ONLINE	30	2,0333	

N: Number of participants, X: Average value, P: Severity level

When the findings are examined according to the effect of the news medium in remembering the 5W 1H of the news, "What" (P =, 002) from the 5W 1H of the news; In the responses given to the "Why" (P =, 011) and "How" (P =, 000) questions, there was a significant difference (P <0.05) compared to the news medium (VR and Online) variable. The question of "Where" was excluded from the **Table 2** since the replies showed no difference between the subgroups. In this context, it can be said that VR news is better understood because it measures the remembering of the "What" question and understanding through "Why" and "How" questions. Therefore, Hypothesis 2 was supported. When the participants were asked "What" is the subject of the news, it was found that it was remembered higher than the online news environment. There was no significant difference in the answers given to "When", "Who" and their questions. The correctness of the answers given to the question "what" indicates that there is a "relative" difference in recall. In that case, Hypothesis 1 was partially supported.

According to the 5-point evaluation scale, the answers to the question "What" from the 5W 1H of the news that the participants watched/read in different environments within the scope of the experiment are good in the VR environment and (3.5333) good in the online environment the recall rate in VR environment is higher than in online. The Independent group's T-test results are shown in the table below to understand whether this difference is significant. According to the test results, it was determined that there was a significant difference (P <0.05) in the answers given to the question "What" (P=, 002) compared to the news environment (VR and Online) variable. According to the 5-point evaluation scale, the average of recalling the answer to the question "Why" from the 5W 1H of the news that the participants watched/read in different environments is 2,6333 (Medium) in the VR environment and 2,10 (Low) in the online. Accordingly, the recall rate in VR environment is higher than in online environment. Independent groups T test results are shown in the table below to see if this difference is significant. Why question; It involves noticing and remembering the cause and effect relationships of the data, which indicated a simple understanding in the previously mentioned Barret taxonomy, and the answer was clearly stated (Barrett, 1968). Again, Talbert stated in his research on different media tools on understanding and remembering that there are questions that measure understanding of "Why and How" questions (Talbert, 2000). For this reason, the test result reveals that it is better understood and remembered than the news read online watched by VR.

According to the 5-point evaluation scale, the average of recalling the answer of the question "How" from the 5W 1H of the news that the participants watched / read in different environments is 4,3333 (Very Good) in the VR environment and 2,7333 (Moderate) in the online environment. Accordingly, the recall rate in VR environment is higher than in Online environment. Independent groups T-test results are shown in the table below to understand whether this difference is significant or not.

According to the test results, it was determined that there was a significant difference (P <0.05) in the answers given to the question "How" (P =, 000) compared to the news environment (VR and Online) variable. As can be understood from here, the participants who watched the news with VR obtained better results in realizing the cause and effect relationships related to the events in the news. Participants who answered the questions asked about the causes of the news subject at a "Very Good" level gave "Moderate" answers when they read the same news online. As a result of the test, it was understood that the meaningful difference between the two-news media was in favor of VR and the second of the news's "understanding level" questions, "How?" the question was found to be answered better through VR.

According to the 3-point evaluation scale the average of the recall was found to be 1,800 (low) in VR and 1,900 (low) in the online environment. Accordingly, the recall rate in VR environment is lower than in Online environment. Independent groups T test results are shown in the table below to understand whether this difference is significant.

According to the test results, it was determined that there was no significant difference (P> 0.05) in the answers given to the question "When" (p =, 286) compared to the news environment (VR and Online) variable. As a matter of fact, it was understood that most of the participants could not remember the historical information in the news in both news environments **Table 2**.

When the answer of the question "Where" from 5W 1H of the news that the participants watch / read in different environments is evaluated according to the 3-point evaluation scale, the recall averages are equal. Since there was no difference between the averages, no tests were performed. In both news environments, all participants answered the questions regarding the place where the event took place **Table 2**.

According to the 5-point evaluation scale, the average of recalling the answer of the question "Who" from the 5W 1h of the news that the participants watched / read in different environments was 1.9333 (low) in the VR environment and 2.0333 (low) in the online environment **Table 2.** Independent groups T test results to see if the difference between the recall rate in the VR environment and the online environment is meaningful can be seen in the table below.

There was no significant difference (P> 0.05) in the answers given to the question "Who" (P =, 738) compared to the news environment (VR and Online) variable. According to this result, "When?" Although there is no meaningful difference in the question of "Who" as in the question, the recall average is lower in the VR news environment, even if it is minimal. In this context, it was understood that the participants who watched with VR remembered and understood "what happened" in the news, "how the event developed", "why it happened", but they remembered the information about the time, people and institutions in the news at a low level. When the participants read the news in the online environment, it was seen that they understood and remembered "what happened", "how did it happen", " the cause of the issue " less, and they remember the information about the time, people and institutions in the news at a low rate.

According to the news subject variable (Refugee and Ukrainian news) in the news watched in VR environment, the results of Mann-Whitney U test can be seen in **Table 3.** In the research, two different news topics were watched and taught with the assumption that different levels of recall and understanding from the news subject might arise. However, in the study, it was understood that there was no significant difference (p> 0.05) according to the news subject variable in the news watched in VR environment. "What is the subject of the news?" In the answers given to the question, it was understood that there was no significant difference between the two news topics (What: Refugee, X̄ = 4.2000), (What: Ukraine, X̄ = 4.4667).

Table 3

Mann-Whitney U Test Results According to The News Subject Variable (Refugee and Ukrainian News) In News Watched in VR Environment

Questions	News Content	N	$\overline{\text{x}}$	P
What?	Refugees - Group A	15	4,2000	,355
	Ukraine - Group B	15	4,4667	
Why?	Refugees - Group A	15	2,6667	,400
	Ukraine - Group B	15	2,5333	
How?	Refugees - Group A	15	3,8667	,070
	Ukraine - Group B	15	4,7333	
When?	Refugees - Group A	15	1,6667	,179
	Ukraine - Group B	15	1,9333	
Where?	Refugees - Group A	15	1,0000	1
	Ukraine - Group B	15	1,0000	
Who?	Refugees - Group A	15	1,6667	,275
	Ukraine - Group B	15	2,2000	

N: Number of participants, X: Average value, P: Severity level

According to the news subject independent variable, no significant difference was observed in the responses given to the question of VR (p> 0.05). Since "How" X̄ =, 070, "When" X̄ =, 179, "Where" X̄ = 1, "Who" X̄ =, 275, no significant difference was found due to the subjects (p> 0.05).

According to the news type variable in the news viewed online, the results of Mann-Whitney U test can be seen in **Table 4.**

Table 4

Mann-Whitney U Test Results According to The News Subject Variable (Refugee and Ukrainian News) in the News Watched Online

Groups: 5W 1H	News Content	N	$\overline{X}$	P
What?	Refugees -Group A	15	3,8000	,077
	Ukraine - Group B	15	3,2667	
Why?	Refugee - Group A	15	2,2000	,886
	Ukraine - Group B	15	2,0000	
How?	Refugee - Group A	15	2,9333	,580
	Ukraine - Group B	15	2,5333	
When?	Refugee - Group A	15	1,9333	,728
	Ukraine - Group B	15	1,8667	
Where?	Refugee- Group A	15	1,0000	1
	Ukraine Group B	15	1,0000	
Who?	Refugee - Group A	15	2,4667	,085
	Ukraine - Group B	15	1,6000	

N: Number of participants, X: Average value, P: Severity level

Accordingly, it is seen that there is no significant difference in the news read online according to the news subject variable (p> 0.05). When the dependent groups reading online news on both news are examined, the answers given to the question "What" were found to be close to each other with the refugee: X̄ = 3.8000, Ukraine: X̄ = 3.2667 and there was no significant difference between them (p> 0.05). When the responses given by the dependent groups according to both news type arguments containing the "Why" question were examined, X̄ = 2.2000, X̄ = 2.0000 could not find a significant difference between the two topics (p> 0.05). Likewise, there was no significant difference between the answers given to "How" (p =, 580), "When" (p =, 728), "Where" (p = 1), "Who" (p =, 085) (p> 0.05). In this sense, it can be said that the aim of minimizing the effect of permanence and comprehension in the memory originating from the subject difference is preferred by the preference of the content of the subject in the news sample selection of the researcher.

Conclusion and Discussion

Since the history of communication studies, the effect of the medium through which information is transferred on behavior, attitude, and perception have been discussed. In many studies conducted within this framework, it has been argued that the way the message is given can also affect the way it is mentally processed. As a matter of fact, it can be said that one of the most memorable claims on this subject is McLuhan's saying "the medium is the message". The evolving structure of the mass media following the technological developments caused the news or message to be conveyed to the audience with different effects. Newspapers, which started to be published on digital platforms with the widespread use of the Internet, can be

regarded as the first break of news transmission from traditional methods. As a reflection of the momentum gained by digital technologies in recent years, "virtual reality" technologies have entered the mass market. These tools, which were first used in the game market, have been used in different areas over time.

The most distinctive feature of virtual reality is that its users perceptually give the feeling of being in the area they watch. From this point of view, the use of VR in journalism brings the audience into a reporter position and includes them in the story from the perspective of first person. When the field literature is examined; The effect of increasing empathy in the early tests of VR news has indicated that these tools have a different effect on the cognitive field than traditional tools. In this sense, the main motivation of this study was to create data on how VR journalism should be done in the future and to measure the effect of VR technologies on the cognitive field. In addition, in this research conducted within the framework of media psychology, the content and technical features of VR news were examined. As a result of these analyzes, it has been observed that VR news has followed a standardization course since the beginning. While there was a lot of diversity in news time, resolution, graphic usage and topics in the past, it is seen that this variety disappeared in the future. This situation reveals that VR journalism is still in its development stage. In the future of VR journalism, journalism and tracks have many disadvantages and advantages on behalf of the audience. It can be said that the two most important disadvantages of VR journalism are the lack of ethical principles and the fact that journalism has not become widespread. With an intense perceptual immersion feature, it should be discussed how VR news should produce content for which age group.

VR content that can maximize the participation of their hearing, sight and senses can make it easier for the viewer to learn and understand the events. In this context, it is thought that the direction of VR news is more suitable for political, culture, art and sports reporting in the format of file journalism rather than economy, police-courthouse, and magazine journalism. It has been observed that VR journalism has a better effect on "news understanding" than online news, and "relatively good" in terms of "news recall". It has been concluded that VR journalism may be more appropriate to use in news that answer the What, Why and How questions. This situation is thought to be due to the presence of more visual and auditory transmission of the event in VR content. The problem of users having difficulty in adapting to new technologies also emerged in the pilot study of the experiment. From this point on, it is thought that there is a significant relationship between the VR usage habit and the effect of the content on the cognitive area. The use of VR technology is still not widespread in Turkey. This situation is thought to be caused by the cost and low popularity of the VR technologies. In addition, VR content requires a device with a high processor speed and a high screen resolution. Due to the relatively high data size of even a short VR story, the speed and quota problem prevents it from becoming widespread. In this context, it has been observed that users who do not have VR experience have difficulty in focusing on the news. VR journalism has the potential to open a new era in journalism due to the powerful effects it can create in the cognitive field. Its structure, which removes the reporter, leaves the advantage of examining the size of the news and the event to the user. In this sense, VR journalism seems to be highly suitable for independent journalism that can be presented non-verbally and independently of any capital structure. The content produced with low-cost drones and 360-degree cameras can be easily broadcast on Youtube and watched via VR devices.

As a result of this research, it has been observed that there is a relationship between the medium in which the news is presented and the level of impact on the cognitive field. In future research, the permanence of the content on long-term memory can be examined. In this study, the effect of the tool on recall and understanding was measured. In future research, the recall and understanding of different types of news viewed with news VR can be compared. Thus, it can be revealed in which type of news has more cognitive effects. In addition, it is suggested to expand the field of media psychology not only in news but also among social media users by using similar techniques. In this context, the effects of interactions in the social media usage process on the neurophysiological field can be demonstrated by tests.

In this research, questions are structured to measure comprehension and recall. But how users feel in the VR news experience is also important. In this context, a holistic research can be done with questions about user feelings. By contacting companies about VR technologies, their opinions about future studies can be obtained. VR is also available views on the future of broadcast journalism with employees responsible for digital journalism in Turkey. Thus, the structural preparedness of the sector regarding the future of journalism evaluated within the scope of this study can be analyzed.

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Cognitive Differences Between Online and Virtual Reality News in the Context of Recall and Comprehension

Extended Abstract

Since 2016 virtual mobile glasses which were previously purchased by game enthusiasts, are now easily accessible to all mobile and computer users (Brautovic & Potrebica, 2017). Virtual reality devices have reached a wide range of professional use today in such professional groups as architecture, design, marketing, education, and medicine. The year 2010 is shown as the first application of the virtual reality experience with the intense participation of the visual and audio senses. In that year, the immersive journalism conceptualization has made with the research conducted by Nonny de la Pena and his team, who is considered to be the pioneer of this new journalism type (Pena et al., 2010; Seijo, 2017). De la Pena revealed that the news watched with virtual reality glasses allowed the user to discover the place where the event took place, the sights, sounds and emotions that accompany the news. With Pena's research, it has been observed that the bodily self-consciousness of VR news viewers is largely manipulated. Following this pioneering research, VR journalism technique, has been gradually moved from research fields to news centers. Today, leading international newspapers such as CNN, Euronews, BBC, produce VR news and encourage the spread of this new journalism technique. If a new technique arises in the newsrooms, new media effects will also be likely to emerge. Based on this idea some psychological effects have been investigated in previous studies, such as the increase of VR empathy. But a very important point such as understanding the news in the field of journalism and its retention has not been investigated. In this context, the effect of news created with virtual reality technologies on recall and comprehension was analyzed in this study. By analyzing the memory measurement methods by the researcher, the most appropriate analysis unit was compiled. The effect of the news being read/watched in VR and Online news formats to the participant group created on memory and comprehension has been investigated.

This paper aims to identify immersive journalism as a new type of journalism, analyze the impact of immersive news on recall and comprehension in the context of media psychology. This study is a quantitative research consisting of two stages. In the research, the model of manipulating the independent variable and comparing groups was used. Virtual reality news and online news has been presented to a participant group consisting of 30 people with a post-test design (N=30). Research has been designed to investigate participants' levels of remembering recall and understanding comprehension news.

Accordingly, participants were selected with the homologous sampling technique, which is a type of purposive sampling method. Purposive sampling means that the sample is formed from a similar subgroup or situation in the universe related to the problem of the research and depending on the purpose (Büyüköztürk, et al., 2012). With the purposeful sampling method, the center of Muğla was determined considering its easy accessibility; In homologous sampling, participants similar in age and education level were selected from professional VR gamers in the VR game studio. The research was conducted in a virtual reality game studio. The participants of the research were selected among e-sports players aged 18-30 with VR experience. In this framework, similar to the number of subjects used in previous studies, 30 participants were conducted (Slater et al., 2018). The fact that subjects had previously experienced or had little experience in VR has been the reason for preference.

When the findings are examined according to the effect of the news medium in remembering the 5W 1H of the news, "What" from the 5W 1H of the news; In the responses given to the "Why" and "How" questions, there was a significant difference compared to the news medium (VR and Online) variable. The question of "Where" was excluded from the Table 2 since the replies showed no difference between the subgroups. In this context, it can be said that VR news is better understood because it measures the remembering of the "What" question and understanding through "Why" and "How" questions. Therefore, Hypothesis 2 was supported. When the participants were asked "What" is the subject of the news, it was found that it was remembered higher than the online news environment. There was no significant difference in the answers given to "When", "Who" and their questions. The correctness of the answers given to the question "what" indicates that there is a "relative" difference in recall. In that case, Hypothesis 1 was partially supported.

The answers to the question "What" from the 5W 1H of the news that the participants watched/read in different environments within the scope of the experiment are good in the VR environment and good in the online environment the recall rate in VR environment is higher than in online. The Independent group's T-test results are shown in the table below to understand whether this difference is significant. According to the test results, it was determined that there was a significant difference in the answers given to the question "What" compared to the news environment (VR and Online) variable. According to the 5-point evaluation scale, the average of recalling the answer to the question "Why" from the 5W 1H of the news that the participants watched/read in different environments is Medium in the VR and "Low" in the online. Accordingly, the recall rate in VR environment is higher than in online environment. Independent groups T test results are shown in the table below to see if this difference is significant. Why question; It involves noticing and remembering the cause and effect relationships of the data, which indicated a simple understanding in the previously mentioned Barret taxonomy, and the answer was clearly stated (Barrett, 1968). Again, Talbert stated in his research on different media tools on understanding and remembering that there are questions that measure understanding of "Why and How" questions (Talbert, 2000). For this reason, the test result reveals that it is better understood and remembered than the news read online watched by VR.

APPENDIX

Appendix 1. Experiment coding guide

News from Refugee Camps to Classes (Online and VR)   The answers given were asked to explain what they remember, not the researcher. It is not answering that are directed and received by yourself. Firstly, the purpose of asking for a general explanation is to transfer information that may include the answers given to the questions of the subject at the first time. They do not pass on to think that the answer to the questions is the scope. But what do you remember as you tell the news to someone you know? In the answers given to the question in the form, it is seen that the skipped data are also given.
What: What happened in the news?   **Answer:** The United Nations Children's Fund (UNICEF) noted that Greece has 20,000 refugees biologically, and in this part most of them have been integrated into Greek schools since October.
When: When will the event occur or will it happen?   **Answer:** Since last October
Where: Where does the event take place?   **Answer:** In Greece

How: How does the event develop? Will be scored to 1-5
Answer: The 2,500 children taken from about 32 refugee camps are distributed to 93 different Greek public schools with school bus vehicles every day. This number corresponds to 80 percent of the total number of child refugees in western Greece. While funded by the European Union, the work is done by the International Organization for Migration. Despite the fact that what is necessary for Greek teachers in public schools is large, they will be sent to school in their own country or about their immigration. The trainers state that they had some difficulties in the early stages. Avlon Primary School Director Efi Kremon states that she shares the same difficulties as the foreign national immigrant who migrated to another country. He explains that each school has the necessary equipment to open its doors to about 20 refugee students and to overcome the difficulties of the instructors in these schools. For the Minister of Education of Greece, for the refugee who is currently separated from a Greek option, he said that they will be able to receive education at the same time from September.

Why: Why is the event happening or happened?
Answer: Before this date, he only received knowledge of language education in refugee camps, and now he is receiving formal education on Greek special schools on a special day. In this way, children are integrated into formal education.

Who: Who are the institutions or people involved in the incident? Will be scored to 1-5
Answer: United Nations Children's Fund (UNICEF), International Organization for Migration, European Union, Avlon Primary School Director Efi Kremon, Greek Education Minister

Experiment Coding Guide
Procurement of Vital Drugs in Ukraine (Online and VR)

1. What: What happened in the news? Will be scored to 1-5
Answer: According to the law, all vital drugs must be provided by the state in Ukraine. However, due to corruption events in the country, private companies were generally awarded to the Ministry of Health tenders. These companies were selling the drugs in question at inflated prices, and as a result, medicine shortages in Ukraine. Therefore, in 2015, the Ukrainian government entrusted the task of supplying and distributing medicines to international organizations such as the United Nations Development Program (UNDP).

2. When: When will the event occur or will it happen?
 Answer: In 2015.

3. Where: Where does the event take place?
Answer: In Kiev, the capital of Ukraine.

4. How: How does the event develop? Will be scored to 1-5
Answer: Despite some difficulties encountered in this process, the study carried out with international organizations produced good results. He states that the work of the United Nations Development Program has brought the government $ 4 million.

While the process of supplying medicines was carried out by the Ministry of Health, only 45 percent of Ukrainian patients needed medicines. For example, due to lack of tuberculosis vaccine, the number of Ukrainian children with this disease has increased.

According to Vasyl Shuripa, director of the Kiev Tuberculosis Hospital, the deficiency of tuberculosis drugs also leads to deaths: "It is really difficult to treat patients who could not use the necessary medicines. Their condition is unpredictable and can lead to a fatal case."
The organization called "Patients of Ukraine" has been campaigning together with other groups for the purpose of making drugs accessible to everyone. Now, with transparent auctions, significant savings have been achieved in drug supply in the country.
Olga Stefanyshyna, Director of Ukraine's Patients Foundation: "We have saved a lot of money. When we compare the prices purchased by the Ministry of Health with the prices that international institutions buy the same drugs, we see that we have saved 34 million dollars thanks to this reform ".

Why: Why is the event happening or happened?
Answer: However, due to the corruption cases in the country, private companies won the tenders of the Ministry of Health. These companies were selling the drugs in question at inflated prices, and as a result, medicine shortages in Ukraine.
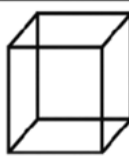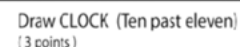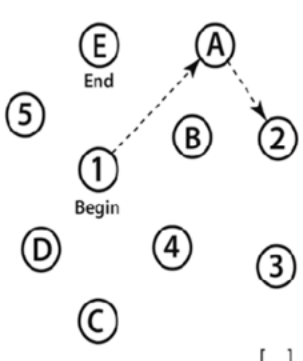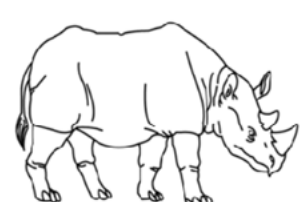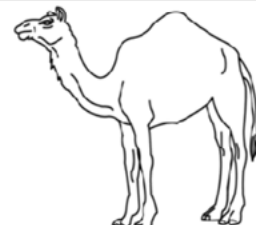
Who: Who are the institutions or individuals involved in the incident? Will be scored to 1-5
Answer: Ministry of Health, United Nations Development Program (UNDP), UNDP's Director of Ukraine Janthomas Hiemstra, Director of Kiev Tuberculosis Hospital Vasyl Shuripa, "Patients of Ukraine", Director of Ukraine's Association Olga Stefanyshyna.

Appendix 2. MoCA test

Appendix 3. Online news

360 video: from camps to classrooms COMMENTS

By **Euronews** • last updated: 27/06/2017

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There are twenty thousand refugee children in Greece according to UNICEF. Some already live in the cities, and others still in accommodation centres. The ones in the city have gradually been introduced into official Greek schools since last October. Before that, they attended only informal education classes inside camps.

TEXT SIZE

The figures are staggering. At the last count there were currently two and a half thousand children living in thirty two refugee camps who are being transported daily to ninety three Greek public schools.

These children represent roughly eighty percent of all those hosted in accommodation centres in mainland Greece. The transportation project that made this change possible is funded by the EU Humanitarian Aid Department and implemented by IOM, the UN Migration Agency.

Teachers told us that some children had never been to school in their home countries. When the project started, the trip from the refugee camp to class was something so big for the kids, that it was even tricky to coordinate. Little by little pupils got used to it and the process has become smoother.

imes aim to leave lasting

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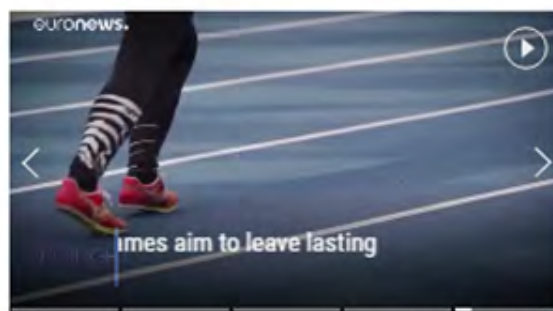
Efi Kremou, the headmaster of Avlona elementary school, said that refugee students face the same problems all foreign students have when moving to a new country. She added that schools have "the know-how, the schedule and the willingness to welcome refugee students". Her school has hosted twenty refugee pupils this year.
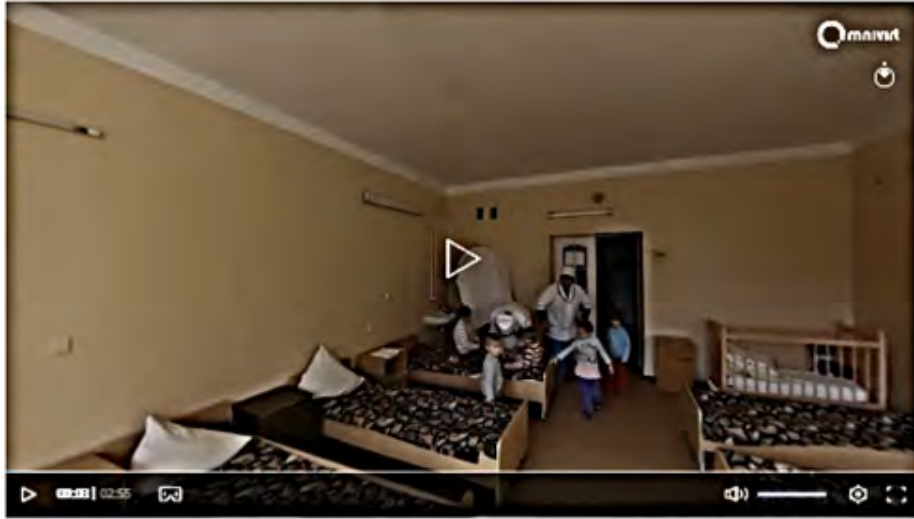
The Ministry of Education has made assurances that refugee children living in camps will return to school next September together with Greek children.

UKRAINE

360 video: How the UNDP is helping save lives in Ukraine

COMMENTS

By **Euronews** with **Euronews** • last updated: 23/11/2016

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TEXT SIZE

Aa Aa

Government hand-over

In Ukraine, by law, all life-sustaining medicines are provided by the state.

However, corruption in the Ukrainian Ministry of Health tender processes means contracts are won by private companies which then buy the drugs at an inflated price.

Medicines can be in short supply in Ukraine as a result.

So, in 2015, the country's government handed over the procurement and distribution of these drugs to international organisations including the UN.

The UN and its agencies

One UNDP warehouse in the Ukrainian capital, Kyiv, is full of life-saving drugs to combat tuberculosis, hepatitis, haemophilia and HIV.

They are shipped from here to healthcare facilities around the country.

"In fact, the minister told me there was a law that said: this medicine has to be bought here – from this company, whatever happens. So, we believe that engaging international organizations like ours allows Ukraine to escape from the old ways of doing things. And, believe me, the old way of doing things was not good. People were not getting the medicine. Some of the medicine that we see in this warehouse is the first shipment for 2 to 3 years," said **Jan Thomas Hiemstra, UNDP Country Director**.

Despite some challenges, the involvement of international organizations in the procurement process has already shown good results.

The UNDP estimates its efforts have saved the government 3.7 million euros.

When procurement was the sole responsibility of the Ministry of Health, only 45% of Ukrainian patients got the medicine they needed.

The lack of TB vaccine, for example, resulted in an increase of the number of Ukrainian children living with the disease. The shortages of TB drugs increased the number of deaths, according to the Head of the Kyiv Region Tuberculosis Hospital.

"It's really hard to treat those patients who are faced with shortages of the necessary medicines. Their condition can be unpredictable, and it may lead to a fatality," said **Vasyl Shuripa, head of the Kyiv region TB dispensary**.

"Patients of Ukraine"

For years, the organisation "Patients of Ukraine" campaigned with other groups to make medicines accessible for all.

Now, transparent tenders increased the cost-effectiveness of medicine procurement in the country.

The result is a significant saving overall.

"The savings we have are huge. If we compare the prices at which the Ministry of Health bought medicines and the prices at which international organizations purchased the same drugs, we'll see that we saved $34 million (32 million euros) as the result of the reform," said Olga Stefanyshyna, the Executive Director of "Patients of Ukraine".

NGOs say the procurement process must not be placed back in the hands of the Ministry of Health.

They are calling for Ukraine to set up an independent National Medicine Procurement Agency instead.