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<b>Article:</b>	<b>Unveiling the Potential of Virtual Reality in Pakistani Journalism: Insights from Experimental Study</b>
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**ABSTRACT**

Virtual reality is becoming the potential power of near future to reshape news and journalism. However, this technology has yet to break new grounds in Pakistani media. This study is to investigate the impact of virtual technology on the Pakistani audience, focusing on how media content consumed through VR affects their sense of presence. In this experimental study, quantitative approach has been used. 240 university students of Media Sciences department within twin cities of Pakistan have gone through the experiment. Three groups, each of eighty students have been created, where each group watched VR news videos selected from The New York Times website; one with head-mounted devices (Oculus Quest 2), one on mobile without head-mounted device and one on LED without a head-mounted device. The evaluation of three groups enlightens that the groups with head-mounted device showed significantly higher level of telepresence as compared to group without head-mounted device. Overall, this study has the potential to promote VR technology as a popular concept in Pakistani news media. Also, study findings can be beneficial for organization and media outlets when selecting VR news themes and creating VR content in Pakistan.

Keywords: *Virtual reality videos, sense of presence, The New York Times, Pakistani audience*

**Introduction**

Virtual reality news has transitioned from its initial experimental stage to a more integrated aspect of many newsrooms over the past few years. Consumers can now access the medium particularly in the form of 360-degree films seen on smartphones and occasionally accompanied with a low-cost cardboard headgear. Virtual reality in particular became a common topic in journalism research and practice when a variety of media sources began experimenting with VR (Doyle, Gelman, & Gill, 2016; Watson, 2017). The New York Times is one of the first and bravest with its use of VR. The company gave away over a million Google Cardboard headsets to its subscribers of the Sunday print edition in 2015 and developed a high-end VR application to share the Times' own VR content and experience (Sirkkunen, Vääätäjä, Uskali, & Rezaei, 2016). According to earlier research, 360° VR videos improve audience engagement by enhancing viewers' feelings of presence and enjoyment (Wang, Gu, & Suh, 2018). The primary objective of this study is to find out the difference of sense of presence while experiencing VR news with head-mounted device, VR news on mobile device, and VR news on LED.

**VR with Head Mounted Device**

Another popular form of immersive technology is virtual reality, particularly given how popular it has become in recent years. While immersed in content, a user of VR is fully cut off from the outside world. Through a head mounted display (HMD), anything the user sees in the headset becomes their "reality," allowing them to immerse themselves in both real and made-up worlds (Kittel et al., 2020).

**Mobile VR**

Mobile VR makes use of HMDs linked to smartphones. These include the now-discontinued Samsung Gear VR and even the Daydream headgear from Google. Even Google Cardboard may be seen by some as mobile virtual reality. Even in retail office supply stores and even in apparel stores, we have found affordable mobile VR headsets (Jenny, 2017).

**360° VR VIDEOS IN THE NEWS INDUSTRY**

VR has become more accessible to the general public thanks to the growth of low-cost devices and 360-degree movies, which has led to useful applications in a number of sectors, including journalism, entertainment, and education. Numerous news outlets, including the New York Times, The Guardian, Euronews, CNN, and BBC, have embraced virtual reality to create news content, enabling their readers to interact with the events or circumstances detailed in their articles. When Google Cardboard debuted in 2014, it offered these organizations a low-cost solution and made it possible for VR news to reach a wider audience. The availability of publishing and viewing support for 360-degree VR videos on video-streaming platforms like Facebook and YouTube has also influenced the development of VR technologies. The most accessible immersive technology for a wide audience to consume is 360-degree VR videos viewed with Google Cardboard headsets (Gutiérrez-Caneda et al., 2020).

Madary and Metzinger (2016) have already cautioned the world how the VR technologies power can be manipulated. Powerful and deep mental and behavioral exploitation is possible with these technologies due to their comprehensive character and potential for global control through experiential content. Driven by ulterior motives pertaining to religious, commercial, political/government nature, an observant eye needs to be kept on the virtual worlds to keep them safe for everyone (Sala & education, 2021).

## Research Questions

By considering the objective of the study following is the research question;

- R.Q1.** What is the difference of sense of presence on Pakistani audience while experiencing VR news with head-mounted device, VR news on mobile device, and VR news on LED

## Literature Review

Virtual reality setting allows its user to get fully immersed in computer generated environment, and to interact with a completely synthetic world, akin to the actual world (P. Milgram, Kishino, & Systems, 1994). Similar to what previous researchers have stated, virtual reality (Goldman & Falcone, 2016) is a feature of computer technology designed to simulate an environment or produce three-dimensional images via artificial sensory input (Arnaldi, Guitton, & Moreau, 2018a). A computer-generated artificial image or scene that is presented to the viewer in a way that makes it appear and feel like a genuine area or situation is known as virtual reality.

The main attribute that distinguishes it as "the first 21st century tool" according to Ken Pimentel and Kevin Teixeira in 1995 is immersion: "inclusion, being surrounded by an environment." VR gives the user access to inner knowledge (Psocka, 1995). Several others emphasize the receptive navigational features employing first-person cinematic "point of view," which according to Daniel Sandin "redefines perspective for the first time since the Renaissance" (Rasmussen, Mason, Millman, Evenhouse, & Sandin, 1998). In terms of three interconnected aspects, Howard Rheingold provides a helpful summary of its ontology: "One is immersion, being surrounded by a 3D world; another one is the ability to walk around in that world, choose your own point of view; and the third axis is manipulation, being able to reach in and manipulate it" (ELLIS, 1993). Although (I. Sutherland, 1965) and his subsequent developed the first head-mounted display (HMD) named "The Ultimate Display" with student Bob Sproull for the Bell Helicopter Company, was used by ARPA military over three years, funding are credited with the field's inception. Major VR advancements didn't occur until the 1980s Oliver Grau later referred to Sutherland's in 1968 invention as "the first step on the route to a media utopia" since it had internal sensors that could follow the user's head motions (Grau, 1999). Although some components, such as the tiny video displays, have been modified throughout the years, the core design of the helmet has remained the same. In order to produce binocular 3D vision, the helmet design contained two tiny monitors that were put near the eye.

## Sense of Presence

In order to integrate interactivity, "being there," and realism, the concept of presence has been hypothesized and operationalized (Gunther, 1992; T. Kim & Biocca, 1997; Nordahl & Nilsson, 2014; D. Shin et al., 2018). According to (J. Lee, Jung, Kim, & Biocca, 2019) presence is an emotional condition in which one perceives virtual objects as real. Immersive technologies have the singular potential to give consumers this physical and spatial awareness, even though some degree of "presence" may be experienced from a number of media types (Ke, Lee, & Xu, 2016; T. Kim & Biocca, 1997). Users who watch immersive journalism films (D. Shin et al., 2018; S. S. Sundar et al., 2017) and nature videos that highlight scientific and/or environmental issues benefit from a larger sense of presence than those who watch regular video (Breves & Heber, 2020; Filter, Eckes, Fiebelkorn, & Büssing, 2020). However, despite the fact that experimental participants often perceive more satisfaction and "fun" due to

increased presence in VR immersion environments (Diemer, Alpers, Peperkorn, Shiban, & Mühlberger, 2015; E. A.-L. Lee, Wong, Fung, & Education, 2010; Parong & Mayer, 2018), they do not learn more from these experiences (Makransky, Petersen, & Klingenberg, 2020). Particularly, stronger presence is achieved with high-immersion VR than with low-immersion VR, but participants typically learn less as a result (O. A. Meyer, Omdahl, Makransky, & Education, 2019). However, some studies have shown that greater engagement and enjoyment might motivate users to stay with the material longer (Parong & Mayer, 2018), which can occasionally result in superior learning outcomes (E. A.-L. Lee et al., 2010; S. S. Sundar et al., 2017).

### **Theory of Telepresence**

Telepresence is no more an unfamiliar concept. Most of us having been raised around televisions, telephones, telescopes, etc. can infer what telepresence suggests. Simply, a person or being projected to be present elsewhere by using modern technological means with interactivity in a remote setting is telepresence.

With a promise to extend human perception to unprecedented lengths of distances, the remote embodiment for telepresence is afforded by robotics, providing physical vessels for telepresence operators remotely embody. The bots controlled through VR provide a contrast to VR approaches that confine one to computer software. These tele-robots allow a more immersive experience through embodiment in physical and virtual environments (M. Slater, Sanchez-Vives, & AI, 2016).

Studies suggest that telepresence experience is considerably higher for virtual reality videos as compared to conventional videos. The foregoing makes a strong case for immersive journalism (Coleman & Ross, 2010; Suh & Lee, 2005).

Positive analysis of sense of presence through telepresence has been shown by other researches (Kang et al., 2019). Noteworthy experiments in this respect have been done and reported by researchers to study the relationship between telepresence and explore its various dimensions. These involved: Virtual Reality news video clip with head mounted device, 360° Virtual Reality, 2d news video, and no exposure to VR news (Coleman & Ross, 2010; Kang et al., 2019; Suh & Lee, 2005)

### **Research Hypothesis**

**H<sub>1</sub>.** The sense of presence will vary in Pakistani audience when they are exposed through a head-mounted device, a mobile device, or an LED screen to VR news.

### **Methodology**

This study used an experimental method due to the nature of the investigation. The dependent variable is sense of presence. To determine the technological qualities that contribute to sense of presence, questions were asked about immersion, perceived interactivity, and vividness of the scene. The subjective sense of presence was determined using questions to gauge how the user felt regarding a sense of being there, involving, and realism. The questions for this condition are drawn from past research questionnaires for presence, such as a presence in a virtual environment questionnaire from Witmer and Singer (1998), a telepresence questionnaire developed by (Lombard & Jones, 2013), and a virtual environment evaluation questionnaire (Chertoff, Goldiez, & LaViola, 2010).

The items measuring telepresence were adopted from the telepresence scale in a

VR environment (T. Kim & Biocca, 1997). The questions measured immersion ( $\alpha=.61$ ), interactivity ( $\alpha=.64$ ), being there ( $\alpha=.83$ ), realness( $\alpha=.74$ ), involving( $\alpha=.85$ ), quality( $\alpha=.84$ ), and interference ( $\alpha=.73$ ).

Immersion was a composite index of four items. The questions were measured on a 1 - 5 scale. Being there was a composite index of two items. The questions were measured on a 1 - 5 scale.

1. "During the news, the news-generated world was more real or present for me compared to the "real world"
2. "During the news, my body was in the room, but my mind was inside the world created by the news"

Realness was a composite index of two items. The questions were measured on a 1-5 scale.

1. "During the news, I felt I was in the world the news created"
2. "During the news, my mind was in the world created by the news, not in the room"

Interactivity was a composite index of one item. The questions were measured on a 1-5 scale.

1. "The news-generated world seemed to me "somewhere I visited" rather than "something I saw"

Involving was a composite index of three items. The questions were measure on a 1-5 scale

1. "When the news ended, I felt like I came back to the "real world" after a journey"
2. "During the news, I forgot that I was in the middle of an experiment"
3. "The news came to me and created a new world for me, and the world suddenly disappeared when the news ended journey"

The final questionnaire was utilized to collect data once the necessary revisions were made as a result of the two pilot experiments. The experiment was given a fully equipped multi-media lab. As previously stated, the experiment was divided into three groups (A, B, and C). To ensure efficacy and secrecy of the results, each group was invited on a different day.

### **Experiment 1: Group A**

There were total of 80 participants in Group A including 58 males and 22 females. The participants are media students enrolled in different universities who volunteered for the study. A special session was organized for them with refreshments. A friend who is familiar with the technology moderated the session. Participants were given VR Head Mounted Devices to watch the above-mentioned videos. Participants were also given questionnaires to record their feedback after the experiment. The moderator facilitated the session and helped participants in recording accurate responses.

### **Experiment 2: Group B**

Group B had a total of 80 participants including 43 males and 37 females. The participants are media students enrolled in different universities who volunteered for the study. In this experiment participants watched the videos on mobile devices. They filled a questionnaire to record their feedback after the experiment. The moderator facilitated the session and helped participants in recording accurate responses.

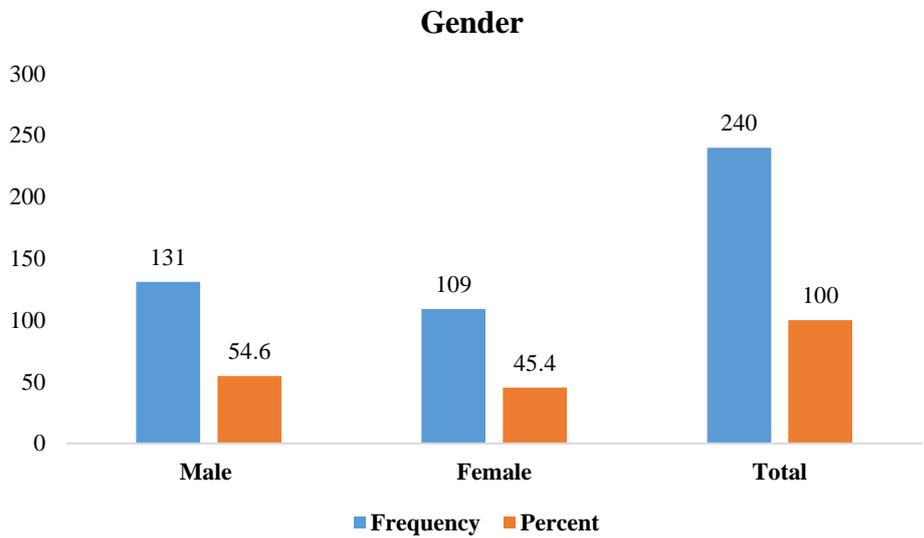
### **Experiment 3: Group C**

Group C had a total of 80 participants including 66 males and 14 females. The participants are media students enrolled in different universities who volunteered for the study. In this experiment participants watched the videos on LED. They filled a questionnaire to

record their feedback after the experiment. The moderator facilitated the session and helped participants in recording accurate responses.

**Data Analysis and Results**

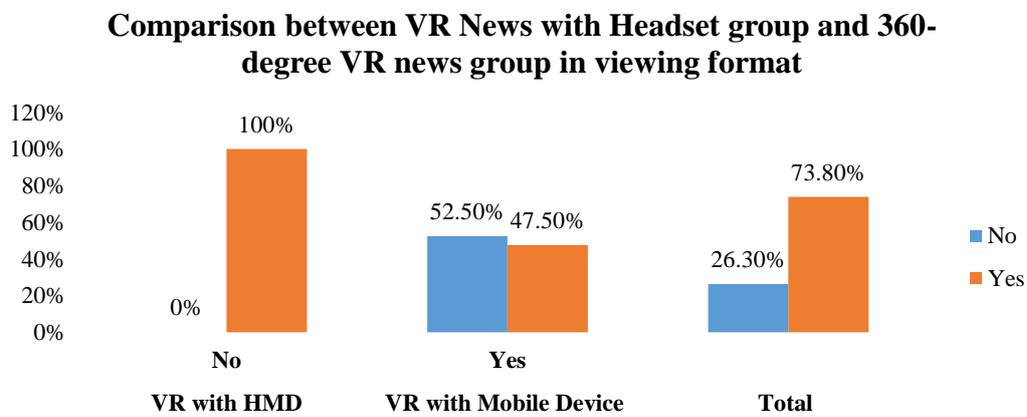
The collected data is analyzed and presented as results in the form of table and graphs to address the stated research questions and hypotheses.



This graph depicts the total number of 240 respondents ( $N=240$ ) of which 131 were male and 109 were female.

**Manipulation Check**

Manipulation check was evaluated to analysis whether or not the subjects accurately understood the different formats of VR news. Experiment group in the VR news with head-mounted device and 360-degree VR news with mobile device were the part of manipulation check and asked to indicate whether the news version they watched was VR news with a headset or standard 360-degree VR news (0= No, 1= Yes). The items were (a) “The news I watched is VR news with a headset” and (b) “The news I watched is standard video news in 360 degrees.” If a significant difference is found between the two responses from the respondents, it indicates the manipulation is adequately established. A chi-square test between VR news with a headset and 360-view VR news was performed,  $X^2 (1, n=160) = 56.59, p < .01$ . Following are the result of manipulation check.



The comparison showed that the respondent who were being exposed VR news with head-mounted device are 100% sure that they were watching the VR news content, whereas the respondents of other group who were being exposed VR news with mobile device, 47.5 % of the respondents correctly understood that they were watching VR content by using the mobile device where as 52.5% respondents were answer negative while watching 360-degree VR news.

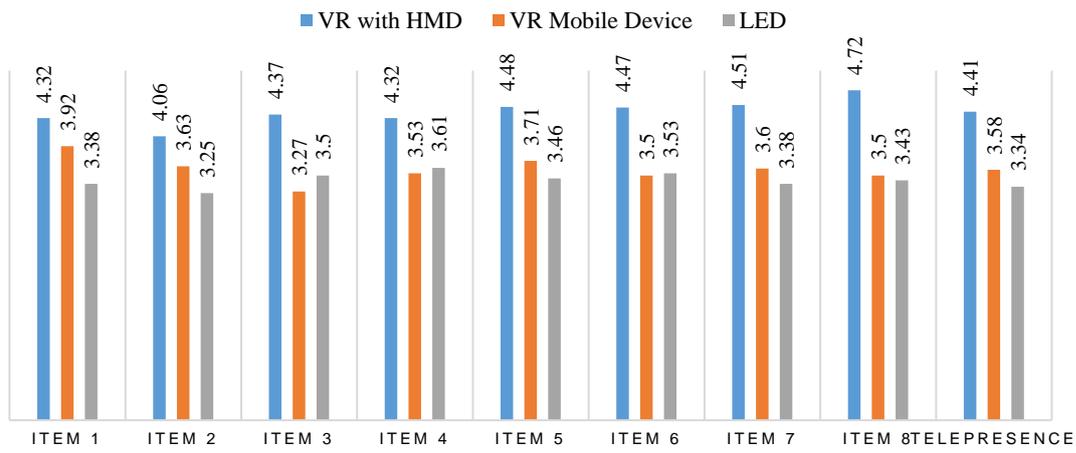
### Results of Telepresence:

Mean of all the items were analysis to get understand of the telepresence of all the experiments including VR with HMD, VR with Mobile Device and VR new on LED Screen.

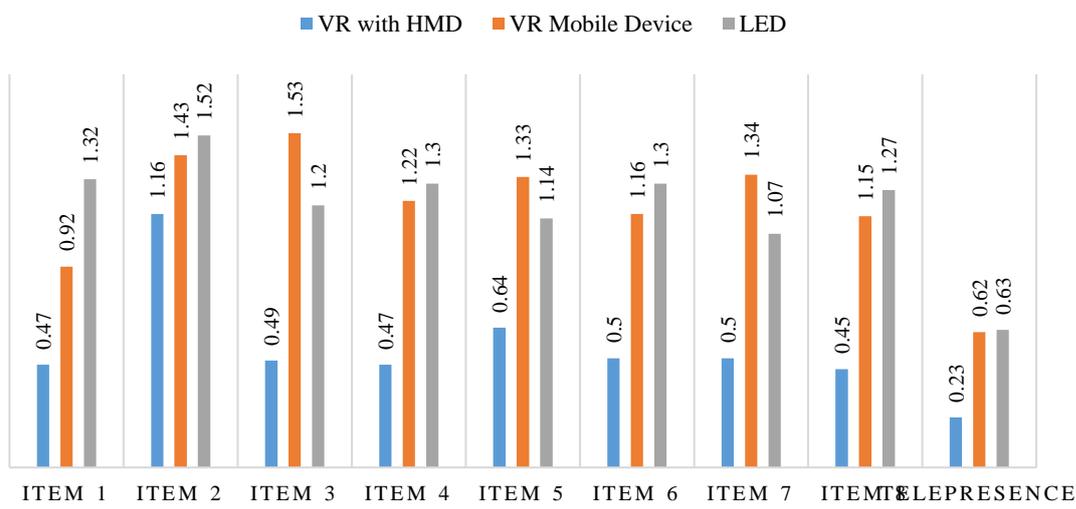
#### Group difference in Telepresence (N=240)

Item	Group (M, SD)			F (Titchener)	$\eta$	$\eta^2$	P
	1 (n=80)	2 (n=80)	3 (n=80)				
1	4.32 (0.47)	3.92 (0.92)	3.38 (1.32)	11.46 (2, 237)	0.40	0.16	0.00
2	4.06 (1.16)	3.63 (1.43)	3.25 (1.52)	6.27 (2, 237)	0.31	0.09	0.00
3	4.37 (0.49)	3.27 (1.53)	3.50 (1.20)	8.22 (2, 237)	0.35	0.12	0.00
4	4.32 (0.47)	3.53 (1.22)	3.61 (1.30)	6.765 (2, 237)	0.32	0.10	0.00
5	4.48 (0.64)	3.71 (1.33)	3.46 (1.14)	12.16 (2, 237)	0.41	0.17	0.00
6	4.47 (0.50)	3.50 (1.16)	3.53 (1.30)	7.93 (2, 237)	0.35	0.12	0.00
7	4.51 (0.50)	3.60 (1.34)	3.38 (1.07)	18.12 (2, 237)	0.49	0.24	0.00
8	4.72 (0.45)	3.50 (1.15)	3.43 (1.27)	20.05 (2, 237)	0.50	0.25	0.00
Telepresence	4.41 (0.23)	3.58 (0.62)	3.34 (0.63)	20.92 (2, 237)	0.87	0.75	0.00

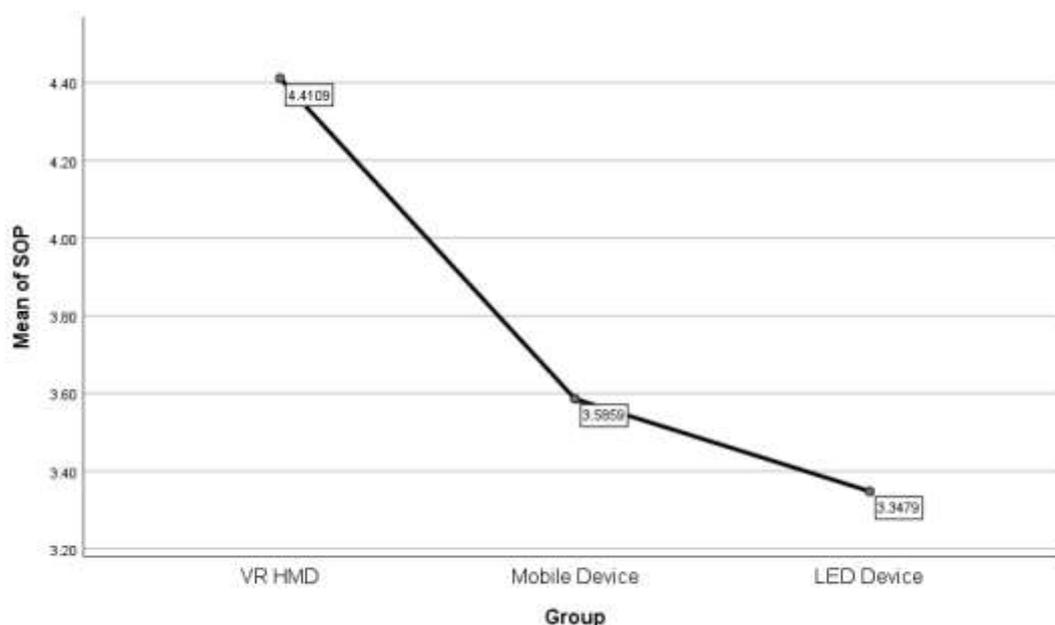
### MEAN GRAPH OF TELEPRESENCE



### STANDARD DEVIATION GRAPH OF TELEPRESENCE



### Overall Mean Graph of Telepresence



Graph shows the telepresence of the news. In the telepresence section of the questionnaire, eight items were used to measure presence. To analyze group differences, values of means, standard deviation and F value, Eta and square of Eta were applied to compare. Item 1 was “When the news ended, I felt like I came back to the “real world” after a journey”, show that users believe VR video with head mount device having more sense of presence ( $M = 4.32$ ,  $S.D = 0.47$ ) as compare to VR with mobile device ( $M = 3.92$ ,  $S.D=0.92$ ) and LED ( $M = 3.38$ ,  $S.D=1.32$ ) whereas the effect size is ( $\eta^2 = 0.16$ ) which indicate the large effect.

Item 2 was “The news came to me and created a new world for me, and the world suddenly disappeared when the news ended journey”, show that users think VR video with head mount device having more sense of presence ( $M = 4.06$ ,  $S.D = 1.16$ ) as compare to VR with mobile device ( $M = 3.63$ ,  $S.D=1.43$ ) and LED ( $M = 3.25$ ,  $S.D=1.52$ ) and the effect size is ( $\eta^2 = 0.09$ ) which indicate the medium effect.

Item 3 was “During the news, I felt I was in the world the news created”, show that users assume more sense of presence while watching VR video with head mount ( $M = 4.37$ ,  $S.D = 0.49$ ) as compare to VR with mobile device ( $M = 3.27$ ,  $S.D=1.53$ ) and LED ( $M = 3.50$ ,  $S.D=1.20$ ) and the effect size is ( $\eta^2 = 0.12$ ) which indicate the medium effect.

Item 4 was “During the news, I forgot that I was in the middle of an experiment”, show that users consider VR video with head mount device having more sense of presence ( $M = 4.32$ ,  $S.D = 0.47$ ) as compare to VR with mobile device ( $M = 3.53$ ,  $S.D=1.22$ ) and LED ( $M = 3.61$ ,  $S.D=1.30$ ) and the effect size is ( $\eta^2 = 0.10$ ) which indicate the medium effect.

Item 5 was “During the news, my body was in the room, but my mind was inside the world created by the news”, show that users reflect VR video with head mount device having more sense of presence ( $M = 4.48$ ,  $S.D = 0.64$ ) as compare to VR with mobile device ( $M = 3.71$ ,  $S.D=1.33$ ) and LED ( $M = 3.46$ ,  $S.D=1.14$ ) and the effect size is ( $\eta^2 = 0.17$ ) which indicate the large effect.

Item 6 was “During the news, the news-generated world was more real or present for me compared to the “real world”, show that users consider VR video with head mount device having more sense of presence ( $M = 4.47$ ,  $S.D = 0.50$ ) as compare to VR with mobile device

( $M = 3.50$ ,  $S.D=1.16$ ) and LED ( $M = 3.53$ ,  $S.D=1.30$ ) and the effect size is ( $\eta^2 = 0.12$ ) which indicate the medium effect.

Item 7 was “The news-generated world seemed to me “somewhere I visited” rather than “something I saw,”, show that users suppose VR video with head mount device having more sense of presence ( $M = 4.51$ ,  $S.D = 0.50$ ) as compare to VR with mobile device ( $M = 3.60$ ,  $S.D=1.34$ ) and LED ( $M = 3.38$ ,  $S.D=1.07$ ) and the effect size is ( $\eta^2 = 0.24$ ) which indicate the large effect.

Item 8 was “During the news, my mind was in the world created by the news, not in the room”, show that users consider VR video with head mount device having more sense of presence ( $M = 4.72$ ,  $S.D = 0.45$ ) as compare to VR with mobile device ( $M = 3.50$ ,  $S.D=1.15$ ) and LED ( $M = 3.43$ ,  $S.D=1.27$ ) and. the effect size is ( $\eta^2 = 0.25$ ) which indicate the large effect.

Whereas the total telepresence effect of all items show that users assume VR video with head mount device having more sense of presence ( $M = 4.41$ ,  $S.D = 0.23$ ) as compare to VR with mobile device ( $M = 3.58$ ,  $S.D=0.62$ ) and LED ( $M = 3.34$ ,  $S.D=0.63$ ) and the effect size is  $\eta^2 = 0.75$  show large effect size.

### Discussion and Conclusion

The quantitative discussion is crucial since it clearly communicates the significance, importance, and applicability of the findings. It highlights and assesses what was discovered and how it pertains to your literature review and research questions hence imparts into the conclusion (Paré & Kitsiou, 2017). For our quantitative findings, three variables of the study i.e Sense of presence. The quantitative approach has been used to analyze how the VR experience affect sense of presence on basis of theory of telepresence and literature review. According to the theory of telepresence (Steuer, 1992), as user's perception of "being there" increases, their sense of telepresence also improves, which leads to positive evaluations of the satisfaction and understanding of the user.

The scale (Igroup Presence Questionnaire, IPQ) in a VR environment was used to adapt the telepresence measurement elements (Schubert, Friedmann, Regenbrecht, & Environments, 2001). To gauge the subjects' exposure to VR news, the eight items were revised, to investigate the sense of presence on group of three; VR with head-mounted device, VR on mobile device and VR on LED. The items measured experiences of telepresence in the VR interface from into VR experience to coming back from VR experience, adhering to the theoretical explanation of telepresence (the feeling of a viewer being present in the mediated environment and not present in the real world) The items (from Strongly Disagree =1 to Strongly Agree =5) were (a) “When the news ended, I felt like I came back to the ‘real world’ after a journey”; (b) “The news came to me and created a new world for me, and the world suddenly disappeared when the news journey ended”; (c) “During the news, I felt I was in the world the news created”; (d) “During the news, I forgot that I was in the middle of an experiment”; (e) “During the news, my body was in the room, but my mind was inside the world created by the news”; (f) “During the news, the news-generated world was more real or present for me compared to the ‘real world’”; (g) “The news-generated world seemed to me ‘somewhere I visited’ rather than ‘something I saw’” (h) “During the news, my mind was in the world created by the news, not in the room.” The 9th item was created as a new variable, called telepresence, to evaluate the whole effect on the groups.

It has been observed that on whole, more sense of presence has been observed in respondents who were wearing head mounted device as compared to those who were watching just on mobile and lesser sense of presence has been observed on users who were watching on LED. It has been observed through responses that watching the VR news gave feelings to the users to go to a new realm similar to embarking on a journey, and that after the VR environment was over, they felt like returning to the actual world. These findings show that the users felt transported to a new environment and immersed. The VR creates feeling of a real world for its users and they feel totally immersed. (Parsons et al., 2017). Participants of the study evaluated the VR world more realistic as compared to real world. During the experience of VR, the audience perceives VR more real than reality (M. E. Owens et al., 2015). Especially, the VR group with head-mounted device shows a significant response to telepresence as compared to the group watching it on mobile and LED, also indicating that without a head-mounted device, users can still feel telepresence through viewing 360-degree VR content on the phone.

These results also align with the telepresence theory shows that understanding the level of presence can help assess the effectiveness of different VR formats in creating an immersive news experience for the Pakistani audience. The results, therefore, suggest the potential usefulness of VR content in the mass communication and telecom market.

### **Conclusion**

Virtual reality 360-degree videos have just started gaining popularity among content creators. Waters of are being tested for head-mounted displays and VR experiences by creators and audiences both. Rules, terminologies, and jargons of VR language are gradually being coined, developed, and used. With VRs growing use, journalists and new agencies are also adopting the use of relevant language.

Among researchers as well the field (Goldman & Falcone, 2016) and its associated terms are fairly recent and the phenomenon, although more known, by now is still new. The narrative of 360 is fast advancing with every passing minute, and the research is also somewhat catching up with the changes owing to the growing interest in it as a field of research in universities and R&D institutions around the world.

Through this dissertation, its author has tried to make a small but significant contribution to exploration of the VR arena, especially in Pakistan. The study reported in this document helps furthering knowledge and understanding of relationship between VR and audience responses. It has been learnt from the study's findings that sights and sounds afforded to user (viewer of a news) by VR provides them a stronger telepresence and empathy, by appealing to their emotions and, sometimes, even trust. The sensory experience rendered to the audience allows them to be more than mere observer giving them confidence in what is being transmitted to them.

This research also shows that retention of the information acquired through immersive VR is more than the one received through conventional means. VR, therefore, has been found to be powerful in influencing user feedback, which is also a major goal of journalism. Immersive journalism is likely to have greater retainability and impact from the audience.

A good social outcome that can be drawn from the understanding of VR and user relationship is improve the society's capacity to be empathetic, helping its members walk in other members' shoes. Immersive journalism provides a means for such shoe-sharing as

otherwise distant and unrecognizable experiences become relatable through the sensory involvement of a user.

We infer the following to be prime objective that VR and journalistic can commonly serve: to give user the field experience to arouse concern and feeling towards the cause covered by the news with better understanding and confidence on it. The New York Times' virtual reality news videos are a testimonial of this inference.

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