



## Effects of Exposure to Animated Videos of Dental Procedures on Patient's Anxiety and Decision-Making: An Experimental Study

Syeda Asma Hussain<sup>1</sup> Nadira Khanum<sup>2</sup>

**Abstract:** *Media has become an effective medium for disseminating health information in an explicit manner that satisfies the needs of the general public. This study investigates the effects of exposure to animated videos of dental procedures on patients' anxiety levels and decision-making. Animated videos have emerged as useful tools for presenting complicated medical information in an accessible and educating manner in the ever-changing world of health communication. A quantitative methodology was employed using a series of experiments on two groups: the experimental group received the intervention (Animated video of a procedure) and in-person consultation by the healthcare provider. The control group only received in-person consultation. The study's results revealed that exposure to animated videos might help patients reduce their anxiety and improve their decision-making regarding their treatment options before dental procedures. The findings show that age and gender may not be the predictors of anxiety levels and preparedness for decision-making. Educational level significantly affects the patient in alleviating anxiety and demonstrating more preparedness for decision-making.*

**Key Words:** Health Communication, Animated Videos, Anxiety, Decision-Making

### Introduction

Nowadays, people are more concerned and aware of their disease management because of health information available through various mediums to improve treatment outcomes. Unfortunately, offering extensive online and offline information does not necessarily result in educated health behaviors. In a world where people, especially literate communities, check social media for health information more frequently than they consult their doctors, knowing the repercussions of accessing online resources is critical for keeping up with changing healthcare practices (Cuan-Baltazar et al., 2020). Recognition of distinguishing elements that increase user engagement and message transmission through social media is a viable strategy in health communication. The continuous progress in animation development is being represented in related fields such as infotainment and even relaxation (Khan & Khanum, 2021). Animations have become a powerful and emerging medium to cater to larger audiences, resulting in its popularity and use worldwide (Khanum et al., 2015).

**H1:** Patients exposed to animated videos before dental procedures will experience significantly lower anxiety.

**H2:** Patients exposed to animated videos before dental procedures will demonstrate more preparedness for their decision-making.

### Health Communication

Digital media delivers health information on various health issues to the general public, patients, and healthcare professionals as this information may solve their health-related issues. Social media allows information to be provided in formats other than text, which helps bring health information to audiences with particular requirements. Patients use a variety of social media channels to communicate with other patients and their clinicians. The general population uses these social media platforms to acquire health information for diseases, symptoms, and diagnostics, as well as personal healthcare choices to make treatment options. Websites give users access to specialized resources while enabling healthcare providers to transfer health information to patients and the general public. (Moorhead et al., 2013).

<sup>1</sup> MS Scholar, Department of Arts & Media, Foundation University, Islamabad, Pakistan.

<sup>2</sup> Assistant Professor, Department of Arts & Media, Foundation University, Islamabad, Pakistan.

Email: [nadirakhanum@fui.edu.pk](mailto:nadirakhanum@fui.edu.pk)

▪ **Corresponding Author:** Syeda Asma Hussain ([asmahussain85@gmail.com](mailto:asmahussain85@gmail.com))

▪ **To Cite:** Asma, S., & Khanum, N. (2024). Effects of Exposure to Animated Videos of Dental Procedures on Patient's Anxiety and Decision-Making: An Experimental Study. *Qlantia Journal of Social Sciences and Humanities*, 5(4), 188–197. [https://doi.org/10.55737/qjssh.v-iv\(CP\).24232](https://doi.org/10.55737/qjssh.v-iv(CP).24232)

### Health Literacy Levels in Urban and Rural Populations of Pakistan

Health literacy can be defined as a person's capability to comprehend information in such a way as to promote health practices by WHO. Verbal communication may be more successful for populations with minimal health literacy because no reading is required. Furthermore, people living in the rural areas of Pakistan with low health literacy frequently lack health-related prior knowledge, which requires increased efforts of healthcare professionals to communicate a message to the patient. Even the people living in the urban areas of Pakistan, when confronted with health-related knowledge, those with low health literacy levels have to experience more cognitive information overload. Reducing cognitive load by designing information to facilitate processing may be essential for persons with inadequate health literacy. It is evident from the research that verbal text (rather than written text) has a positive effect on memory and retention of information among those with low health literacy (Abdullah et al., [2020](#)).

### Technological Integration in Health Communication

Various individuals, governmental or private entities, and media platforms disseminate health information to patients in written, electronic, and audiovisual formats. Patient information content plays a significant role in increasing patients' health literacy. The strengthened clinician-patient relationship can be achieved by improved healthcare technological advancement that provides a foundation for collaborative decision-making, and the patient's health (Mehrabi et al., [2024](#)). Health information in the form of animated videos created via multimedia addresses inadequacies in conventional oral and written methods of delivering information to patients. Health-related information by watching simple animated videos that integrate speech and images, catering to patients of various ages and educational levels (Yang et al., [2021](#)) to better understand health issues and their treatments.

### Transformation of the Traditional Healthcare Industry into Digital Avenues

The cultural transformation of the traditional healthcare industry into digital health settings demonstrates how technological advancements make health information available to healthcare providers and health information seekers, which leads to shared decision-making. Technology breakthroughs are increasingly linked to healthcare systems worldwide, which has brought a paradigm change (Mesko et al., [2017](#)). Poor socio-economic and environmental conditions make it difficult for most of the population to opt for treatment options (Braveman et al., [2011](#)). Poor health conditions are caused due to poverty and the poor socio-economic status of the majority of Pakistan's population. Improving public health in numerous places requires education, economic stability, access to modern diagnostic equipment, and regular contact with physicians, among other things. Most of the patients in Pakistan don't utilize state-owned medical facilities due to poor quality and unreliability of the healthcare system (Meppelink, [2016](#)).

### Lower Oral Health Communication and Literacy

Inadequate health information can be a hindrance to efficient patient-dentist communication. Understanding complex surgical procedures through verbal communication with patients may pose a challenging situation for patients with low literacy levels. There exists an association between existing knowledge and the oral health condition of the patient. Patients with low educational backgrounds are more prone to oral diseases, and this population may be facing challenges in accessing oral health preventive measures due to poor socio-economic conditions. Rural populations have lower health information than urban residents. Gender, educational level, financial position, and dental treatment access are widely recognized risks for poor dental health (Baskaradoss, [2018](#)).

### Theoretical Framework

This study will adopt the Cognitive Theory of Multimedia Learning (CTML) by Richard Mayer ([1997](#)) as a theoretical framework for understanding how it will help patients reduce anxiety and make informed decisions. It states that learning is enhanced by integrating words and pictures rather than when only words are used for a specific purpose. The CTML by Richard Mayer uses cognitive designs for effective learning. Books with texts and pictures or computer-based resources with images and words can be used as multimedia instructions. The theory defines how a person receives these shown pictures and then connects them to their previous knowledge to generate new information. CTML recommends instructional



goals based on certain principles to help users create cohort information. The three instructional design goals are to minimize unnecessary data processing, manage important information processing, and promote generative processing to generate cohort information (Mayer, 2009).

By using the principles of CTML, healthcare professionals may design health information in a way that effectively alleviates anxiety and facilitates decision-making. The use of multimedia interventions has become a common practice in recent years among healthcare professionals as an instructional tool to improve their understanding and information recall regarding their healthcare initiatives. Videos have become more influential than printed material for patient education. According to cognitive learning theories, learners have limited cognitive resources when a new concept is being introduced for processing information. The formats, wording, and visual aids can reduce the cognition process of the brain to generate cohort ideas for understanding.

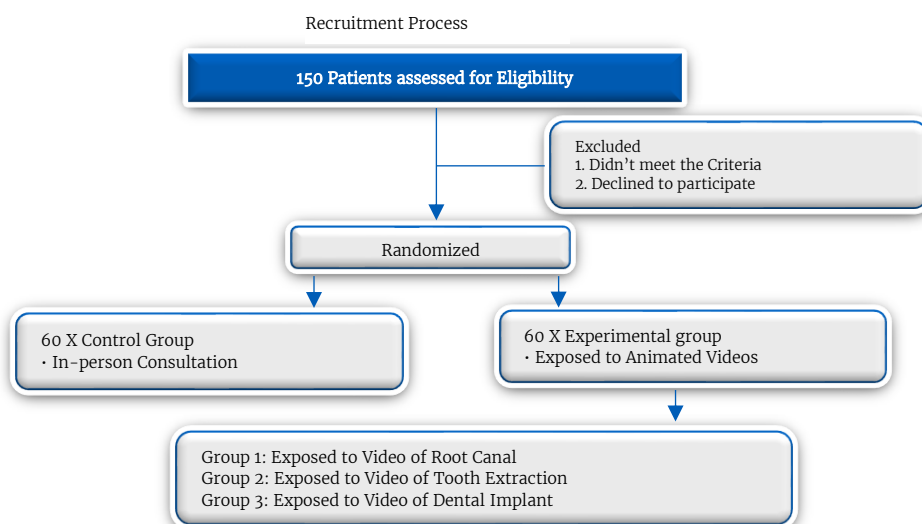
Richard Mayer's Cognitive Theory of Multimedia Learning (CTML) can efficiently relate to the present study that animated videos of dental procedures affect patients' anxiety and decision-making. During multimedia presentations, effective learning takes place when a learner engages in necessary cognitive processing (Mayer, 2014). According to Mayer's CTML, the multimedia principle states that a person learns better if the explanation is accompanied by illustrations rather than being provided with text alone. In this study, when static images blended with sound (narrations) are used to explain oral procedures, patients can comprehend the procedures better and may be able to exhibit lower anxiety levels. This is following what Mayer (1997) demonstrated.

### Research Methodology

It was quantitative research in which a series of experiments were conducted and the data was collected using a questionnaire from the patients in the dental OPD of FUCD & Hospital. The study investigates the relationship between animated video exposure and its effects on patient anxiety and decision-making using a randomized controlled trial (RCT). Data was collected after the exposure to animated videos along with the in-person consultation with the clinician from the experimental group to see the differences in how much patients experienced anxiety and does it affected their decision-making process. The study recruited a diverse dental patient sample, encompassing different age groups, genders, and educational backgrounds. Random assignment of participants in two groups, the experimental group and the control group, was done; the participants in the Experimental group were exposed to animated videos of dental procedures along with in-person consultation with the clinician, while participants in the Control group only received in-person consultation. Animated videos have covered dental procedures such as root canal treatment (RCT), tooth extraction, and dental implants, emphasizing clarity and accurate representation of the procedure in a series of experiments. Animated videos with Urdu voice-overs were shown to the patients for better understanding. A series of experiments were conducted to collect data from the patients using a questionnaire.

**Figure 1**

Figure Showing Recruitment Process



## Ethics

Administrative approval was obtained from the Dean FUCD before the start of this study, and the Questionnaire was discussed with The HOD (Surgical Deptt). The researcher introduced herself to the patients and then explained the study's goal. Participants were also informed that their information would be kept confidential and utilized exclusively for research.

## Measures

In alleviating patients' anxiety, it is necessary to determine their level of anxiety. Many researchers have examined changes in anxiety according to age, gender, Doctor's communication quality, and patient preoperative awareness about surgical procedures. The two variables are conceptually and operationally defined as follows: Anxiety and decision-making.

## Anxiety

Anxiety is an organic reaction characterized by physical (numbness, pounding of the heart, difficulty breathing, etc.) and mental (fear, inability to relax, fear of losing control, etc.) symptoms (Yang X et al., 2021). Anxiety is operationally defined as the assessment of anxiety symptoms based on self-reported responses (Karsten et al., 2011). Beck Anxiety Inventory Scale (BAI) measured the levels of anxiety; it consisted of 21 self-reported items with response options such as Not at all =0, Mildly but it didn't bother me much =1, Moderately – it wasn't pleasant at times =2, Severely – it bothered me a lot=3. Anxiety about oral procedures significantly affects the avoidance of dental care by patients. Researchers have identified the cycle of dental avoidance, in which patients with anxiety postpone seeking dental treatment, allowing their oral health problems to develop. Avoidance of dental treatment by the patient until pain or severe symptoms force them to seek treatment has been observed in various studies (Caltabiano et al., 2018).

## Decision-Making

It is described as a rational decision made by an individual based on pertinent information, knowing all the merits and demerits of all available options based on the individual's beliefs (Bekker et al., 1999). According to the PrepDM Scale, decision-making is operationally defined as the process by which a patient perceives the usefulness of intervention provided to them to support their decision regarding treatment options to make health decisions (Bennett et al., 2010). PrepDM Scale (Preparation for Decision-Making Scale) was used for measuring decision-making and consisted of Ten items on a 5-point Likert scale with the response options Not at all =1, A little =2, Somewhat=3 Quite a bit =4, A great deal =5. The scale has measured the patient's preparedness for decision-making by recognizing the need for a decision, readiness to make an informed decision, and overall preparedness to engage in the decision-making process with their healthcare provider (Bennett et al., 2010).

## Demographics

Demographics such as age, gender, and education level significantly influence how individuals engage with animated videos in health communication. The degree of pain was measured using a Visual Analogue Scale (VAS). Participants used a scale of 0 to 10 to indicate their discomfort(Pain) level. The coding of demographics is presented in Table 1

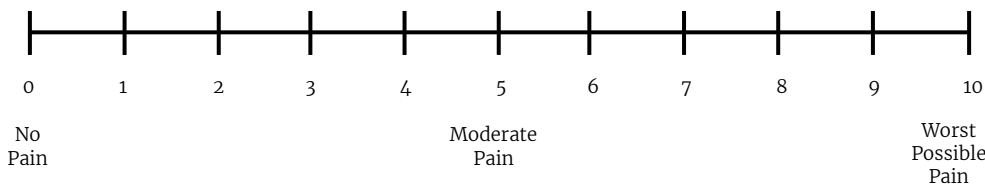
**Table 1**

*Coding System for the Demographic Variable of the Questionnaire*

Age	Gender	Education	Treatment
Under 18 -1	Male -1	Under Matric-1	Root Canal -1
18-24 -2	Female-2	Matriculation -2	Tooth Extraction-2
25-34 -3		Intermediate -3	Dental Implant-3
35-44 -4		Graduation-4	
45-54 -5		Masters or above-5	
55-64 -6			
65 or above -7			



How severe is your pain today? Place a vertical mark on the line below to indicate how bad you feel your pain is today.



## Results

### Data Analysis

Reliability analysis, regression analysis, independent sample t-test, and descriptive statistics were applied in statistical packages for social scientists, or SPSS, to analyze data collected through a series of experiments. Construct reliability was assessed using Cronbach Alpha. The results revealed that the Anxiety scale with 21 items ( $\alpha = .971$ ) and the preparedness for decision-making scale with 10 items ( $\alpha = .98$ ) was reliable. Reliability results are presented in Table 2.

**Table 2**

*Reliability Analysis of Anxiety and Decision-making Scale*

	Cronbach's Alpha	N of Items
Anxiety	.97	21
Decision-making	.98	10

### Hypothesis Testing

#### Hypothesis 1

To test H1: Patients exposed to animated videos before dental procedures will experience significantly lower anxiety ( $\mu_{ACG} > \mu_{AEG}$ ). An independent sample t-test was conducted to compare the Anxiety levels of the Control and Experimental groups. The results calculated outcomes means, standard deviation (SD), and standard errors of the mean (SEM) were compared in the group. In SD (Control group =12.54 and Experimental group =14.90), the Experimental group has a larger standard deviation compared to the Control group, indicating greater variability in the Experimental group.

**Table 3**

*Group Statistics of Anxiety Level*

	Mean	Std. Deviation	Std. Error Mean
Control Group	42.12	12.54	1.62
Experimental Group	19.30	14.91	1.92

Note: (N=120, where Control group=60 and Experimental Group=60)

The independent sample T-test was executed, and Levene's test was used to determine whether equal variance in any groups was assumed. From  $p > 0.01$ , it may be concluded that there was a statistically significant difference in anxiety levels among the two groups, with the Control group characterized by having higher anxiety levels. The Control group ( $M=42.12$ ,  $SD=12.54$ ) scored significantly higher than the Experimental group ( $M=19.30$ ,  $SD=14.91$ ) ( $t(118) = 9.07$ ,  $p < 0.01$ ).

**Table 4**

*Independent Sample T-Test for Anxiety*

	t-test for Equality of Means						
	t	df	P	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
Equal Variances Assumed	9.07	118	.00	22.82	2.51	17.84	27.80

Note: Levene's test for equality of means is 0.37, Sig. (2-tailed) = p



The mean and standard deviation scores show a substantial difference in variance and mean across the groups studied. The t-value represents the size of the difference between the groups, which was 9.07. The 95% confidence range of the difference reveals that the lower interval is 17.84 and the upper interval is 27.80. These findings confirm hypothesis H1 since exposure to animated videos has a greater impact on patients' Anxiety levels than on those not exposed.

### Hypothesis 2

To test H2: Patients exposed to animated videos before dental procedures will demonstrate more preparedness for decision-making ( $\mu_{DCG} < \mu_{DEG}$ ). An independent sample t-test was conducted to compare the Preparedness for the Control and Experimental groups. The results calculated outcomes means, standard deviation (SD), and standard errors of the mean (SEM) were compared in the group. In SD (Control group =7.80 and Experimental group =11.13). The experimental group has a larger standard deviation compared to the Control group, indicating greater variability in the Experimental group.

**Table 5**

Group Statistics for Preparedness of Decision-making

	Mean	Std. Deviation	Std. Error Mean
Control Group	29.90	7.80	1.00
Experimental Group	41.65	11.13	1.44

Note: (N=120, where Control group=60 and Experimental Group=60)

Independent sample T-test was conducted, and Levene's test was first observed to check whether equal variance in any groups was assumed as the value of  $p < 0.01$ . The Control group (M=29.90, SD=7.80) scored less than the Experimental group (M=41.65, SD=11.13) in conditions ( $t(118) = -6.70, p < 0.01$ ).

**Table 6**

Independent Sample T-test for Preparedness for Decision-making

t-test for Equality of Means							
						95% Confidence Interval of the Difference	
	t	df	p	Mean Difference	Std. Error Difference	Lower	Upper
Equal variances not assumed	-6.70	105.66	.00	11.75	1.75	-15.23	-8.27

Note: Levene's test for equality of means is 0.002, Sig. (2-tailed) = p

The mean and standard deviation scores show a substantial difference in variance and mean across the groups studied. The t-value represents the size of the difference between the groups, which was -6.70, whereas the negative value shows the direction. 0.95% Confidence interval of the Difference, the Lower interval is -15.23, and the upper interval is -8.27. These statistics support hypothesis H2 as exposure to animated videos has more effect on patients' preparedness for decision-making compared to those not exposed.

### Hypothesis 3

The hypotheses formulated focus on the relationship of age, gender, and education level on the anxiety level of the patients in the Experimental group.

**H3<sub>a</sub>:** There is a significant relationship between age and patients' levels of anxiety. Older patients exhibit higher levels of anxiety as compared to younger patients when exposed to an animated video.

**H3<sub>b</sub>:** There is a significant relationship between gender and patients' levels of anxiety. Female patients exhibit higher levels of anxiety as compared to male patients when exposed to an animated video.

**H3<sub>c</sub>:** There is a significant relationship between education level and patients' levels of anxiety. Patients with higher education levels exhibit lower levels of anxiety as compared to patients with lower education levels when exposed to an animated video.



**Table 7**

*Regression Analysis of Anxiety for Age, Gender, and Education Level*

Hypothesis	B	$\beta$	R <sup>2</sup>	F	t	p	Results
H3 <sub>a</sub>	-.15	-.01	.00	.01	-.13	.90	Not Supported
H3 <sub>b</sub>	-4.30	-.12	.02	1.74	-1.32	.19	Not Supported
H3 <sub>c</sub>	-2.54	-.19	.04	4.46	-2.11	.04*	Supported

Note: \* $p < 0.05$

The table shows the results of a Regression Analysis to examine the relationship between age, gender, educational level, and anxiety levels in patients. The hypotheses H3<sub>a</sub> and H3<sub>b</sub> were not supported due to their *P*-value (.90 and .19) not being significant. H3<sub>c</sub> was supported as the *p*-value is .04, indicating a small but significant negative relationship. The results indicated that age and gender did not significantly predict anxiety levels. Despite having a low explained variance (R<sup>2</sup>) of .04, H3<sub>c</sub> remains statistically significant.

### Hypothesis 4

The hypotheses formulated focus on the relationship of age, gender, and education level to patients' preparedness for decision-making in the experimental group.

- H4<sub>a</sub>:** There is a significant relationship between age and patients' preparedness for decision-making. Younger patients demonstrate more preparedness for the decisions than older patients when exposed to an animated video.
- H4<sub>b</sub>:** There is a significant relationship between gender and patients' preparedness for decision-making. Male patients demonstrate more preparedness for decisions than female patients when exposed to an animated video.
- H4<sub>c</sub>:** There is a significant relationship between education level and patients' preparedness for decision-making. Patients with higher education levels demonstrate more preparedness for decisions than patients with lower education levels when exposed to an animated video.

**Table 8**

*Regression Analysis of Preparedness for Decision-making for Age, Gender, and Education Level*

Hypothesis	B	$\beta$	R <sup>2</sup>	F	t	p	Results
H4 <sub>a</sub>	-1.26	-.16	.03	3.05	-1.75	.08	Not Supported
H4 <sub>b</sub>	.37	.02	.00	.03	.18	.86	Not Supported
H4 <sub>c</sub>	2.44	.29	.08	10.84	3.3	.001*	Supported

Note: \* $p < 0.05$

The table shows the results of a Regression Analysis to examine the relationship between age, gender, educational level, and preparedness for decision-making in patients. The hypotheses H4<sub>a</sub> and H4<sub>b</sub> were not supported due to their *P*-value (.08 and .86) not being significant. H4<sub>c</sub> was supported because the *p*-value is .001, indicating a significant positive relationship explaining 8% of the variance (R<sup>2</sup>=.08). The results have indicated that age and gender did not significantly predict the preparedness of decision-making of the patients, whereas educational level has a significant and meaningful impact.

### Findings and Discussion

Advancements in technology-mediated tools for instructional purposes engage people's attention and provide an understanding of implicit information through animations (Saade et al., 2011). Because animation can link abstract concepts and processes into something concrete and relevant, it has become increasingly popular today. It also adapts well to complicated ideas and conveys them in an intelligible manner (Puspaningtyas & Ulfa, 2020). Creating an engaging learning environment with non-textual elements such as gestures, tone, sound, and background music might increase engagement and motivation (Unal Çolak & Ozan, 2012). Animation influences Information recall based on previous experiences (Khanum et al., 2015). Animated videos uniquely capture attention and retain an interest in the subject (Rashid et al., 2024).

A significant impact on patients' preoperative anxiety was revealed through the study findings, indicating that the animated videos may affect the anxiety levels of the patients, supporting the hypothesis. Health information dissemination through various channels to the public may help shape their attitudes about healthcare practices and encourage them to adopt positive healthcare behaviors as preventive measures (Turon et al., 2023). Dental procedures usually result in a complex phenomenon, such as anxiety's psychosomatic effects, that may exacerbate the perioperative process (Omezli et al., 2020).

The concept of dental anxiety is a complex phenomenon with behavioral, cognitive, and physiological elements (Al-Khotani et al., 2016). Exposure to interventions such as animated videos before dental procedures may better prepare patients to make informed decisions about their treatment alternatives. Video support is simple to implement and has the potential to be widely distributed across different media. Additional versions of the animated videos could be produced in multiple languages for further invasive procedures and in medical settings (Lattuca et al., 2018).

The relationship between age and anxiety, according to this study, has revealed that interventions, such as animated videos, might be equally effective or ineffective in reducing anxiety across different age groups. Numerous studies on how age affects a patient's anxiety have produced generally conflicting results. The results are consistent with previous studies indicating that psychological characteristics of the individual have a stronger impact on anxiety than demographic characteristics such as age (Salzmann et al., 2021). Gender may not be a crucial consideration when putting into practice an intervention to lower patient anxiety levels, as evidenced by the lack of a significant correlation between gender and exposure to animated videos. There was no variation in the anxiety levels of patients during medical operations based on their gender (Auerbach et al., 2005).

The results reveal that clinical practices indicate that lowering anxiety in patients having dental treatments may be achieved by implementing an intervention for patients with higher educational levels. To maximize the efficacy of the intervention in clinical settings, future studies could examine the intricacy and depth of the information presented through animated movies. Higher educated people might be more capable of taking in and assimilating the knowledge provided, which would lower their anxiety levels. Higher educated people might be more capable of taking in and assimilating the knowledge provided, which would lower their anxiety levels. This suggests that the effectiveness of animated videos is moderated by educational attainment, most likely as a result of variations in cognitive processing abilities and health literacy (Mayer et al., 2014).

Patients who have watched animated videos do not seem to be considerably more or less prepared to make decisions based on their age. Age did not significantly affect the effectiveness of animated movies in medical education in terms of increasing knowledge and readiness for making decisions. Rather, the videos' structure and substance were crucial in keeping patients interested and helping them understand. (Hoban, 2007; Hacker & Wignall, 1997).

There was no substantial correlation between gender and decision-making readiness. It implies that the efficiency of seeing animated movies of dental operations before surgery is not significantly influenced by a person's gender. Patient decision-making preparedness is significantly influenced by educational attainment. Better understanding and coping mechanisms are often associated with higher education levels, which reduce worry and increase readiness. Higher-educated patients are more aware and informed in decision-making regarding their medical care (Rafiq et al., 2014).

## Conclusion

The present study revealed that the effects of exposure to animated videos of dental procedures may affect patient's anxiety levels and decision-making processes. Demographic factors such as age, gender, and educational level may play a decisive role in determining the targeted audiences, which may be affected by the implementation of the intervention. According to the results of the investigation through RCT, the Age, and gender of the patient may not be the predictors in alleviating anxiety and making more informed decisions, whereas an education level significantly affects the patient in alleviating anxiety and demonstrating more preparedness for decision-making.





## References

- Abdullah, M., & Zakar, P. D. R. (2020). Health literacy in South Asia: Clarifying the connections between health literacy and wellbeing in Pakistan. *South Asian Studies*, 34(2), 569–582. <http://111.68.103.26/journals/index.php/IJSAS/article/view/3286>
- Al-Khotani, A., Bello, L. A., & Christidis, N. (2016). Effects of audiovisual distraction on children's behaviour during dental treatment: a randomized controlled clinical trial. *Acta Odontologica Scandinavica*, 74(6), 494–501. <https://doi.org/10.1080/00016357.2016.1206211>
- Auerbach, S. M., Kendall, P. C., Cuttler, H. F., & Levitt, N. R. (1976). Anxiety, locus of control, type of preparatory information, and adjustment to dental surgery. *Journal of Consulting and Clinical Psychology*, 44(5), 809–818. <https://doi.org/10.1037//0022-006x.44.5.809>
- Baskaradoss, J. K. (2018). Relationship between oral health literacy and oral health status. *BMC Oral Health*, 18(1), 2–6. <https://doi.org/10.1186/s12903-018-0640-1>
- Bekker, H., Thornton, J. G., Airey, C. M., Connelly, J., Hewison, J., Robinson, M. B., ... & Pearman, A. D. (1999). Informed decision making: An annotated bibliography and systematic review. *Health Technology Assessment*, 3(1). <https://doi.org/10.3310/hta3010>
- Bennett, C., Graham, I. D., Kristjansson, E., Kearing, S. A., Clay, K. F., & O'Connor, A. M. (2010). Validation of a preparation for decision making scale. *Patient Education and Counseling*, 78(1), 130–133. <https://doi.org/10.1016/j.pec.2009.05.012>
- Braveman, P., Egerter, S., & Williams, D. R. (2011). The social determinants of health: Coming of age. *Annual Review of Public Health*, 32(1), 381–398. <https://doi.org/10.1146/annurev-publhealth-031210-101218>
- Caltabiano, M. L., Croker, F., Page, L., Sklavos, A., Spiteri, J., Hanrahan, L., & Choi, R. (2018). Dental anxiety in patients attending a student dental clinic. *BMC Oral Health*, 18(1), 2–6. <https://doi.org/10.1186/s12903-018-0507-5>
- Cuan-Baltazar, J. Y., Muñoz-Perez, M. J., Robledo-Vega, C., Pérez-Zepeda, M. F., & Soto-Vega, E. (2020). Misinformation of COVID-19 on the internet: infodemiology study. *JMIR public health and surveillance*, 6(2), e18444. <https://doi.org/10.2196/18444>
- Hacker, K. L., & Wignall, D. L. (1997). Issues in predicting user acceptance of computer-mediated communication (CMC) in inter-university classroom discussion as an alternative to face-to-face interaction. *Communication Reports*, 10(1), 107–114. <https://doi.org/10.1080/08934219709367664>
- Hoban, G., Loughran, J., & Nielsen, W. (2011). Slowmotion: Preservice elementary teachers representing science knowledge through creating multimodal digital animations. *Journal of Research in Science Teaching*, 48(9), 985–1009. <https://doi.org/10.1002/tea.20436>
- Karsten, J., Nolen, W., Penninx, B., & Hartman, C. (2011). Subthreshold anxiety better defined by symptom self-report than by diagnostic interview. *Journal of Affective Disorders*, 129(1–3), 236–243. <https://doi.org/10.1016/j.jad.2010.09.006>
- Khan, F., & Khanum, N. (2021). Need Assessment through Animation in TV Food Advertisements: An Experimental Study. *Journal of Behavioral Sciences*, 31(2), 190–214.
- Khanum, N., Shareef, A., & Khanam, F. (2015). The effects of animation in TV commercials on information recall. *Academic Research International*, 6(3), 349–358.
- Lattuca, B., Barber-Chamoux, N., Alos, B., Sfaxi, A., Mulliez, A., Miton, N., Lévassieur, T., Servoz, C., Derimay, F., Hachet, O., Motreff, P., Metz, D., Lairez, O., Mewton, N., Belle, L., Akodad, M., Mathivet, T., Ecartot, F., Pollet, J., ... Bouleti, C. (2018). Impact of video on the understanding and satisfaction of patients receiving informed consent before elective inpatient coronary angiography: A randomized trial. *American Heart Journal*, 200, 67–74. <https://doi.org/10.1016/j.ahj.2018.03.006>
- Mayer, K. U. (2009). New directions in life course research. *Annual review of sociology*, 35(1), 413–433. <https://doi.org/10.1146/annurev.soc.34.040507.134619>
- Mayer, R. E. (1997). Multimedia learning: Are we asking the right questions? *Educational Psychologist*, 32(1), 1–19. [https://doi.org/10.1207/s15326985ep3201\\_1](https://doi.org/10.1207/s15326985ep3201_1)
- Mayer, R. E. (2014). Incorporating motivation into multimedia learning. *Learning and Instruction*, 29, 171–173. <https://doi.org/10.1016/j.learninstruc.2013.04.003>

- Mehrabi, R., Sheikshoaei, F., Changizi, V., Poursalehi, N., Mehdizadeh, M., & Pak, F. (2024). Designing a model for production of children's health information content in radiology centers: A case study. *Iranian Journal of Pediatrics*, 34(2). <https://doi.org/10.5812/ijp-141825>
- Meppelink, C. S. (2016). *Designing digital health information in a health literacy context*. Universiteit van Amsterdam.
- Meskó, B., Drobni, Z., Bényei, É., Gergely, B., & Gyórfy, Z. (2017). Digital health is a cultural transformation of traditional healthcare. *mHealth*, 3, 38-38. <https://doi.org/10.21037/mhealth.2017.08.07>
- Moorhead, S. A., Hazlett, D. E., Harrison, L., Carroll, J. K., Irwin, A., & Hoving, C. (2013). A new dimension of health care: Systematic review of the uses, benefits, and limitations of social media for health communication. *Journal of Medical Internet Research*, 15(4), e85. <https://doi.org/10.2196/jmir.1933>
- Omezli, M. M., Torul, D., & Kahveci, K. (2020). Does watching videos increase the perioperative anxiety in patients undergoing third molar surgery? A randomized trial. *Journal of Oral and Maxillofacial Surgery*, 78(2), 216.e1-216.e9. <https://doi.org/10.1016/j.joms.2019.09.027>
- Puspaningtyas, N. D., & Ulfa, M. (2020). Improving students learning outcomes in blended learning through the use of animated video. *Kalamatika: Jurnal Pendidikan Matematika*, 5(2), 133-142. <https://doi.org/10.22236/kalamatika.vol5no2.2020pp133-142>
- Rafiq, M., Keel, G., Mazzocato, P., Spaak, J., Guttmann, C., Lindgren, P., & Savage, C. (2019). Extreme consumers of health care: Patterns of care utilization in patients with multiple chronic conditions admitted to a novel integrated Clinic. *Journal of Multidisciplinary Healthcare*, 12, 1075-1083. <https://doi.org/10.2147/jmdh.s214770>
- Rashid, N., Khanum, N., & Khan, F. R. (2024). The effect of animation as a teaching tool on students' learning – an experimental study. *Media Literacy and Academic Research*, 7(1), 129-144. <https://doi.org/10.34135/10.34135/mlar-24-01-07>
- Saadé, R. G., & Alkhorri, C. (2011). Technology mediated learning: Observations in two technologies. *Issues in Informing Science and Information Technology*, 8, 395-408. <https://doi.org/10.28945/1426>
- Salzmann, S., Rienmüller, S., Kampmann, S., Euteneuer, F., & Rüschi, D. (2021). Preoperative anxiety and its association with patients' desire for support – an observational study in adults. *BMC Anesthesiology*, 21(1). <https://doi.org/10.1186/s12871-021-01361-2>
- Turon, H., Wolfenden, L., Finch, M., McCrabb, S., Naughton, S., O'Connor, S. R., Renda, A., Webb, E., Doherty, E., Howse, E., Harrison, C. L., Love, P., Smith, N., Sutherland, R., & Yoong, S. L. (2023). Dissemination of public health research to prevent non-communicable diseases: A scoping review. *BMC Public Health*, 23(1). <https://doi.org/10.1186/s12889-023-15622-x>
- Unal-colak, F., & Ozan, O. (2012). The Effects Of Animated Agents On Students' Achievement And Attitudes. *Turkish Online Journal of Distance Education*, 13(2), 96-111. <https://dergipark.org.tr/en/pub/tojde/issue/16900/176146>
- Yang, Q., Wu, Z., Xie, Y., Xiao, X., Wu, J., Sang, T., Zhang, K., Song, H., Wu, X., & Xu, X. (2021). The impact of health education videos on general public's mental health and behavior during COVID-19. *Global Health Research and Policy*, 6(1), 2-11. <https://doi.org/10.1186/s41256-021-00211-5>