

Development and Evaluation of Polymer-based Educational Materials for Reducing Anxiety During MRI Scans

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Abstract

Magnetic Resonance Imaging (MRI) scans are crucial diagnostic tools, but patient anxiety can hinder successful completion of the procedure. This study investigates the design, development, and evaluation of educational materials fabricated from polymers for use in reducing anxiety in patients undergoing MRI scans. We aimed to create informative and user-friendly materials using polymers due to their potential advantages, such as durability, visual appeal, and ease of disinfection. The educational materials encompassed information about the MRI procedure, potential sensations experienced during the scan, and relaxation techniques. The study involved a group of patients undergoing MRI scans. One group received the standard pre-procedural instructions, while the other group received the newly developed polymer-based educational materials in addition to standard instructions. Anxiety levels were measured before and after the intervention using validated scales. The results will be presented to assess the effectiveness of the polymer-based educational materials in reducing anxiety compared to the control group. Additionally, the durability, reusability, and user experience associated with the polymer materials will be evaluated. This study contributes to the development of innovative patient education tools while exploring potential applications of polymers in healthcare settings. By potentially reducing anxiety during MRI scans, these materials can improve patient experience and enhance the efficiency of medical procedures

Keywords: Polymers, MRI scan, anxiety, medical/diagnostic procedures, medical imaging

INTRODUCTION

Many individuals have experienced unease at some point in their lives. We can distinguish between two primary types of unease: trait unease and state unease. Trait unease relates to a person's overall tendency to feel anxious, while state anxiety refers to anxiety experienced at a particular moment.

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Patient distress may range from mild anxiety that can be eased with reassurance to severe panic attacks that might necessitate psychiatric treatment or medication. Sudden Occurrence of at least four of the following psychological reactions to Magnetic Resonance examinations are parenthesis, nausea, chest pain, palpitations, dyspnea, choking sensation, faintness, sweating, trembling, vertigo, fear of losing control or dying, and depersonalization [1].

Patients who fall victim to cancer, stroke, or accidents need to undergo various scans such as X-rays, Ultrasonography, Bone density scanning, Computed Tomography, PET scanning, and

Magnetic Resonance Imaging, etc. It is estimated that around 80 million people undergo MRI scanning procedures each year worldwide. Anxiety, fear, and claustrophobia torment the client who is about to go for an MR scan [2]. Studies have shown that between 5 % and 10% of people develop phobia related to MRI scans. nearly 25% of patients experience anxieties during the Magnetic Resonance Procedure manifested by increased motor unrest and the development of claustrophobia that requires special interventions resulting in hampering the course of the examination. Nearly 1.2% of patients cancel the procedure [3].

Moreover, it was discovered that 7% of clients had previously undiagnosed claustrophobia and required premature termination of the scanning procedure. This termination of MRI due to claustrophobia leads to the loss of valuable data that could help the medical team understand the condition of the client and treat him with better protocols. And this problem is not just with those who are claustrophobic, but anyone who goes for an MRI. Almost 30% of clients reported experiencing mild distress due to the requirement of remaining still in a confined space for an extended period [4]. Studies have also indicated that the body part involved in the scanning, the gender of the patient, and the positioning of the patient in the Magnetic Resonance Machine also led to terminated MRIs [5]. Nurses play a crucial role in preparing patients for scanning procedures before, during, and after the MRI scan. If tailored preparation and execution of examinations contribute to patient comfort during an MRI, it will result in benefits for both patient well-being and resource utilization efficiency [6].

In our research a study assessing the effectiveness of pre-procedural teaching on anxiety levels in patients undergoing MR Imaging at a chosen hospital in Dehradun, Uttarakhand is undertaken wherein the objectives will be to evaluate the anxiety levels among patients undergoing MR imaging. Further assessing the effectiveness of the impact of pre-operative teaching on the level of trait unease among patients undergoing MR imaging. We will try to measure the effectiveness of the impact of pre-operative teaching on the level of trait unease among patients undergoing MR imaging. Finally will explore the association between the level of state unease and certain demographic variables and the association between the level of trait unease and specific demographic variables.

METHOD

A quantitative approach employing a quasi-experimental design was utilized to assess the impact of pre-operative teaching on unease levels. Participants were randomly allocated to either experimental or control groups. The research was conducted at a tertiary care hospital in Dehradun, involving patients undergoing MRI of the head, neck, thorax, or abdomen. A total of 69 patients were enrolled using consecutive sampling, encompassing all eligible patients. Data collection occurred over 2 weeks. Upon enrollment, patients were randomly assigned to either group using the chit method. Pre-and post-levels of anxiety were evaluated using the State-Trait Anxiety Inventory.

RESULTS

Table 1 demonstrates that most study participants were between 43-52 years. Most of the samples in the trial group were male (62.9%) and the control group were females (55.9%), majority were graduates, (42.9%) (38.2%) and were unemployed (40.0%), (47.5%). In both experimental and control groups very few samples (8.6%), (14.7%) had any previous knowledge regarding MRI procedure. Most of the patients in both groups (77.1%) (82.4%) were scheduled to undergo the scanning of the head region.

Figure 1 depicts the pre-and post-anxiety levels of State Anxiety for both groups. It was observed that most samples in both groups exhibited moderate levels of anxiety. However, the number of samples experiencing severe anxiety was more than double in the control group.

Figure 2 illustrates that overall; the trait anxiety was almost similar in all the groups. The samples experiencing mild anxiety were more in both groups as compared to those experiencing moderate anxiety.

Table 1. Occurrence and percentage dispersion of the baseline data.

S.N.	Demographic Variable		Groups		X ²	'p' value
			Experimental (n ₁ = 35)	Control (n ₂ = 34)		
			F (%)	F (%)		
1	Age	22.5–32.5 Yrs.	8 (22.9)	3 (8.8)	4.84	.304
		32.5–42.5 Yrs.	6 (17.1)	6 (17.6)		
		42.5–52.5 Yrs.	10 (28.6)	11 (32.4)		
		52.5–62.5 Yrs.	6 (17.1)	7 (20.6)		
		62.5–72.5 Yrs.	5 (14.3)	7 (20.6)		
2	Gender	M (Male)	22 (62.9)	15 (44.1)	0.36	.547
		F (Female)	13 (37.1)	19 (55.9)		
3	Educational Qualification	Primary	4 (11.4)	9 (26.5)	19.40	.001
		Secondary	4 (11.4)	5 (14.7)		
		Senior Secondary	7 (20.0)	3 (8.8)		
		Graduation	15 (42.9)	13 (38.2)		
		Post Graduation	5 (14.3)	4 (11.8)		
4	Occupation	Government Job	5 (14.3)	7 (20.6)	12.91	.005
		Private Job	6 (17.1)	9 (26.5)		
		Self Employed	10 (28.6)	2 (5.9)		
		Unemployed	14 (40.0)	16 (47.5)		
5	Knowledge regarding MRI Procedure	Yes	3 (8.6)	5 (14.7)	40.71	.001
		No	32 (91.4)	29 (85.3)		
6	The region of the body to be scanned	Head	27 (77.1)	28 (82.4)	66.87	.001
		Neck	0 (0.00)	0 (0.00)		
		Thorax	4 (11.4)	2 (5.9)		
		Abdomen	4 (11.4)	4 (11.8)		

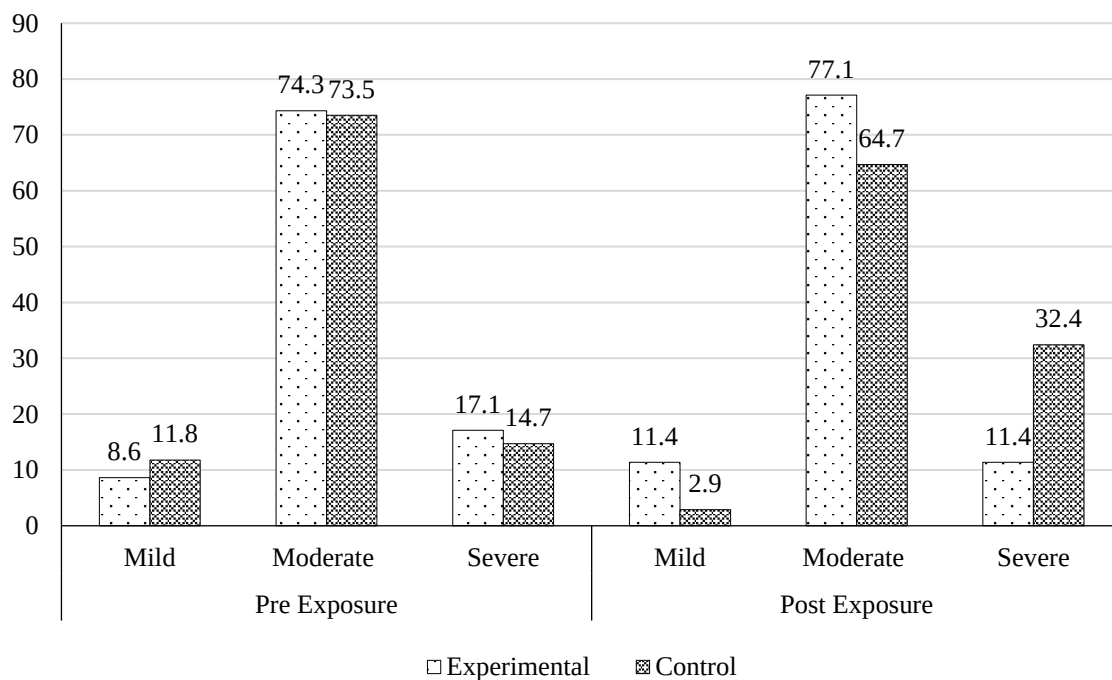


Figure 1. Assessment of state anxiety levels.

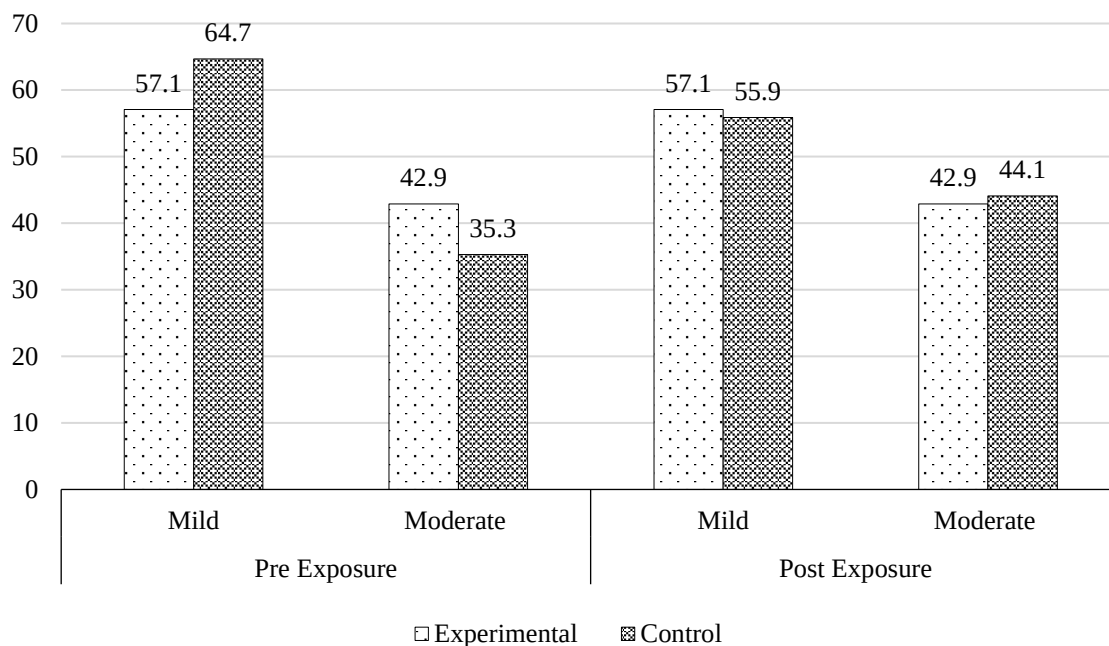


Figure 2. Assessment of trait anxiety levels.

Table 2. Comparison of the state anxiety levels between the trial and control groups.

(n, experimental = 35; Control=34)

Groups	Pre-Experience Mean ± SD	Post Experience Mean ± SD	Mean Difference	Paired 't' Value	'p' Value	95% CI	
						Lower	Upper
Experimental Group (df=34)	53.20 ± 8.51	49.03 ± 7.35	4.171	7.91	.001*	3.10	5.24
Control Group (df=33)	52.47 ± 7.99	55.44 ± 8.10	2.97	2.63	0.13	-5.27	-0.67

Table 2 shows the pre and post-exposure comparison of state unease among the two groups. The difference of means in the experimental group was 4.171 and was statistically significant. Contrastingly the difference in the control group was not statistically different.

Table 3. Contrast of state anxiety level of experimental and control groups.

Groups	Pre-Experience Mean ± SD	Post Experience Mean ± SD	Mean Difference	Paired 't' Value	'p' Value	95% CI	
						Lower	Upper
Experimental Group (df=34)	38.3 ± 4.6	39.40 ± 4.51	-1.114	-3.892	.001*	-1.696	-0.532
Control Group (df=33)	37.9 ± 5.31	38.30 ± 5.45	-0.353	-1.612	0.116	-0.798	-0.092

Table 3 shows the pre and post-exposure comparison of Trait anxiety among the two groups. The difference of means in the experimental group was -1.114 and was statistically significant. On the contrary, the distinction in the control group did not reach statistical significance.

Table 4 shows that there was no notable correlation between sociodemographic variables and pre-exposure state anxiety levels except in the patients' educational qualification and the patients who had previous knowledge regarding Magnetic Resonance Imaging. The table shows that most (96.7%) of the patients who had no previous knowledge regarding magnetic resonance imaging had moderate to severe

anxiety during the scan. Out of those who had previous knowledge regarding MRI, the majority (62.5%) had mild anxiety during the scan. The chi-square showed a significant association between previous knowledge of MRI and the level of anxiety had a significant association.

Table 4. Association between state anxiety and selected demographic variables.

S.N.	Demographic Variable		Mild	Moderate	Severe	X ² /Fisher's Exact	'P' Value
1	Age	22.5–32.5 Yrs.	1 (9)	9 (82)	1 (9)	3.904	9.13
		32.5–42.5 Yrs.	0	9 (75)	3 (25)		
		42.5–52.5 Yrs.	4 (19)	14 (67)	3 (14)		
		52.5–62.5 Yrs.	1 (8)	10 (77)	2 (15)		
		62.5–72.5 Yrs.	1 (8)	9 (75)	2 (17)		
2	Gender	M (Male)	5 (14)	27 (72)	5 (14)	1.175	.566
		F (Female)	2 (6)	24 (75)	6 (19)		
3	Educational Qualification	Primary	2(15.4)	9(69.2)	2(15.2)	14.116	.028
		Secondary	0	6(66.7)	3(33.3)		
		Senior Secondary	1(1)	9(9)	0		
		Graduation	1(3.6)	24(85.7)	3(10.7)		
		Post Graduation	3(33.3)	3(33.4)	3(33.3)		
4	Occupation	Government Job	3(25)	8(66.6)	1(8.4)	4.127	.672
		Private Job	1(6.7)	12(80)	2(13.3)		
		Self Employed	1 (8)	8 (67)	3 (25)		
		Unemployed	2 (7)	23 (77)	5 (17)		
5	Knowledge regarding MRI Procedure	Yes	5 (62.5)	3 (37.5)	0	16.555	.001
		No	2 (2.9)	48 (78.6)	11 (18.1)		
6	The region of the body to be scanned	Head	6 (11)	40 (73)	9 (16)	.834	1.000
		Thorax	0	5 (83)	1 (17)		
		Abdomen	1 (13)	6 (74)	1 (13)		

DISCUSSION

Pre-procedural teaching was administered to patients before scanning, and upon statistical evaluation, it was determined to be highly effective in reducing state anxiety. Similar studies have been conducted by various authors to assess the effectiveness of different interventions on anxiety levels. The results of this research study were supported by Entsar Kamel Mohammed, Josephin Atef, Howida Abu Ellife [7] conducted a study to evaluate the effectiveness of health instructions in reducing unease levels and claustrophobia among female adolescents undergoing MRI. The study concluded that health instructions are essential for reducing anxiety during MRI procedures and recommended implementing a structured program for patients unable to complete the procedure successfully or return for additional MRI scans. Rosa Maria Pinto Escudero, Elisa Harumi Kozasa, and José Roberto Leite J [8], Conducted a study aimed at alleviating fear and anxiety in patients undergoing Magnetic Resonance examinations. The study concluded that the group receiving a combination of interventions was the most effective. Susan J Grey, Geraint Price, Andrew Mathews [9]. Developed an unease reduction protocol and evaluated its suitability for standard implementation with neurology and neuropsychiatry patients undergoing brain or spinal scans. Results indicated that the experimental group demonstrated markedly reduced anxiety levels compared to the control group. Additionally, the study discovered that anxiety related to scans can be mitigated by implementing straightforward modifications to MR imaging procedures. Selim MA [10]. Performed research to assess the influence of pre-instruction on anxiety levels among patients undergoing MRI scanning. Results indicated a notable reduction in unease levels within the experimental group in contrast to the control group.

CONCLUSION

The evaluation of the impact of pre-procedural education on the unease levels of patients undergoing MRI in selected hospitals in Dehradun, Uttarakhand, underscores the significance of patient-centered care in healthcare settings. By providing comprehensive education and information to patients before undergoing MRI procedures, healthcare providers can effectively alleviate anxiety and unease levels, ultimately enhancing the overall patient experience. The findings of this study highlight the importance of implementing pre-procedural education interventions as standard practice in radiology departments, with potential benefits for patient well-being, satisfaction, and adherence to medical recommendations. Moving forward, continued research and quality improvement efforts are essential to further refine and optimize pre-procedural education strategies, ensuring that patients receive the support and reassurance they need to undergo MRI procedures with confidence and comfort. Ultimately, prioritizing patient education and empowerment contributes to a more compassionate, responsive, and patient-centered healthcare environment in Dehradun and beyond.

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