

Pediatric MRI Experience

MUSC Children's R. Keith Summey
Medical Pavilion

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Background

Magnetic resonance imaging (MRI) is a cornerstone of modern diagnostic medicine, providing high-resolution, radiation-free images with soft-tissue contrast. Despite these advantages, MRI poses unique challenges in treating pediatric populations due to prolonged scan times, the confined environment of the scanner, and high acoustic noise levels thereby causing anxiety and distress for children^{1,2}. Confined space within an MRI and loud acoustic environment has shown to evoke fear and distress of the exam and causes difficulty in remaining still among pediatric patients^{2,3}, all while the parents and families remain uncertain about “ins and outs” of the MRI procedure itself⁶.

Studies indicate that up to

50%
of children aged 2–5 years
and

35%
of those aged 6–7 years
prematurely terminate MRI scans
due to fear or discomfort^{3,4}

The success rates for non-sedated neuroradiologic MRI in children aged 1–7 years remain variable, with many examinations still requiring sedation to achieve diagnostic-quality images⁵.



About MUSC

Facility: MUSC Children's R. Keith Summey Medical Pavilion, Charleston, South Carolina, USA

Hospital type: Pediatric outpatient facility at MUSC

Area of specialization: Pediatric radiology, MRI brain and spine exams

Equipment used: 3-Tesla MAGNETOM Vida (Siemens Healthineers)

Mission: Deliver innovative, compassionate, and patient-centered care

Customer Challenges and Goal

Operational workflows:

The need for rescheduling, sedation preparation, or repeat imaging due to patient anxiety and fear increases scan times and strains imaging department resources, ultimately affecting throughput and workflow efficiency.

Customer goal:

Enhance pediatric pre-scan preparedness and the overall MRI experience, which may help decrease exam duration, repeat imaging, and avoidable sedations



Study Overview

This cohort study was conducted at the MUSC Children's R. Keith Summey Medical Pavilion to evaluate the effects of preparatory education on pediatric MRI experience. The study population included children ages 4-10 years, along with their caregivers, undergoing abbreviated MRI protocols for brain and spine examinations from April to September 2025. All MRIs were performed on a 3-Tesla MAGNETOM Vida system at this outpatient pediatric facility.

The primary objective of this study was to:

- 1) Characterize the experiences of pediatric patients and their caregivers pre-, post- and during MRI examinations
- 2) Examine whether providing preparatory materials before the exam leads to greater patient ease and enhanced satisfaction

Participants were randomly assigned to one of two groups: experiment group—received preparatory MRI education materials prior to the exam, and control group—no additional preparation was provided prior to the exam. For the experiment group, child-life specialists contacted families to confirm participation and to share, as well as distribute, preparatory materials prior to the exam. Families received educational resources, including the storybook Baskin Gets an MRI and the children's VR app called Pengonaut Trainer that aims to prepare children for MRI scans. During the scan, patients could use MR-specific goggles to stream videos, listen to music, receive ear protection, and caregiver presence during the exam. Patients and their caregivers received surveys before and after the MRI exam to assess their comfort levels and overall satisfaction throughout the imaging experience. The results from these surveys are summarized below.

Results

Figure 1: Demographic breakdown of study participants

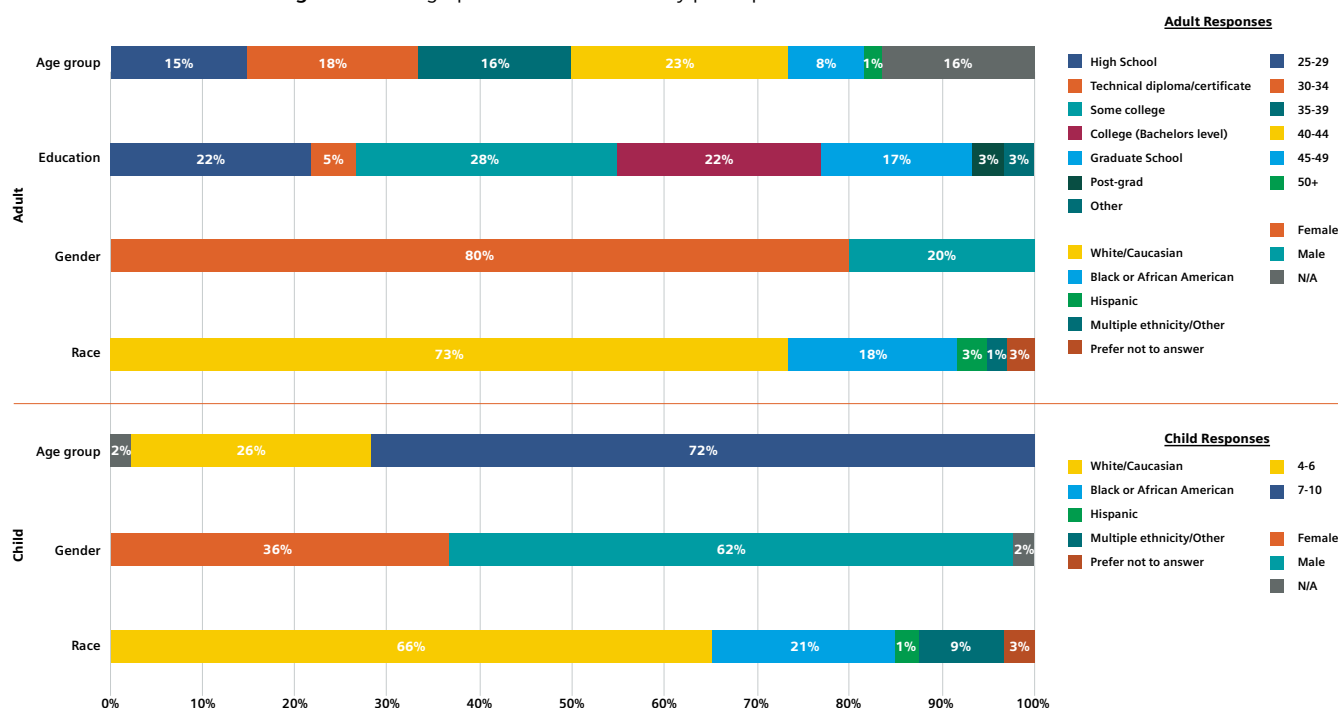


Figure 1: A total of 60 pediatric patients participated in the study, with 43 enrolled in the control group and 17 enrolled in the experiment group. One child participant did not share age or gender, this is represented as N/A in Figure 1. Among the children, 26% were between 4-6 years old, and 72% were between 7-10 years old. 36% of the children identified as female, and 62% identified as male. For race and ethnicity, 66% of the children identified as White or Caucasian, 21% identified as Black or African American, 1% as Hispanic, 9% as Multiple ethnicity/Other, and 3% preferred not to answer.

A total of 60 adult guardians participated in the study. 80% of the adult participants identified as female and 20% identified as male. 73% of the adults identified as White or Caucasian, 18% identified as Black or African American, 3% identified as Hispanic, 1% identified as Multiple Ethnicity/Other, and 3% preferred not to answer. 16% of the adult participants did not submit a response for age group, and 4 of those adults provided their child's age in place of their own; these responses were marked N/A in Figure 1. Of those who shared their age group, 15% of adults were between 25-29 years old, 18% were between 30-34 years old, 16% between 35-39 years old, 23% between 40-44 years old, 8% were between 45-49 years old, and 1% were over 50 years or older. Of the adults who shared their education history, 30% completed high school, a technical diploma/certificate or selected other, 50% had completed some college or a bachelor's degree, and 20% had completed graduate school or post graduate education.

Figure 2: Children responses in pre-exam survey

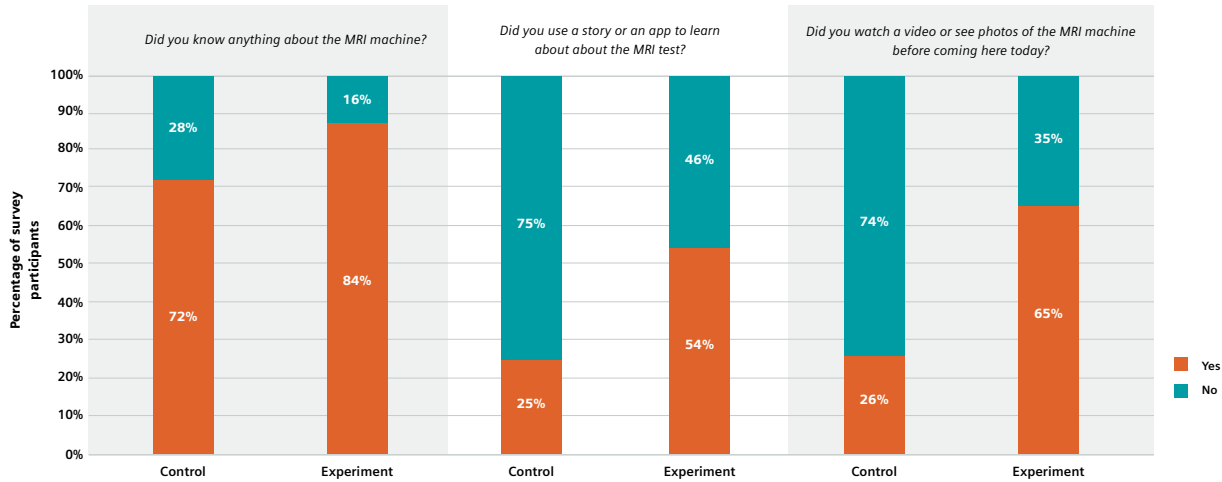


Figure 2: In the experiment group, 84% of the children shared they had knowledge of the MRI machine and familiarity with it prior to the exam, in contrast to 72% of the control group. 54% of the children in the experiment group had also used a story or an app to learn about the MRI scan prior to the exam, which is a sizable increase in using preparatory materials compared to 25% of the control group. Similarly, 65% of the experiment group shared they had watched a video or seen photos of the MRI machine prior to the exam, increasing familiarity with the MRI machine compared to the control group.

Figure 3: Guardian responses in pre-exam survey

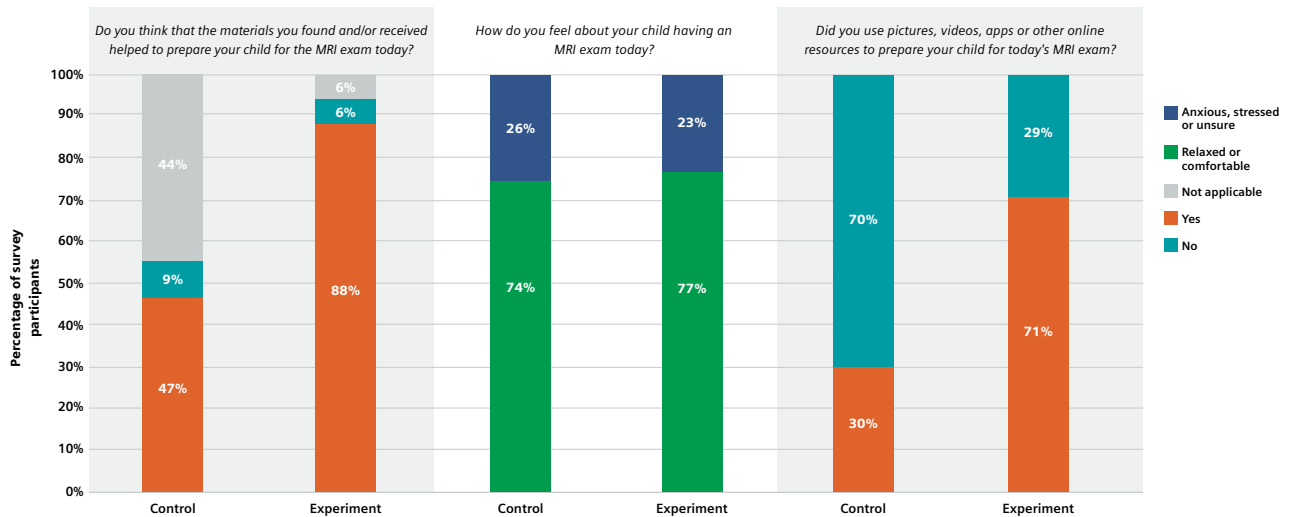


Figure 3: 88% of the guardians reported that the materials they found and/or received helped them prepare their child for the MRI exam, compared to 47% of the control group. 71% of adults in the experiment group reported using pictures, videos, apps or other online resources to prepare their child for the MRI exam, a notable contrast to 30% of the control group. In addition, accessing and using preparation materials is further supported by the finding that 77% of the adults in the experiment group reported feeling relaxed and comfortable about their child having an exam today, compared to 74% of the control group.

Figure 4: Children responses in post-exam survey

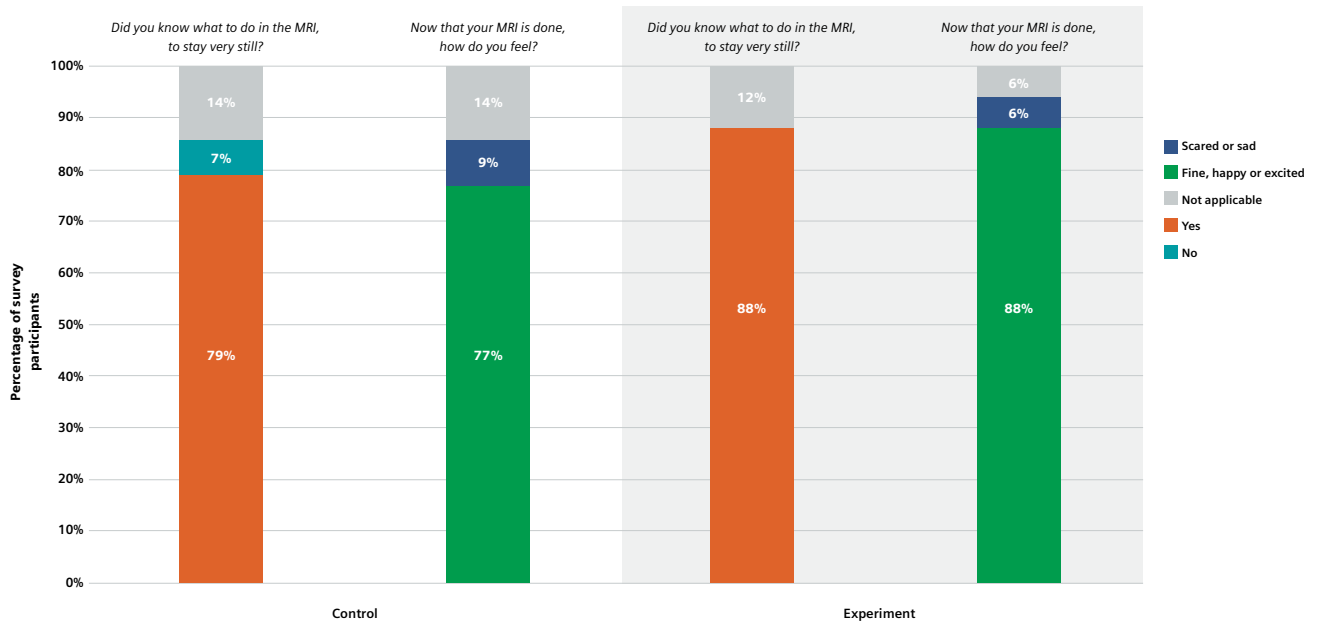


Figure 4: Among children in the experiment group, 88% reported positive feelings following their MRI exam, compared with 77% in the control group.

Figure 4: Children responses in post-exam survey

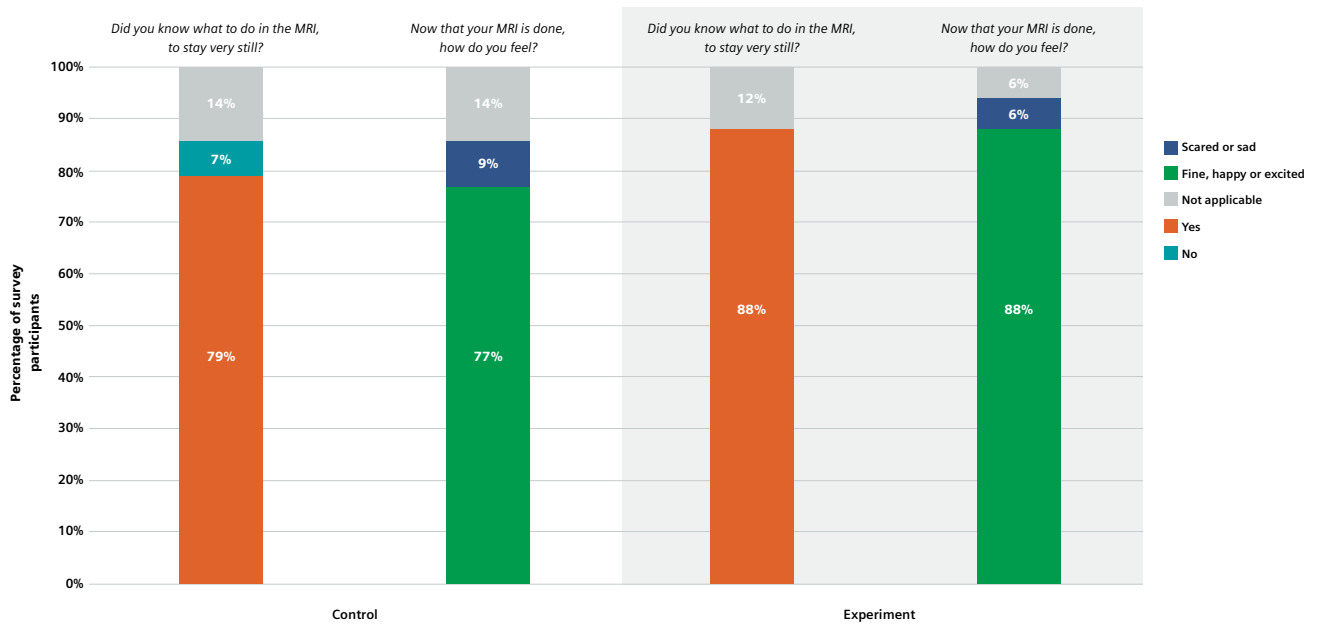


Figure 4: Following the MRI exam, among children in the experiment group, 88% reported positive feelings, compared with 77% in the control group. 88% of the experiment group reported they knew what to do during the MRI exam compared to 77% of the control group. The experiment group reported more awareness, education and reported reduced negative feelings about the MRI exam. This improvement may reflect the impact of preparatory materials that enhanced readiness before the scan.

Figure 5: Guardian responses to post-exam survey

If you received and/or used preparation materials, do you think they helped your child's experience?

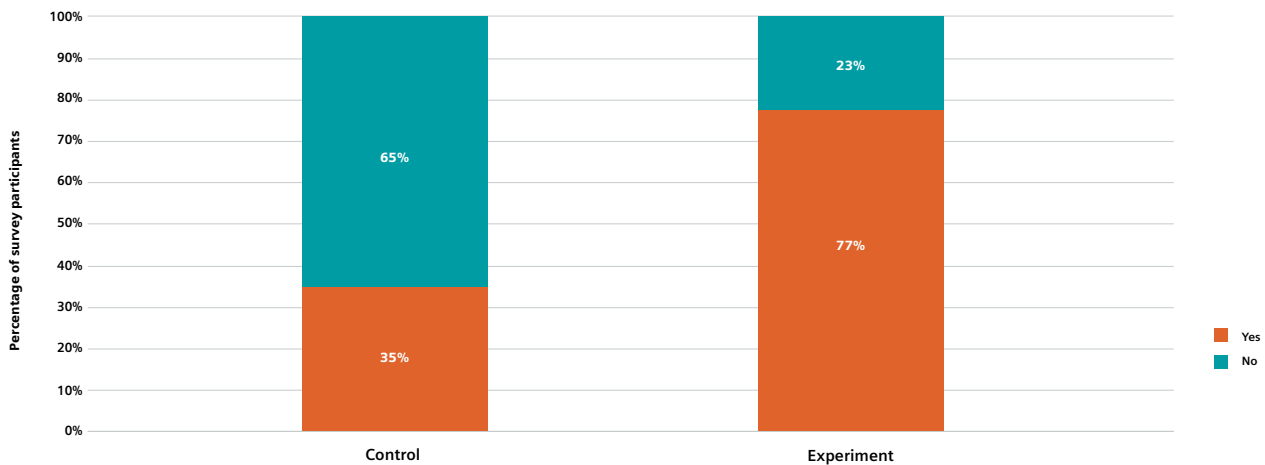


Figure 5: Similar to the children, 77% of guardians in the experiment group shared that using preparatory materials prior to the exam helped their child's MRI experience, compared to 35% of the control group. Access to preparation materials supported the guardians in the experiment group, thus resulting in a more positive MRI patient experience for their child and the adults.

Discussion

Children and their families in the experiment group were significantly more likely to use preparatory materials and have a positive impact on their experience during and after the MRI exam. Specifically, 30% of guardians in the control group reported using these materials compared with 71% of the experiment group. Moreover, both children and adults in the experiment group noted preparatory materials as being useful and reported greater positive feelings about the MRI exam. The study results suggest that even minimal exposure to structured pre-visit education can meaningfully influence how families prepare for imaging, potentially improving pediatric readiness for the exam.

Guardians in the experiment group were significantly more likely to report that preparatory materials they found and/or received were helpful in preparing their child for the MRI exam. Within the control group only 47% of guardians reported preparatory materials were helpful versus the 88% of the experiment group. These findings support that the structured materials sent via email were used and improved the perceived effectiveness, supporting greater confidence and readiness for families.

Research shows that a guardian's understanding of the procedure as well as their emotional response has a direct influence on how their child experiences the exam⁷. When families receive easy to understand, supportive education about what to expect, guardians' express confidence and less worry, and that reassurance is often mirrored by their children. This emphasizes why preparatory material reduces fear and stress around the MRI experience by introducing it prior to the exam. Guardians in the experiment group reported higher levels of preparedness and their children were able to indicate the same.

Children in the experiment group who received preparatory material were also more likely to indicate they were prepared for the exam. They were also able to report they understood something about the exam before arriving, and the importance of remaining still. Within the experiment group many also reported feeling happy or excited rather than fearful. This alignment between structured preparation and improved patient/guardian confidence highlights how important preparatory education materials can enhance the pediatric patient experience.

By providing families with easy-to-use materials prior to the visit, child life and clinical teams can extend their impact, improve workflow inefficiencies, and better allocate staff support to children and their families. Familiarity with the exam appointment protocol and the MRI scan environment can not only reduce uncertainty but also promote cooperation and lessen fear among children and their families. Importantly, improving preparedness may also contribute to reduced anesthesia use in pediatric imaging exams. When children arrive calmer, more informed, and better able to remain still, the reliance on sedation for successful imaging may decrease. While this study did not measure anesthesia rates directly, the improvements in preparedness and comfort offer promising indicators that such interventions could support safer, less resource-intensive imaging practices in the future. Thus, hospitals, clinics and outpatient facilities could integrate these materials into pre-appointment communication/scheduling, online portals, or mobile apps to standardize preparation across all patient populations.

Limitations

First, the small sample size limited the generalizability of the findings and reduced the statistical power to detect more nuanced effects. Additionally, since the study was conducted at a single institution, the results may not reflect the experiences of more diverse healthcare settings or patient populations. The reliance on self-reported data from guardians and children also potentially introduces the possibility of recall bias and social desirability bias, which may influence how participants describe their preparation and experience.

Ultimately, the study assessed only immediate outcomes and did not evaluate whether improvements in preparedness or reductions in patient ease are sustained over time. With these limitations, study findings support early evidence that preparatory materials prior to MRI exams can meaningfully enhance MRI readiness for pediatric patients. This study also offers actionable insights for future clinical practice and program development.

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Siemens Healthineers Headquarters

Siemens Healthineers AG
Siemensstr. 3
91301 Forchheim, Germany
siemens-healthineers.com

USA

Siemens Medical Solutions USA, Inc.
Healthcare
40 Liberty Boulevard
Malvern, PA 19355-9998, USA
siemens-healthineers.us