

Utility of Hand-on Scanning for Assimilating MRI concepts (www.learnmri.org)

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Purpose: To determine the effectiveness of hands-on MRI scanner exercises in teaching graduate students, medical students, residents, and fellows basic MRI concepts.

Methods: Hands on MRI scanner exercises were developed to guide an inexperienced operator through the tasks of 1) MRI safety and patient screening, 2) optimizing resolution, SNR and CNR on a phantom, 3) optimizing T1 and T2 weighting in the volunteer brain, 4) creating, identifying and eliminating various artifacts, 5) adapting scanning parameters to match varying anatomy in the volunteer knee and abdomen and 6) implementing various approaches to minimizing respiratory motion effects. Motivated MRI students, residents and fellows were surveyed before and after completing each workbook exercise to determine the impact on their level of MRI knowledge and ability. Survey questions were directed to the teaching points of each exercise. Wilcoxon signed rank test was used to determine the significance of changes in scores following exercises.

Results: For every subject the survey score increased following scanner exercises. No safety lapses occurred during the study. The mean survey score of 11 volunteers before hands-on MRI scanner exercises was 19.36 and this increased to 37.45 following the exercises ($p = 0.002$). Additional free form survey comments indicated workbook exercises were more enjoyable than just reading MRI books.

Discussion and Conclusion: Learning MRI is challenging. These data from 11 graduate students, medical students, residents, and fellows suggest that learning MRI by operating the MRI scanner instead of book reading can be an effective approach. This approach may be preferred when book reading has not been effective. Exercises are available at www.learnmri.org.

References: (1) McRobbie et al. (2003) MRI from Picture to Proton. Cambridge, UK: Cambridge University Press, chapters 3 & 6. (2) Schild (1999) MRI Made Easy (...well almost). Wayne, NJ: Berlex Laboratories, Inc. (3) Shellock (2006) Reference Manual for Magnetic Resonance Safety, Implants, and Devices: 2006 Edition. Los Angeles, CA: Biomedical Research Publishing Group and Shellock R & D Services, Inc, section I (4) Signa Horizon LX Reference Manual: A Training in Partnership Program (2003) Milwaukee, Wisconsin: General Electric Co.

STEP 5: Scanning the Phantom

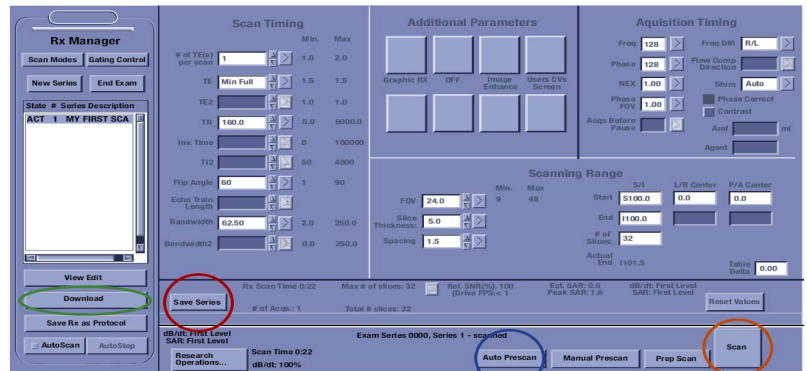


Fig 1.12 Scanning the Phantom

NOTE: Be sure to shut off automatic scan sending to the central computer. Click 'Scan Modes' on the Rx Manager. Select 'Research' for the Mode, turn off 'Auto Transfer by Exam' and 'Auto Transfer by Series' then Accept. This will not send the images to the workstation upon successful completion of the scan. REMEMBER TO DO THIS AT THE BEGINNING OF EVERY SCAN.

A. Once all the parameters are entered: Click **Save Series**, click **Download**, then click **Auto Prescan**.

If the scan does not start, check to see if the Move to Scan button on the keyboard is flashing. Press this button and click Auto Prescan again.

What is "Prescan"? We'll learn about that later.

B. Click **Scan**. Now you have to wait while the scanner collects the Fourier data. You can watch the Scan count down as the scan progresses.

Fig 1.12a Rx Manager



Fig 1 Sample screenshot of the MRI scanner exercise

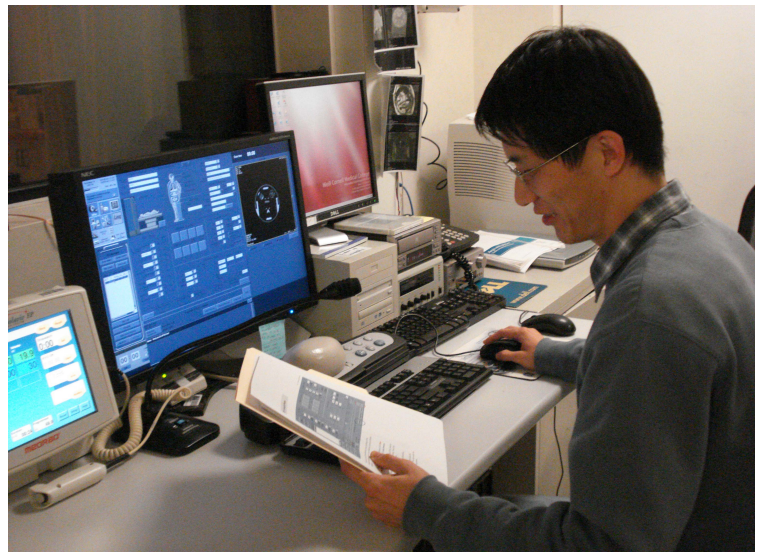


Fig 2 Volunteer trying out the exercise