

PEDRIATRIC NEUROIMAGING ACQUISITION AND ANALYSIS SUCCESS RATES AT AGES 5 AND 7 YEARS

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Introduction

This project aims to provide a guideline when deciding on the fraction of children to use, in different age ranges and their ability to tolerate scans of different length and the proportion of usable data.

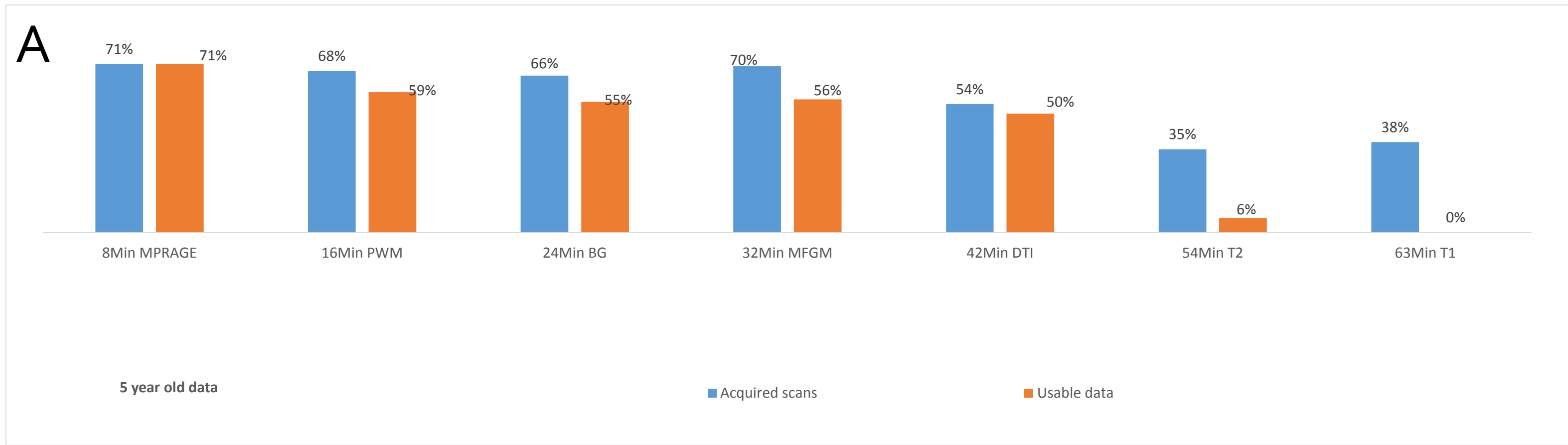
Methods

- Children from a longitudinal neuroimaging follow-on study (CHER trial) were scanned on a 3T Allegra (Siemens, Erlangen) using protocols approved by the Human Research Ethics Committees of the UCT.
- Age 5 : 136 children were recruited
- Age 7: 137 children were recruited.
- The scanning procedure was explained and practiced with a mock scan.
- During scanning they watched a movie of their choice and a research assistant remained with them throughout the scan [1]
- Protocol: MPRAGE (6 min); MRS in basal ganglia (BG), midfrontal gray matter (MFGM) and peritrigonal white matter (PWM) (6 min each); DTI (8 min); T2 (6 min) and T1 (11 min).
- At 7 years, the T1 acquisition was replaced with resting state BOLD (6 min) and DTI was acquired prior to MRS.
- The data were analyzed using Freesurfer, LCMoel, FSL and AFNI.

Results

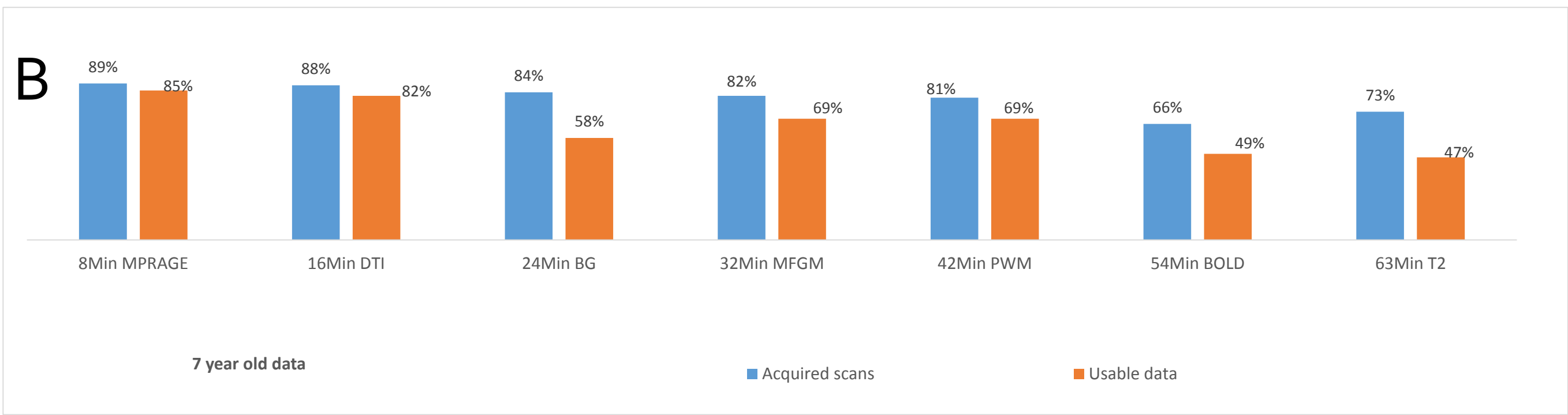
Age 5 years: (Chart A)

- 24 (18%) of the children were not attempted, and 32 (24%) were unsuccessful on the day of scan.
- 80(59%) of the children completed at least one acquisition
- 23 (17%) completed the entire protocol, and of these all the data were usable in less than half.
- Of the 112 children in whom scanning was attempted, MPRAGE data were acquired in 80 (71%) and were usable in all but one child.



Age 7 years: (Chart B)

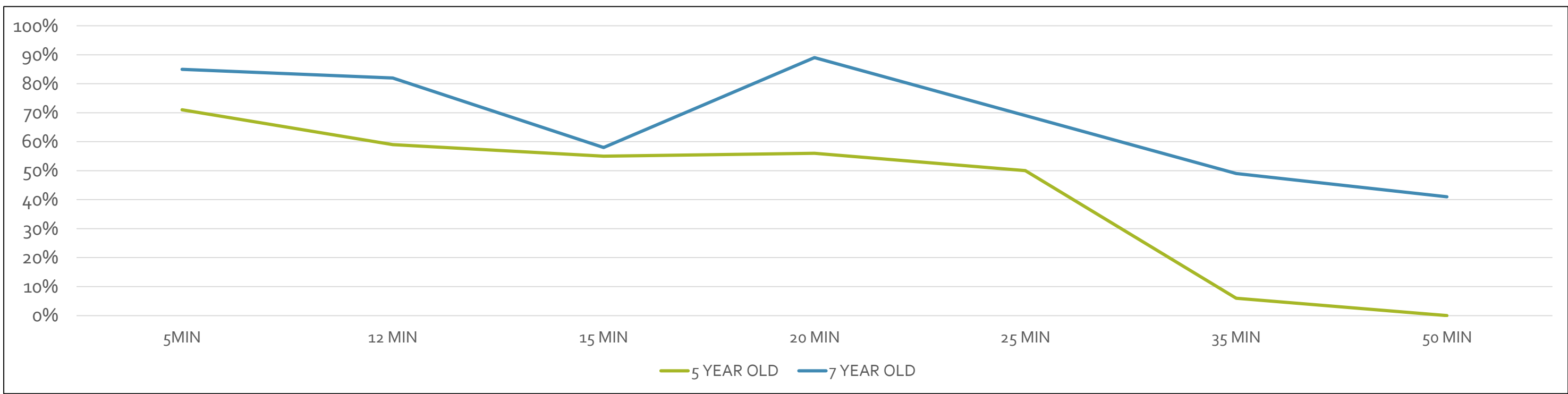
- 10 (7%) scans were unsuccessful.
- 75 (59%) were successful and 52(41%) were incomplete.
- In 29 (21%) of the children all of the data were successfully analyzed.
- Of the 127 children who provided some data, MPRAGE acquisitions were successful in 122 (96%) and data from 117 (92%) could be successfully analyzed.



Conclusion

- The success rate decreased with scan time.
- The success rate increased from, 71% at age 5 to 89% at age 7.
- The analyzability of the data were relatively consistent at both ages.
- 5 year old could keep still for an average of 43 min of scanning (this time includes roughly 15 minutes required for planning and shimming).
- 7 year old could manage 50 minutes (15 minutes for planning and shimming).

The results (below) show that 7 year olds tolerate longer scan times (from 43 to 50 minutes), and that quality of data acquired is similar across both ages.



References

[1] Naama Barnea-Goraly, Stuart A. Weinzimen, Katrina J. Rudy et al. 2014. High success rates of sedation-free brain MRI scanning in young children using simple subject preparation protocols with and without a commercial mock scanner. Paediatric Radiology; 44(2): 181–186

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