

Multi-Site Aging Study

Age-Normed Quality Assessment Report

Total Subjects: 4

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Executive Summary

This report presents the quality control assessment results for 4 subjects using age-normalized MRIQC metrics. The assessment applies age-appropriate thresholds to reduce false rejections in pediatric and aging populations. **Key Findings:** • 2 subjects (50.0%) passed quality control • 1 subjects (25.0%) failed quality control • 1 subjects require manual review The age-normalization approach helps ensure that quality assessments are appropriate for the subject's age group, reducing bias against younger and older participants.

Study Summary

Quality Distribution

Quality Status	Count	Percentage
Pass	2	50.0%
Warning	1	25.0%
Fail	1	25.0%
Uncertain	0	0.0%

Age Group Distribution

Age Group	Count	Percentage
Young Adult	2	50.0%
Middle Age	1	25.0%
Elderly	1	25.0%

Quality Metrics Overview

Metric	Mean	Std Dev	Min	Max	Count
SNR	11.50	3.70	7.80	15.20	3.0
CNR	2.93	1.11	1.90	4.10	3.0
FBER	1316.67	732.01	650.00	2100.00	3.0
EFC	0.56	0.15	0.42	0.72	3.0
FWHM_AVG	3.53	1.14	2.60	4.80	3.0
Q11	0.68	0.22	0.45	0.88	3.0
CJV	0.58	0.24	0.38	0.85	3.0

Individual Subject Details

Subject 1: sub-001

Age	25.5
Sex	F
Scan Type	T1w
Quality Status	Pass
Composite Score	85.3
Confidence	0.95

Recommendations:

- Excellent quality scan, suitable for all analyses

Subject 2: sub-002

Age	72.0
Sex	M
Scan Type	T1w
Quality Status	Fail
Composite Score	22.1
Confidence	0.98

Recommendations:

- Exclude from analysis due to poor image quality
- Consider rescanning if possible
- Check scanner calibration and subject motion

Quality Flags:

- low_snr
- low_cnr
- high_noise
- excessive_smoothing
- motion_artifacts

Subject 3: sub-003

Age	45.2
Sex	F
Scan Type	T1w
Quality Status	Warning
Composite Score	68.7
Confidence	0.75

Recommendations:

- Manual review recommended
- Consider inclusion with caution
- Monitor for analysis sensitivity

Quality Flags:

- **borderline_snr**
- **borderline_cnr**

Subject 4: sub-004

Age	28.0
Sex	M
Scan Type	BOLD
Quality Status	Pass
Composite Score	78.9
Confidence	0.88

Recommendations:

- Good quality functional scan

Appendices

Appendix A: Methodology

This report uses age-normalized MRIQC quality metrics to assess MRI data quality. The normalization process compares each subject's metrics against age-appropriate reference populations to reduce false rejections in pediatric and aging cohorts. Quality thresholds are applied based on percentile rankings within age groups: • Pass: Metrics within acceptable ranges for age group • Warning: Some metrics borderline, manual review recommended • Fail: Critical metrics exceed age-appropriate thresholds • Uncertain: Insufficient data or conflicting indicators

Appendix B: MRIQC Metric Definitions

SNR: Signal-to-Noise Ratio - measure of signal strength relative to noise

CNR: Contrast-to-Noise Ratio - measure of tissue contrast relative to noise

FBER: Foreground-Background Energy Ratio - measure of ghosting artifacts

EFC: Entropy Focus Criterion - measure of ghosting and blurring

FWHM: Full-Width Half-Maximum - measure of image smoothness

QI1: Quality Index 1 - composite anatomical quality measure

CJV: Coefficient of Joint Variation - measure of noise in tissue contrast