

Pilot Testing and Preliminary Evaluation of the Nine-Item MRI Subject-Experience Questionnaire Among 40 Adult MRI Patients

Sahil Gupta¹, Dr. Mukesh Kumar Sharma², Dr. Ghalib Mirza³

¹Research Scholar, Department of Radiation and Imaging Technology, NIMS College of Allied & Healthcare Sciences, NIMS University Rajasthan, Jaipur, India

²Professor, Department of Radio-Diagnosis, NIMS University Rajasthan, Jaipur, India

³Assistant Professor, Department of Radio-Diagnosis, Jaipur National University Institute of Medical Sciences & Research Centre, Jaipur, India

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ABSTRACT

Background: MRI examinations can be associated with anxiety, acoustic annoyance, sensory responses and discomfort related to remaining still. A brief questionnaire may help document these different experiences, but its measurement properties should not be assumed before formal evaluation.

Aim: To evaluate the feasibility and preliminary item-level response distribution of the nine-item MRI Subject-Experience Questionnaire in a pilot sample of 40 adult patients undergoing MRI, and to identify measurement issues relevant to subsequent validation.

Methods: A cross-sectional methodological pilot study was conducted among 40 adult patients undergoing MRI. Demographic and examination characteristics were summarized using descriptive statistics, and responses to each questionnaire item were reported as frequencies and percentages. An exploratory Cronbach's alpha was calculated after coding Disagree=1, Neutral=2 and Agree=3; the fourth option, Strongly Agree, was not selected by any participant. The alpha estimate was treated as diagnostic only because the items represent heterogeneous experiences and no validated total-score model or scoring key was available.

Results: The 40 participants had a mean age of 33.80 years (SD 10.58; median 31; range 18–50); 23 (57.5%) were male and 17 (42.5%) female. Contrast examinations accounted for 22 participants (55.0%) and non-contrast/plain examinations for 18 (45.0%). All 40 participants had responses to all nine items. Agreement was highest for anxiety inside the scanner (Q1; 47.5%) and was also observed for duration/immobility discomfort (Q6; 40.0%) and familiarity with a previous MRI (Q7; 40.0%). Agreement was lowest for dizziness/sleepiness-like sensation (Q3; 15.0%). No Strongly Agree responses were recorded. The exploratory nine-item alpha was –0.269.

Conclusion: The pilot findings support a descriptive review of item response patterns and response completeness, but they do not establish questionnaire validity or reliability. The negative exploratory alpha, heterogeneous item content and different conceptual direction of Q7 require cautious interpretation and further content and measurement evaluation.

Keywords: magnetic resonance imaging; subject experience; questionnaire; pilot study; feasibility; content validity; reliability

1. INTRODUCTION

Magnetic resonance imaging (MRI) is an important diagnostic modality, but the examination places the patient in a distinctive technical environment involving a confined scanner space, loud acoustic sequences, prolonged periods of immobility and a requirement to remain still. Some patients experience anxiety, fear or claustrophobic concerns, while others report sensory or procedural responses without prominent anxiety. Earlier work has described anxiety during MRI, phobic responses, premature termination and variation in patient tolerance across scanner environments [1–6]. These findings support routine attention to the patient's subjective experience in addition to technical image quality and procedural completion.

The MRI Subject-Experience Questionnaire examined here contains nine closed-ended items addressing anxiety inside the scanner (Q1), annoyance from scanner noise (Q2), dizziness or a sleepiness-like sensation (Q3), fear associated with the scanner structure (Q4), unusual taste (Q5), discomfort associated with examination duration and remaining still (Q6), familiarity with a previous MRI (Q7), warmth during the scan (Q8), and previous anxiety associated with close spaces (Q9). This broad coverage may be useful for describing an experience profile, but

the items do not necessarily represent one underlying psychological construct. For example, Q7 concerns prior familiarity and is positively framed, while Q9 concerns a previous history of close-space anxiety. They are conceptually different from current sensory responses during a scan

Questionnaire development and validation require attention to relevance, comprehensiveness and comprehensibility, as well as appropriate evaluation of measurement properties for the intended use [11,12]. A high or low coefficient alone cannot demonstrate validity. Reliability statistics such as internal consistency are interpretable as evidence for a combined scale only when the score has a defensible conceptual and structural basis. A preliminary pilot study can identify response patterns and potential comprehension problems, but it cannot substitute for expert review, cognitive interviewing, test-retest work or a larger study designed around a prespecified measurement model.

The present study provides a preliminary pilot evaluation of the nine-item MRI Subject-Experience Questionnaire among 40 adult MRI patients. Its purpose is to examine response completeness and item-level distributions, calculate one explicitly exploratory internal-consistency diagnostic, and identify issues that should be resolved before a formal questionnaire-validation study.

2. AIM AND OBJECTIVES

Aim: To conduct a preliminary pilot evaluation of the nine-item MRI Subject-Experience Questionnaire in 40 adult MRI patients, focusing on response completeness, item-level response distributions and early measurement concerns.

The specific objectives were:

To summarize the demographic and examination characteristics of the 40 participants.

To examine completeness of responses across Q1–Q9 and describe the distribution of each response category.

To calculate an exploratory internal-consistency coefficient while clearly limiting its interpretation.

To identify questionnaire wording and scoring issues that should be addressed before formal validation.

3. MATERIALS AND METHODS

3.1 Study design

A cross-sectional, descriptive methodological pilot study was conducted among 40 adult patients undergoing MRI. The study was designed to examine the questionnaire's response distributions and identify issues that should be addressed before a larger validation study.

3.2 Study setting and participants

The study included adult outpatients undergoing MRI in the clinical setting described in the parent thesis protocol at Jaipur National University Institute of Medical Sciences and Research Centre, Jaipur. The parent protocol specifies a 1.5-T Siemens MAGNETOM SEMPRA system. Demographic characteristics, examination details, contrast status and responses to the nine questionnaire items were summarized for the 40 participants. Direct personal identifiers are not reproduced in this manuscript.

Participant information was handled confidentially, and findings are presented only in aggregate form. No patient names or direct personal identifiers are included in this manuscript.

3.3 Questionnaire instrument

The instrument contains nine closed-ended items with four response choices: Disagree, Neutral, Agree and Strongly Agree. Among the 40 participants, only Disagree, Neutral and Agree responses were observed.

The nine items were described individually rather than assumed to comprise a single scale. In particular, Q3 includes wording that may combine dizziness with sleepiness-like sensations; Q6 combines duration and movement restriction in one question; Q7 measures familiarity rather than discomfort; and Q9 asks about previous history rather than only the current examination. These features are relevant for interpretation and subsequent item refinement, but no wording changes were applied to the existing data.

3.4 Variables and coding

Age was summarized as mean, standard deviation, median and range. Gender, contrast status and examination categories were summarized as counts and percentages. For each item, the frequencies of Disagree, Neutral, Agree and Strongly Agree were tabulated. As no item-level scoring manual or validated global score was provided, no primary nine-item total score was interpreted. For a diagnostic internal-consistency calculation only, response categories were coded Disagree=1, Neutral=2 and Agree=3. Strongly Agree was not observed and therefore did not contribute to the observed coding. Q7 was not reverse-coded because the instrument did not specify a formal scoring rule; this makes the coefficient explicitly exploratory rather than a test of a finalized scale.

3.5 Statistical analysis

Descriptive statistics were calculated for the 40 participants. Categorical values are presented as n (%), using

N=40 as the denominator. Item completeness was checked across all nine responses. Cronbach's alpha was calculated from the simple ordinal coding described above and is reported only to identify a potential scoring/construct problem. No hypothesis testing, factor analysis or subgroup significance testing was undertaken because the pilot sample was small and the item set had no prespecified unidimensional scoring model. The analysis was not intended to establish predictive validity, criterion validity or test-retest reliability.

3.6 Ethical considerations and confidentiality

The parent thesis methodology describes participant information and informed consent under an institutional approval process. Before submission of this standalone pilot manuscript, the investigator should verify and report the applicable ethics committee, approval reference and consent details. Only details confirmed by the approved protocol should be included. Patient names and other direct identifiers are not presented in this report.

4. RESULTS

4.1 Demographic and examination profile

The 40 participants ranged in age from 18 to 50 years. Mean age was 33.80 years (SD 10.58), with a median of 31 years. There were 23 male participants (57.5%) and 17 female participants (42.5%). Contrast examinations accounted for 22 participants (55.0%), while non-contrast/plain examinations accounted for 18 (45.0%). The participants covered 15 named MRI examination categories.

Table 1. Demographic and examination characteristics of the pilot sample (N=40)

Characteristic	Value
Sample size	40 (100.0%)
Age, mean $\pm$ SD (years)	33.80 $\pm$ 10.58
Age, median (years)	31
Age range (years)	18–50
Age 18–30 years	19 (47.5%)
Age 31–40 years	7 (17.5%)
Age 41–50 years	14 (35.0%)
Male	23 (57.5%)
Female	17 (42.5%)
Contrast examination	22 (55.0%)
Non-contrast/plain examination	18 (45.0%)
Distinct named examination categories	15

Table 2. Distribution of named MRI examination categories

MRI examination category	n	%
Ankle	5	12.5
Cervical spine	4	10.0
Dorsal spine	4	10.0
LS spine	4	10.0
MRA brain	4	10.0
MRCP	3	7.5
Whole spine	3	7.5

MRI examination category	n	%
Brain	2	5.0
Hip	2	5.0
Pelvis	2	5.0
Shoulder	2	5.0
Wrist	2	5.0
Left knee	1	2.5
MRV brain	1	2.5
Right knee	1	2.5

4.2 Questionnaire response completeness

All 40 participants had a recorded response for each of Q1–Q9, giving 360 item responses and no missing questionnaire responses. Although the questionnaire form includes Strongly Agree as an option, no participant selected that category for any of the nine items. Cognitive interviews and a review of the administration process should explore whether this reflects the participants' experiences and interpretation of the response options.

4.3 Item-level response distributions

Agreement varied by item. Q1, which asked about anxiety inside the machine, had the highest proportion of Agree responses (19/40; 47.5%). Q6, concerning the combined burden of examination duration and remaining still, had 16 Agree responses (40.0%). Q7 also had 16 Agree responses (40.0%); however, agreement with Q7 indicates familiarity with a previous MRI procedure and should not be interpreted as discomfort. Q3 had the lowest proportion of Agree responses (6/40; 15.0%) and the highest proportion of Neutral responses (19/40; 47.5%).

Table 3. Response distribution for the nine MRI Subject-Experience Questionnaire items

Item / experience	Disagree, n (%)	Neutral, n (%)	Agree, n (%)	Strongly Agree, n (%)
Q1: Anxiety inside the machine	12 (30.0%)	9 (22.5%)	19 (47.5%)	0 (0.0%)
Q2: Annoyance from MRI noise	15 (37.5%)	15 (37.5%)	10 (25.0%)	0 (0.0%)
Q3: Dizziness/sleepiness-like sensation	15 (37.5%)	19 (47.5%)	6 (15.0%)	0 (0.0%)
Q4: Fear of scanner structure	8 (20.0%)	17 (42.5%)	15 (37.5%)	0 (0.0%)
Q5: Unusual taste during scan	11 (27.5%)	18 (45.0%)	11 (27.5%)	0 (0.0%)
Q6: Duration/remaining-still discomfort	10 (25.0%)	14 (35.0%)	16 (40.0%)	0 (0.0%)
Q7: Familiarity with previous MRI	11 (27.5%)	13 (32.5%)	16 (40.0%)	0 (0.0%)
Q8: Warm sensation during scan	15 (37.5%)	12 (30.0%)	13 (32.5%)	0 (0.0%)
Q9: Previous close-space anxiety	14 (35.0%)	12 (30.0%)	14 (35.0%)	0 (0.0%)

The patterns should be interpreted descriptively. The higher Q1 agreement suggests that anxiety inside the scanner was endorsed by a notable fraction of the participants. Agreement with Q4 (37.5%) and Q9 (35.0%) concerned two distinct concepts: fear associated with seeing the scanner's structure and a previous history of close-space anxiety. Q2 noise annoyance was endorsed by 25.0% of participants. Q5 unusual taste was endorsed by 27.5%, while Q8 warmth was endorsed by 32.5%. These response proportions describe this pilot sample and should not be interpreted as prevalence estimates for a broader population.

4.4 Exploratory internal-consistency diagnostic

When all nine items were coded in their recorded order (Disagree=1, Neutral=2 and Agree=3) and included in a single diagnostic calculation, Cronbach's alpha was -0.269 . The value was not treated as an estimate of acceptable or unacceptable reliability for a validated scale. The item set is heterogeneous, the instrument does not supply a scoring key, Q7 is positively framed around familiarity, and Q9 asks about a previous issue rather than a concurrent symptom. A single all-item coefficient is therefore difficult to interpret as a property of one construct. The result highlights the need to define the intended measurement model and item scoring before reporting a global scale score.

5. DISCUSSION

This pilot study describes response patterns among 40 adult MRI patients using a nine-item questionnaire intended to document multiple aspects of MRI subject experience. All nine questionnaire items were answered by all 40 participants, and the response distribution varied across items. Anxiety inside the scanner was the most frequently agreed-with experience (47.5%), whereas dizziness/sleepiness-like sensation was least frequently endorsed (15.0%). The result is consistent with the broader literature showing that MRI-related experience can include psychological, sensory and procedural dimensions, rather than one single type of discomfort [1–10]. Because this is a small pilot sample, the findings should be considered preliminary and descriptive, not estimates of population prevalence.

5.1 Interpretation of item response patterns

Q1 yielded the greatest percentage of Agree responses. This item may be useful for identifying self-reported anxiety, but it does not provide a validated anxiety score by itself. Q4 and Q9 also require separate interpretation: one concerns fear associated with the scanner structure, and the other asks about prior close-space anxiety. The clinical relationship between the two is plausible, but the pilot sample does not establish that they form a single domain. Q2, Q3, Q5 and Q8 address different sensory experiences, while Q6 concerns a compound procedural burden. These differences support a profile-based approach in which each item is reported individually until domain structure and scoring have been justified.

The 40.0% agreement for Q7 must not be interpreted as 40.0% discomfort. The item asks whether the patient was familiar with a previous MRI procedure; agreement therefore reflects reported familiarity, a context variable that may or may not correspond to reduced anxiety. If a future total score is intended to represent "greater difficulty" or "greater discomfort," item direction must be specified in advance, including whether Q7 should be excluded from that score or treated separately. Reverse coding should not be introduced simply to improve a reliability coefficient; it must follow a defined conceptual model.

5.2 Meaning of the exploratory alpha

The exploratory alpha of -0.269 is a warning against presenting an unqualified overall nine-item score as a homogeneous scale. Negative alpha can arise when items have negative average inter-item covariance, when coding directions are inconsistent with the construct, or when unrelated content is combined. In this case, the instrument intentionally covers anxiety, noise, dizziness, taste, warmth, immobility, familiarity and prior close-space concerns. Such a heterogeneous set can be valuable as a clinical experience inventory even when it is not internally consistent as a single psychometric scale. Questionnaire-validation guidance emphasizes that the construct, target population, content validity and dimensionality should be specified before reliability statistics are interpreted [11,12].

The alpha estimate is based on a pilot sample of 40 participants and the three response categories observed in this study. It should be considered exploratory and should not be interpreted as definitive evidence of the instrument's reliability. The appropriate next step is to determine whether the questionnaire is intended to be (a) a multidimensional checklist/profile, with item-level reporting, or (b) a set of one or more coherent subscales. Only the second option would justify internal-consistency analysis for each defensible subscale after its item content and dimensionality are examined.

5.3 Item wording and response-option considerations

The pilot analysis identifies several candidate issues for cognitive interviewing. First, Q3 uses "dizziness" in English while the Hindi wording refers to a sleepiness- or drowsiness-like experience; these may not be identical sensations. The investigator should confirm what the translated item intends to measure and whether respondents interpret the English and Hindi forms equivalently. Second, Q6 combines the long duration of the examination and the requirement not to move. A patient may find one aspect difficult but not the other, so the item may be double-barrelled. Third, Q7's wording is grammatically awkward and should be tested for comprehensibility. Fourth, Q9 refers to previous close-space anxiety, whereas most other items appear to concern the present examination. A clear recall frame would improve interpretability. These observations are recommendations for further review; they do not mean that the original responses can be retroactively changed.

No Strongly Agree responses were recorded for any item. The response options should remain available unless further evidence supports a change. Cognitive interviews should ask participants how they distinguish Disagree,

Neutral, Agree and Strongly Agree, especially when questions concern uncommon sensations or prior history.

5.4 Implications for formal validation

The present pilot study supports descriptive feasibility reporting, but several core validation activities were not undertaken in this phase. There were no expert ratings from which to calculate content-validity indices; no cognitive interview notes; no duplicate administration for test–retest reliability; no external comparator for criterion or convergent validity; and no prespecified measurement model for structural validity. Consequently, the study cannot claim that the questionnaire is validated. The next step should be content review by MRI clinicians, radiographers, patient-experience researchers and a measurement-methodology expert, followed by cognitive interviews with adult MRI patients. A separate feasibility sample should then be used to assess completion, comprehension, administration time and practical acceptability. A larger appropriately powered sample would be needed for any planned structural analysis, with the analysis chosen according to whether the instrument is a profile or a scale [11,12]. If test–retest reliability is eventually evaluated for a suitable stable measure, the reliability model and statistic should be prespecified and reported transparently [14].

6. STRENGTHS AND OPERATIONAL INSIGHTS

All nine questionnaire items had complete responses from the 40 participants, allowing item-level descriptive summaries.

The analysis preserves the questionnaire’s broad coverage and avoids forcing a global score when there is no established scoring model.

The item-level table highlights concrete questions for cognitive review, particularly Q3, Q6 and Q7.

The pilot highlights the importance of consistent participant coding and a clearly defined unit of analysis in subsequent validation work.

7. LIMITATIONS

The pilot sample included 40 participants and was too small to establish a stable factor structure or support broad psychometric validation. No confirmatory measurement model was specified.

The pilot did not formally assess questionnaire completion time, patient comprehension, acceptability, expert content validity or test–retest reliability.

The fourth response option, Strongly Agree, was not selected by any participant. Further cognitive interviewing should explore how participants interpret the response categories, and administration procedures should be reviewed before larger-scale use.

The nine items cover heterogeneous concepts and have no documented scoring manual. The exploratory alpha is not a definitive measure of questionnaire quality.

The final manuscript should include the verified ethics approval reference and consent information applicable to this pilot study before dissemination.

8. RECOMMENDED NEXT STAGE OF QUESTIONNAIRE VALIDATION

The present pilot study should be used to plan the next validation stage rather than to declare the instrument validated. The following sequence is recommended. The exact number of experts, participants and measurement procedures should be agreed with the supervisor and research ethics committee and documented in a prospective protocol.

Stage	Proposed activity	Expected output
1. Standardize participant coding	Use unique coded participant IDs; define the intended unit of analysis; keep direct identifiers separate from the analysis file.	A clear participant identification and data-management procedure.
2. Expert content review	Ask a multidisciplinary expert panel to rate item relevance, clarity and coverage; keep comments and revisions.	Documented content-validity assessment and item-level revision decisions.
3. Cognitive interviews	Interview a small varied group of adult MRI patients in the intended languages; probe the meaning of Q3, Q6, Q7 and response options.	Evidence on comprehension, interpretation and needed wording changes.
4. Separate feasibility pilot	Administer the revised version to a clearly defined group of unique participants; record missing items, completion time, requests for clarification and refusal/dropout.	Feasibility outcomes with explicit denominators.

Stage	Proposed activity	Expected output
5. Reliability where appropriate	Consider repeat administration only for items whose target construct is expected to remain stable and whose recall frame supports retesting; prespecify the statistic.	Reliability estimates and confidence intervals for the intended score/item type.
6. Larger validation study	Define whether the instrument is a multidomain profile or one/more scales before selecting structural, convergent or known-groups analyses.	Evidence tied to a prespecified measurement model; no global score unless justified.

9. Conclusion

The pilot study provides a preliminary view of how responses to the nine-item MRI Subject-Experience Questionnaire are distributed among 40 adult MRI patients. All 360 questionnaire item responses were recorded, and item agreement ranged from 15.0% for Q3 to 47.5% for Q1. No Strongly Agree responses were present. The exploratory nine-item Cronbach's alpha was -0.269 under a simple, unidirectional coding scheme; given the heterogeneous item content and the different direction of the familiarity item, this should not be interpreted as a definitive reliability estimate or as proof that the questionnaire is invalid. The finding instead emphasizes the need for a clarified construct and scoring approach.

The present study does not establish content validity, construct validity, criterion validity or test-retest reliability. A formal validation programme should begin with expert content review and cognitive interviewing, followed by feasibility testing and appropriately designed psychometric evaluation

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