Quantifying the Cognitive and Neurobiological Processes Underlying Remote Viewing Practice

(Stage 1 Registered Report)

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Abstract

Remote viewing (RV) is a structured mental practice in which individuals attempt to perceive or describe distant or hidden targets using non-ordinary cognition. Since the 1970s, practitioners have reported subjective experiences of altered perception during RV sessions, yet the psychological and neurobiological processes underlying these reported experiences remain poorly understood. This registered report describes a multi-method investigation examining the relationships between psychological traits—including emotional intelligence, absorption, interoceptive awareness, and mindfulness—and RV performance, operationalized as target identification accuracy (the proportion of sessions in which a practitioner's description is correctly matched to the intended target by quantified by Social RV). In Aim 1, we will analyze data from over 3,000 Social RV sessions combined with a comprehensive psychological assessment battery to test which cognitive and emotional traits associate with target identification accuracy. Participants will be offered either a full assessment battery (~60 minutes) or a brief battery (~30 minutes) to maximize enrollment while maintaining measurement depth. In Aim 2, we will compare cognitive and emotional profiles of RV practitioners to 195 participants from the Shamatha Project Vipassana meditation retreat to identify shared and distinct characteristics between these practices, both of which involve deliberate alterations in attentional and perceptual states. In Aim 3, we will conduct portable EEG and fNIRS neuroimaging in 50 RV practitioners to characterize neural activity associated with the RV state. We hypothesize that absorption, interoceptive awareness, and emotional intelligence significantly predict target identification accuracy; that RV and meditation

practitioners show overlapping but distinct cognitive-emotional profiles; and that the RV state engages brain networks supporting sustained attention, interoceptive processing, and emotional regulation. By characterizing the cognitive and neurobiological correlates of this practice, this study aims to advance understanding of the psychological mechanisms that underlie RV experiences and inform potential translational applications.

1. Introduction

Research Question: Background, Importance and Relevance

Remote viewing (RV) is a structured mental practice, developed in laboratory settings in the 1970s, in which individuals attempt to describe or identify targets that are shielded from conventional sensory access (Targ & Puthoff, 1974; Escola-Gascon et al., 2023). While the veridicality of RV as a mode of information acquisition remains scientifically contested, the practice itself is well-documented: thousands of individuals engage in structured RV protocols and report subjective experiences of heightened focus, imagery, and altered perceptual states (Bem, 2011; Sedlmeier, 2018). Regardless of one's position on whether RV involves genuine anomalous cognition, the psychological and neurobiological processes that practitioners engage during sessions—and the individual difference variables that predict who reports higher accuracy—are legitimate and underexplored scientific questions.

Prior research has suggested that emotional intelligence and emotional cognition may be relevant factors in performance on precognition tasks (Escola-Gascon et al., 2021; May et al., 2011). Individuals who are skilled at processing and identifying emotions may demonstrate greater facility with tasks requiring subtle perceptual discrimination (Cardena, 2018). However, emotional intelligence is only one of several psychological constructs that may be relevant. Research on related altered-state practices—including meditation, hypnosis, and sensory deprivation—suggests that traits such as absorption (the tendency to become deeply immersed in experiential states; Tellegen & Atkinson, 1974), interoceptive awareness (sensitivity to internal bodily signals; Mehling et al., 2012), and transliminality (the tendency for psychological material to cross thresholds into awareness; Thalbourne & Maltby, 2008) may also play important roles. No studies have comprehensively examined this broader set of psychological constructs in relation to RV performance outcomes.

Since RV and meditation both involve focused attention, perceptual openness, and deliberate shifts in conscious state (Bem et al., 2016; Zeng et al., 2017), comparison between practitioners of these two practices is warranted. The Shamatha Project provides open-source data examining psychosocial and emotional outcomes from a 7-day Vipassana retreat in 195 individuals (Cohen et al., 2017), offering an ideal comparison dataset for psychological measures that overlap between the two studies.

Furthermore, although numerous neuroimaging studies have examined meditation and other contemplative practices (Fox et al., 2014; Zeng et al., 2017), no published studies have characterized the neural activity associated with the RV state. The advent of accurate and portable neuroimaging systems makes this the optimal time to conduct remote EEG and fNIRS recording during RV sessions to characterize the brain states associated with this practice.

Hypotheses

Primary Hypotheses:

1. Higher trait absorption (Tellegen Absorption Scale), interoceptive awareness (MAIA-2, particularly the Noticing and Not-Distracting subscales), and emotional intelligence (TEIQue) will each significantly predict target identification accuracy (proportion of correct matches scored by Social RV, z-score transformed), with absorption accounting for unique variance beyond emotional intelligence alone.
2. Among Big Five personality traits, Openness to Experience will be the strongest predictor of target identification accuracy, with Neuroticism negatively predicting accuracy.
3. Higher trait mindfulness (FFMQ), particularly the Observing and Non-Reactivity subscales, will significantly predict target identification accuracy.
4. The relationship between absorption and target identification accuracy will be partially mediated by emotional intelligence, such that high-absorption individuals who also demonstrate strong emotion recognition and regulation will show the highest accuracy rates.
5. RV practitioners and Shamatha meditators will show comparably elevated scores on Openness to Experience and reduced Neuroticism relative to population norms, reflecting a shared dispositional profile among individuals who engage in consciousness-altering practices. However, Shamatha meditators will score higher on the Acting with Awareness and Non-Judging subscales of the FFMQ, while RV practitioners will show comparable or higher scores on the Observing subscale.
6. During the RV state relative to rest, EEG will show increased frontal midline theta power (4–8 Hz), consistent with sustained internally directed attention. fNIRS will show increased prefrontal cortex and insular activation, consistent with executive attention and interoceptive processing.

Secondary Hypotheses:

1. Higher target identification accuracy will correlate with greater changes in frontal theta power and prefrontal oxygenation during RV sessions.
2. Practitioners with higher absorption scores will show greater default mode network suppression (reduced posterior alpha power) during RV, suggesting deeper disengagement from self-referential processing.
3. Practitioners with higher interoceptive awareness (MAIA-2) will show greater insular activation (fNIRS) during RV, and this activation will partially mediate the relationship between interoceptive awareness and target identification accuracy.
4. RV practitioners will score significantly above published population norms on absorption (TAS), interoceptive awareness (MAIA-2), and transliminality, establishing a distinct psychological profile for this population.

Exploratory Objectives:

- Identify clusters of psychological characteristics that predict target identification accuracy using hierarchical clustering, with the tentative prediction that a “perceptual” cluster (high absorption,

high transliminality, high interoception) will show higher accuracy than a “contemplative” cluster (high mindfulness, low dissociation).

- Explore whole-brain functional connectivity patterns during RV, with attention to whether the RV neural profile more closely resembles patterns associated with focused-attention meditation, hypnagogic states, or mental imagery tasks.
- Examine relationships between neural measures and specific cognitive/emotional domains, including whether RV shows greater right-hemisphere lateralization and posterior visual cortex engagement relative to meditation EEG profiles.

Timeline

The study is planned for completion within 18 months. Months 1–3: Finalize questionnaire integration with Social RV platform (both full and brief battery versions), obtain IRB approval for neuroimaging component. Months 4–9: Data collection for Aim 1 (psychological assessments) and Aim 2 (data harmonization with Shamatha dataset). Months 6–15: Neuroimaging data collection for Aim 3 (recruitment, headset distribution, data acquisition). Months 12–18: Data analysis and manuscript preparation. Stage 2 submission is anticipated 18 months following Stage 1 acceptance.

2. Methods

Experimental Design

Aim 1: Psychological Assessment of RV Practitioners

We will conduct a comprehensive observational study analyzing Social RV’s existing dataset of 3,000+ sessions combined with prospective psychological assessment data via e-mail link. An opt-in feature will be integrated into the Social RV platform allowing users to complete standardized questionnaires. To maximize participant enrollment while maintaining measurement depth, participants will be offered two battery options: a **Full Battery (~60 minutes)** and a **Brief Battery (~30 minutes)**. Both batteries share a core set of measures; the Full Battery adds additional scales for deeper characterization.

Assessment Batteries

Full Assessment Battery (~60 minutes)

The full battery includes the following measures, with estimated administration times. Where validated short forms exist, these are used to maximize construct coverage within the time constraint:

Measure	Construct	Items	~Min
Tellegen Absorption Scale (TAS)	Absorption / experiential immersion	34	8
MAIA-2	Interoceptive awareness	37	8

TEIQue-SF	Trait emotional intelligence	30	7
FFMQ-15 (short form)	Five facets of mindfulness	15	3
BFI-2-S (short form)	Big Five personality traits	30	5
Transliminality Scale	Threshold consciousness	29	6
ERQ	Emotion regulation strategies	10	3
AAQ-II	Experiential avoidance	7	2
PHQ-9	Depression screening	9	2
GAD-7	Anxiety screening	7	2
DES-C (brief)	Non-pathological dissociation	8	2
ACS	Attention control	20	5
Demographics + RV history	Practice characteristics	—	5
TOTAL		**~236**	**~58**

Brief Assessment Battery (~30 minutes)

The brief battery prioritizes the constructs most theoretically central to RV experiences and those with direct comparability to the Shamatha dataset. Measures were selected based on theoretical relevance to altered-state experiences, psychometric efficiency, and overlap with the Shamatha comparison dataset:

Measure	**Construct**	**Items**	**~Min**
TAS (Modified Short Form)	Absorption	18	4
MAIA-2 (Noticing + Not-Distracting)	Interoceptive awareness (key subscales)	10	3
TEIQue-SF	Trait emotional intelligence	30	7
FFMQ-15 (short form)	Mindfulness (5 facets)	15	3
BFI-2-XS (extra-short)	Big Five personality	15	3

ERQ	Emotion regulation	10	3
PHQ-4	Depression/anxiety ultra-brief screen	4	1
Demographics + RV history	Practice characteristics	—	5
TOTAL		**~102**	**~29**

Rationale for Brief Battery selection: The brief battery retains the three constructs hypothesized to be most predictive of RV target identification accuracy (absorption, interoceptive awareness, emotional intelligence), the primary mindfulness and personality measures needed for Shamatha comparison, and a minimal clinical screen. The TAS, MAIA-2 subscales, and BFI-2 are shortened using validated short forms. The brief battery omits transliminality, dissociation, experiential avoidance, attention control, and separate anxiety screening, which are available in the full battery for participants willing to invest additional time. Analyses will include battery type (full vs. brief) as a covariate to assess potential selection effects.

RV outcome measure: Target identification accuracy is defined as the proportion of sessions in which the practitioner's description is correctly matched to the intended target by independent blind judges (i.e., hit rate above chance expectation). This operationalization quantifies how often practitioners' subjective impressions correspond to actual targets under controlled conditions, without making claims about the mechanism of information transfer. Hit rates will be z-score transformed for analysis. Additional outcomes include confidence ratings and task-specific performance metrics.

Aim 2: Comparison with Meditation Practitioners

We will harmonize Social RV psychological assessment data with the open-source Shamatha Project dataset (Cohen et al., 2017), which includes 195 individuals who participated in a 7-day Vipassana meditation retreat. The Shamatha dataset includes measures of mindfulness, emotion regulation, Big Five personality traits (including Openness to Experience and Neuroticism), psychological well-being (Ryff PWB scales), empathy, ego resiliency, attachment style, depression, and trait anxiety assessed at pre- and post-retreat timepoints. We will match questionnaires administered to RV practitioners to enable direct comparison on overlapping measures. For constructs measured in our battery but not in the Shamatha dataset (absorption, interoceptive awareness, transliminality, dissociation), RV practitioner scores will be compared to published population norms.

Aim 3: Neuroimaging Study

A subset of 50 experienced RV practitioners (minimum 50 completed sessions on Social RV) will be recruited to participate in a remote neuroimaging study. Participants will receive research-grade 32-channel portable EEG headsets (sampling rate: 256 Hz) and fNIRS headsets via mail. Following remote training on device use, participants will complete standardized RV sessions while wearing both devices. The neuroimaging protocol includes: 5-minute baseline (eyes open/closed), 15-minute RV session, 5-minute post-session rest. Sessions will be recorded and synchronized with Social RV session data. Experimenters will be blinded to RV targets during data collection and initial processing.

Exclusion Criteria:

Aim 1/2: Incomplete questionnaire responses (>10% missing items on the selected battery); fewer than 5 completed RV sessions. Aim 3: History of neurological disorder; current use of psychotropic medications; inability to complete remote training; equipment malfunction affecting >30% of recording time. Data from excluded participants will not be replaced; analyses will proceed with available sample sizes with appropriate power considerations reported.

Sample and Statistical Power

Aim 1:

Based on prior research showing medium effect sizes ($r = 0.25–0.35$) for emotional intelligence–precognition relationships (Escola-Gascon et al., 2021), and anticipated similar or larger effects for absorption (based on the anomalous experience literature), power analysis using G*Power 3.1 indicates that $N = 150$ participants are needed to detect $r = 0.25$ with 80% power at $\alpha = 0.05$ (two-tailed). With the existing Social RV user base of 3,000+ sessions, we anticipate recruiting 200–300 participants across both battery options, providing adequate power for primary analyses and subgroup comparisons.

Aim 2:

The Shamatha dataset includes $N = 195$ participants. Power analysis indicates this sample size provides 80% power to detect medium effect sizes (Cohen's $d = 0.40$) in between-group comparisons at $\alpha = 0.05$.

Aim 3:

$N = 50$ participants provides 80% power to detect large within-subject effects ($d = 0.58$) for repeated-measures comparisons (baseline vs. RV) at $\alpha = 0.05$. This sample size is comparable to or larger than prior portable EEG/fNIRS studies of meditation (typical $N = 20–40$). Minimum detectable correlation between neural measures and RV performance is $r = 0.38$.

Covariates:

All analyses will include age, sex, RV/meditation experience level, and battery type (full vs. brief, for Aim 1) as covariates. Additional covariates for Aim 3 include time of day of recording and equipment-specific variance.

Data Collection, Processing, and Planned Analysis

Data Sources:

- Social RV platform: Session data (target type, outcome, confidence ratings, timestamps, user demographics)
- Psychological questionnaires: Administered via integrated platform feature (full or brief battery)
- Shamatha Project: Open-source dataset (Cohen et al., 2017)
- Neuroimaging: EEG (32-channel, 256 Hz) and fNIRS (prefrontal/parietal regions)

Pre-processing:

EEG: Bandpass filtering (0.5–45 Hz), artifact rejection (amplitude threshold ±100 μV), independent component analysis (ICA) for ocular artifact removal, re-referencing to average reference. fNIRS: Motion artifact correction using wavelet filtering, modified Beer-Lambert law conversion to oxy/deoxy-hemoglobin concentrations, bandpass filtering (0.01–0.1 Hz). Questionnaire data: Scoring according to published guidelines, z-score normalization for cross-measure comparisons.

Data Collection Timeline:

Questionnaire data collection will occur continuously following platform integration (Months 4–12). Neuroimaging data collection will proceed in two waves: Wave 1 (Months 6–10, n=25), Wave 2 (Months 10–15, n=25), with headsets rotating among participants.

Variations from Intended Sample Size

Anticipated challenges include participant drop-out for neuroimaging (remote protocol), technical difficulties with portable devices, and lower-than-expected opt-in rates for questionnaires. Offering both full and brief battery options is expected to substantially increase enrollment compared to a single lengthy battery. Mitigation strategies: over-recruitment by 20% for neuroimaging; remote technical support for participants; incentivization for questionnaire completion (entry into prize drawing). If final sample sizes are below 80% of targets, we will report sensitivity analyses indicating detectable effect sizes and acknowledge power limitations.

Pilot Data

No pilot data have been collected for this specific protocol. Effect size estimates are derived from prior published research: Escola-Gascon et al. (2021, 2023) reported correlations of r = 0.25–0.35 between emotional intelligence measures and precognition task performance. Effect sizes for absorption in relation to anomalous experiences are typically medium to large (r = 0.30–0.50; Roche & McConkey, 1990). Cohen et al. (2017) reported medium-to-large effects (d = 0.40–0.80) for psychological changes following meditation retreat. Neuroimaging effect sizes are estimated from meta-analyses of meditation studies (Fox et al., 2014).

Statistical Methods

Aim 1 Analyses:

- Primary: Multiple regression with target identification accuracy (z-scored hit rate) as dependent variable; TAS total score, MAIA-2 subscales, and TEIQue total score as primary predictors; age, sex, experience, and battery type as covariates.
- Model comparison: A combined model incorporating absorption, interoceptive awareness, mindfulness (Observing facet), and emotional intelligence will be compared against single-predictor models using AIC/BIC and likelihood ratio tests.
- Mediation analysis: Test whether emotional intelligence mediates the relationship between absorption and target identification accuracy using Hayes PROCESS macro (Model 4).

- Big Five analysis: Separate regression testing Openness to Experience and Neuroticism as predictors of target identification accuracy.
- Exploratory: Agglomerative hierarchical clustering on psychological variables to identify participant subgroups; subsequent ANOVA comparing target identification accuracy across clusters.

Aim 2 Analyses:

- Independent samples t-tests (or Mann-Whitney U for non-normal distributions) comparing RV practitioners to meditation practitioners on each overlapping psychological measure (mindfulness, Big Five, emotion regulation, depression, anxiety).
- Discriminant function analysis to identify which psychological variables best differentiate groups.
- For non-overlapping measures (TAS, MAIA-2, Transliminality Scale, DES-II): one-sample t-tests comparing RV practitioner scores to published population norms.

Aim 3 Analyses:

- EEG: Power spectral analysis (Welch's method) comparing baseline vs. RV for theta (4–8 Hz), alpha (8–13 Hz), and beta (13–30 Hz) bands; repeated-measures ANOVA with topographic analysis of frontal midline theta and posterior alpha.
- fNIRS: General linear model analysis of prefrontal and insular oxygenation changes during RV vs. baseline.
- Correlation analyses between neural measures (frontal theta power, posterior alpha suppression, prefrontal/insular oxygenation) and target identification accuracy.
- Moderation analyses testing whether absorption (TAS) and interoceptive awareness (MAIA-2) moderate the neural correlates of target identification accuracy.

Missing Data:

Missing questionnaire items (<10%) will be handled via multiple imputation (m=20 imputations). Participants missing >10% of questionnaire items will be excluded. Missing neuroimaging epochs due to artifacts will be excluded from analyses; participants with >30% excluded data will be removed from neuroimaging analyses.

Outliers:

Outliers will be identified as values >3 SD from the mean. Primary analyses will be conducted with outliers included; sensitivity analyses excluding outliers will be reported.

Multiple Comparisons:

False discovery rate (FDR) correction will be applied within each aim. Primary hypotheses will be evaluated at $\alpha = 0.05$ (FDR-corrected); exploratory analyses at $\alpha = 0.05$ (uncorrected) with effect sizes reported.

Software:

Statistical analyses: R (v4.3+; packages: lme4, lavaan, PROCESS, cluster). EEG processing: MNE-Python (v1.5+). fNIRS processing: Homer3 (v1.80+). All analysis code will be made publicly available.

Interpreting Results

If Hypothesis 1 is confirmed (absorption, interoceptive awareness, and emotional intelligence predict target identification accuracy), this will provide evidence that specific psychological traits—particularly those related to experiential immersion and internal perceptual sensitivity—are associated with higher accuracy in RV tasks. This would suggest that the experiences practitioners report during RV sessions are related to measurable individual differences in perceptual and emotional processing, regardless of the underlying mechanism of any apparent information transfer. If disconfirmed, this would suggest that target identification accuracy in RV is not systematically related to these trait-level psychological variables, and that other factors (e.g., training, motivation, task-specific learning) may be more relevant.

If Hypothesis 5 is confirmed (distinct but overlapping profiles for RV vs. meditation), this will establish that RV practitioners represent a psychologically distinct population from meditation practitioners, with characteristic patterns that may inform our understanding of different routes to altered perceptual states. If disconfirmed (largely overlapping profiles), this would suggest that the two practices draw on similar psychological mechanisms and attract similar individuals.

Neuroimaging findings will contribute to characterizing the brain states associated with RV practice, providing a neurobiological description of what practitioners experience during sessions. These findings are descriptive of the RV state itself and do not constitute evidence for or against the veridicality of RV as a mode of anomalous information acquisition.

Dissemination of Information

We are committed to open-source sharing of data, analysis code, and results. De-identified data will be deposited in the Open Science Framework (OSF) repository upon study completion. Analysis code will be shared via GitHub. Results will be submitted for peer-reviewed publication regardless of outcome (positive, negative, or inconclusive). Preprint versions will be posted prior to peer review.

Study Status

At the time of writing, data collection has not begun. The principal investigator has obtained approval for working with de-identified human data. IRB approval for the neuroimaging component (Aim 3) will be sought following Stage 1 acceptance. The Social RV platform integration for questionnaire administration (both full and brief battery versions) is under development.

3. Other Required Information

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Author Contributions

F.M. conceived and designed the study, drafted the protocol, and will oversee all aspects of data collection, analysis, and manuscript preparation. F.M. is the corresponding author.

Ethical Approval

This study will be approved by the Institutional Review Board. The principal investigator is currently approved for the proposed experimental procedures working with de-identified human data. Full IRB approval for the neuroimaging component involving human subjects (Aim 3) will be obtained prior to data collection, and all participants will provide written informed consent.

Registration

This study protocol does not involve a clinical trial. The protocol will be registered on OSF Registries upon Stage 1 acceptance.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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