

Red-Light Multimodal Ganzfeld Elicits Equivalent Complex Imagery to Moderate-Dose Psilocybin: A Cross Study Comparison

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Background & Research Question

Altered States of Consciousness (ASCs)

- Multidimensional shifts in waking subjective experience (Ludwig, 1966; Fort et al., 2025).

ASC Classification

- Induction-domain classification schemes distinguish **pharmacological vs. non-pharmacological** induction methods (Vaitl et al., 2005; Fort et al., 2025).

Core Question

- Pharmacological ASCs are often assumed as **more intense**, yet both types may share a **common phenomenological structure** (Dittrich, 1998; Fort et al., 2025).

- *How comparable are the experiences generally elicited by a pharmacological vs. non-pharmacological induction method?*

Datasets

Psilocybin (n = 21)

- 0.17 mg/kg Psilocybin (UMaastricht MRI; Mason et al., 2020; Mortaheb & Fort et al., 2024).
- 5D-ASC completed **360 min post-dose**
- Double-blind protocol**

MMGF (n = 33)

- Red Light/White Noise Multi-Modal Ganzfeld reclined in bed (Uliège)
- 5D-ASC + free association interview **after 25 min induction** (order randomized)
- Deception-based blinding**

Results

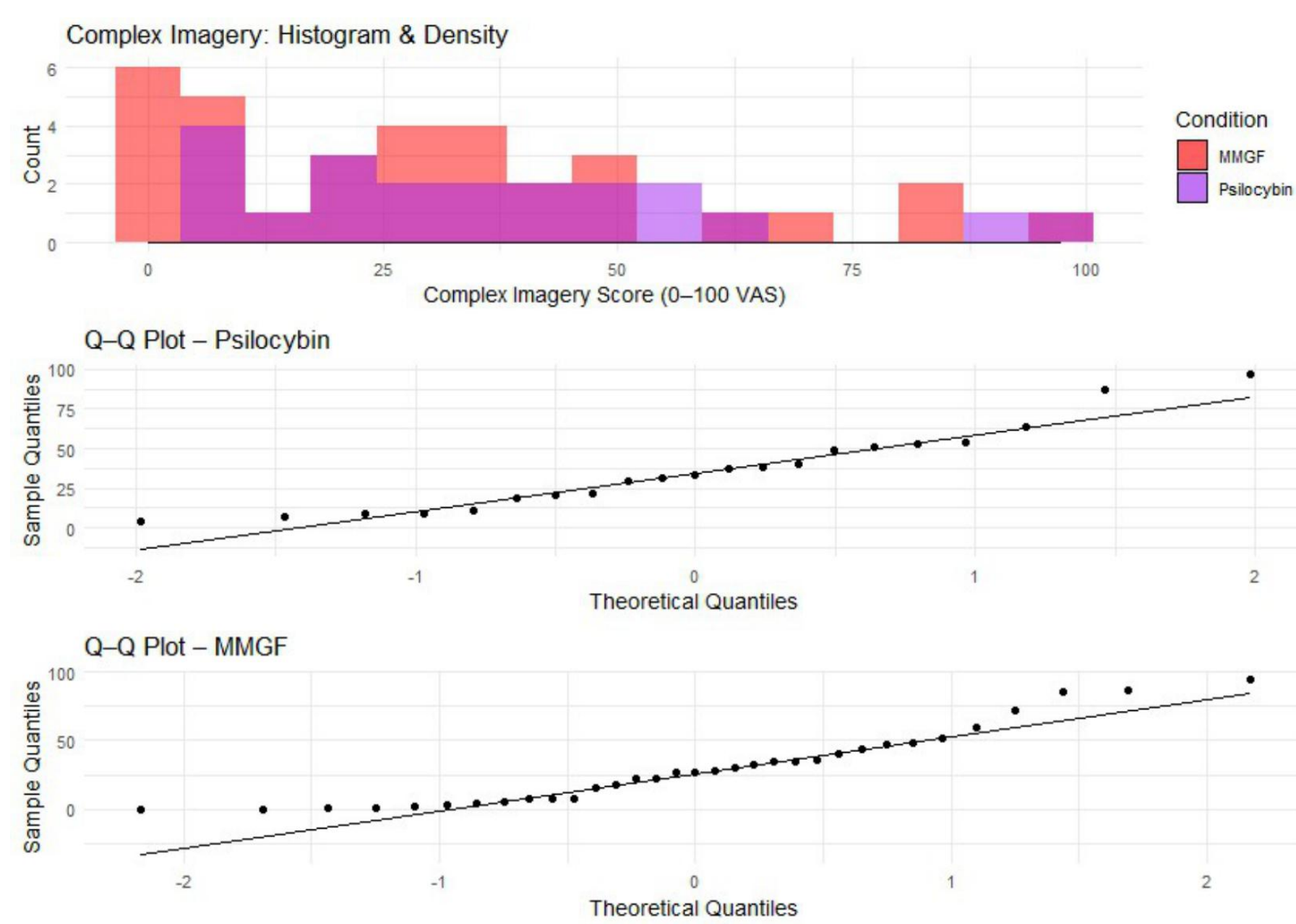


Figure 1. Normality Assessment.

Shapiro-Wilk tests indicated that **Psilocybin scores did not significantly deviate from normality** ($W = 0.93, p = .13$), while **MMGF scores showed a significant deviation from normality** ($W = 0.90, p = .006$). This violation of normality assumptions supports the use of **nonparametric methods**.

	Variable	Statistic (W)	pFDR	Cliff's Delta (δ)
5D-ASC	General Altered State Score (G-ASC)	137	.001***	-0.605
	Oceanic Boundlessness	111	<.001***	-0.68
	Dread of Ego Dissolution	279	.307	-0.195
	Visionary Restructuralization	108.5	<.001***	-0.687
	Auditory Alterations	293.5	.427	-0.153
	Vigilance Reduction	390.5	.440	0.127
11-ASC	Experience of Unity	177.5	.005**	-0.488
	Spiritual Experience	197.5	.014*	-0.43
	Blissful State	138.5	.001***	-0.6
	Insightfulness	153	.001***	-0.558
	Disembodiment	296.5	.430	-0.144
	Impaired Control and Cognition	301.5	.440	-0.13
	Anxiety	248.5	.129	-0.283
	Complex Imagery	277.5	.307	-0.199
	Elementary Imagery	167	.003**	-0.518
	Audio-Visual Synesthesia	70	<.001***	-0.798
	Changed Meaning of Percepts	78	<.001***	-0.775

Table 1. Mann-Whitney U NHST Results.

Moderate-dose psilocybin induced significantly more intense experiences overall (G-ASC) particularly in **Oceanic Boundlessness** and **Visionary Restructuralization** dimensions. Several factors (e.g., **Experience of Unity**, **Spiritual Experience**, **Blissful State**, and **Elementary Imagery**) also showed **significantly higher scores under psilocybin**. Differences could not be found (supplemented with **small effect sizes**) in some dimensions (e.g., **Dread of Ego Dissolution**) and factors (e.g., **Complex Imagery**).

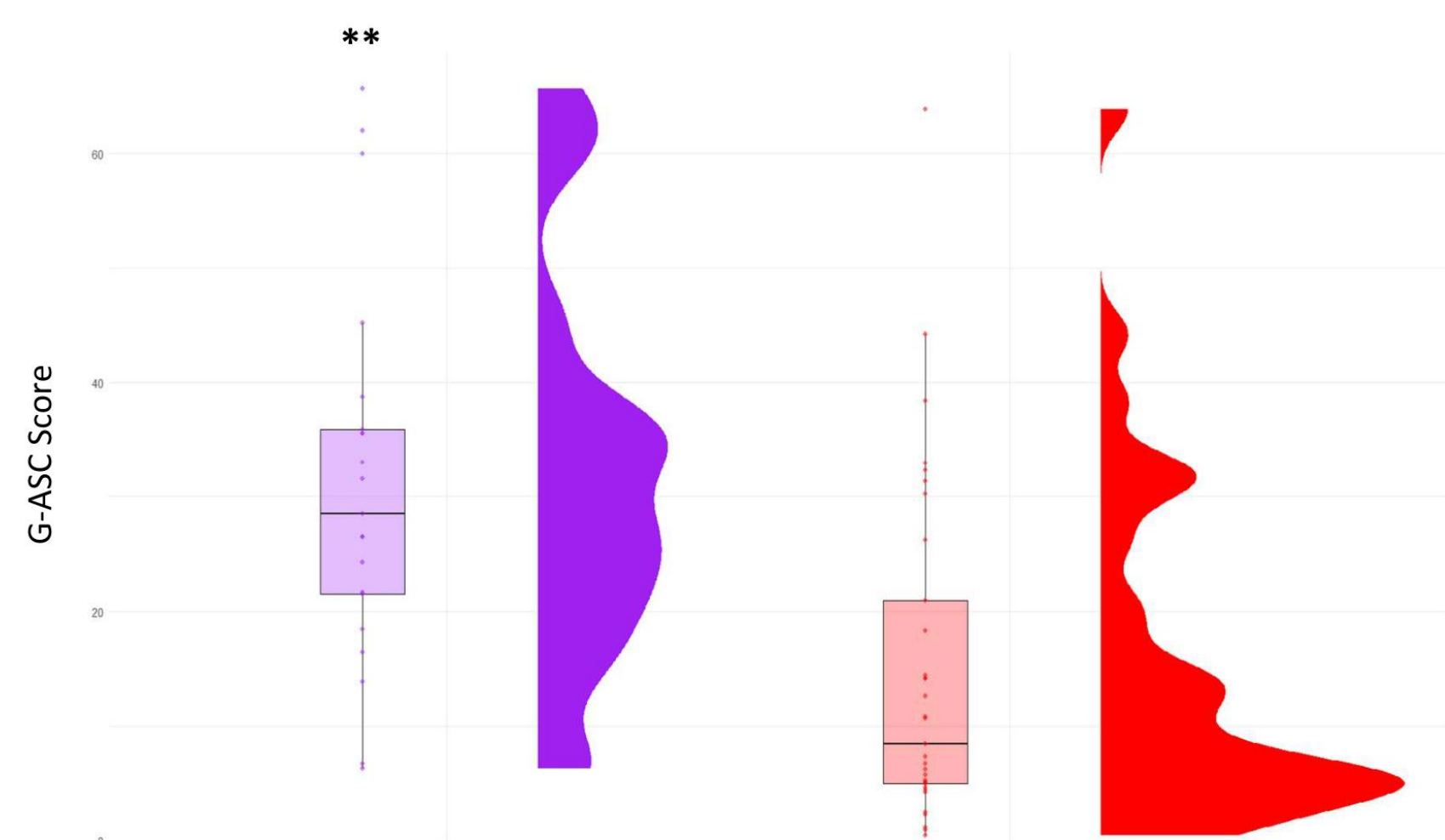


Figure 2. G-ASC Raincloud Plots. Psilocybin (purple) compared to MMGF (red). ** = $p < 0.01$.

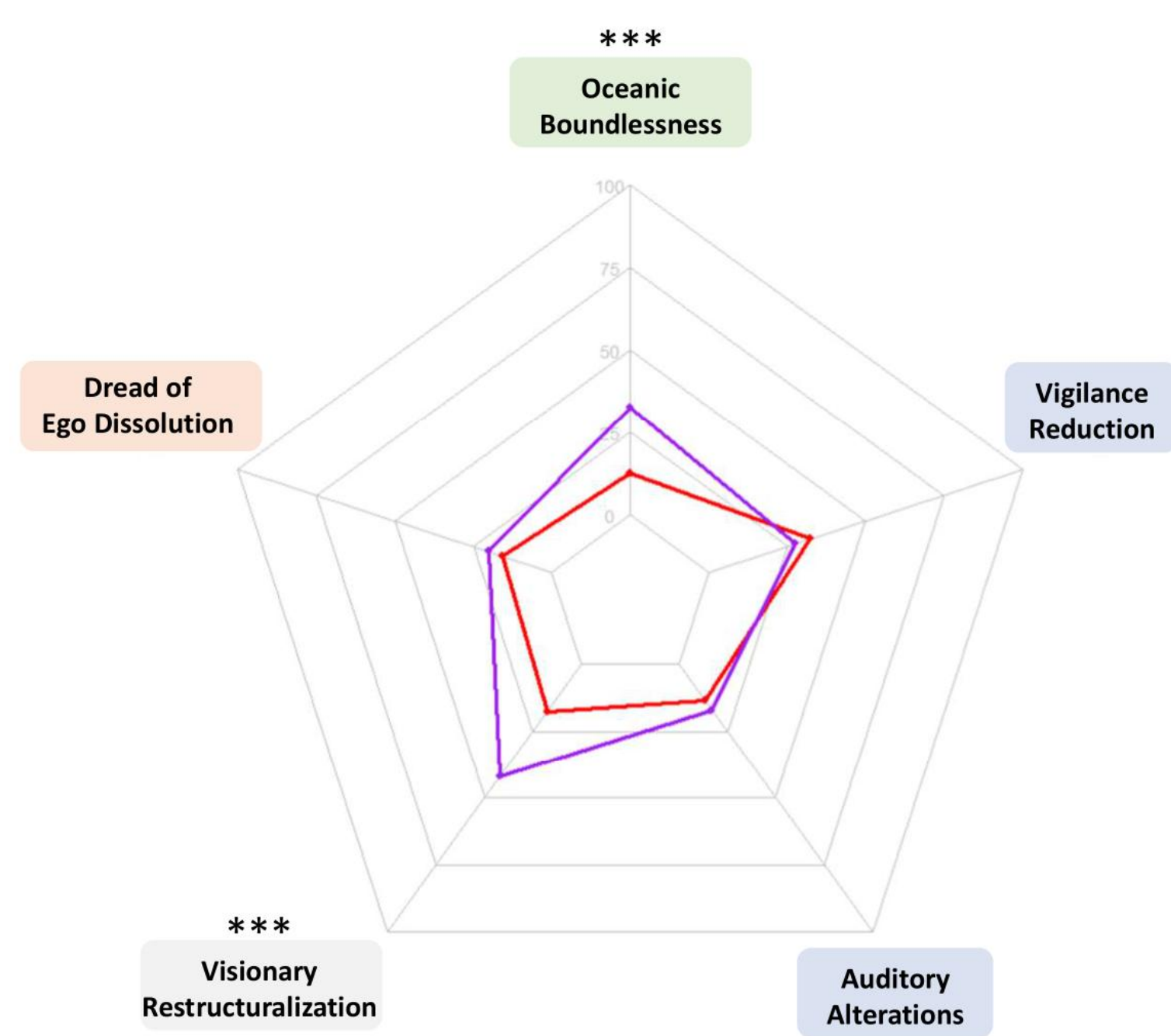


Figure 3. Radar Plot using Dimension Score means. Psilocybin (purple) compared to MMGF (red). * = $p < 0.05$, ** = $p < 0.01$, *** = $p < 0.001$

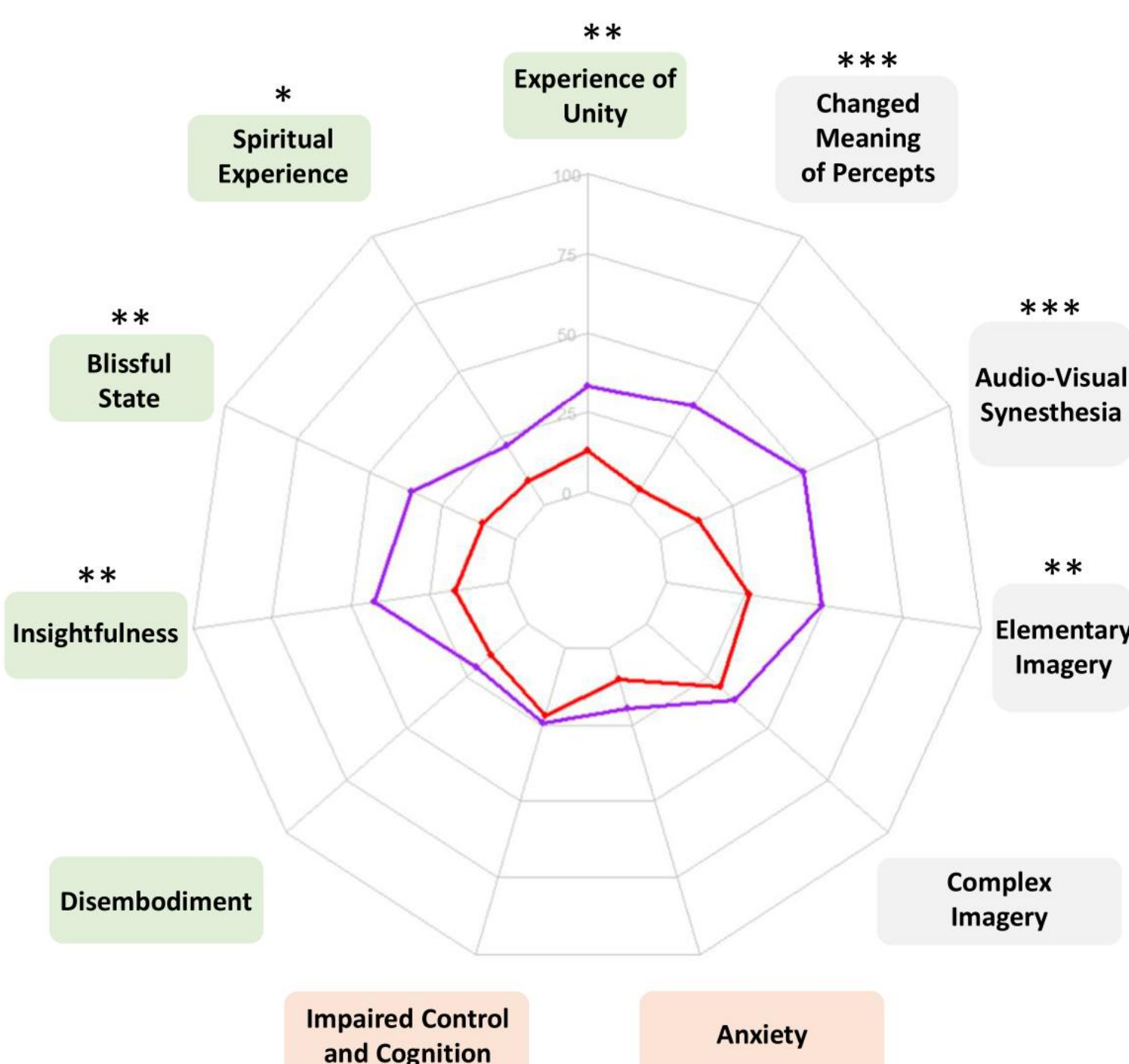


Figure 4. Radar Plot using Factor Score means. Psilocybin (purple) compared to MMGF (red). *** = $p < 0.001$

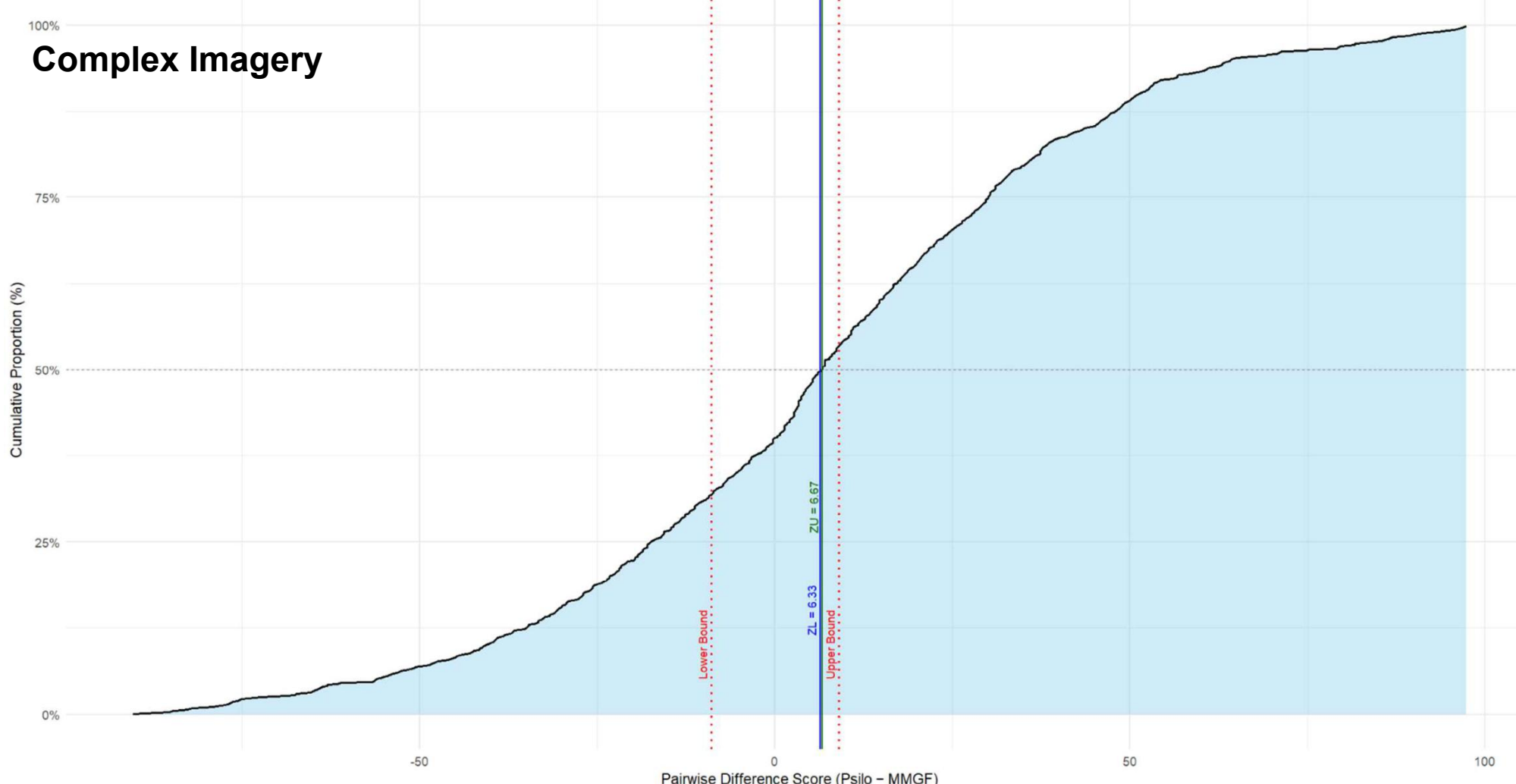


Figure 5. Non-Parametric Equivalence Test (Meier, 2010) on Complex Imagery.

- Pairwise Differences**
 - 21 x 33 MMGF = 693 differences (Psilo - MMGF, 0-100 VAS ON 5D-ASC).
- Empirical Cumulative Distribution Frequency**
 - X-axis = difference score; Y-axis equals cumulative % of comparisons.
 - 50% line gives the **plausible median range** (ZL = 6.33, ZU = 6.67).
- Equivalence bounds (SESOI raw score)**
 - A single step on the **Hallucination Rating Scale (HRS, 0-4; Strassman, 2005)** spans ≈ 25 VAS points (5D-ASC).
 - $\pm 9 = < \frac{1}{2}$ HRS category \rightarrow **too small to be phenomenologically noticed**.
 - Conservative domain-based margin.** Reasoned to be **minimal point shift**.
- Decision**
 - Entire median range lies within ± 9 = **phenomenological equivalence**.
 - Supports NHST metrics (Mann-Whitney $p = .207$, Cliff's $\delta = -0.20$).

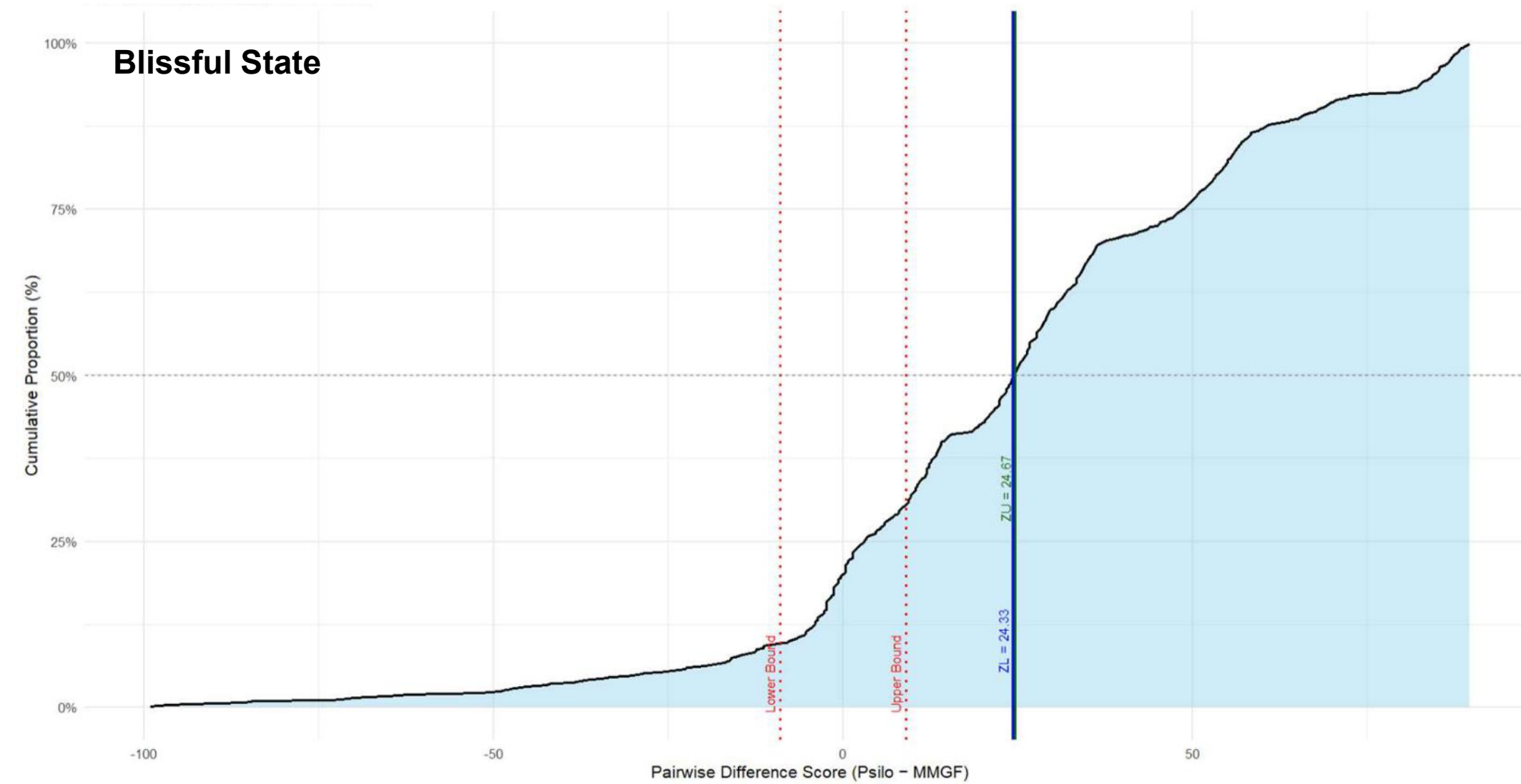


Figure 6. Non-Parametric Equivalence Test (Meier, 2010) on Blissful State.

- Proof of Concept**
 - Test on factor where we do not expect equivalence.
 - Plausible median range** (ZL = 24.33, ZU = 24.67).
- Equivalence bounds (SESOI raw score)**
 - ± 9 maintained
- Decision**
 - Entire median range lies outside ± 9 = **no phenomenological equivalence**.
 - Supports NHST metrics (Mann-Whitney $p = .001$, Cliff's $\delta = -0.6$).

Conclusion

- Moderate-dose psilocybin** induces a more intense ASC than **red-light/white noise MMGF**.
- Of interest, are the **non-significant p-values** and **small effect sizes** associated with the factors of **Impaired Control and Cognition**, **Disembodiment**, **Anxiety**, and **Complex Imagery**.
- Nonparametric equivalence testing (Meier, 2010) suggests **phenomenological equivalence** between them in **Complex Imagery**.
- MMGF** offers a viable method to investigate the neural correlates of hallucinatory phenomena, suggesting the importance of factors such as **Complex Imagery** (Schmidt, 2020).
- Complex Imagery** is of interest as it may have **therapeutic potential**, possibly confronting unconscious material (Singer, 1971).
 - \rightarrow MMGF could hold **clinical value** as both a **standalone induction** or in **combination with serotonergic psychedelics** (e.g., psilocybin).
- The **cross-domain compatibility** of these states support developing **hybrid-induction ASCs** to engineer clinically relevant dimensions of experience.
- Future studies are needed** to directly compare MMGF and psilocybin **under matched conditions** to confirm the present findings.

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