How Personalized is Connectivity Mapping in Current Treatments for Neurodevelopmental and Psychiatric Disorders?

Connectivity Mapping for Personalized Treatment: Promising but Only Partially Personalized So Far

Connectivity mapping uses brain network measurements (mostly fMRI) to understand symptoms and guide treatment. Research is moving rapidly toward personalization, but current clinical care is still only lightly personalized and mostly experimental.

How “Personal” Are Current Connectivity Maps?

Individualized vs Group-Level Mapping

- Studies show that **individual-specific connectivity** is more informative than group-averaged templates for tracking symptoms in psychosis and transdiagnostic samples (Li et al., 2022; Wang et al., 2018).
- Personalized network mapping outperforms group methods in predicting symptom domains and estimating psychosis severity (Li et al., 2022; Wang et al., 2018)and in characterizing ASD vs ADHD (Zhang et al., 2024).

Tables: Where Personalization Is Strongest

Use of Connectivity for Personalization

Domain / Use-case	Level of Personalization Today	Citations
Symptom tracking across diagnoses	Moderate: subject-specific connections map to transdiagnostic symptom domains (attention, appetite-energy, psychosis) and functional domains (negative valence, cognition, social) (Li et al., 2022; Mulders et al., 2022; Voldsbekk et al., 2023)	(Li et al., 2022; Mulders et al., 2022; Voldsbekk et al., 2023)
Predicting treatment outcome (MDD, internalizing disorders, ECT)	Moderate: baseline whole-brain FC predicts multidimensional outcomes and ECT response, but effect sizes modest and not treatment-specific (Tura & Goya-Maldonado, 2023; Zhang et al., 2025; Sun et al., 2024; Mao et al., 2025)	(Tura & Goya-Maldonado, 2023; Zhang et al., 2025; Sun et al., 2024; Mao et al., 2025)
Stratifying biotypes / subgroups	Advanced research stage: personalized circuit scores define depression/anxiety biotypes with different treatment responses (Tozzi et al., 2024); distinct connectivity-based subgroups in ADHD/ASD (Mohammad et al., 2025; Zhang et al., 2024; Shen et al., 2024)	(Mohammad et al., 2025; Zhang et al., 2024; Tozzi et al., 2024; Shen et al., 2024)
Directly choosing treatments for individuals	Early/experimental: reviews emphasize potential but stress need for large, prospective validation and better standardization (Tura & Goya-Maldonado, 2023;	(Tura & Goya-Maldonado, 2023; Mohammad et al., 2025; Meyer-Lindenberg, 2023;

Domain / Use-case	Level of Personalization Today	Citations
	Mohammad et al., 2025; Meyer-Lindenberg, 2023; Cash & Zalesky, 2023; Abi-Dargham et al., 2023)	Cash & Zalesky, 2023; Abi-Dargham et al., 2023)

FIGURE 1 Current roles of connectivity in personalization

Neurodevelopmental vs Psychiatric Disorders

- In **neurodevelopmental disorders** (ASD, ADHD), personalized functional and structural mapping is mainly used to parse heterogeneity and quantify "neurodivergence," not yet to select specific treatments (Diao et al., 2026; Mohammad et al., 2025; Zhang et al., 2024; Shen et al., 2024; Argyropoulou et al., 2024).
- In **adult psychiatric disorders** (depression, anxiety, psychosis), connectivity markers can predict symptom profiles and some treatment outcomes, but are not yet precise enough for routine clinical decision-making (Tura & Goya-Maldonado, 2023; Zhang et al., 2025; Sun et al., 2024; Mao et al., 2025; Wang et al., 2018; Abi-Dargham et al., 2023).

Key Limitations and Challenges

- Effect sizes for individual-level prediction are modest; substantial outcome variance remains unexplained (Zhang et al., 2025; Tura & Goya-Maldonado, 2023; Mao et al., 2025).
- Heterogeneity, small samples, and lack of standardization and external validation limit clinical translation (Tura & Goya-Maldonado, 2023; Mohammad et al., 2025; Yamashita et al., 2024; Abi-Dargham et al., 2023).
- Reviews stress that **clinically actionable biomarkers** must be reliable, robust across sites, and truly predictive at the single-patient level—criteria rarely met so far (Yamashita et al., 2024; Meyer-Lindenberg, 2023; Abi-Dargham et al., 2023).

Conclusion

Connectivity mapping is increasingly personalized at the level of data analysis (individual-specific networks, biotypes, prediction models), and it can already track symptoms and forecast response probabilistically. However, in day-to-day treatment for neurodevelopmental and psychiatric disorders, its use is still largely experimental and not routinely guiding specific therapies for individual patients.

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