How are Neurodevelopmental and Psychiatric Disorders atypical forms of aging?

Neurodevelopmental/Psychiatric Disorders as Atypical Aging

Research increasingly frames neurodevelopmental disorders (NDDs) and serious mental illnesses as involving **altered aging trajectories** rather than purely "early-life" or "brain-only" problems. This shows up at multiple levels: symptoms across the lifespan, brain structure and gene expression, and systemic biological aging markers.

Types of Atypical Aging

1. Accelerated / Premature Biological Aging

- Serious mental disorders (schizophrenia, bipolar disorder, major depression) show **shorter lifespans, excess age-related physical illness, and biomarkers of accelerated biological aging**, suggesting a "whole-body" premature aging phenotype (Antolini & Colizzi, 2023; Diniz et al., 2026).
- Epigenetic "clock" studies find that higher psychiatric burden is associated with **epigenetic age acceleration** in blood (Yusupov et al., 2023), and that MDD increases epigenetic age while some NDDs (ASD) show reduced intrinsic epigenetic age (Hong, 2025; Felt et al., 2023).
- Faster biological aging (DunedinPoAm) predicts **poorer adult cognition** in people with early adversity and psychiatric disorders (Felt et al., 2023).

2. Older-Than-Expected Brain Age

- MRI-derived "brain age" is **older than chronological age** in schizophrenia, bipolar disorder, mood and neurodevelopmental disorders, with largest effects in schizophrenia and mood disorders (Zhao et al., 2026).
- Transcriptomic "molecular age" of frontal cortex is **elevated in schizophrenia and bipolar disorder**, suggesting older brain tissue at the same chronological age (Lin et al., 2020).
- Large MRI cohorts show **distinct, heritable patterns of apparent brain aging** across many brain disorders, implying shared developmental/aging pathways (Kaufmann et al., 2019).

3. Lifespan-Long Neurodevelopmental Trajectories

- NDDs (ASD, ADHD, ID, Down syndrome) are **lifelong phenotypes** with variable adult outcomes and aging-related concerns, not childhood-limited conditions (Fröhlich et al., 2024; Wallin et al., 2023).
- Longitudinal imaging shows disorders as **perturbations of normal brain growth curves**: delays (ADHD), early overgrowth (autism), or accelerated loss/silencing of growth (childhood-onset schizophrenia) (Shaw et al., 2010).
- In 22q11.2 deletion syndrome, NDD and psychiatric diagnoses remain common into adulthood, with **progressive functional impairment** (Wallin et al., 2023).

4. Shared Mechanisms with Neurodegeneration

- NDDs show **oxidative stress, chronic neuroinflammation, mitochondrial dysfunction, cellular senescence** and biomarker changes (telomere shortening, GFAP, NfL, brain-age deviations) that mirror neurodegenerative pathways, supporting "altered brain aging" (De Aguiar Da Costa et al., 2026; Mihalcea et al., 2025).
- Single-cell and bulk transcriptomic work demonstrates **convergent aging and psychiatric signatures** in prefrontal/orbitofrontal cortex, including disrupted synaptic transmission and accelerated transcriptomic aging (Fröhlich et al., 2024; Girdhar, 2025).
- Editorials on ASD/PDD highlight overlap in synaptic, mitochondrial, immune and proteostasis pathways with classical neurodegenerative diseases, suggesting **heightened vulnerability to atypical aging and dementia**, though data are still sparse (Mihalcea et al., 2025).

Very Concise View of Aging Phenotypes

Phenotype	Evidence in NDD/psychiatric disorders	Citations
Accelerated systemic aging	Epigenetic clocks, medical comorbidity, mortality	(Antolini & Colizzi, 2023; Diniz et al., 2026; Hong, 2025; Yusupov et al., 2023; Felt et al., 2023)
Accelerated brain aging	Brain-age MRI, molecular age, scRNA-seq	(Lin et al., 2020; Kaufmann et al., 2019; Fröhlich et al., 2024; Zhao et al., 2026; Girdhar, 2025)
Altered developmental tempo	Delayed, overshoot, or derailed trajectories	(Shaw et al., 2010; Fröhlich et al., 2024; Wallin et al., 2023)
Shared neurodegenerative biology	Oxidative stress, inflammation, mitochondria, proteostasis	(De Aguiar Da Costa et al., 2026; Mihalcea et al., 2025; Gonzales et al., 2022)

FIGURE 1 Different atypical aging patterns in mental illness

Summary

Neurodevelopmental and psychiatric disorders can be viewed as **atypical forms of aging**: they often involve earlier or faster biological and brain aging, distorted developmental trajectories, and sharing of core aging mechanisms with neurodegeneration. However, patterns differ by diagnosis (and even subtype), and longitudinal, lifespan data are still limited, so these are best seen as **divergent aging trajectories**, not simple "early dementia."

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