A Roadmap for Advancing Knowledge and Clinical Practice of Brain & Behavioral Effects of X and Y Chromosome Variation

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How Can We Improve Intervention for Brain & Behavioral Effects of X/Y Variation?

- We need to understand brain and behavioral effects much, much better
  - In particular, “state” and “trait” for each condition
- We need to remember that DSM diagnoses are not “real” conditions and they will not help specify X/Y brain and behavioral issues
  - Though can be useful for obtaining services and insurance reimbursement
- We need to conduct developmental (longitudinal) research studies to better understand “cause and effect” and “critical windows”
- We need to conduct studies where multi-dimensional data are collected (brain, behavior, genetic, molecular, hormonal, environment, etc.)
  - Assess for subgroups within each condition (e.g., fragile X, Turner syndrome)
- We need to analyze the data from these studies in ways that take maximal advantage of their multi-dimensional and developmental nature
  - Big data analytics
- *If* we can do all of the above, we will then design new, more specific and effective interventions based on this new knowledge, but........
DSM Disorders: What do the Scientific Data Say?

- Risk Factor A
- Risk Factor B
- Risk Factor C
- Risk Factor D
- Risk Factor E
- Risk Factor F
- Risk Factor G
- Risk Factor H

Neural Pathways

“DSM Dx”
“State” and “Trait”

- State – a temporary way of being (i.e., thinking, feeling, learning behaving, and relating)
  - Environmental influences interacting with biological predisposition
- Trait – a more stable and enduring characteristic or pattern of behavior
  - Genetic and/or hormonal influences interacting with long-term environmental shaping
- We probably do not have the necessary scientific knowledge right now to clearly differentiate these two constructs in X/Y variation
Building a precision medicine approach to X/Y variation

Data
- Symptom-Based
- Cohort-Based
- Algorithm-Based

Actions
- Intuition Medicine
- Evidence-based Medicine
- Precision Medicine

Yesterday
- Symptom-Based
- Intuition Medicine

Today
- Cohort-Based
- Evidence-based Medicine

Tomorrow
- Algorithm-Based
- Precision Medicine

Actions
- Brain development & function
- Genetic & molecular profile
- Physiological profile
- Treatment response
- Family environment
- Cognition and behavior

Big data analytics (TDA, ML)
Reference databases/algorithms

Precision Medicine for X/Y
Website:
• med.stanford.edu/BGAPstudy

Eligibility:
• is.gd/BGAPstudy
• Table at AXYS Meeting

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