

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.....

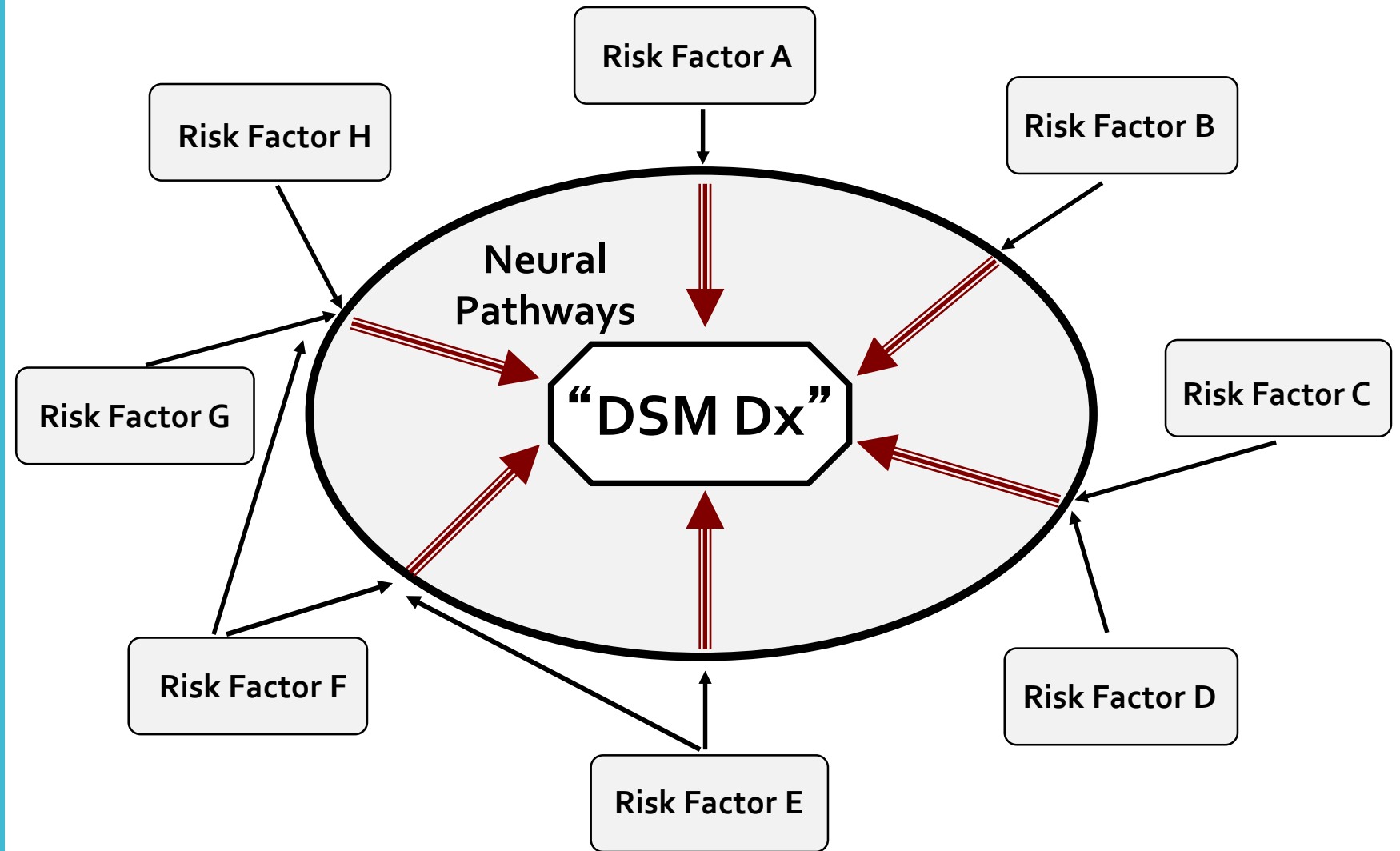
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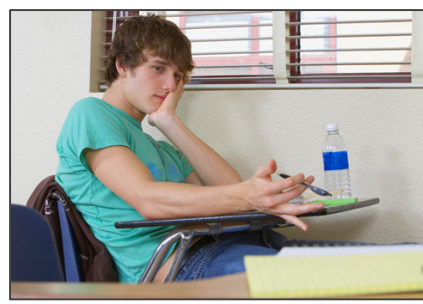
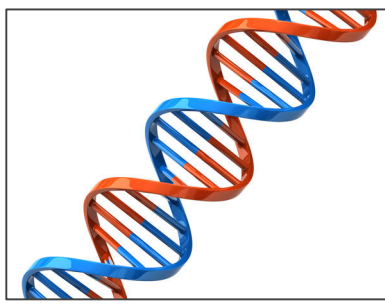
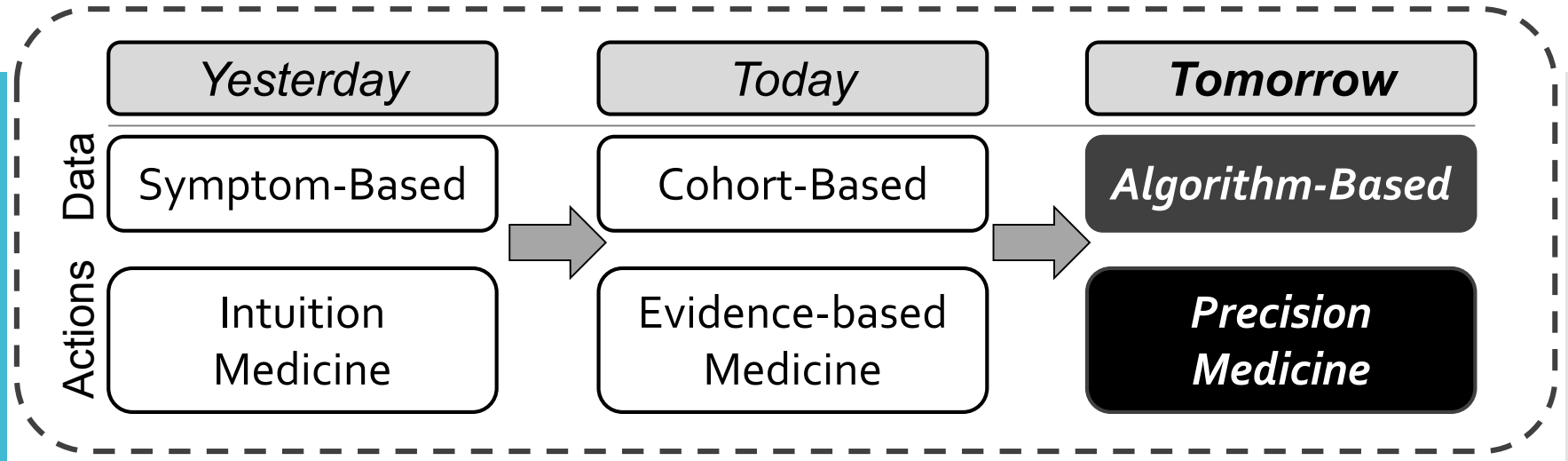
DSM Disorders: What do the Scientific Data Say?



“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



- 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



BGAP STUDY

BRAINS, GENES, AND PUBERTY

Website:

- med.stanford.edu/BGAPstudy

Eligibility:

- is.gd/BGAPstudy
- Table at AXYS Meeting

Email :

- BGAPstudy@stanford.edu

Facebook:

- [@StanfordBGAPstudy](https://www.facebook.com/StanfordBGAPstudy)

The screenshot shows the homepage of the BGAP Study website. At the top left is the Stanford Medicine logo. To its right is the text "BGAP Study: Brains, Genes, and Puberty" and "A study of Klinefelter Syndrome and male adolescent neurodevelopment". On the top right are social media icons for Facebook and YouTube. Below the header is a navigation menu with items: "BGAP Study", "About the Team", "About the Study", "Preparing for your visit", "Family Section", "Presentations and Publications", "News & Events", "Join Our Study!", and "Contact Us". A red banner on the left side of the navigation menu says "BGAP Study". To the right of the navigation menu are three stylized brain icons (black, red, black) and the text "BGAP STUDY BRAINS, GENES, AND PUBERTY". Below this is a red button that says "New presentations posted. Click here to view". The main content area has a heading "Welcome to the BGAP Study site!" followed by a paragraph: "BGAP stands for Brain, Genes, And Puberty and is a study of Klinefelter syndrome and male adolescent neurodevelopment. At the Center for Interdisciplinary Brain Sciences Research we investigate brain development and function and specific genetic influences in children, and strive to understand how this information is associated with behavioral and cognitive variation across development." Below this is another paragraph: "Led by Dr. Allan Reiss and Dr. Judith Ross, this study is investigating the development of brain and behavior in boys with and without Klinefelter syndrome (KS). It is a longitudinal study during which families will participate in 4 annual visits, giving insights into the development of boys and pre-teens with KS." At the bottom of the page are three columns of content. The first column has a photo of a man and the text "Meet the BGAP Team" with a "Click Here >" link. The second column has a brain diagram and the text "About the BGAP Study" with a "Click Here >" link. The third column has a photo of children reading and the text "Join the BGAP Study" with a "Click Here >" link. On the left side of the main content area, there is a blue button that says "For more information on how to prepare for your MRI scan, click here" with a right-pointing arrow.