

Practical and scientific challenges in biomarker development for ASD

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Overview

- Biomarkers
 - Definition
 - Objectives
- Challenges in ASD
- Progress and shortcomings
- Needs for future research
 - More rigorous studies
 - More sensitive biomarkers
 - Practical biomarkers

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Biomarker definition

Any characteristic that is objectively measured and evaluated as an indicator of normal biological processes, pathogenic processes, or pharmacologic responses to a therapeutic intervention

***No clinically practicable
biomarkers in ASD***

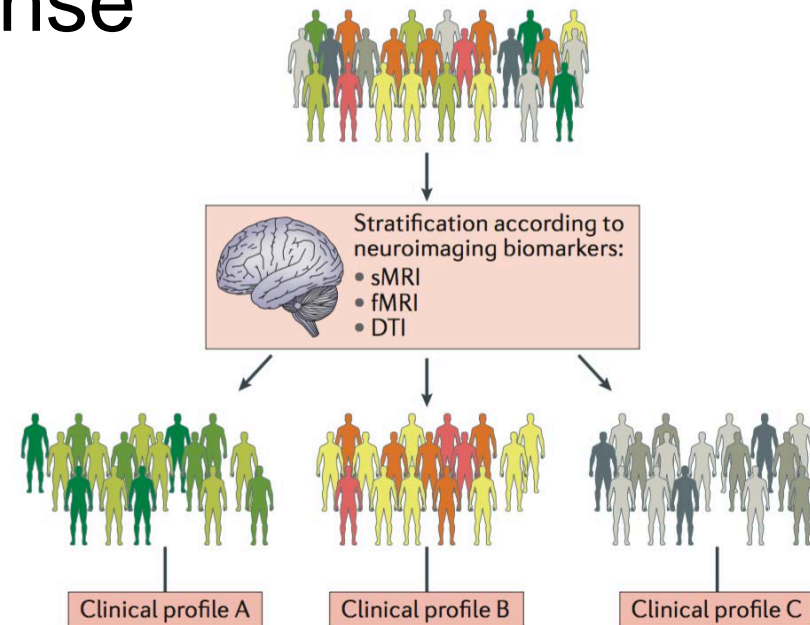
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Biomarker objectives

- Diagnosis/screening
- Stratification
 - Treatment selection
 - Prognosis
- Treatment response



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Challenges in ASD

- Behavioral diagnosis
 - Social-communicative impairment
 - Rigid, repetitive behaviors and atypical sensory responses

Developmental change

Multiple etiologies

Heterogeneity

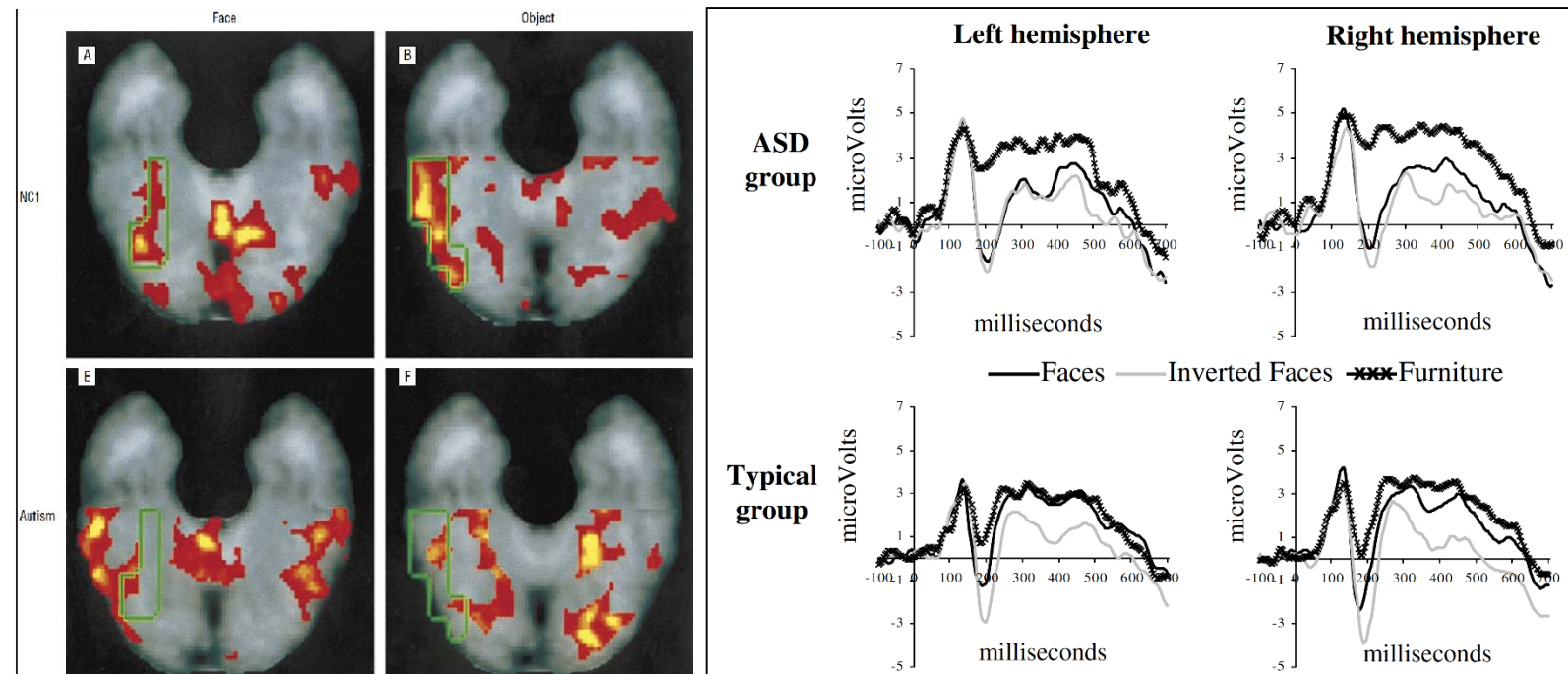
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ASD biomarkers: Progress

- Numerous promising biomarkers
 - Neural response to faces
 - fMRI: Fusiform gyrus activation
 - Event-related potential: N170



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Schultz et al., 2000

McPartland et al., 2004

McPartland et al., 2004; O'Connor et al., 2005, 2007 McPartland et al., 2011; Dawson et al., 2012

ASD biomarkers: Shortcomings

- Inconsistent reproducibility
 - True heterogeneity in ASD
 - Underpowered studies
 - Methodological variability
 - No frame of reference in typical development

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McPartland et al., 2004, 2011; Grice et al., 2005; O'Connor et al., 2005, 2007; Dawson et al., 2005; Senju et al., 2005; Valdizan, 2005; Kemner et al., 2006; Webb et al., 2006, 2009, 2012; Boeschoten et al., 2007; Gunji et al., 2009; Magnee et al., 2008; Wong et al., 2008; McCleery et al., 2009; Akechi et al., 2010; Churches et al., 2010, 2012; Hileman et al., 2011; Batty et al., 2011; Apicella et al., 2013; Khorrami et al., 2013; Wagner et al., 2013; Tye et al., 2013, 2014; Cygan et al., 2014; Key et al., 2014

Needs: More rigorous studies

- Larger samples to understand variability
- Tightly controlled methods
- Longitudinal design
- Development of normative “atlas”



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SIMONS FOUNDATION
AUTISM RESEARCH INITIATIVE

THE
biomarkers
CONSORTIUM



Needs: More sensitive biomarkers

- Questionable ecological validity of social neuroscience methods
- Interactive social neuroscience



Schilbach et al., 2013; Rolison et al., 2015; Naples et al., in press; Hirsch et al., under review

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Needs: Practical biomarkers

- Practicality limits ultimate utility
 - Cost
 - Accessibility



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