Identifying Challenges
Faced by Neurodiverse
Software Engineers:
Ensuring an Inclusive
Technical Workforce

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Andrew Begel

- · Senior Researcher on the Ability Team at Microsoft Research, Redmond
- Current Research Areas
 - Autism (Employment, Career Preparation, Video Calling)
 - Programming for Accessibility, Accessible Programming Environments
 - Software Engineering for Al
- Past Research
 - · Empirical Studies and Tools to Support Software Engineering Practice at Microsoft
 - Biometrics for Software Development
 - · Computer Science Education



Autism Background (Quick)

Autism Stats

- · 1 in 40 children (2.5%) are diagnosed with ASD in USA (2018).
- More than half of diagnoses occur before age 6.
- · 3.5:1 Male:Female diagnosis ratio
- Autism has a strong genetic basis
 - · 80-90% co-occurrence in identical twins
 - Only 3-10% co-occurrence in fraternal twins

Autism History

• First described by Asperger (Vienna) and Kanner (Johns Hopkins) in the 1940s

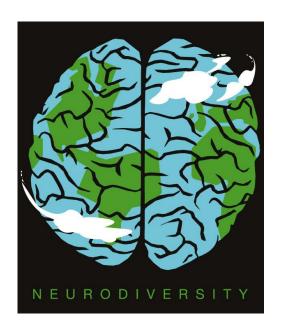
- Debunked Explanations
 - · Schizophrenia caused by trauma Kanner, 1949 (original diagnosis)
 - · Refrigerator mothers Bettelheim, 1949 (Debunked in 1964 by Rimland)
 - · Thimerosal preservative in vaccines Wakefield, 1998 (Debunked in 2010)

Cognitive Theories Explaining Autism

- Theory of Mind (Baron-Cohen, Leslie, Frith, 1985)
 - · Ability to attribute mental states to others, understand another's perspective, predict actions
- Weak Central Coherence (Frith, 1989)
 - · Cognitive style focusing on details at the expense of understanding the big picture. Also connected with sensory sensitivities
- Executive Function (Boucher, 2009)
 - · Dysfunctions in planning, organizing, switching focus, self-regulation, impulse control, motivation, coping with change
- Hyper-Systemizing (Baron-Cohen, 2005)
 - · Process phenomena as systems with inputs, outputs, and governed by rules
- Spoons Metaphor (Miserando, 2003)
 - · People spend energy (i.e. spoons) throughout day. Activities can use up or renew spoons. Autistic people start with fewer spoons and use them up more quickly.

Neurodiversity: Ability or Disability?

- · Applied Behaviorial Analysis (ABA) is often used to improve social and communication skills in young children.
 - · Occupational, speech, and physical therapy as well.
- · There is no cure (and as autistic self-advocates say, they are not broken).
- · Neurotypicals find it (too) easy to focus on impairments and disabilities





Autism and Employment

The Narrow Autism at Work Pipeline

- · Only 17.4% autistic people graduate high school.
- · Only 1/3 of those go to college.
- · Only 20% of those finish college in 5 years. 40% graduate within 7 years.
- · 85% autistic adults are unemployed. Only 14% work for pay.
- Employment outcomes are significantly worse than one would expect for people with average or above-average cognitive ability.
 - · Resumes have glaring gaps and many indications of underemployment.
 - · Except for RIT and U Delaware, no universities have autism internship programs or programs to connect disability offices to university career offices.
- · Autistic people without cognitive disabilities are 3x more likely to be unemployed than those with cognitive disabilities

"Some job tips for people with autism or Asperger's syndrome... Computer science is a good choice because it is very likely that many of the best programmers have either Asperger's syndrome or some of its traits."

Temple Grandin



Autistic People Are Drawn to CS/IT

- Hyper-systemizing theory suggests that autistic people have unique ability to process large amount of information in order to make it fit their mental models.
 - Excellent attention to detail
 - Passionate interests
 - · Adherence to rules and standards
 - Associations of rules to parts of the system
 - · Recognition of repeating patterns
 - · Perception and processing of information presented in multiple modalities

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How Autism Can Help You Land a Job

SAP, Freddie Mac Recruit Autistic Workers to Fill Roles That Call for Precision; Debugging Software

Inclusive Hiring at Micro X

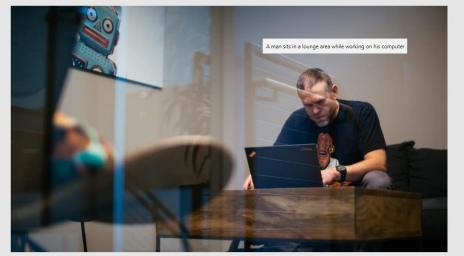




One of the main reasons people choose to attend college is to improve potential job prospects, but that last part may not be a guaranteed for people with autism. Lately, major companies such as Microsoft have been starting hiring programs to ease this process. These initiatives are extremely valuable, both to people with autism and their new employers, and they promote the value of the skill sets those with ASD bring to the workplace

Automaker Ford Motor Company has launched their own new program, called FordInclusiveWorks, which partners with the Autism Alliance of Michigan to identify and hire individuals with autism. The program goes beyond hiring to provide support to employees with autism and training to their coworkers. Reactions have been positive thus far with individuals employed in areas ranging from vehicle preparation to engineering, and all new hires have a high school or

Meet with Microsoft: Upcoming Events



Autism Hiring Program

To learn more about the Autism Hiring Pro check out our FAQs. If you would like to the program, please send your resume to msautism@microsoft.com

- March 27 28, 2019 Microsoft Store & Bellevue, WA
- · April/May Vancouver, Canada
- April 1 5, 2019 Redmond, WA
- August 12 16, 2019 University Ever Redmond, WA
- October 21 25, 2019 Redmond, W











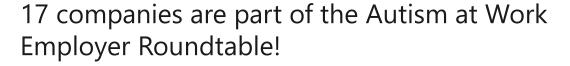
































Google has an autism internship program.

Autism Hiring Programs

- · Fill important jobs suffering from skills shortage
- · Offer access to much higher levels of talent
- Provide marketing benefits for favorable corporate perception
- Increase employee engagement and morale, which improves productivity and work quality
- Innovation through "accessing outliers" neurodiverse employees offer a diversity of ideas
- · Strong potential for process improvement comes from neurodiverse abilities to spot irregularities and inefficiencies, and the willingness to call them out.

Spillover Benefits

- · Challenges experienced by neurodiverse employees are also experienced by others, but they're more impactful to the neurodiverse.
- Designing for neurodiversity helps the rest of the company's employees
 - · Organizational communication standards reduce ambiguity
 - · Improvements in mgmt. practices because of being aware of needs to manage neurodiversity program. Makes managers better.
 - · Improved employee support practices (e.g. coping with stress and depression) for neurodiverse help the NT employees.
 - · Explicit processes are easier to improve. Provides way for anyone to question processes whereas before, everything was assumed.

Neurodiversity at Microsoft

- Interviewed 10 autistic tech workers in USA/UK
 - · 4 Autistic, 4 Asperger's, 1 PDD-NOS, 1 ADHD. 90% male.
- · 32 questions based on interview findings
- · Sent to 2600 random U.S.-based developers at Microsoft
- · 846 completed surveys (32.5% response rate)
 - · 85% male
 - · 59 neurodiverse (7%)
 - · 11 (1.3%) w/ ASD
 - · 38 (4.5%) w/ attention-deficit disorder
 - · 16 (1.9%) w/ dyslexia or learning disabilities

Neurodiverse Workplace Challenges

- Diagnosis late in life
- Disclose autism to coworkers?
- Team meetings
- Job interviews
- Environmental distractions
- Team reorganizations
- Communication tools

Self-perceived Strengths and Weaknesses

Strengths

- · Pattern recognition
- Hyperfocus
- Coding Style
- Out-of-the-box thinking

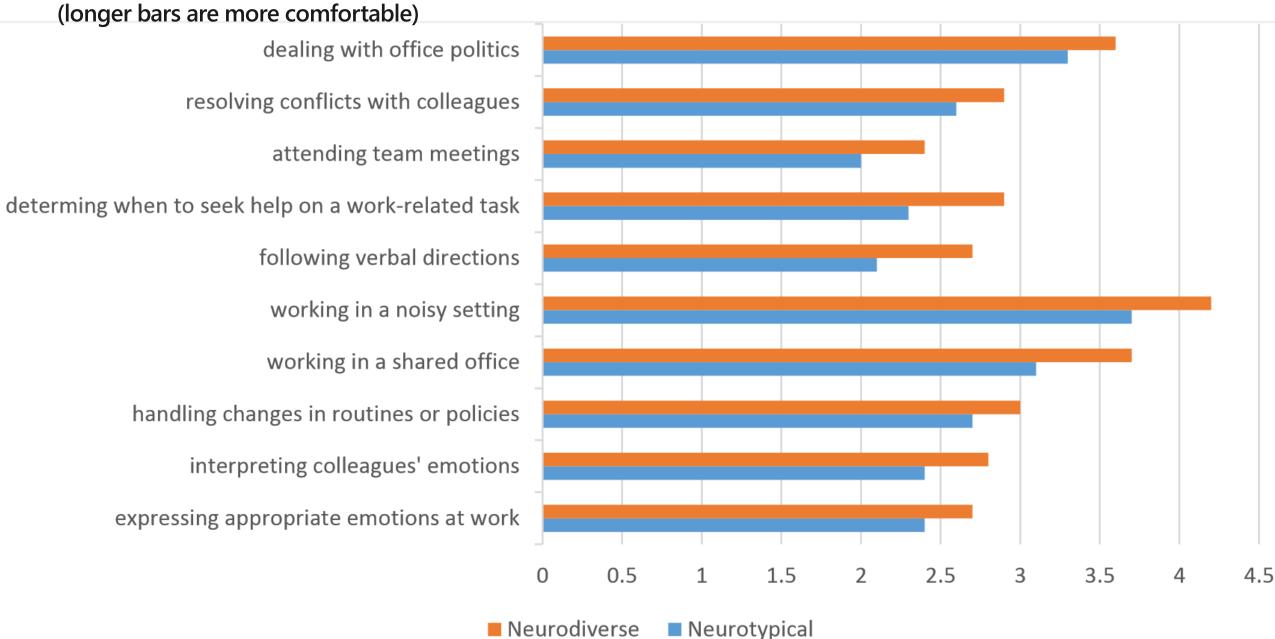
Weaknesses

- · Rigidly interpreting coding style or team process
- · Difficulty focusing on particular tasks (e.g. testing)
- · Inappropriate emotional reactions (e.g. code review)

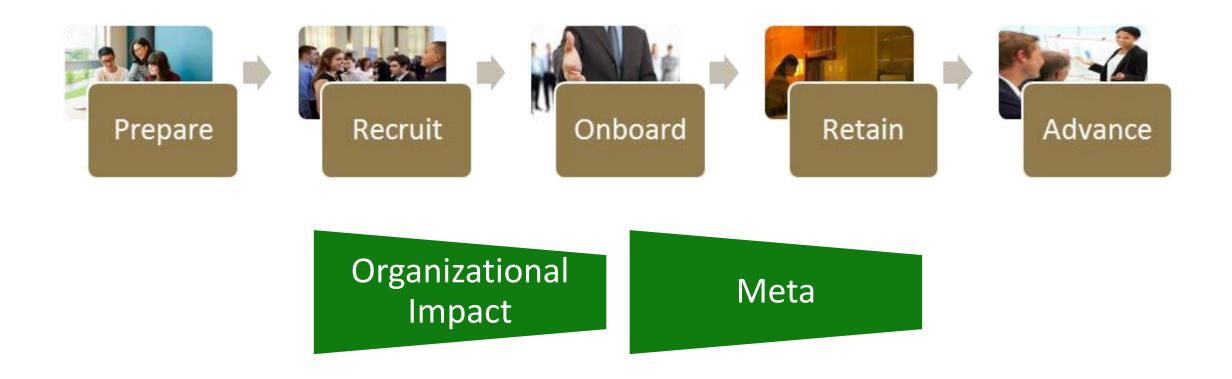
How good are you at this software engineering task?

(longer bars are better) reviewing other peoples' code requesting code reviews writing test cases focusing on a particular task detecting patterns in code employing good coding style 0.5 1 1.5 2 2.5 3 3.5 4 4 ■ Neurodiverse ■ Neurotypical

How comfortable are you with this activity?



Framing the Autism at Work Research Agenda



Preparation

How can we enhance workplace readiness through evidence-based early intervention? How can these programs reach autistic persons outside of school? Investigate the implications of disclosure for those neurodiverse adults who are already in the workplace. How can we facilitate transition without vocational rehab funding? Investigate the different preparation needs for job readiness across gender/ethnicity/other identities What is the role of educational institutions in thinking about the ecosystem around autism hiring?

Recruitment

How do we develop closer relationships between autistic jobs seekers and the companies who want to employ them?

How do we fill the job pipeline with individuals with autism who are 22 and older? How can we more easily find them?

How do we ensure we don't engage in job channeling (i.e. stereotyping) in the recruitment process?

What are the impact to autistic individuals after going through autism hiring programs?

How do we assess the outcomes of the different varieties of autism hiring programs?

Onboarding

How can we evaluate onboarding processes and associated outcomes for people on the spectrum?

When is it safest/best to disclose autism to management and co-workers?

What activities might promote a culture of autism awareness?

Is it better to have specialized onboarding processes for autistic people or embellish mainstream processes?

Retention

How can we best support autistic people with co-occurring mental health needs to enhance retention and advancement? Moving new hires across the country uproots them from their support networks. How does this impact their quality of life? What is the impact of the supervisor in retaining autistic employees? What is working well for autistic people in organizations without autismspecific hiring programs? How do needs vary across different identities / intersectionality? How do we better meet those needs?

Advancement

Should we redefine advancement for autistic employees? How do autistic employees define advancement for themselves? How can we support autistic employees in the advancement process? How do we utilize measurements across differences to help maintain equity? What cultures best support those who may or may not want to follow a traditional career path? Are neurodiverse employees hitting glass ceilings or getting stuck in their job positions?

Organizational Impact

What are the barriers at the C-suite level for neurodiversity employment?

What types of neurodiversity do well in particular industries?

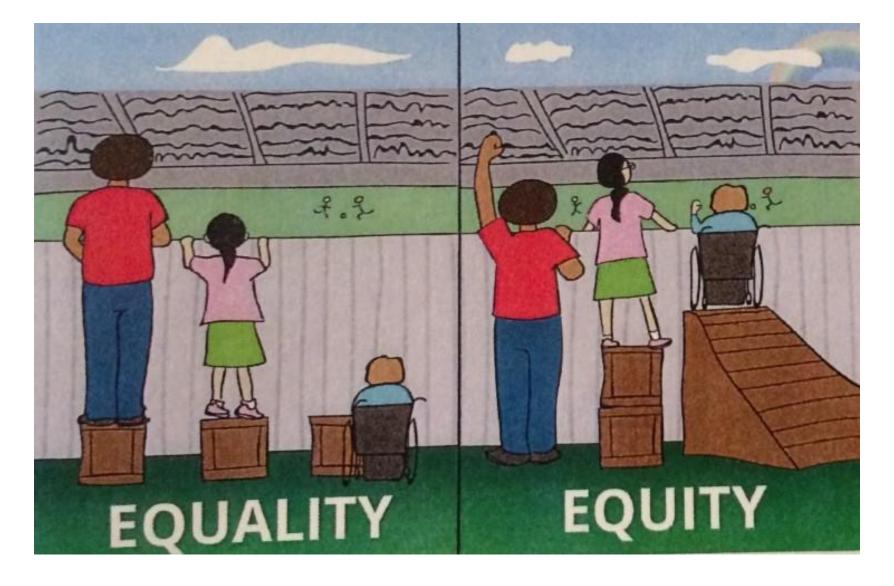
What are the key cultural enablers that enable autism hiring programs?

How to we best scale programs across local and functional areas?

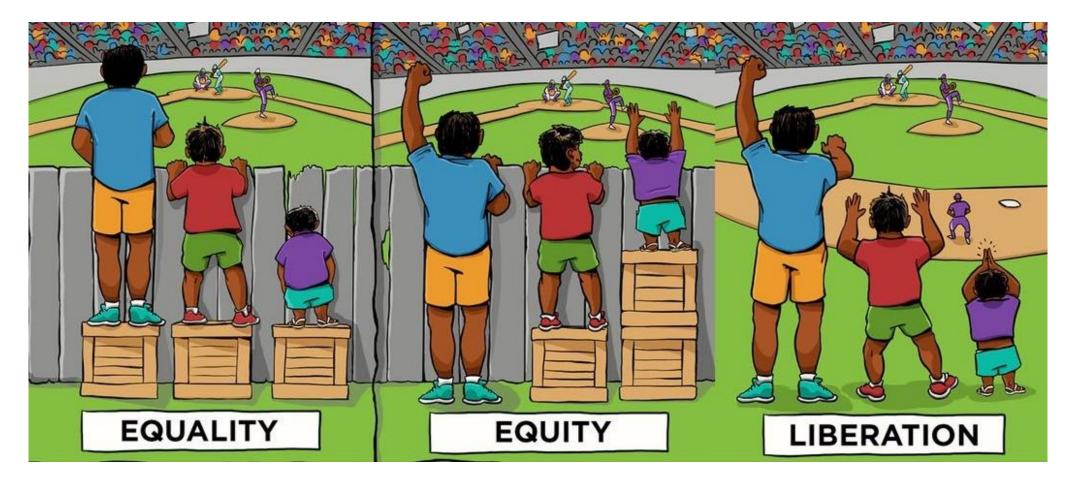
How should we measure success/performance of autism programs?

Meta

How do we make the voice of self advocates most prominent? How can we best facilitate/support/manage job transitions throughout life? What unique strengths would autistic people bring to management positions? How do we best allocate resources to support autism hiring programs? How do we get access in industry to study and evaluate the outcomes of the programs?



When you do not intentionally, deliberately, and proactively include, you will unintentionally exclude. – Joe Gerstandt



Supporting neurodiversity is not about lowering the bar.

We must remove the *barriers* to the bar in order to let people leapfrog past it.

Questions?

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