



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

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- 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 AI
- 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

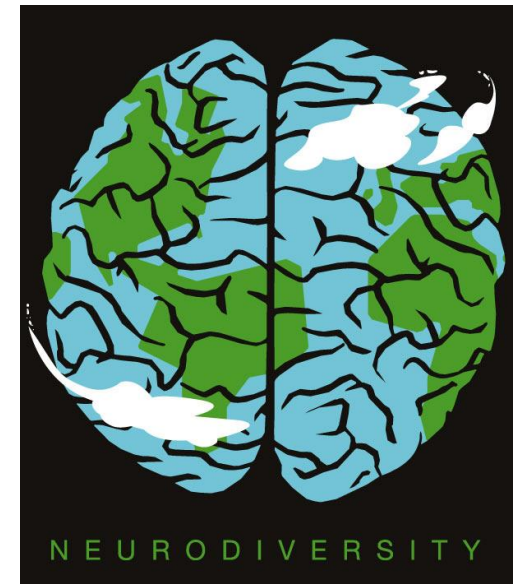
- First described by Asperger (Vienna) and Kanner (Johns Hopkins) in the 1940s
- Debunked Explanations
 - Schizophrenia caused by trauma – Kanner, 1949 (original diagnosis)
 - Refrigerator mothers – Bettelheim, 1949 (Debunked in 1964 by Rimland)
 - Thimerosal preservative in vaccines – Wakefield, 1998 (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 Behavioral 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



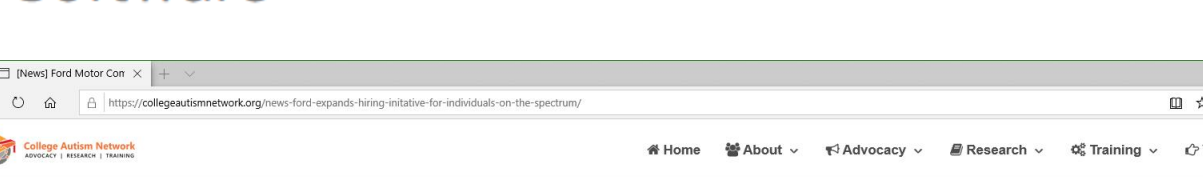
Autistic People Are Drawn to CS/IT

- 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

BUSINESS

How Autism Can Help You Land a Job

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



[News] Ford Motor Company expands hiring program for individuals on the spectrum




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

Inclusive Hiring at Micrc

https://www.microsoft.com/en-us/diversity/inside-microsoft/cross-disability/hiring.aspx

Meet with Microsoft: Upcoming Events



Autism Hiring Program

To learn more about the Autism Hiring Program, check out our [FAQs](#). If you would like to apply 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, WA

Spring 2019

Autism at Work Summit

Sponsored by the Autism at Work Employer Roundtable



JPMORGAN CHASE & CO.



WillisTowersWatson

17 companies are part of the Autism at Work Employer Roundtable!

Started just 4 years ago.

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

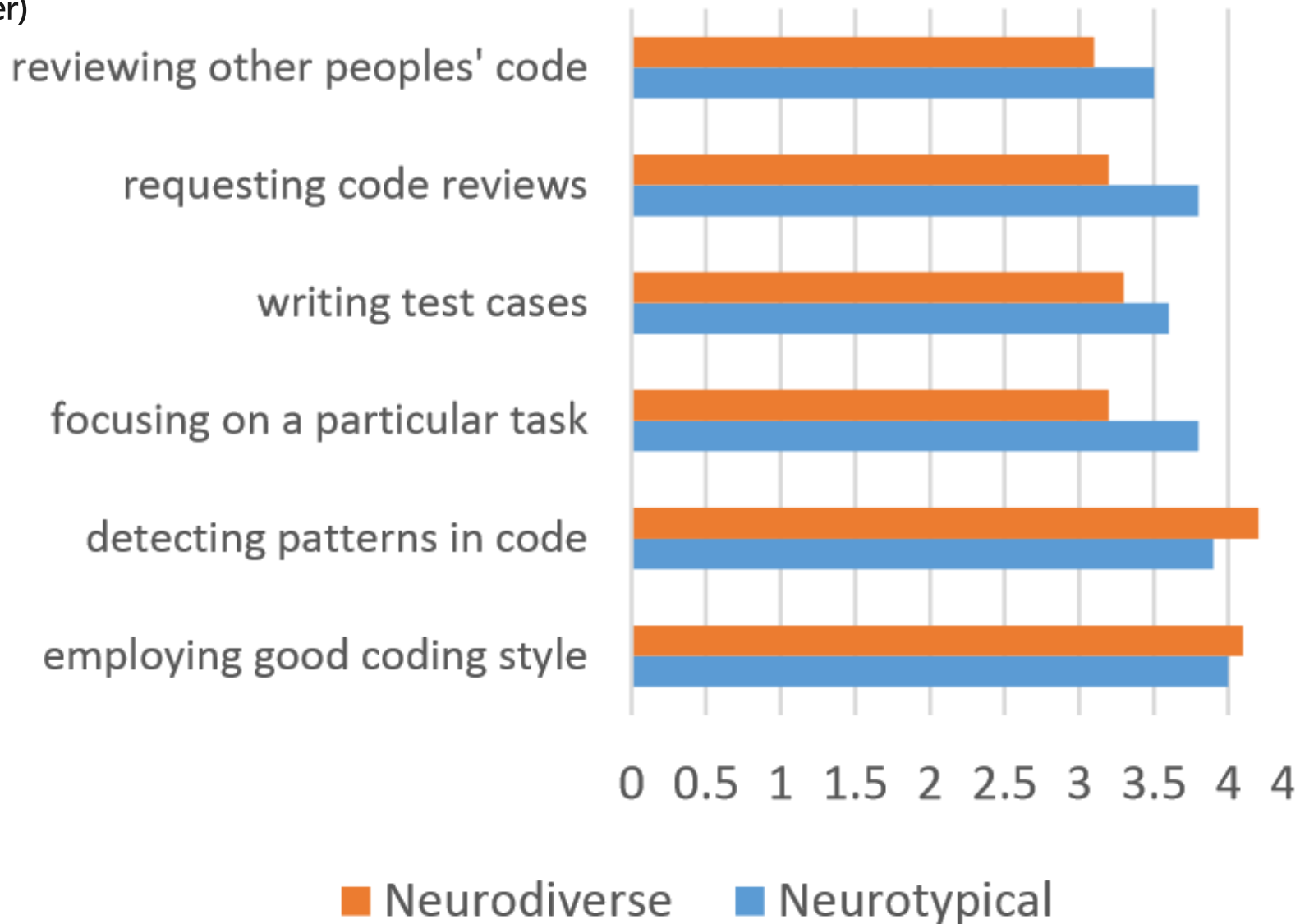
- Diagnosis late in life
- Disclose autism to coworkers?
- Team meetings
- Job interviews
- Environmental distractions
- Team reorganizations
- Communication tools

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)

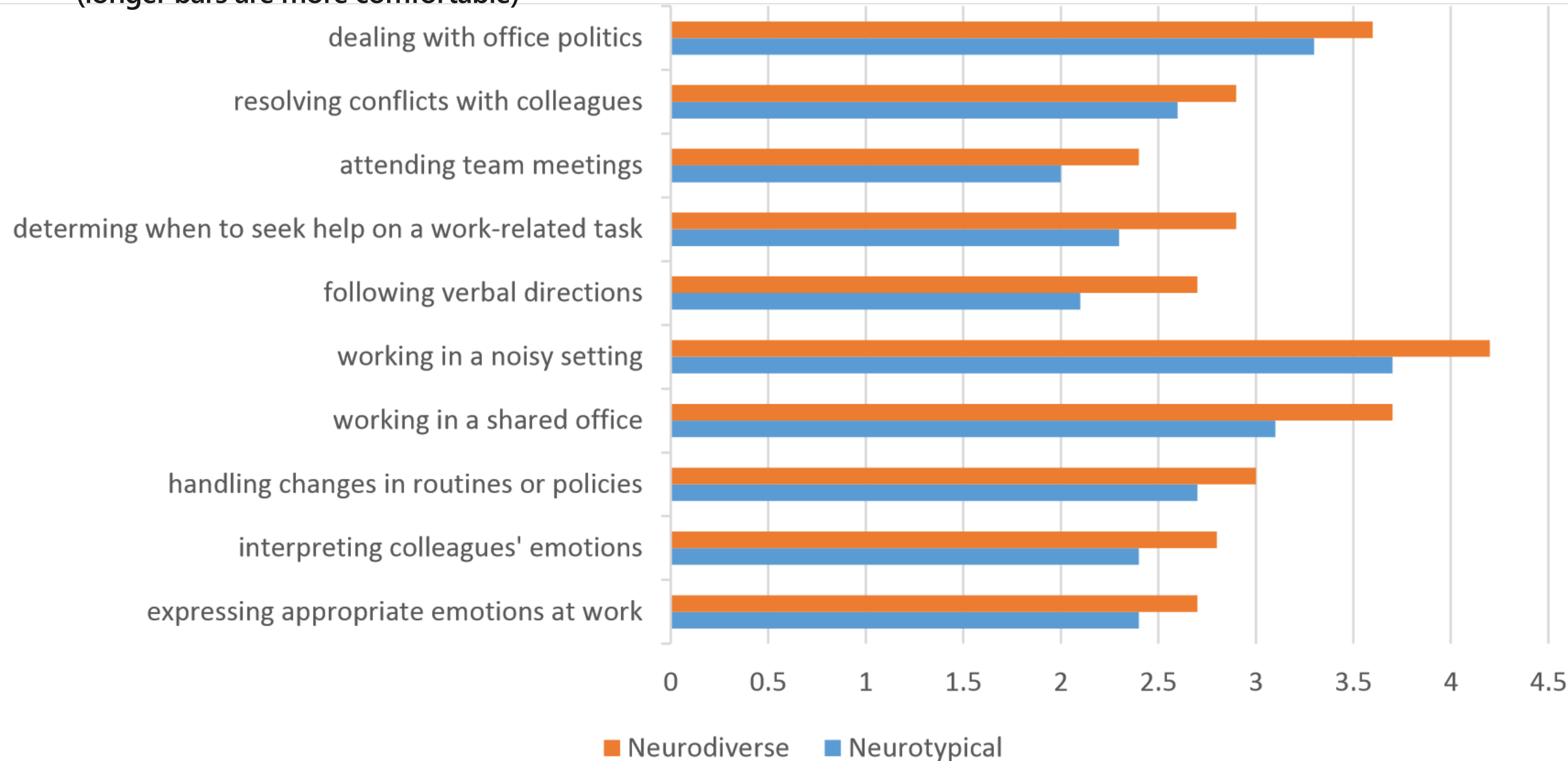
How good are you at this software engineering task?

(longer bars are better)

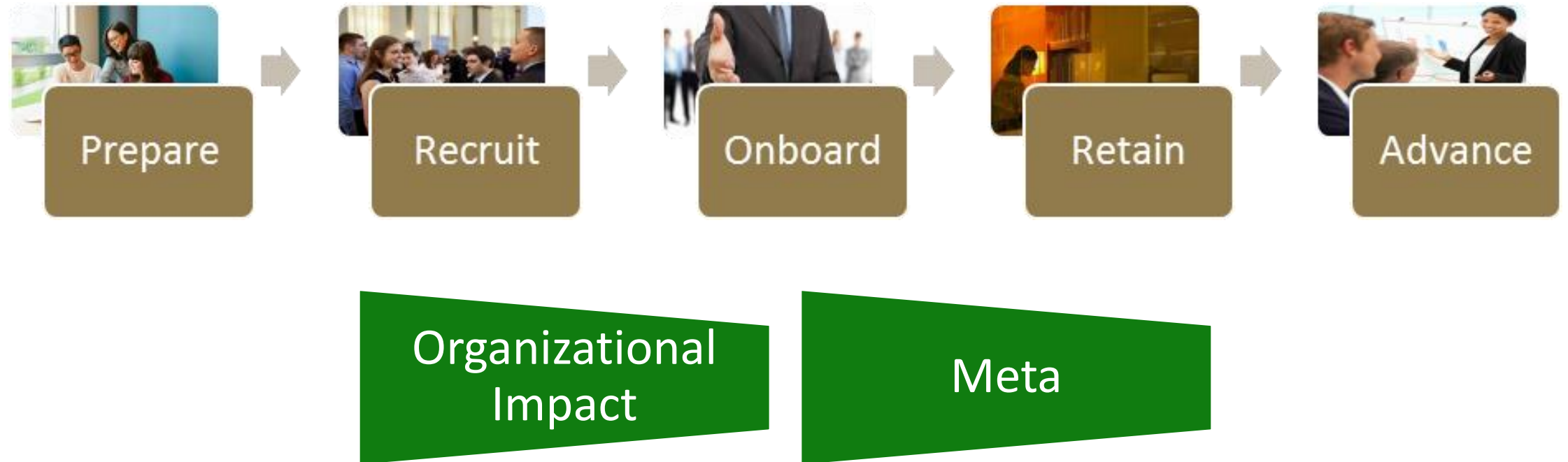


How comfortable are you with this activity?

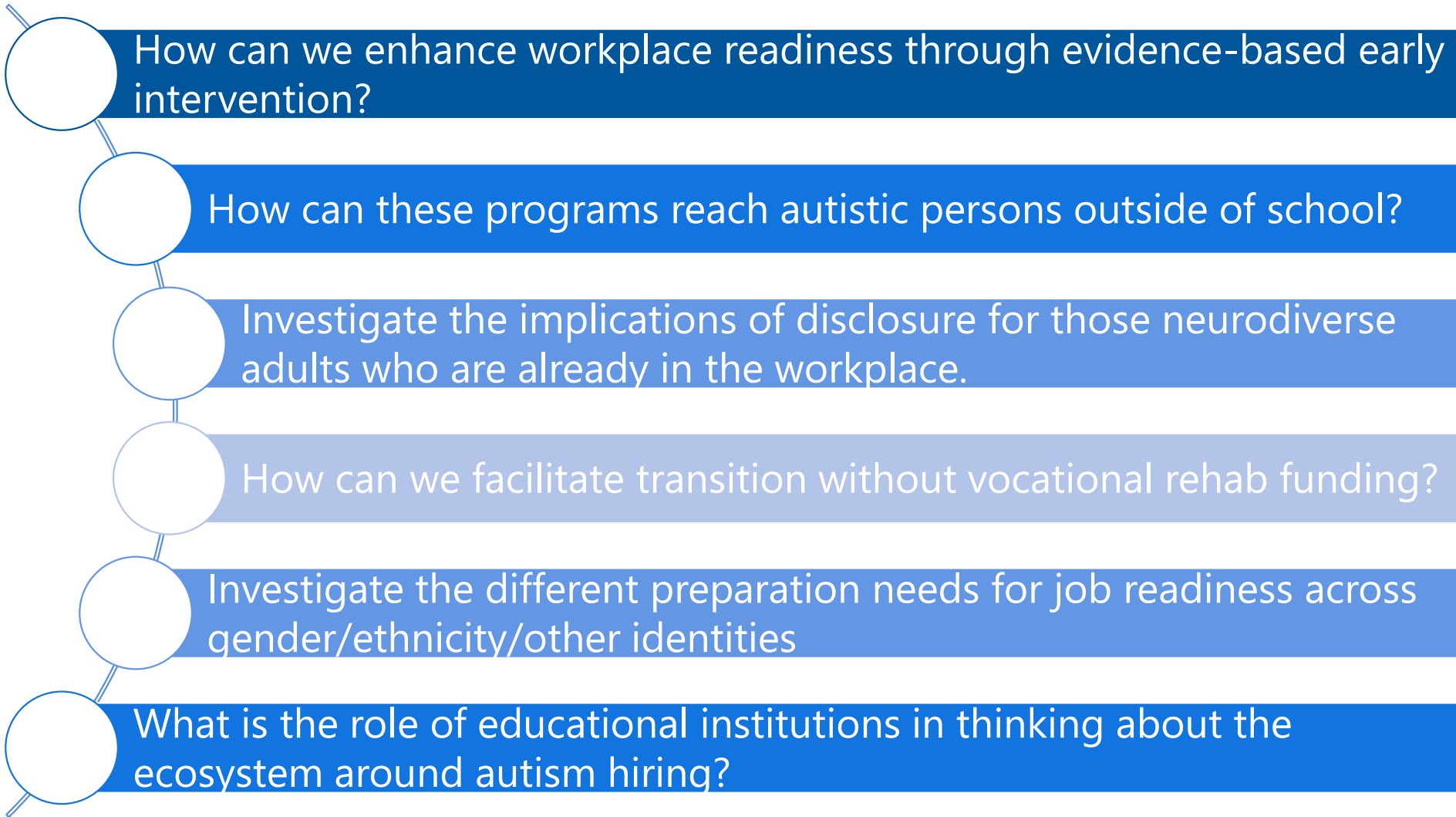
(longer bars are more comfortable)



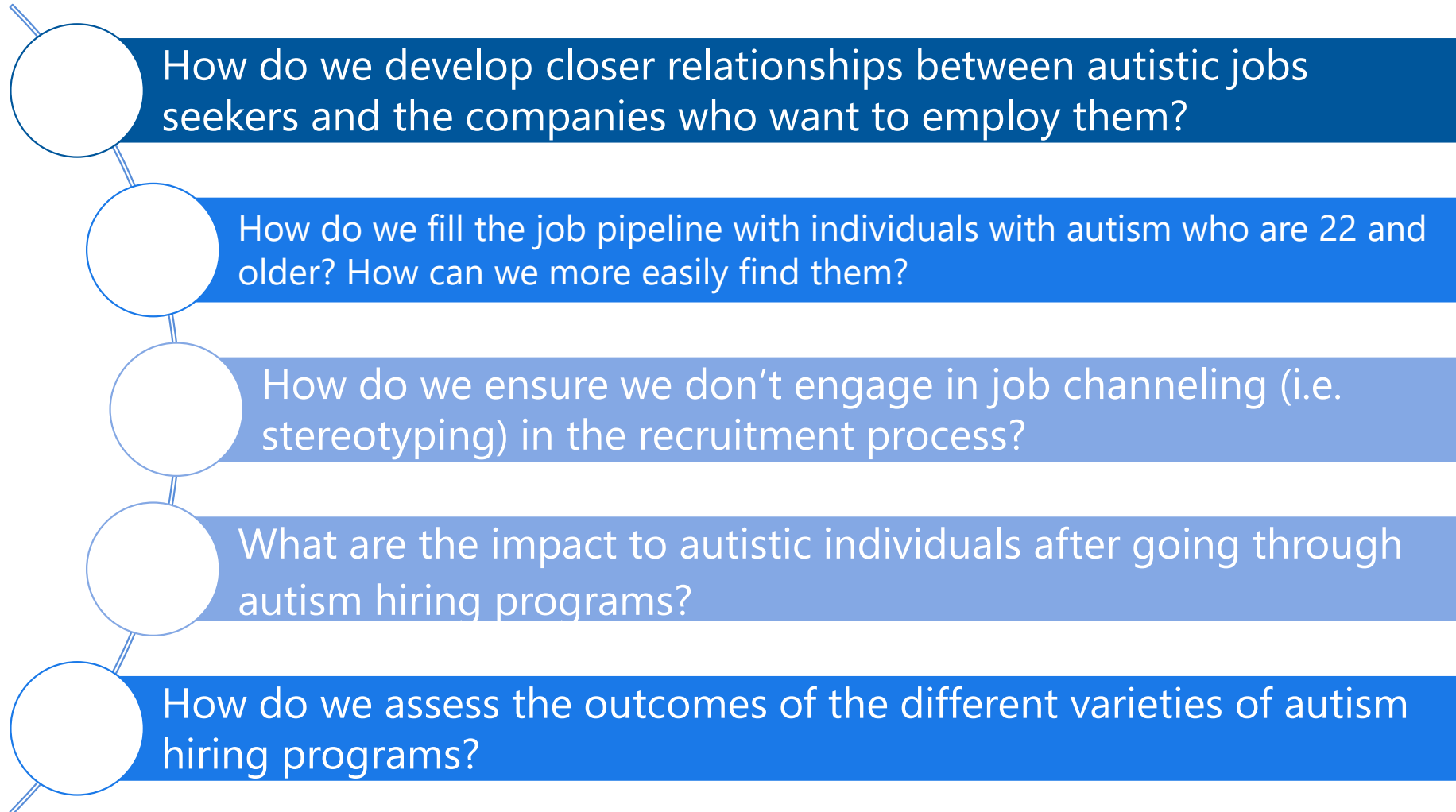
Framing the Autism at Work Research Agenda



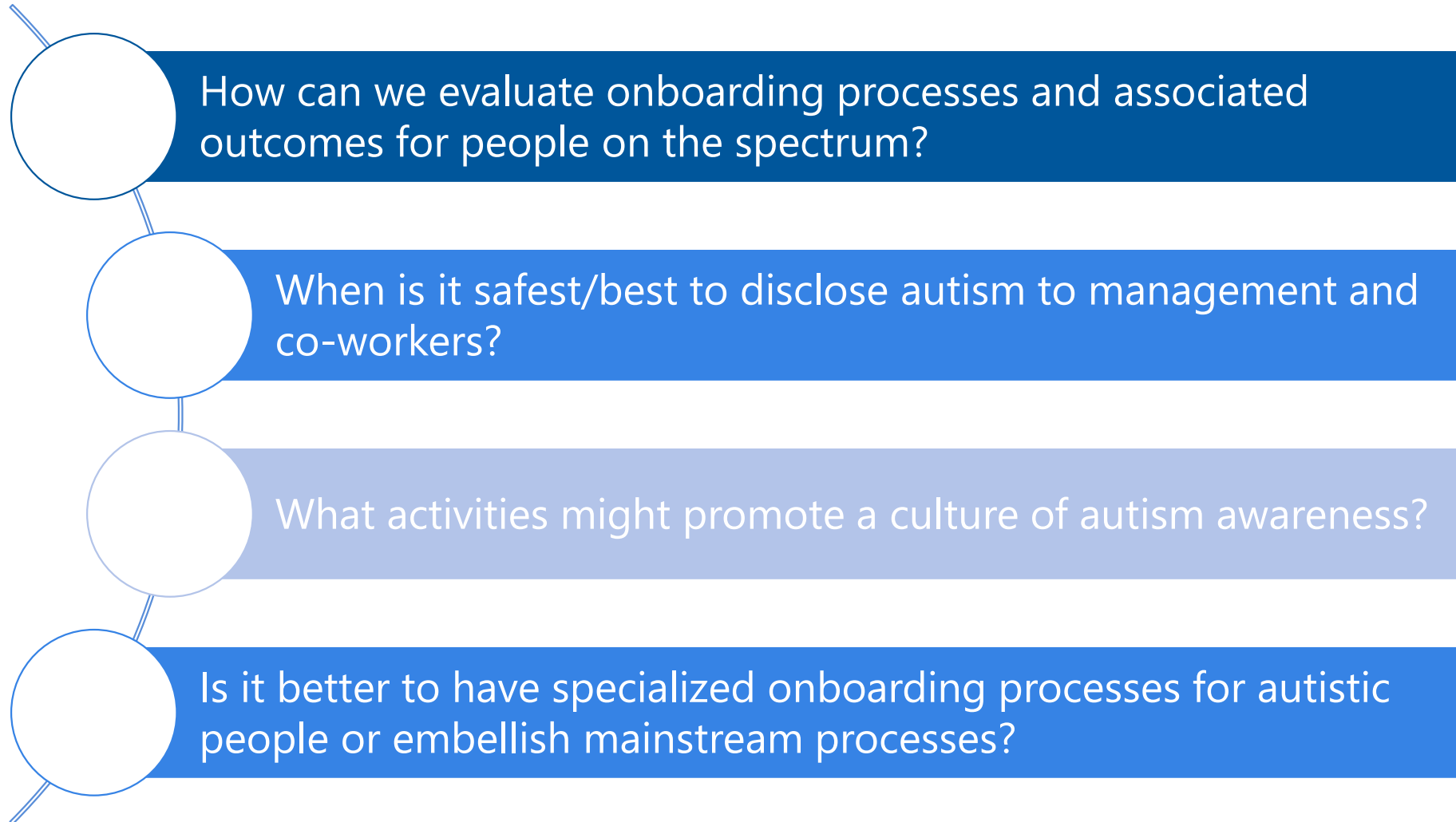
Preparation



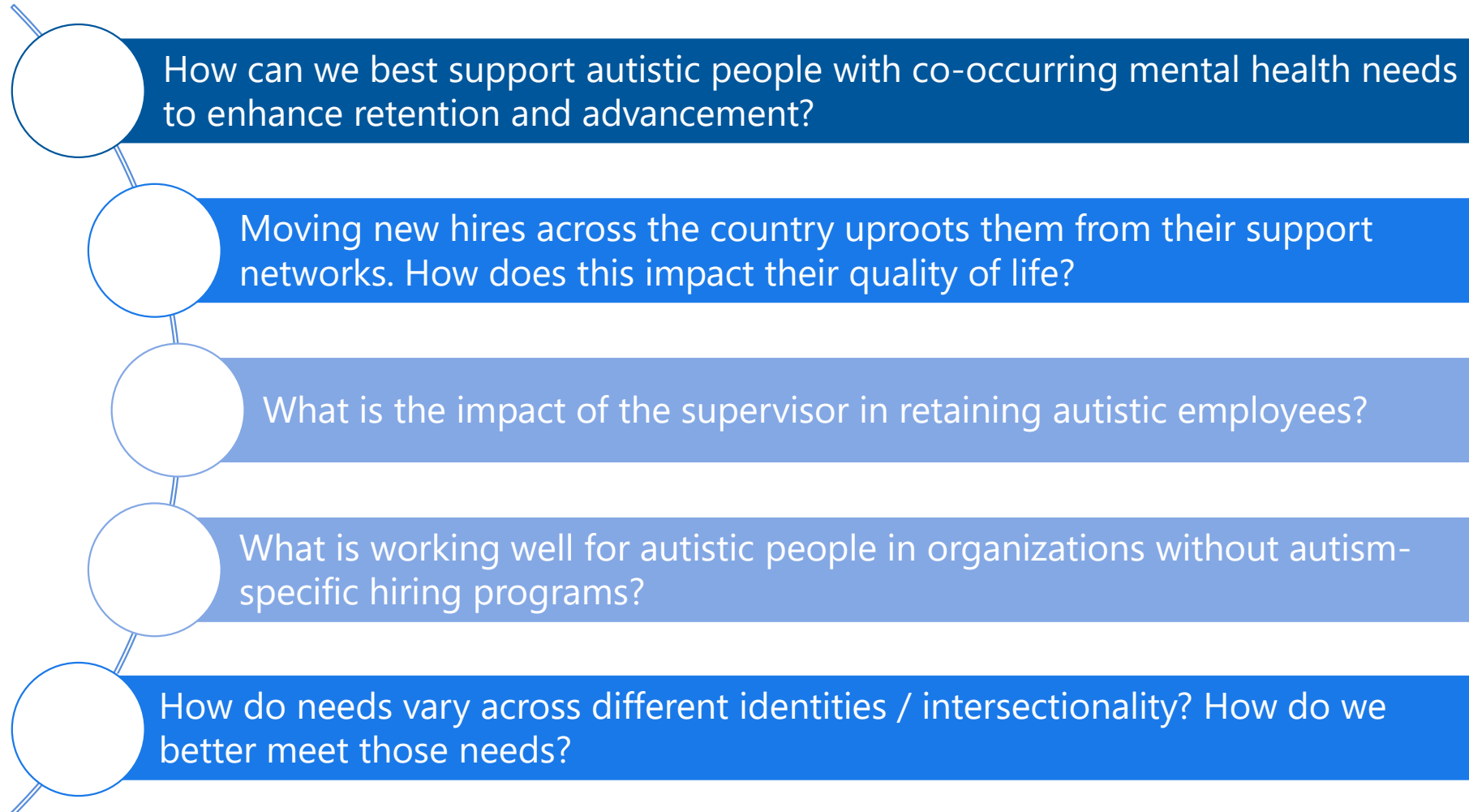
Recruitment



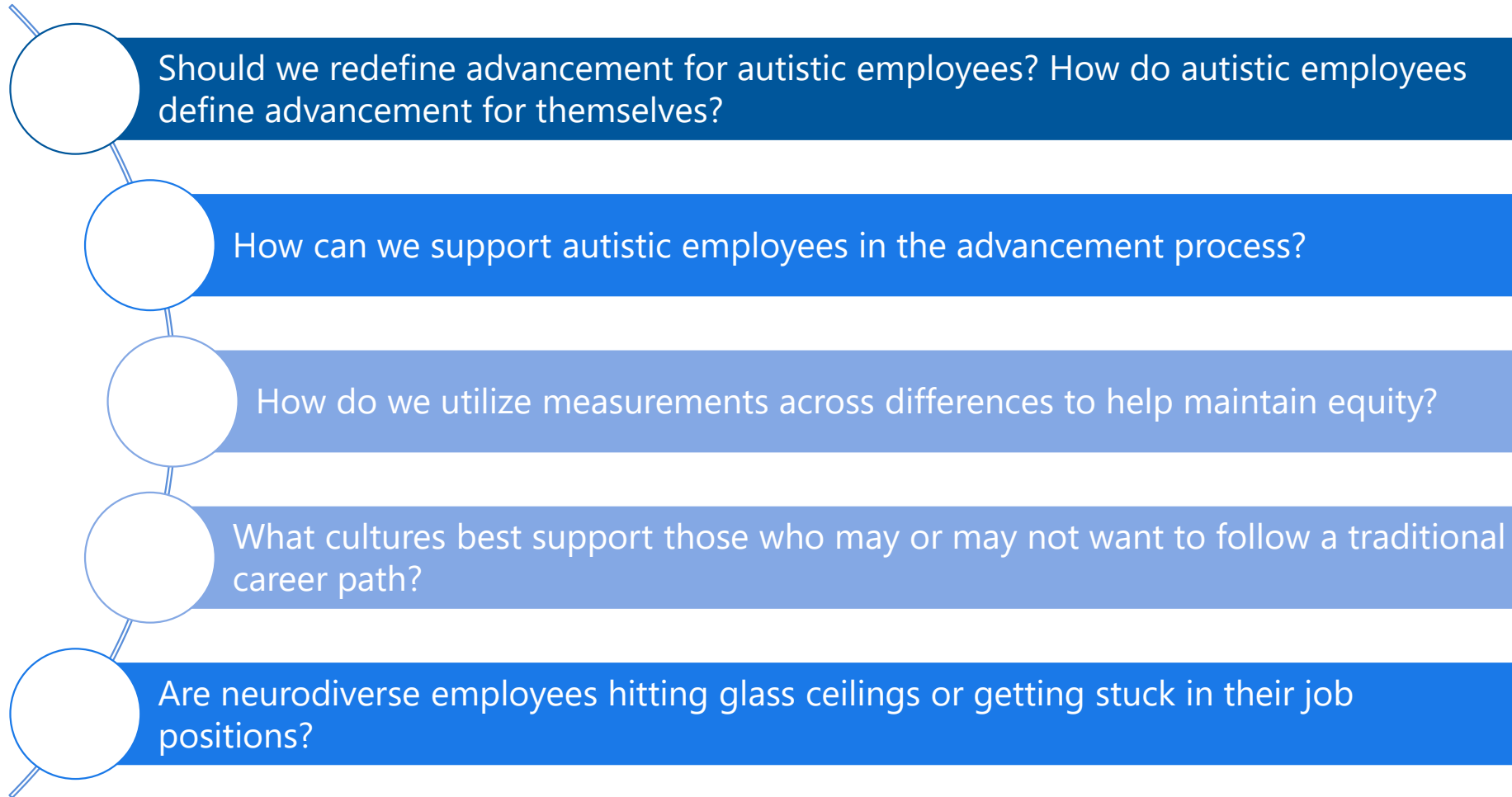
Onboarding



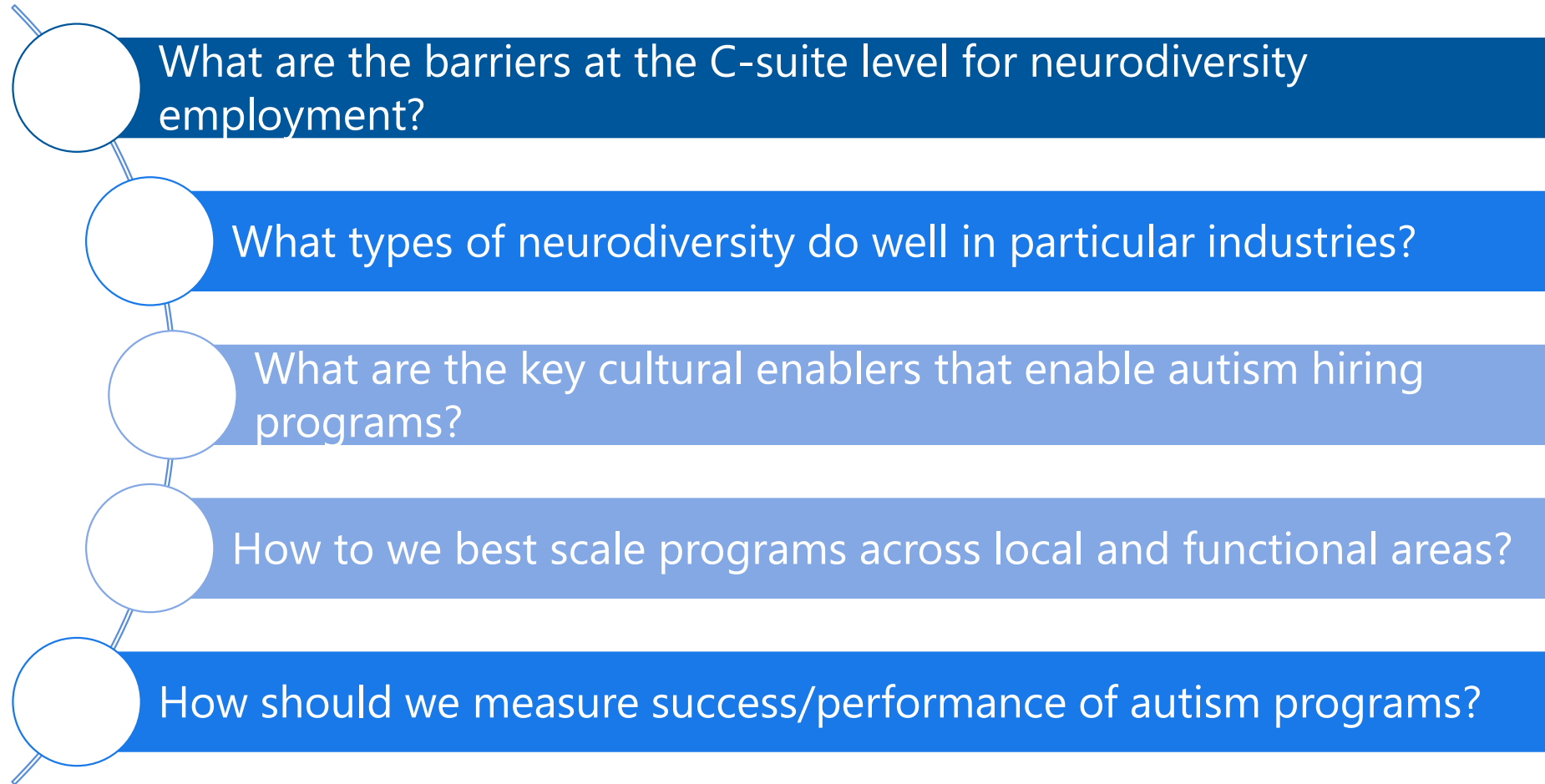
Retention



Advancement

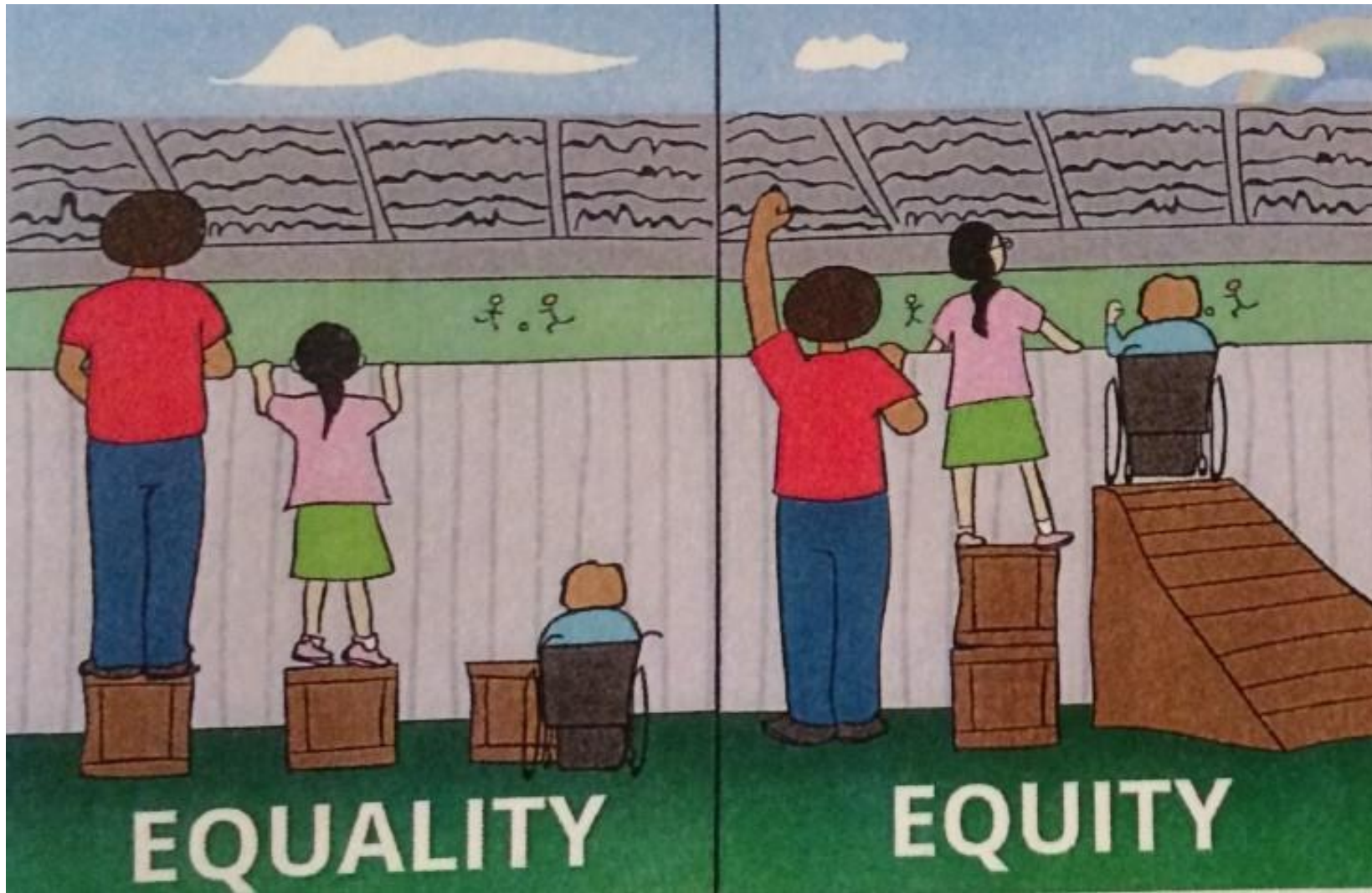


Organizational Impact

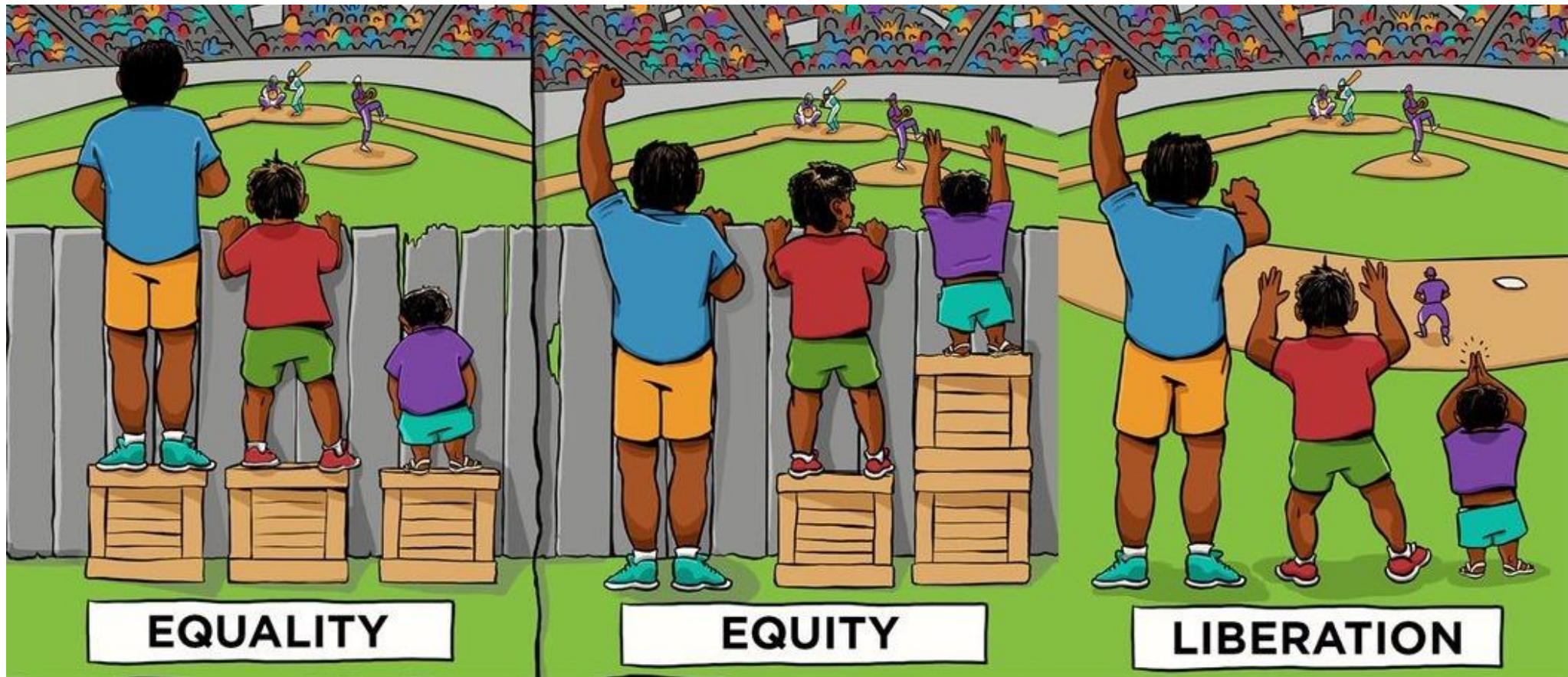


Meta





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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