The Importance of Motor Function and Physical Activity in Autism Spectrum Disorder

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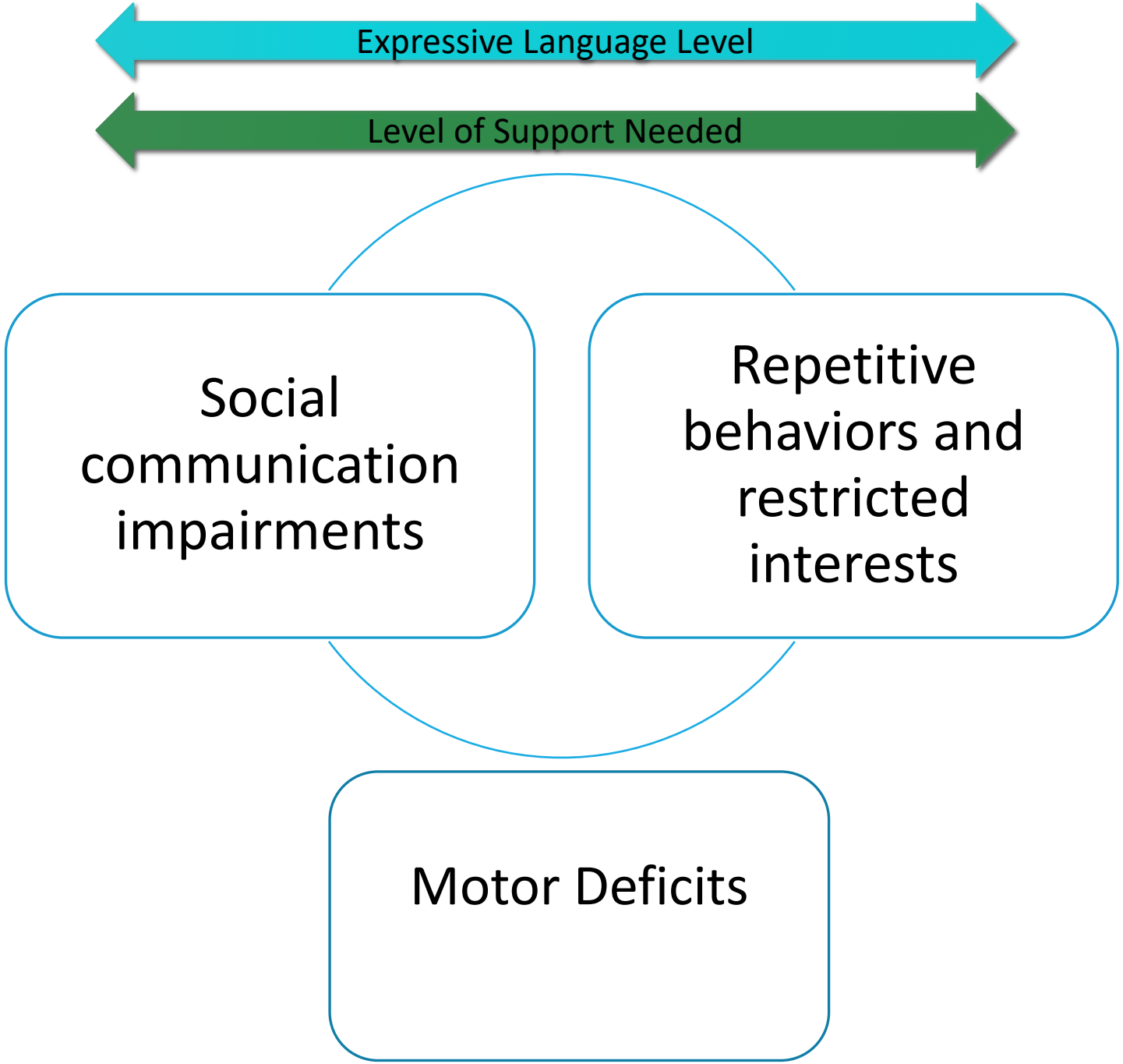
Outline

1. Motor Skills in Autism Spectrum Disorder (ASD)
2. How do we measure motor function
3. Importance of physical activity interventions and sports programs

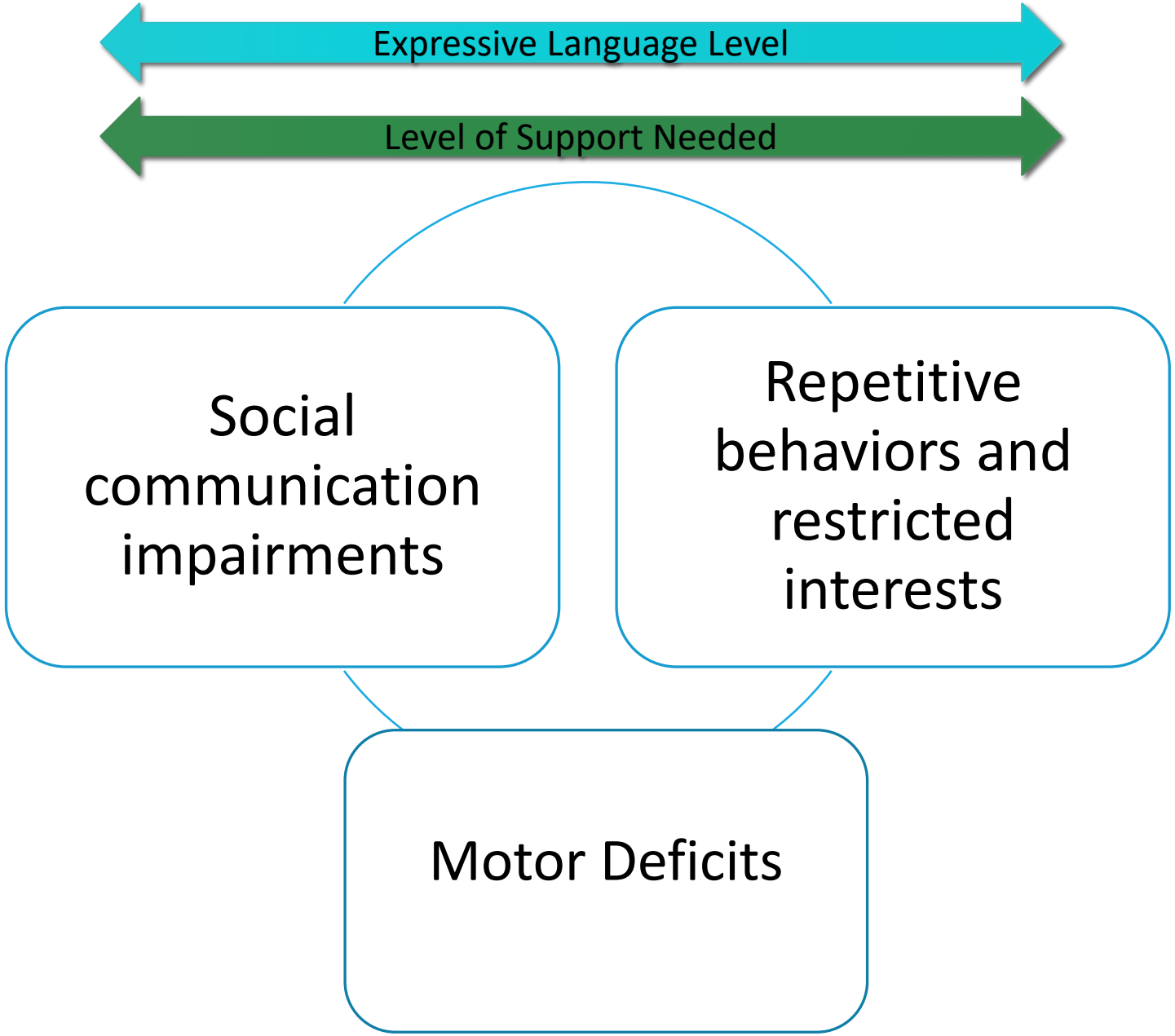
Why is motor function in ASD important ?

- Motor challenges are common in ASD
- Often present very early
- Related to social communication, adaptive function, and peer relationships
- Target for intervention

DSM-V Diagnostic Criteria for ASD



DSM-V Diagnostic Criteria for ASD



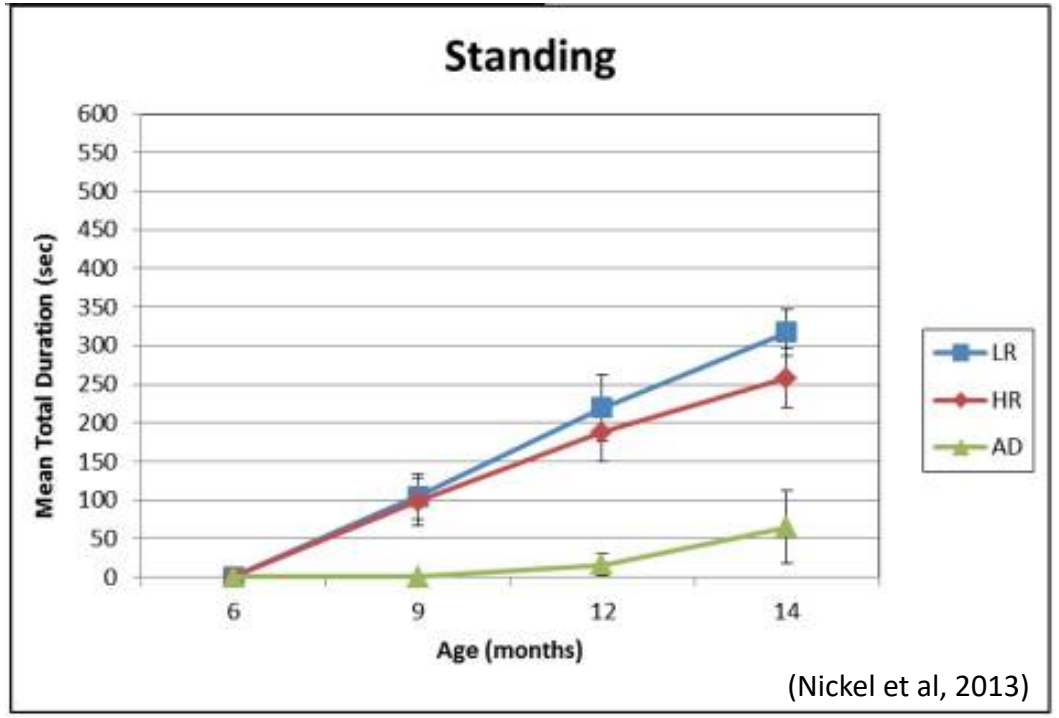
Motor challenges and delays in individuals with ASD across a lifespan

Motor challenges or Delays	Delays in infants at risk for ASD and toddlers with ASD	Challenges in Children and Adults with ASD
Gross Motor Coordination	Delays in supine and prone positions, sitting, onset of walking	Poor coordination of arms and legs
Fine Motor Coordination	Delays in reaching and grasping	Difficulty with writing, and grip
Postural Coordination	Delays in postures such as rolling and sitting. Unusual postures held for periods of time	Difficulty in controlling posture and balance

(Bhat et al, 2011; Fournier et al, 2010)

First Sign of Atypical Development

- Infants at risk for ASD not able to roll over or sit at 4-6 months of age
- Atypical walking in the first and second year of life
- **Motor differences and delays were identified prior to core diagnostic ASD symptoms**



(Nickel et al, 2013)

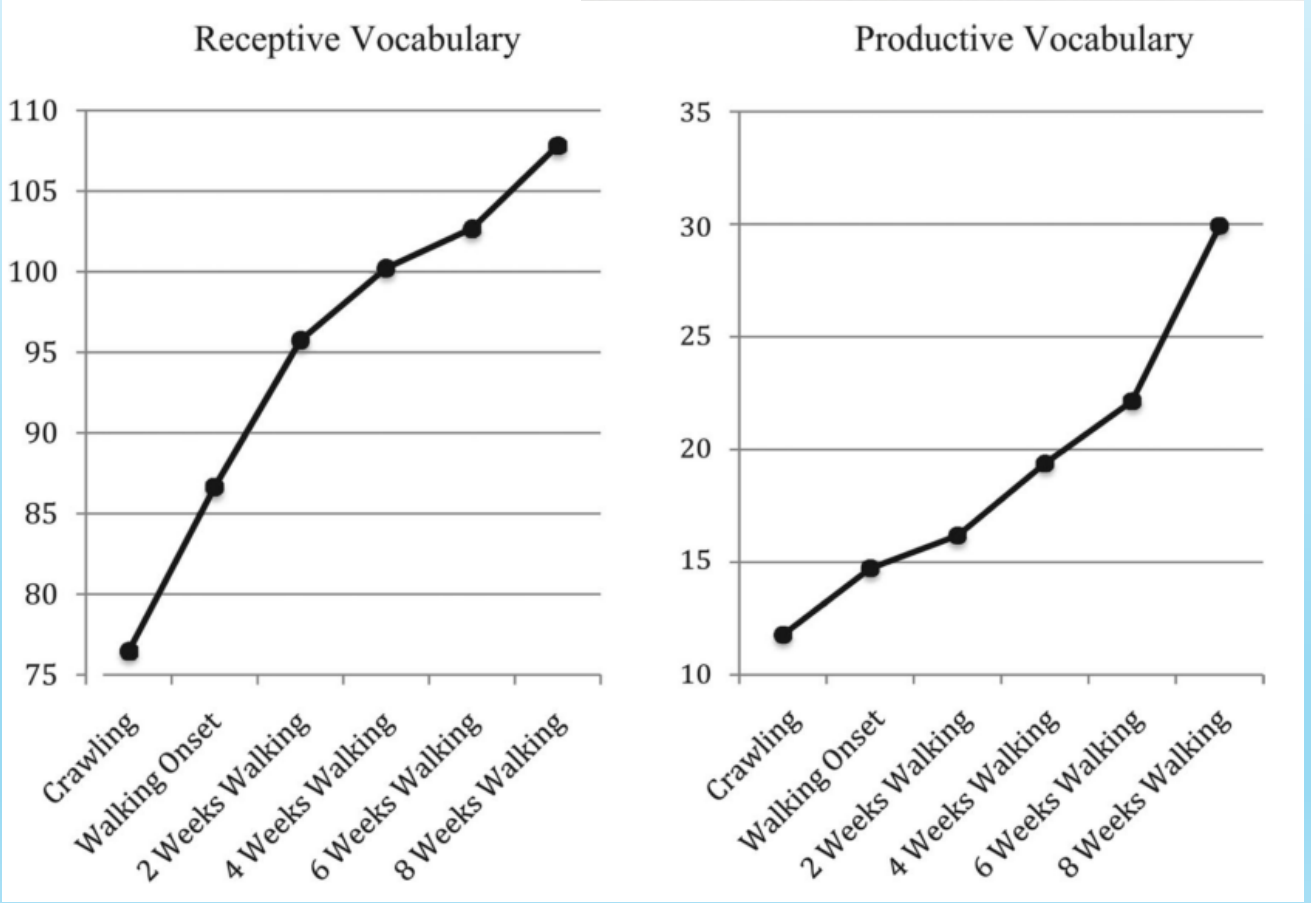
LR = Infants without a sibling with ASD
HR = Infants with a sibling with ASD
AD = Infants with a sibling with ASD and an ASD Diagnosis

(Teitlebaum et al, 1998; Ozonoff et al, 2008; Zwaiggenabaum et al, 2007, Bryson et al, 2007)

Relationship between motor development and language and social communication

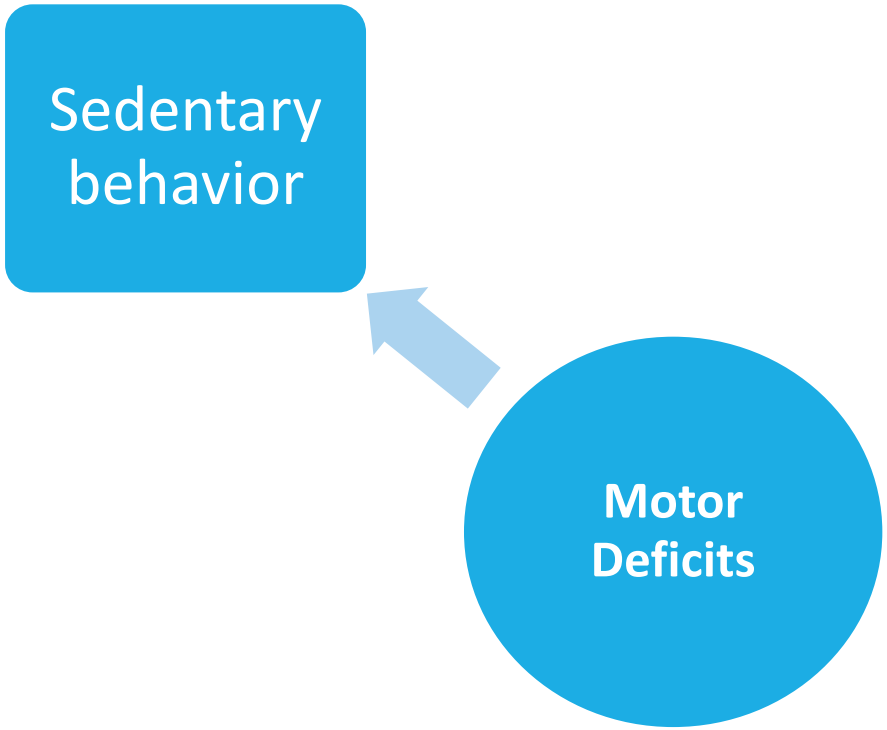
Movement and gestures are related to social referencing and joint attention

Infants and toddlers with greater exploration show higher vocabulary



(Karasik et al, 2011; Iverson, 2010; Walle & Campos, 2014)

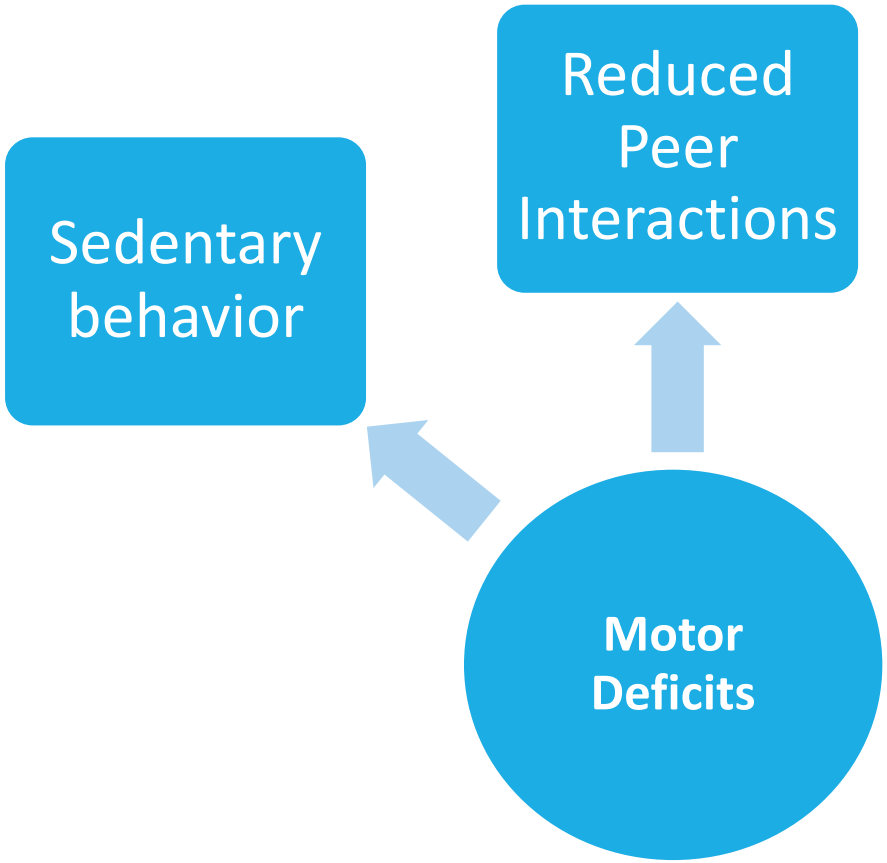
Impact on physical activity and health outcomes



- Not meeting recommended 60 minutes of physical activity a day for children
- Reduced bone mineral density
- Higher rates of bone fractures
- Increased rates of obesity

(Srinivasan et al, 2014; Jones et al 2016; Neumeyer et al, 2015; Neumeyer et al, 2018)

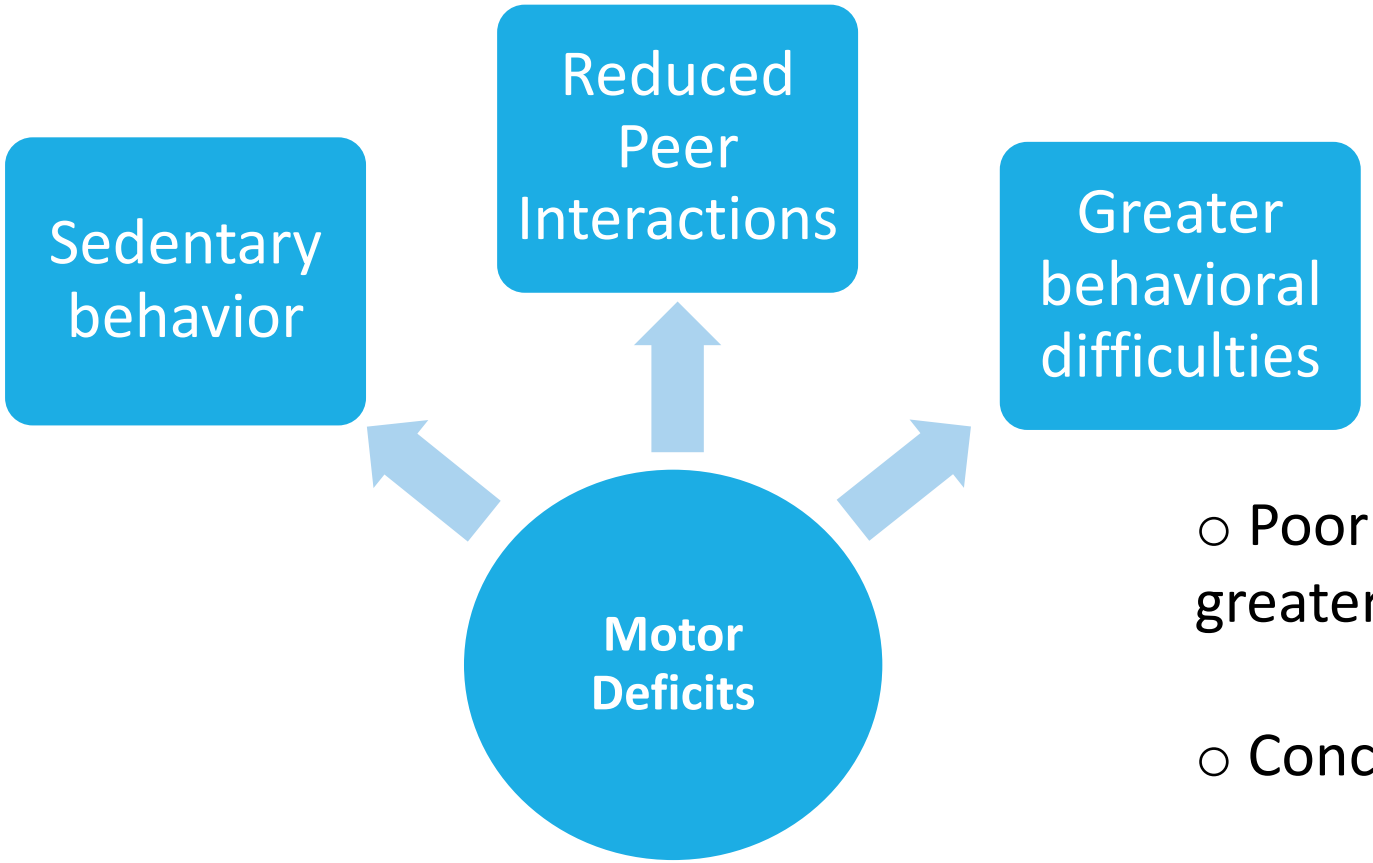
Impact on peer relationships



- Missed opportunities to engage with peers
- Increased screen time leading to less interaction with peers and family members

(Jones et al 2016; Bhat et al, 2011)

Impact on behavior

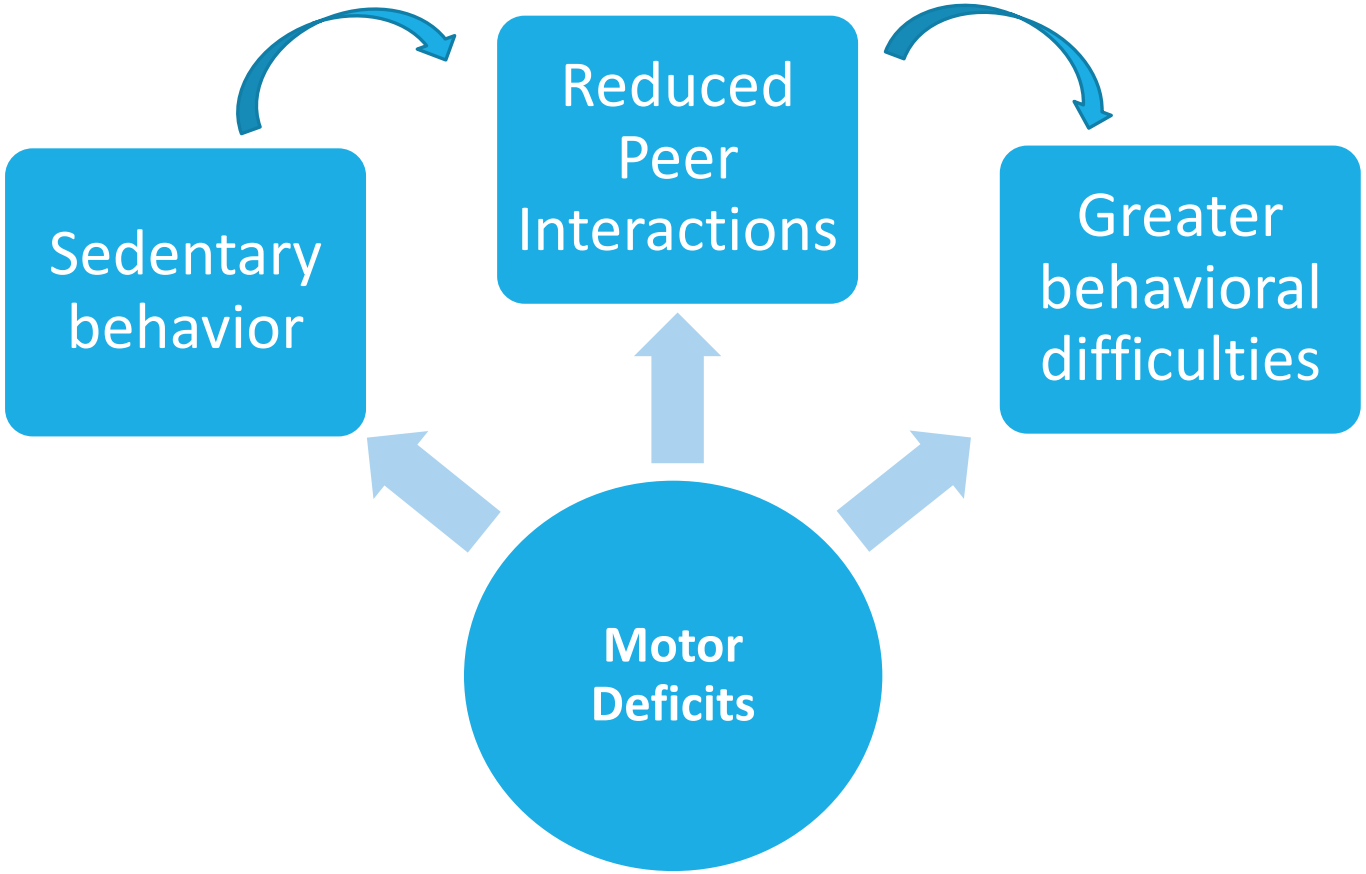


- Poor motor coordination associated with greater social and emotional difficulties

- Concerns of not being accepted by peers

(Papadaplous et al, 2011)

Impact on physical activity, peer relationships, and behavior



How do we measure motor function?

Caregiver Questionnaires

Vineland Adaptive Behavior Scales

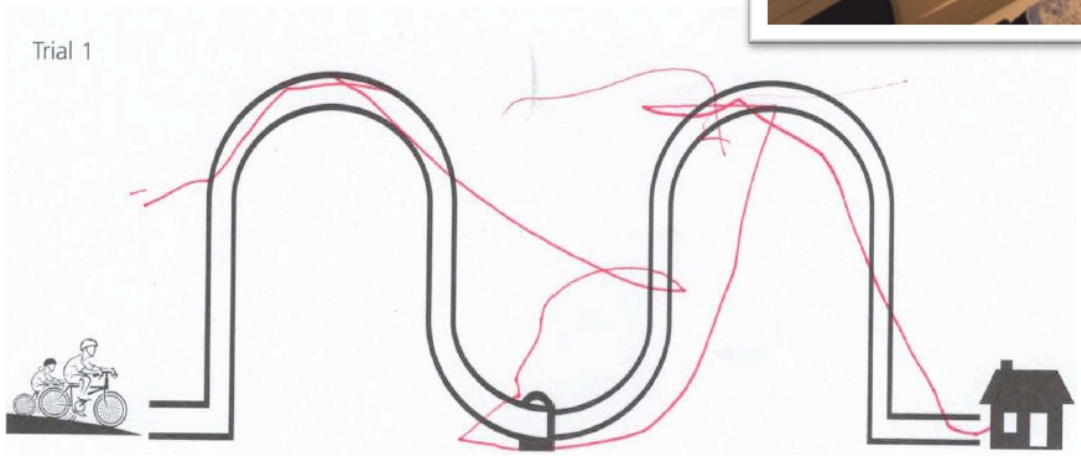
Motor Measures

Neurological Examination

Movement Assessment Battery for Children

Mullen Scales of Early Learning

Alberta Infant Motor Scale



(Wilson et al, 2018)

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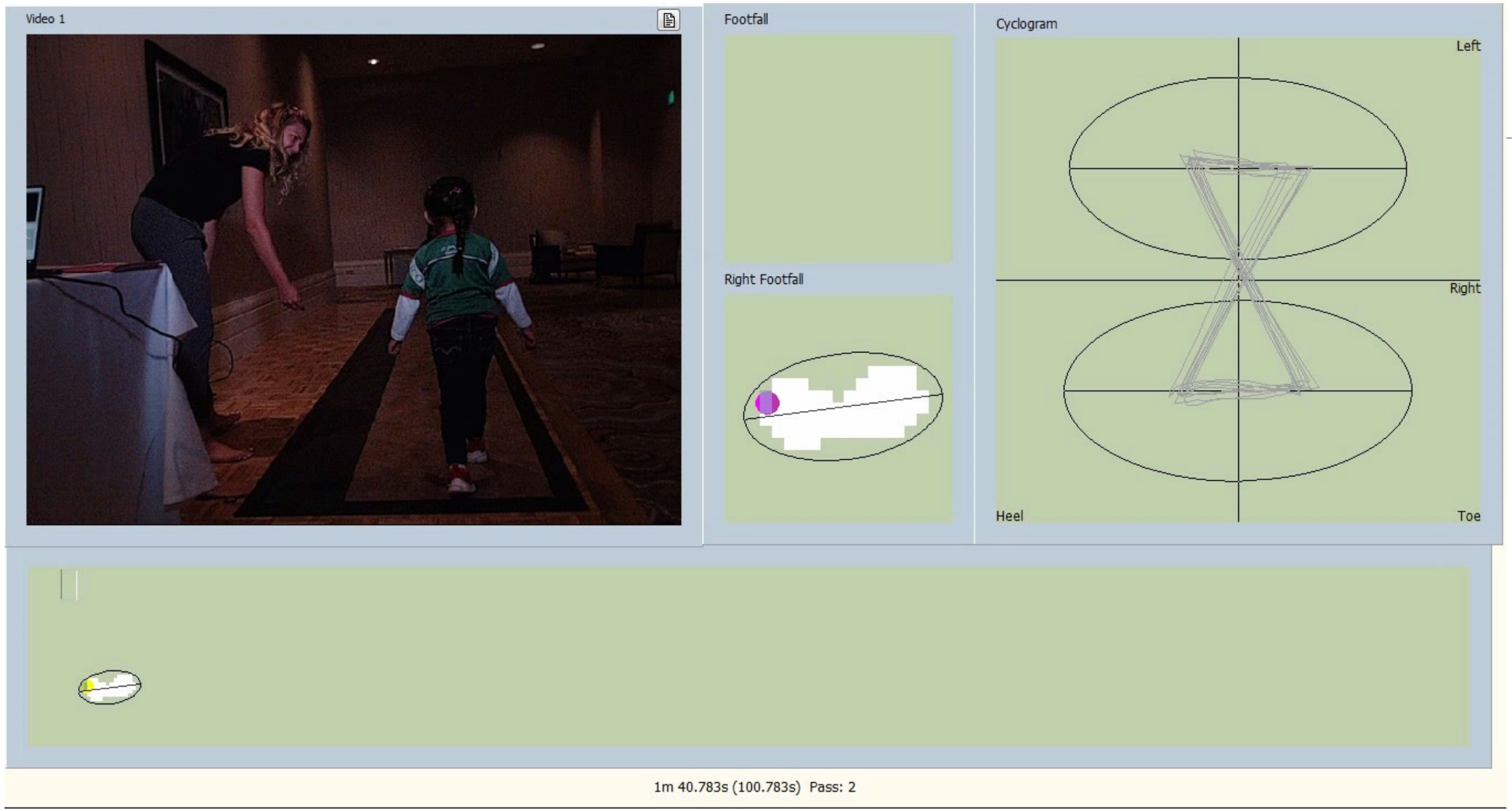
Quantitative measures of motor function



Sibling without ASD

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PROTOKINETICS
equipment for gait and function

Sibling with ASD

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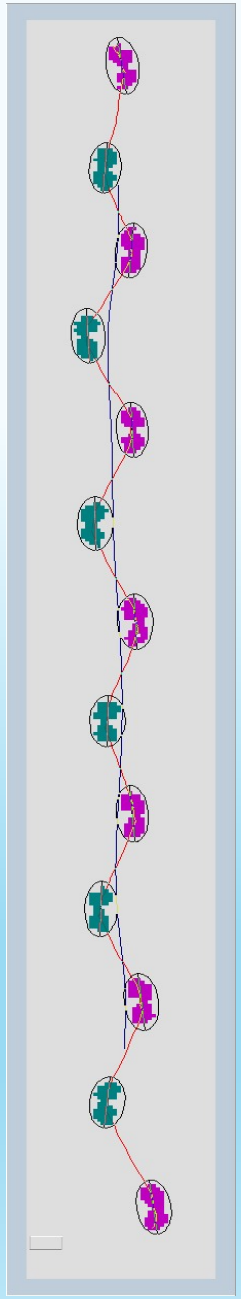
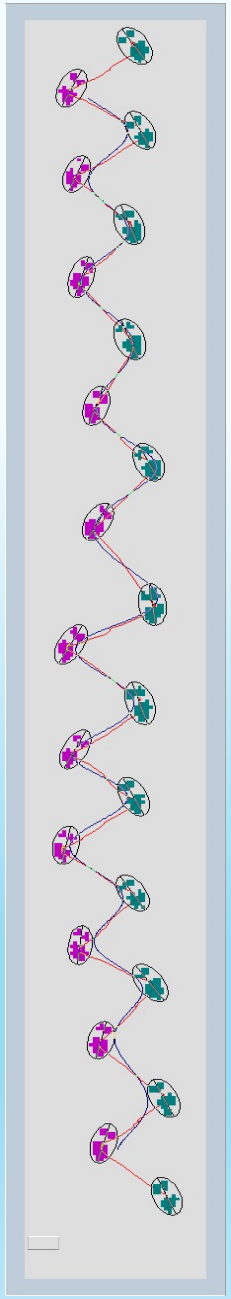
PROTOKINETICS
equipment for gait and function

No ASD Sib



ASD sib



Differences in walking between sibling without ASD and sibling with ASD

Walking variables	Sibling with ASD 5 y/o F	Sibling without ASD 4 y/o F	Normative value 4-5 y/o
Velocity (speed of walking, cm/sec)	34.9	72.9	99.1
Length of steps (cm)	19.5	36.3	41.8
Width of steps	19.5	11.0	7.8

Studying differences in movement in early infancy

-Identifying the earliest motor differences/delays
-How motor function changes over time in ASD
-What early motor interventions might prevent later motor challenges

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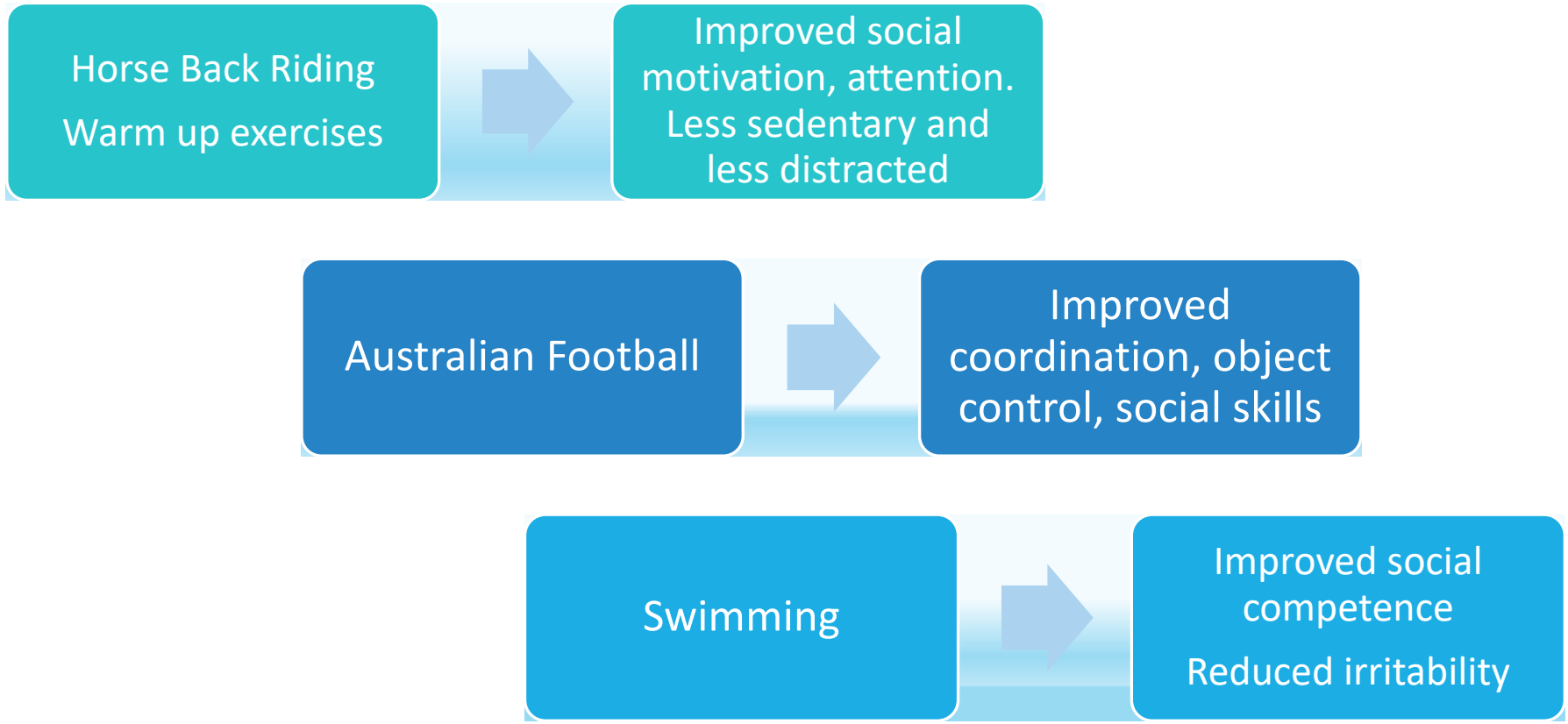
Physical Activity Interventions and Sports Programs that Target Motor Function

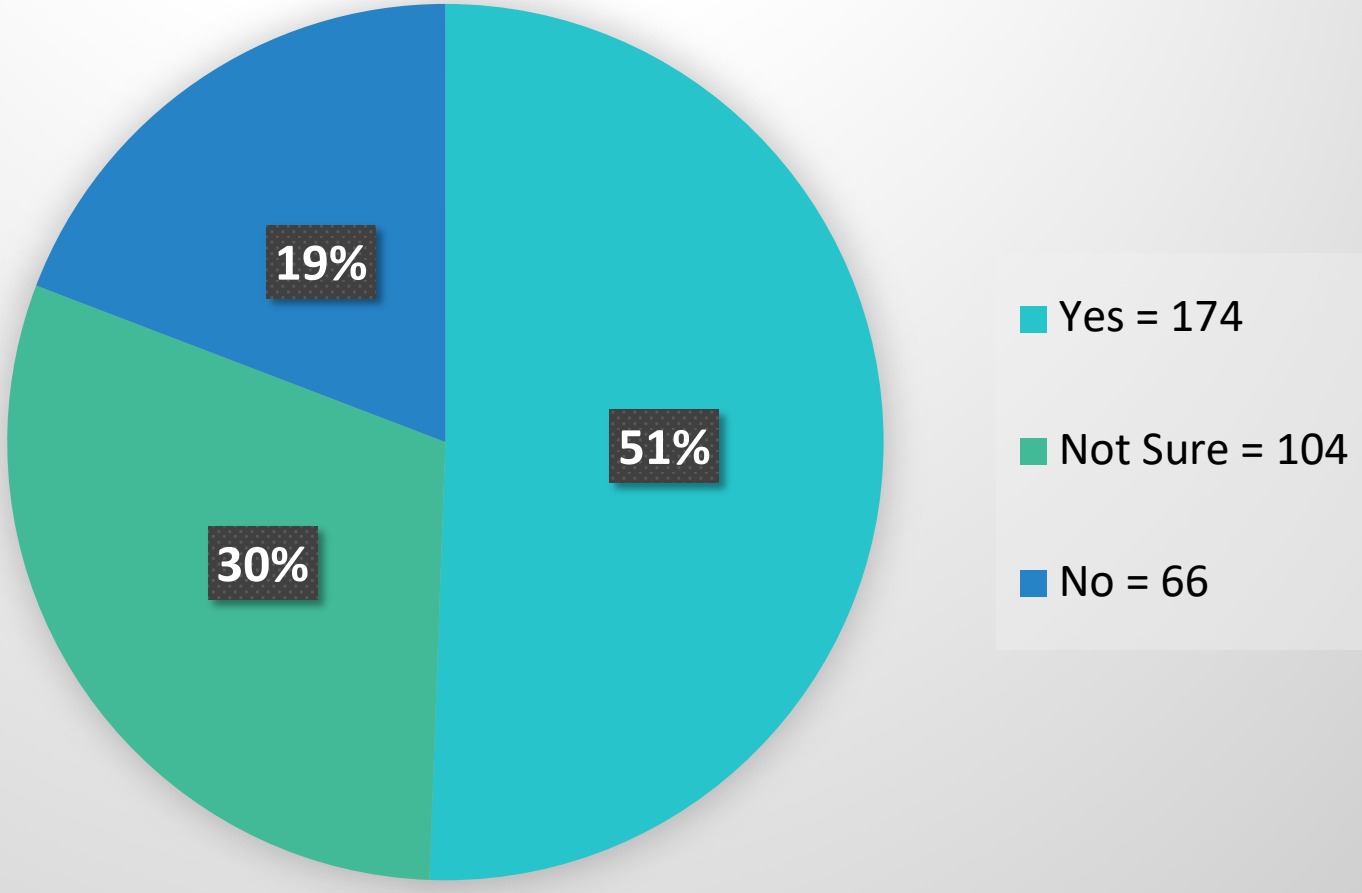
Benefits of Physical Activity Programs



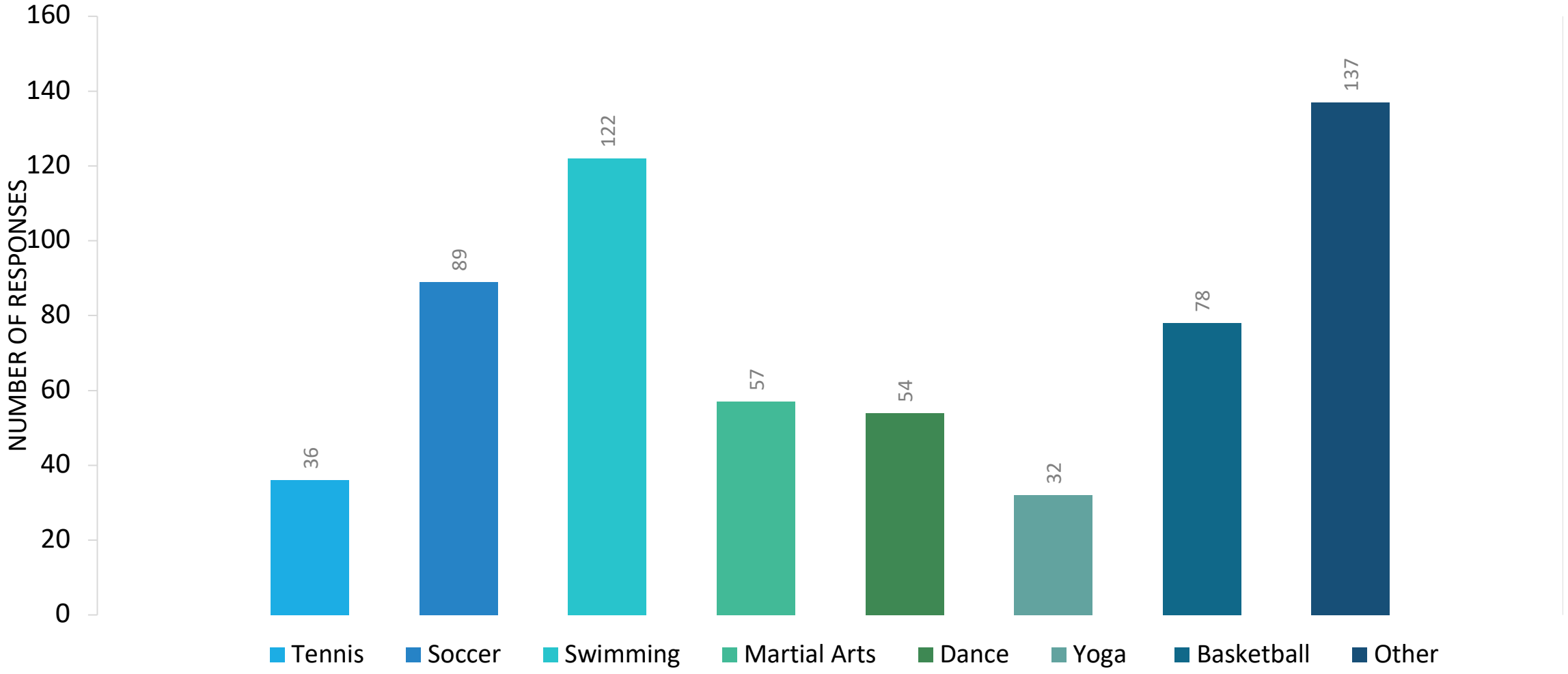
(Bremer et al, 2016; May et al, 2016)

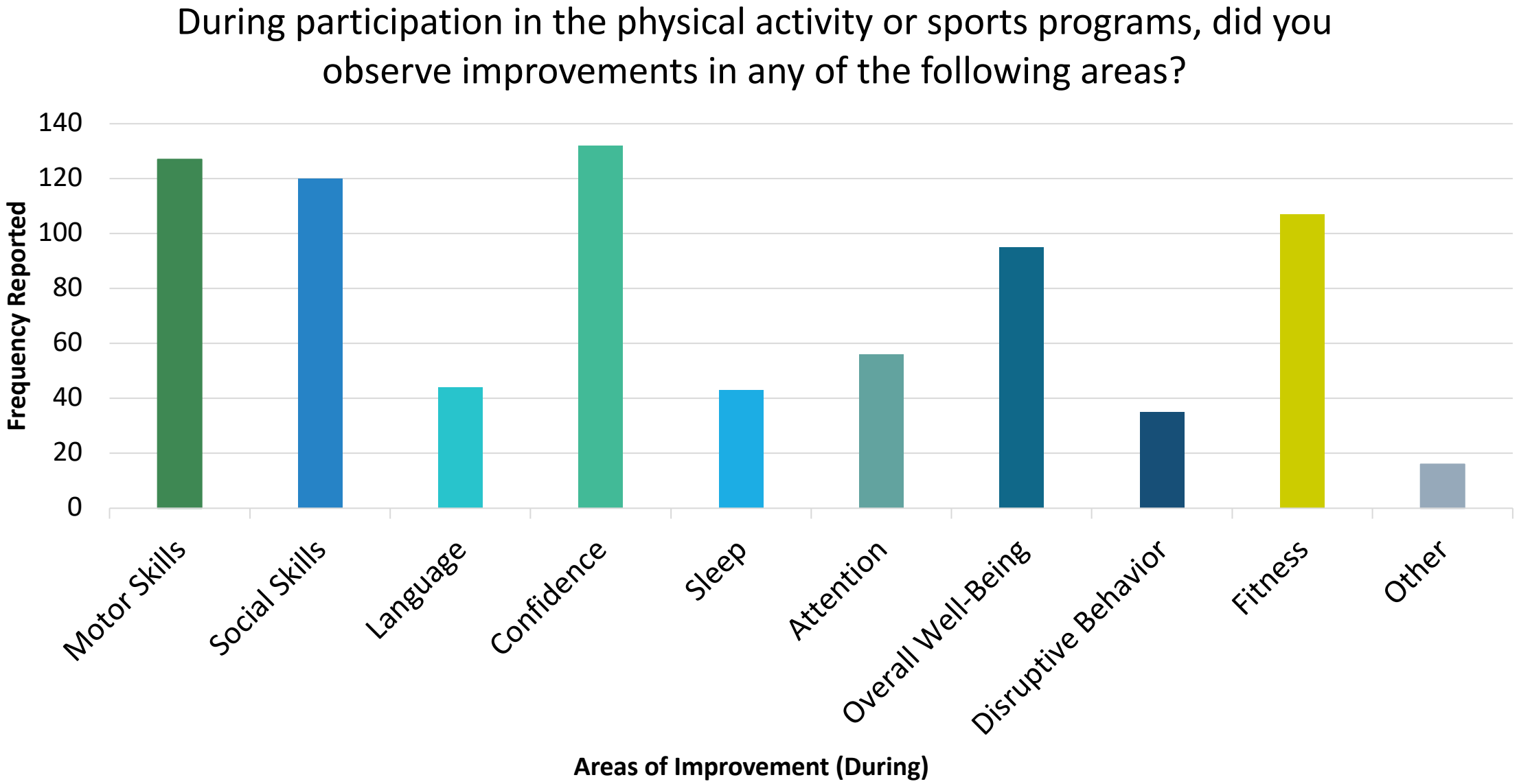
SPARK
Igniting autism research
Improving lives

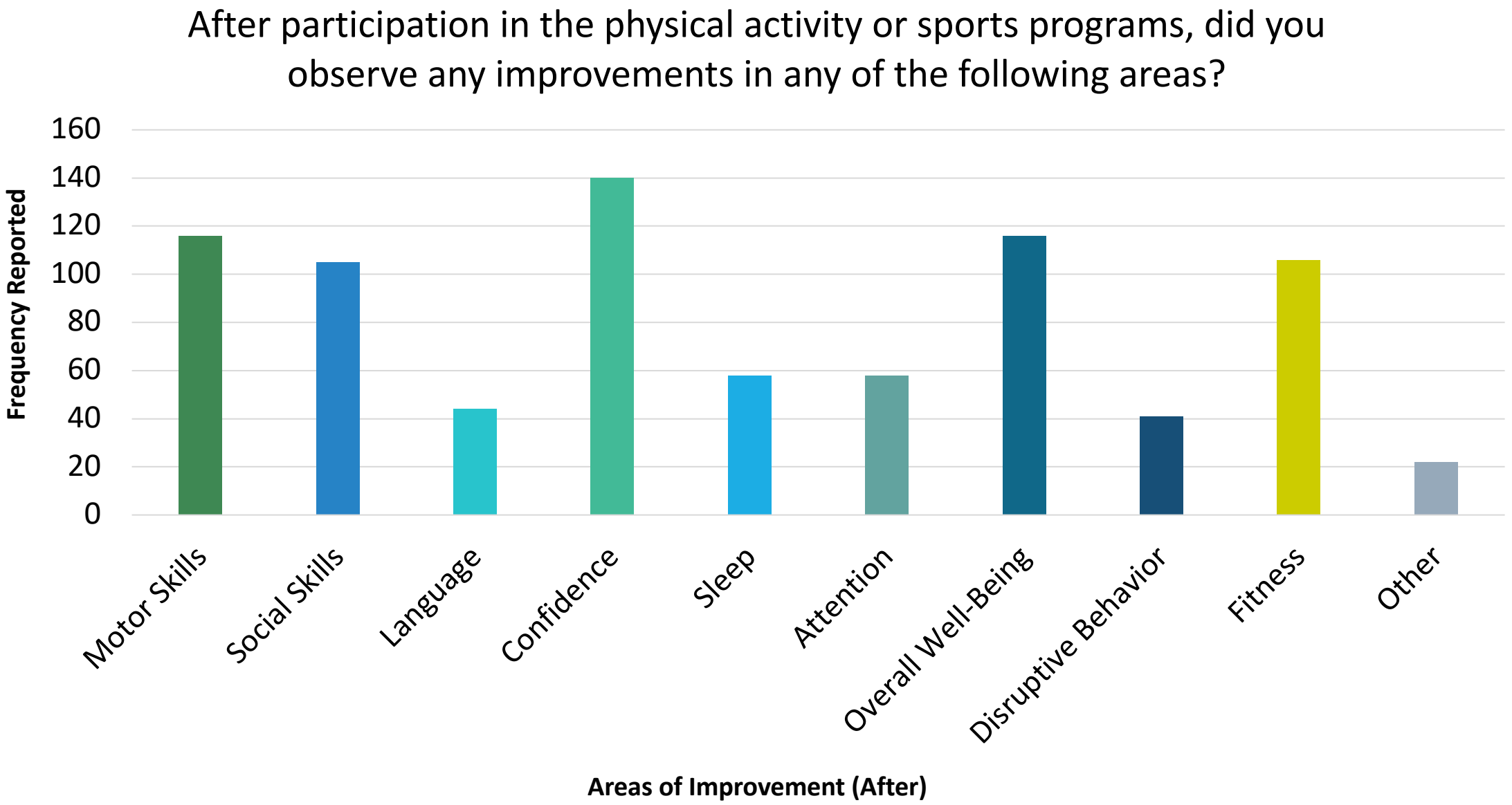
Are there physical activity or sports programs adapted for individuals with ASD available in your community?



TYPES OF ADAPTED PHYSICAL ACTIVITY PROGRAMS AVAILABLE




During participation in the physical activity or sports programs, did you observe improvements in any of the following areas?
Frequency Reported
140
120
100
80
60
40
20
0
Motor Skills
Social Skills
Language
Confidence
Sleep
Attention
Overall Well-Being
Disruptive Behavior
Fitness
Other
Areas of Improvement (During)


After participation in the physical activity or sports programs, did you observe any improvements in any of the following areas?
Frequency Reported
160
140
120
100
80
60
40
20
0
Motor Skills
Social Skills
Language
Confidence
Sleep
Attention
Overall Well-Being
Disruptive Behavior
Fitness
Other
Areas of Improvement (After)

Gaps and Needs in Sports Programs

How Can the Programs Improve?

- Greater availability and accessibility
- Better advertising
- Consistent availability
- More coaches and instructors
- Autism specific programs
- More programs for “higher functioning” children
- More programs for children with “greater needs”

Why some do not participate?

- No programs available
- Unaware that a program exists
- Program does not meet specific needs
- Not interested in participating

Addressing the Gaps

Appropriate screening for motor challenges and delays in children with ASD and varying degrees of abilities

Measuring the benefit of physical activity programs on behavior and motor skills

Designing programs specific to children's needs

Advocating for evidence based physical activity interventions for individuals with ASD

Shafali Jeste, MD
Associate Professor in Psychiatry, Neurology, Pediatrics
UCLA Center for Autism Research and Treatment
Board of Directors, ACEing Autism

Mission

- Started in 2008 in Boston, MA in response to an unmet need … lack of recreational programs for those with ASD

- *To connect children with autism through unique tennis programs, and to develop and advance proven methods to positively impact the children, families, and communities we serve.*

- *www.aceingautism.org*

ACEing® Autism
Connecting kids through tennis

10 years later.....

700 Participants

2000+ Volunteers

62 Programs

28 States

ACEing Autism
Connecting kids through tennis


ACEing Autism
HEAD
© Alex Huggan www.alexhuggan.com ACEing Autism 2015


hand eye coordination
VOLUNTEER
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ACEing Autism
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Program development

- Panel of parents, autism specialists, tennis professionals
- Inclusion of children often excluded from programs: minimally verbal, behavioral challenges, cognitive impairment
- Individualized, yet structured/manualized programming
- Combination of group activities and individual skill building
- Respite for parents/caregivers
- Training manual and videos

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Connecting kids through tennis

Outreach

- Strong social media presence --- online community building
- Quarterly newsletter distributed to >10,000 individuals

Courtside with ACEing Autism – Fall 2017 Newsletter

October 12, 2017 / by Alex Huggan / in News, Newsletter / Tags ACEing Autism, Newsletter

Our program growth has been unprecedented this year. We have added 17 new program locations and by year's end will have added 24, bringing our total to 55 programs! The demand for play-based programs for children with autism exists in all communities and we hope to continue our growth. Our board of directors has developed a capacity campaign which will require that we raise over $5million in the next three years. As you plan your end of year giving please consider making a donation to our organization. If anyone is interested in learning more about our plans and fundraising goals please do not hesitate to contact me at richard@aceingautism.org. – **Richard Spurling**, ***Executive Director & Founder***

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Program basics

- 8 week sessions, 1 hour each
- 1:1 staff to child ratio
- Sessions divided based on age of participants
- Training sessions for staff before launch of programs
- Parent surveys completed at start and end of session

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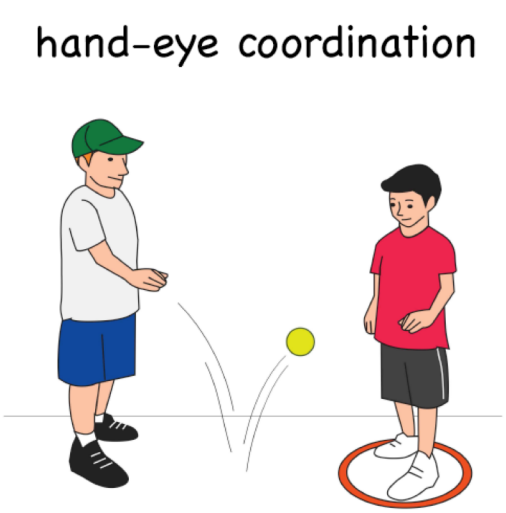
Program details

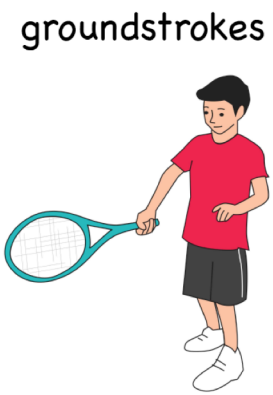
Group warm-up

Hand-eye coordination

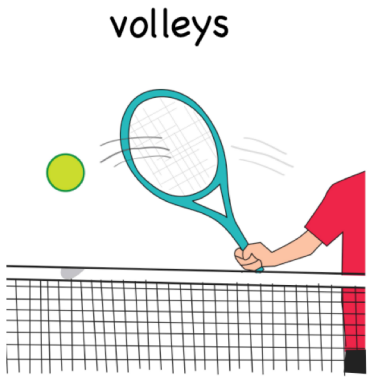


Racket skills

groundstrokes



Volleys



Games

Final Cheer

http://aceingautism.org/volunteer/training-videos

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Parent Survey

- 91% Retention Rate (Within 1 year)
- 98% Satisfied with the Program
- 93% Definitely Would Recommend the Program
- 95% Met or Exceeded Expectations
- Top 4 areas of improvement: Tennis Skills, Social Skills, Motor skills & Confidence

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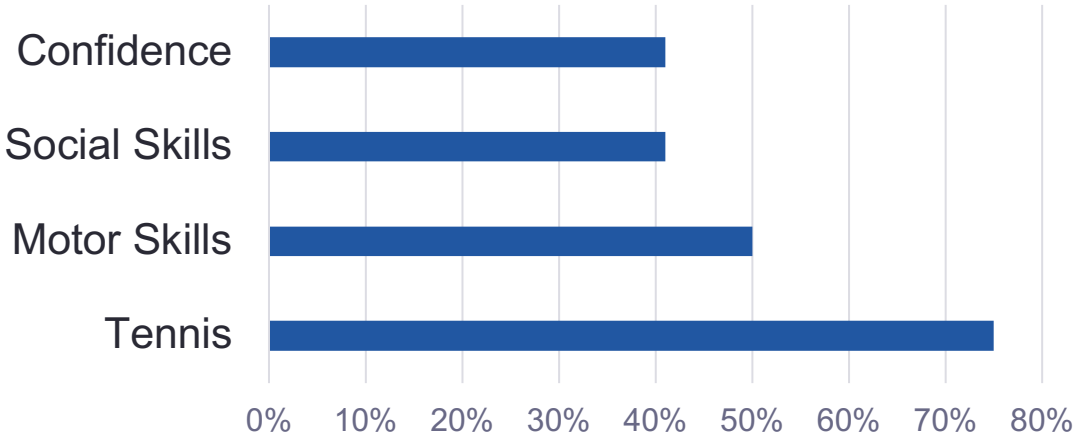
Areas of Improvement



Other Areas of Improvement

Language
General Behavior
Self Regulation
Sleep
Diet
Overall Fitness

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Quantified outcome measures (pilot program)

Adaptive living skills:
--improvements in communication, coping skills, fine motor skills

Behavioral challenges:
--improvements in irritability and social withdrawal

Motor skills:
--Movement Assessment Battery for Children and Gait mat…

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New initiatives

Adult programs

Partnerships with schools

Peer modeling programs

Family support and engagement

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Thank you to our families and volunteers!

ACEing Autism Program Directors 2018

Loriane Favoretto, Chad and Elana Campbell, AJ Song , Elliot Pegg, Harvey Rubin, Will Janos, Fong Rungrugira, Victoria Mongiard, Elise Josh, Brian Browne, Helen Min (Daniel and Brian), Kevin Springer, Jana Reyes (PD) , James Giles (PD), Joey Snell (Cliff Drysdale); Lauren Lukehart, Craig Marshall, Bob Migliorini, Chad Periman, Erica and Andrew Grub, Julie Steven, Nicole Jacobs, Noreen McEnery, Marty Tomory / Rita Gladstone, Mary Pike, Sue Hites, Amy Bonner, Haley Humes, Akshaya Sabapathy, Katie Harris, Hannah Case / Abby Marden, Ashleigh McLean, Chandler Semjen, Victoria Podsiadlo / Grant Lewandrowski, Charlie Humes (Chuck Willenborg), Lynn Gertzog, Celina Cerf, Jamie Fu, Emily Weber, Alexander Brandt, Anna Catherine Henley, Perry Myers, Alicia Bullock, Elana Bowman, Lisa Klaud, Trenton Alenik, Anouk Lambers , Bob Mayerhofer, Dalia Khakshoor, Caroline Zhou, Paige Mills, Tom Tvedt, Rachel Bowden, Sara Longo, Zdenka Olenik, Avery Semjen, Eric Speer, Adrienne Bransky, Anshu Sharma, Cal Loveridge, Alex Richards, Donald Widener, David Young, Kailyn Skjonsby, Paula Kopischkie