

Measuring Effort with a Progressive Ratio Task to Activate Music and Bubbles in Early Childhood



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Introduction

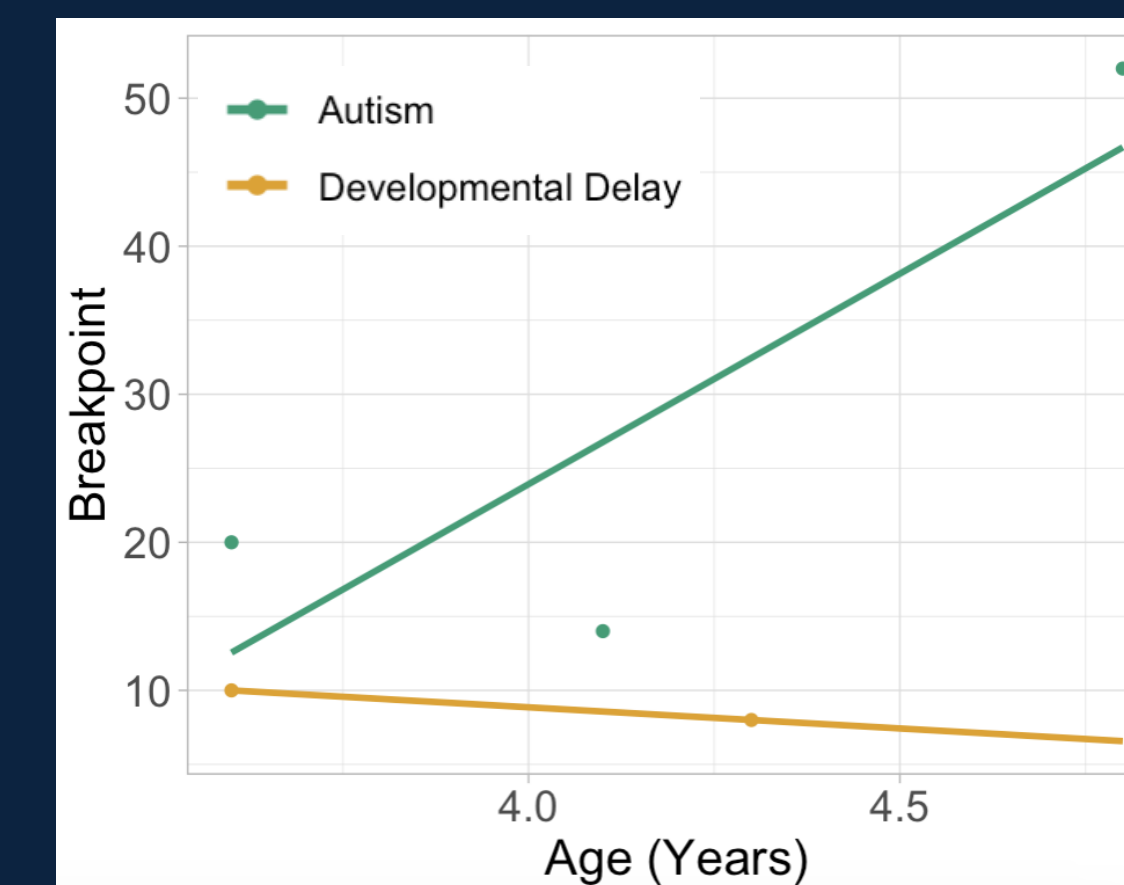
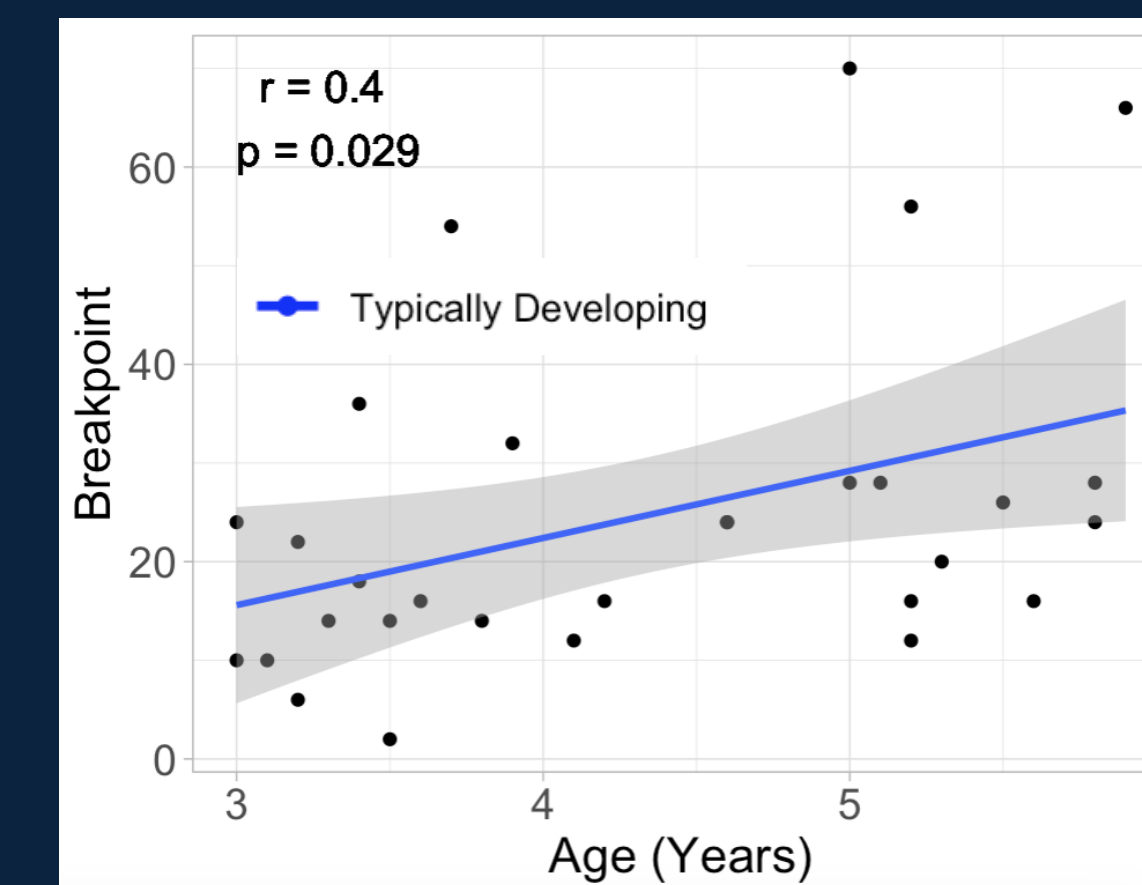
- Autistic individuals show differences in reward processing such as less anticipation and response to rewards, both social and some nonsocial^{1,2,3,4,5}
- Effort (a component of reward processing⁵) to obtain a reward is not well understood in autism, but interventions often involve exerting rewarded effort to shape behavior
- Effort is commonly measured using a progressive ratio task

Objectives:

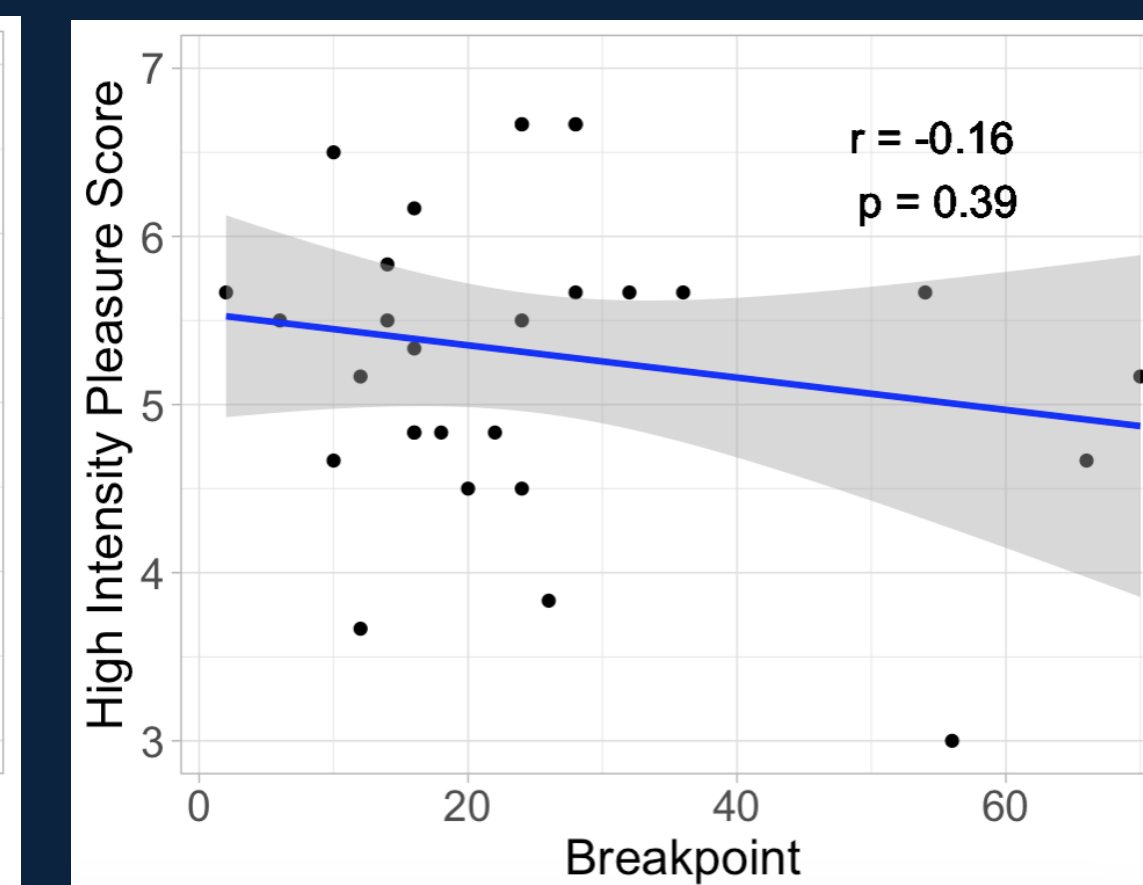
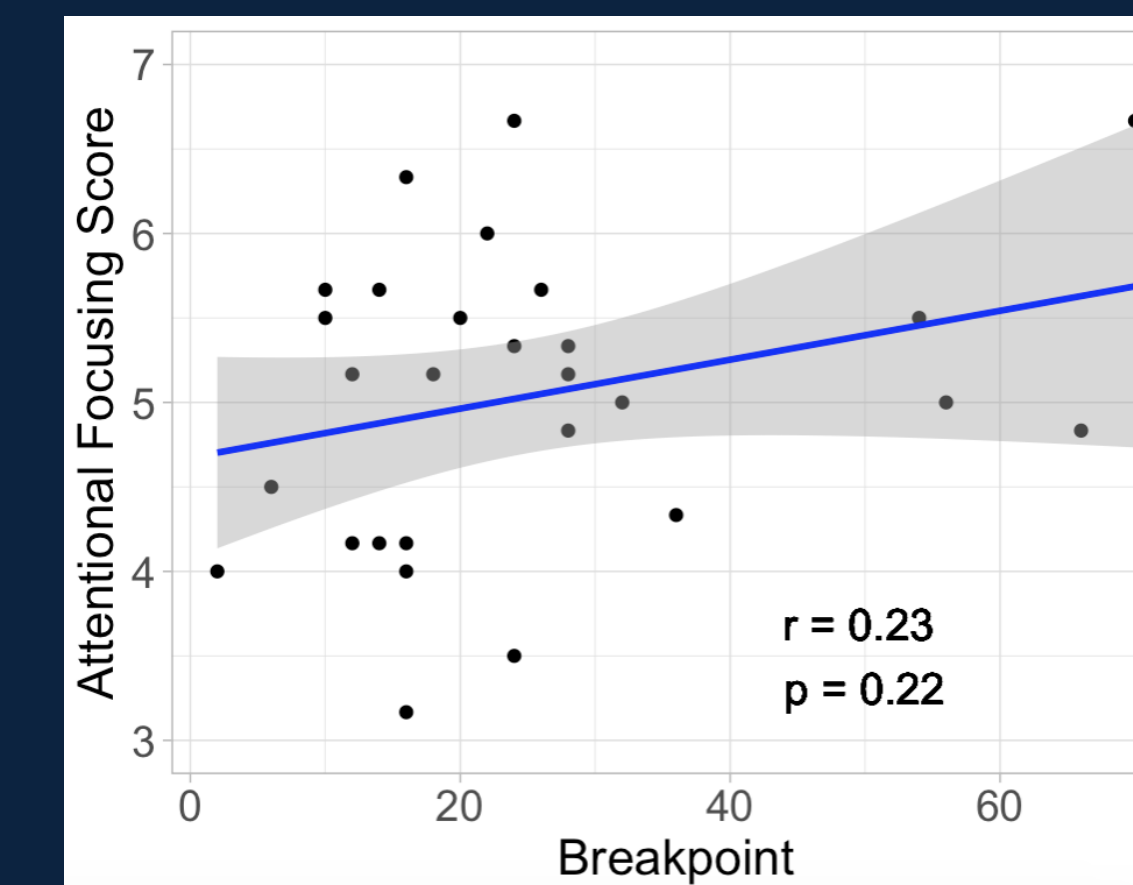
- Characterize the relationship between age and effort, measured with novel technology: pressMORE
- Demonstrate the convergent validity of pressMORE
- Explore the relationship between effort and Social Responsiveness Scale

pressMORE feasibly measures effort in children of differing ages and abilities.

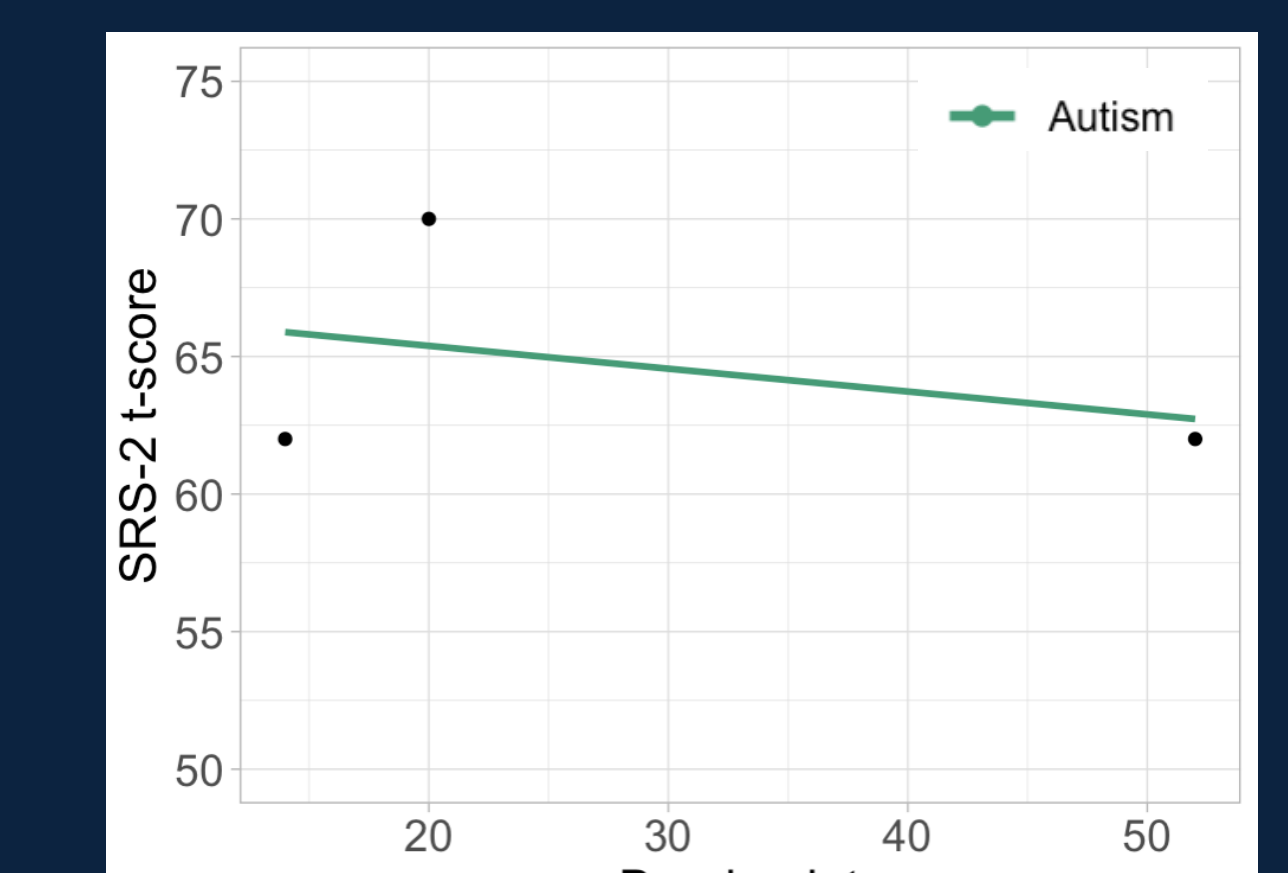
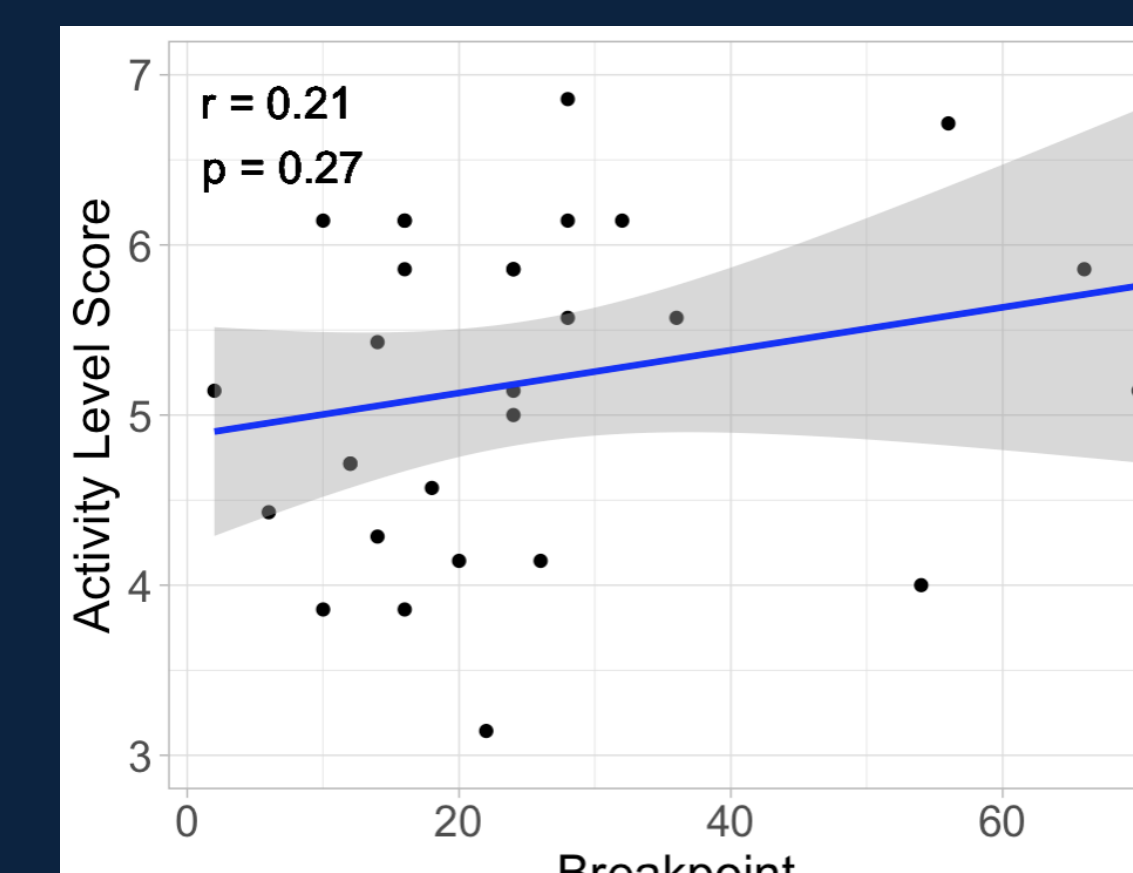
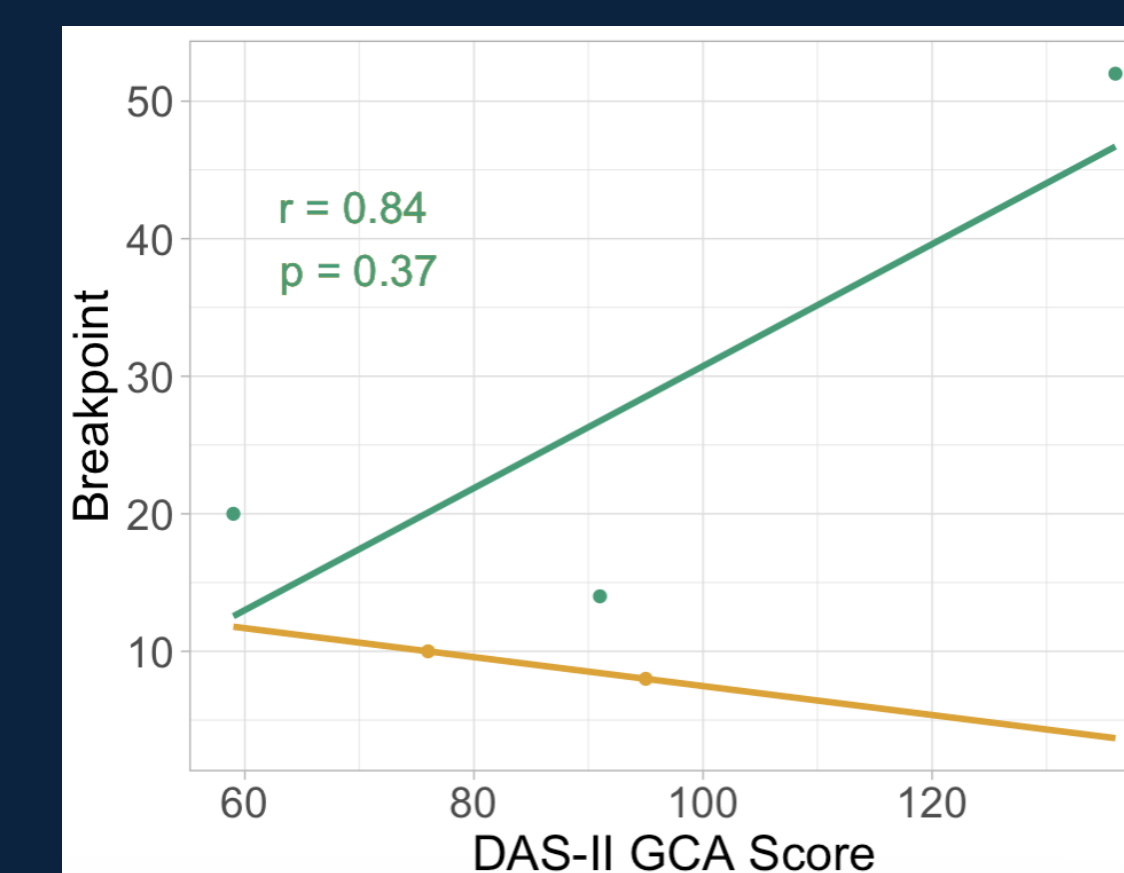
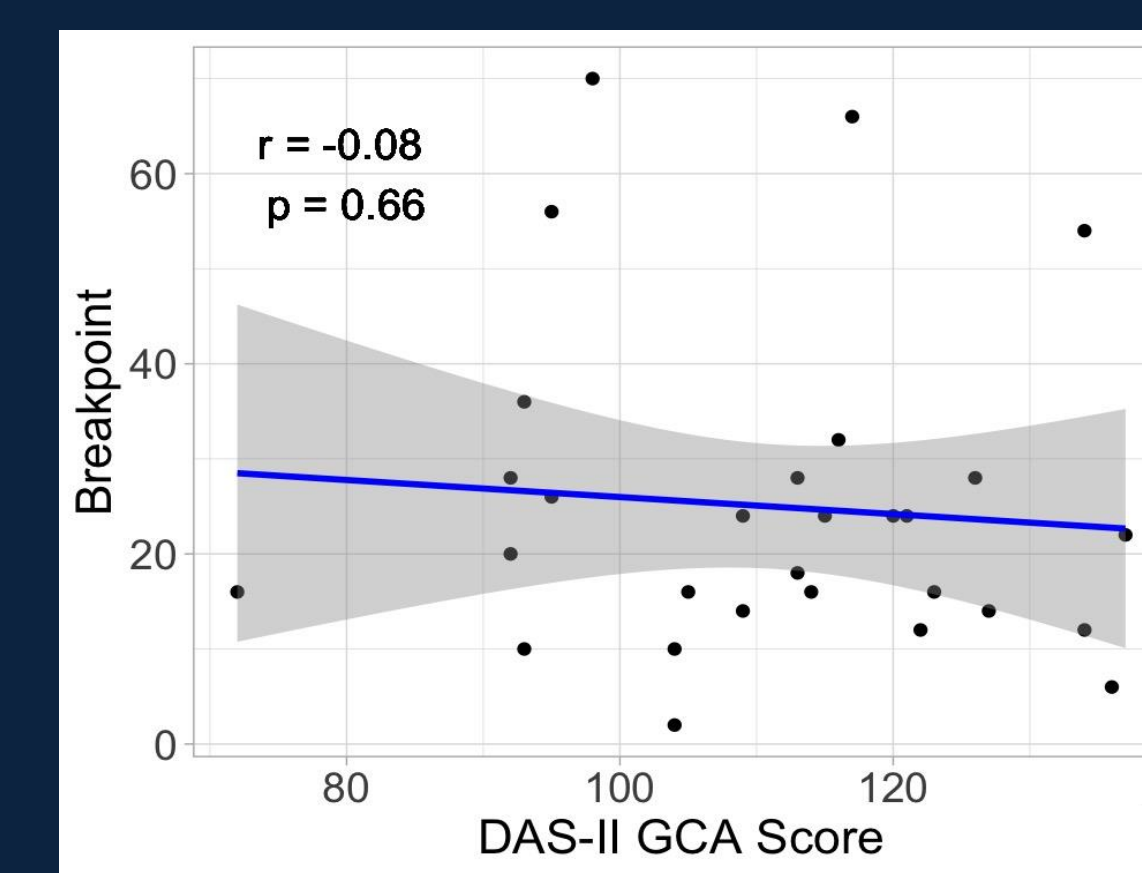
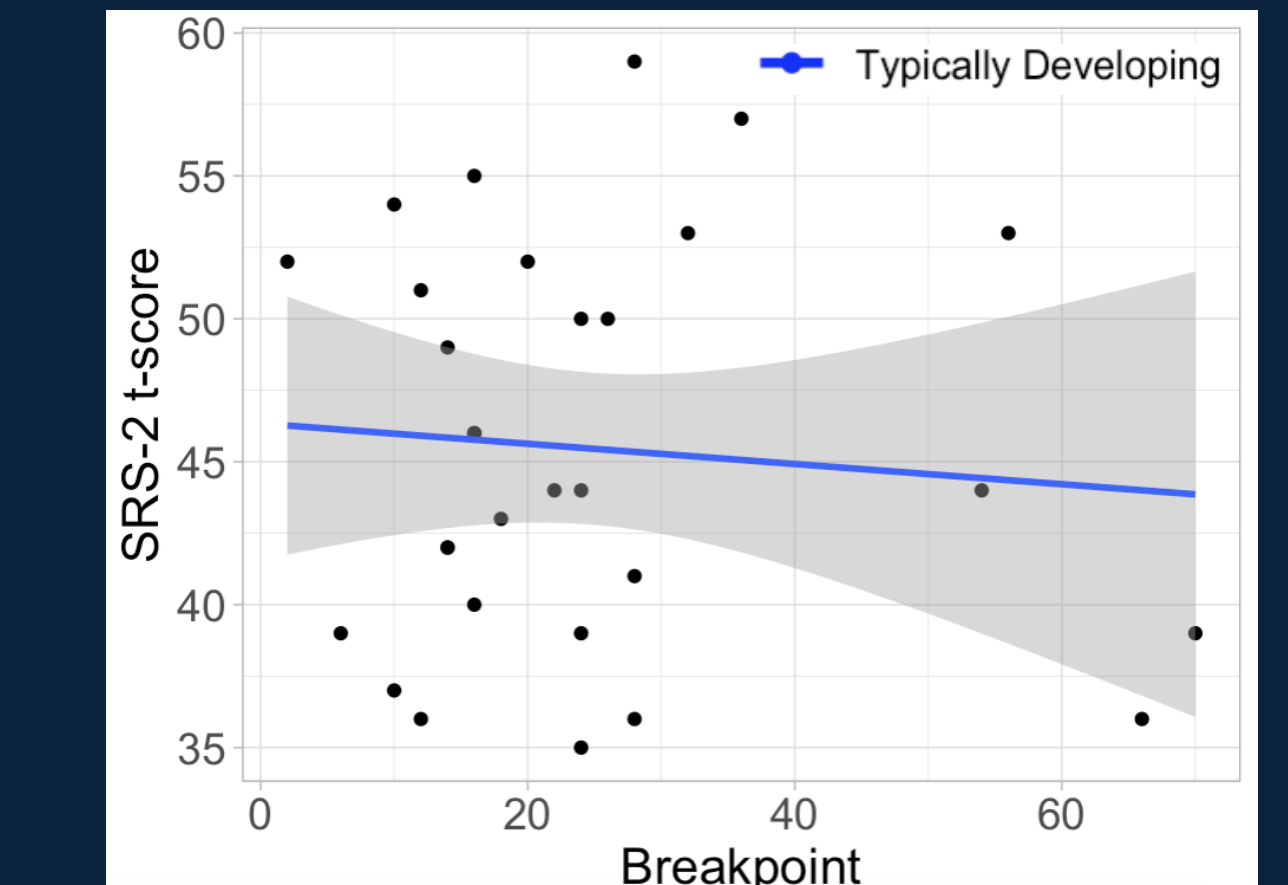
1) Breakpoint increases with chronological, not developmental, age.



2) Attentional focusing is the most promising parent-report measure of effort.



3) No relationship observed between breakpoint and SRS-2.



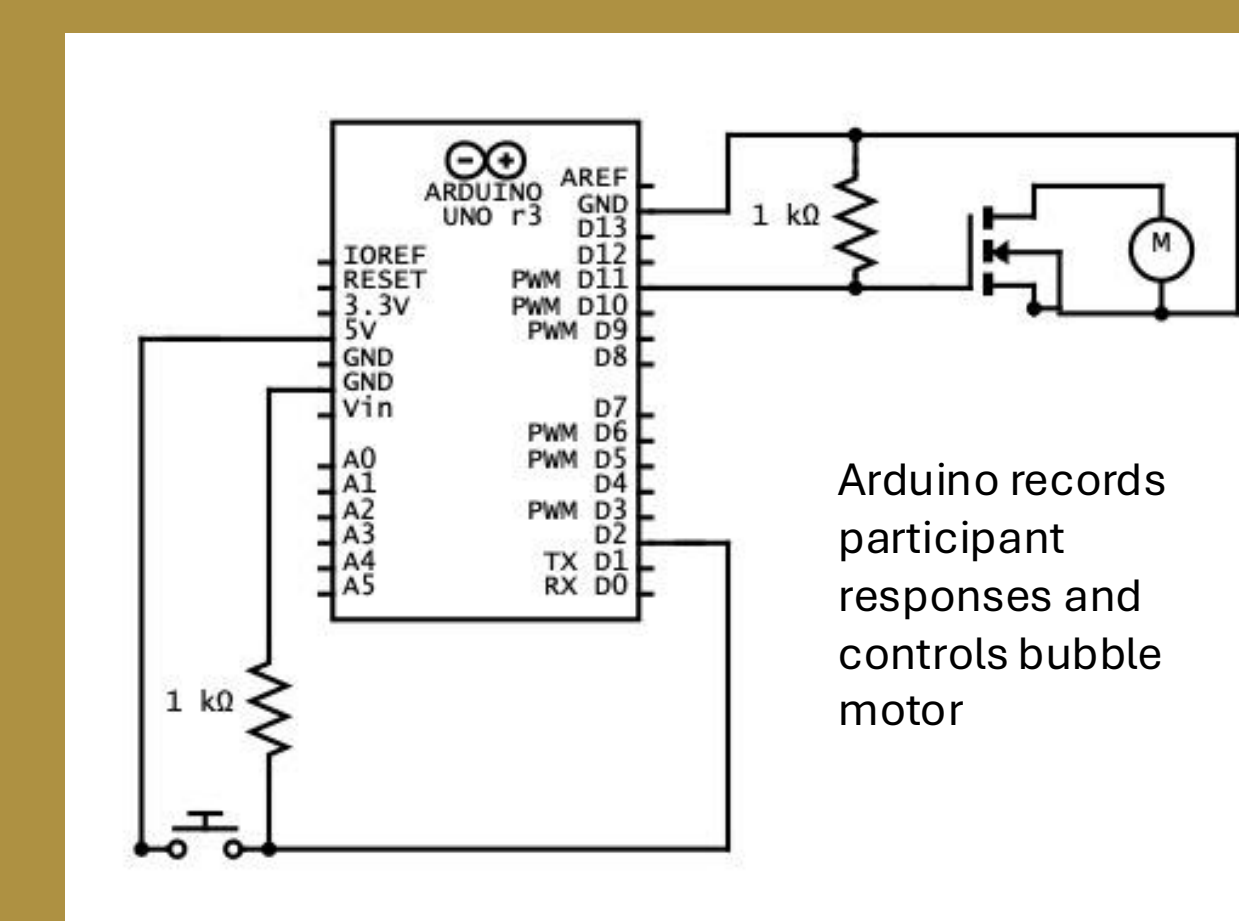
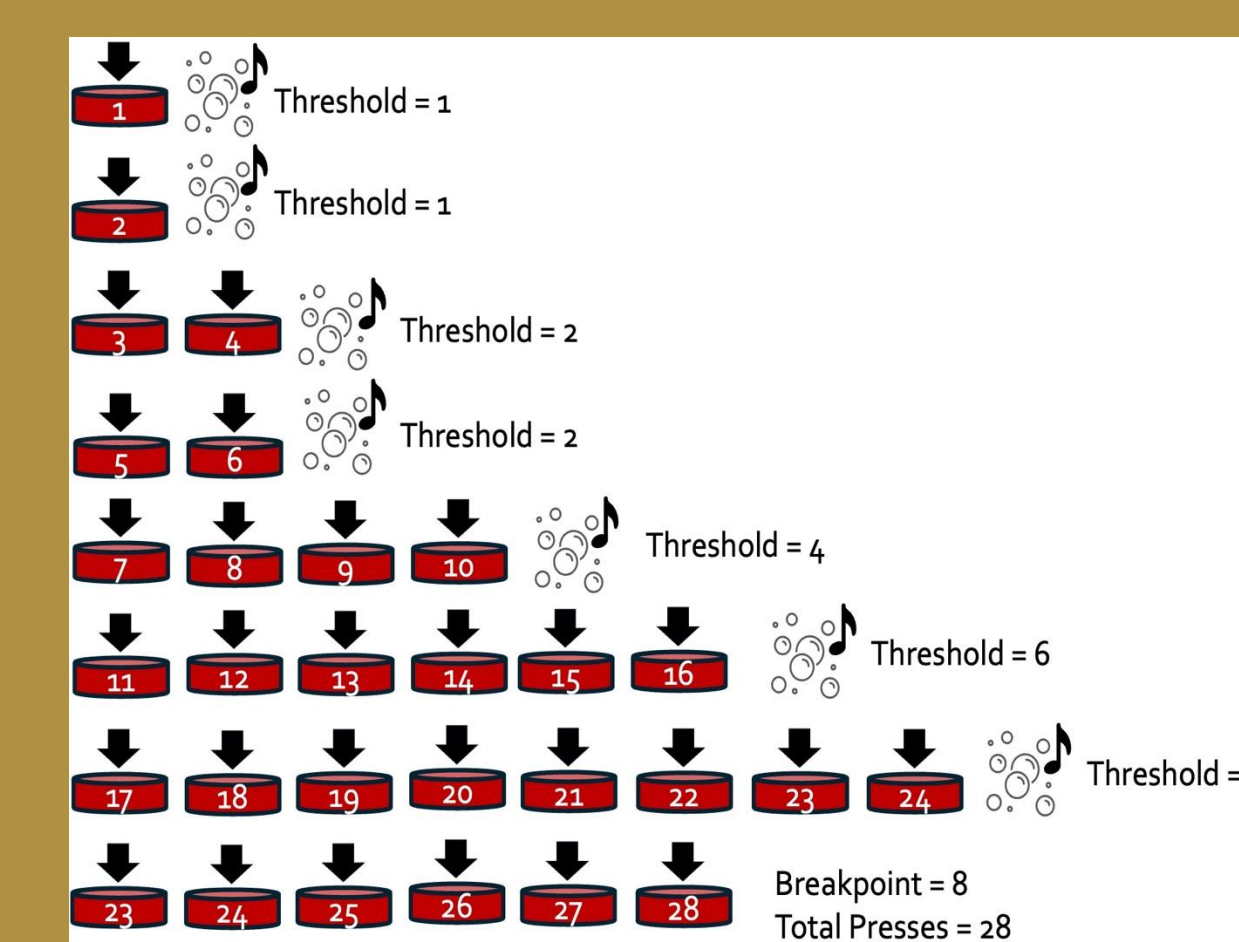
Methods

pressMORE (pressing Measure Of Rewarded Effort) is an infant- and child- friendly progressive ratio task designed to measure individual differences in effort to receive a reward

- Participants pressed a large button to experience 4s of bubbles and music
- Number of presses required to activate the bubble machine progressively increases
- Caregiver directed not to engage with child
- Trial stopped when two of the following behaviors occur within 30s:

- Language (verbal, sign, or AAC) indication of “all done” or similar (“I’m finished” etc.)
- Not touching the button with any body part for 10s, excluding time interacting with bubbles
- Crying, whining or signs of distress lasting 10s

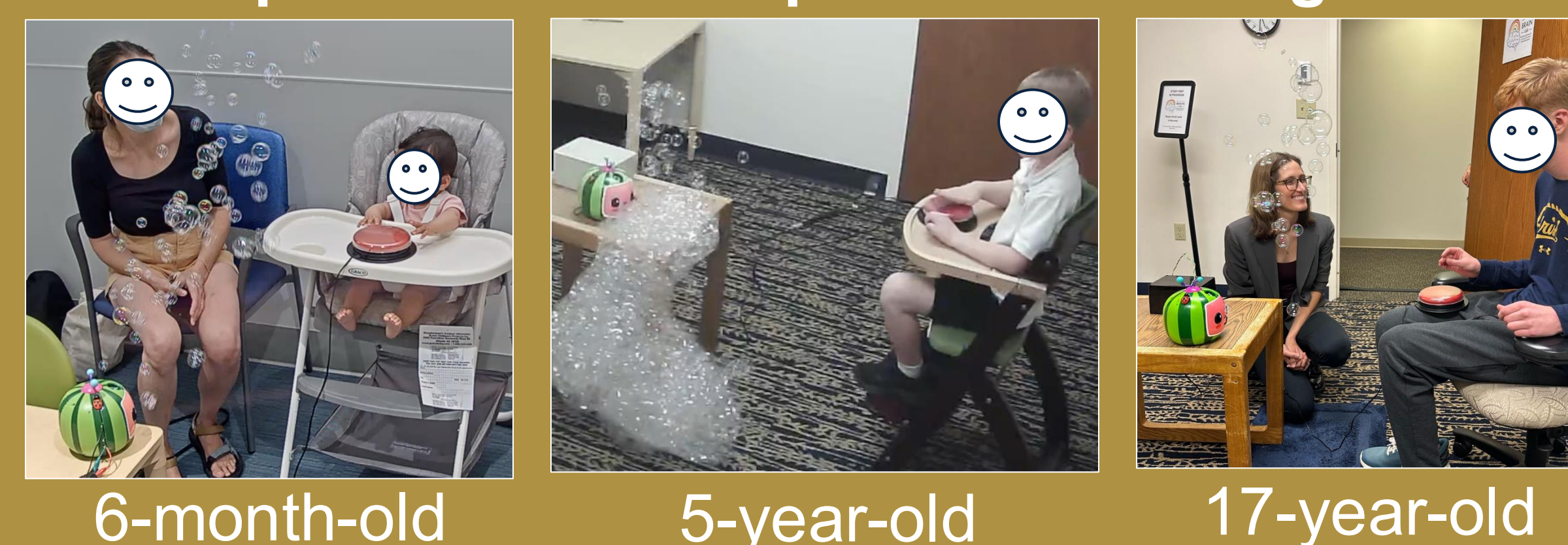
Breakpoint: greatest number of times the button was pressed (largest threshold⁶) to experience 4s of bubbles and music



Measures:

- pressMORE
- Children’s Behavior Questionnaire (CBQ)
- Social Responsiveness Scale-2 Preschool (SRS-2)
- Differential Ability Scales-II

pressMORE completion across ages



	Total	Typically Developing (TD)	Autism (AUT)	Developmental Delay (DD)
N	34	29	3	2
Age	4.3 (0.92)	4.3 (0.98)	4.4 (0.61)	4.0 (0.50)
% White	79%	83%	67%	50%
% Black	21%	17%	33%	50%
% Male	38%	38%	33%	50%
SRS-2 T-score	47.1 (8.7)	43.3 (7.1)	64.7 (4.6)	47.0 (4.2)
DAS GCA	108.4 (19.1)	111.3 (15.9)	95.3 (38.7)	85.5 (13.4)
Breakpoint	24.4 (16.9)	25.0 (16.9)	28.7 (20.4)	9.0 (1.4)

Note. Values represent mean and standard deviation

Discussion

- Breakpoint correlates positively with age in the TD group, and a similar trend is seen in the autism group.
- Attentional focusing (CBQ subscale) is the most promising parent-report measure of early effort, but additional measures of convergent validity are sought.

Future Directions:

- Explore additional pressMORE outcome variables
- Characterize the developmental trajectory of effort and its correlates through longitudinal study of pressMORE

References & Acknowledgments

¹Chevallier et al., 2012 ²Keifer et al., 2021 ³Clements et al., 2018
⁴Matyjek et al., 2023 ⁵Clements et al., 2023 ⁶Hodos 1961

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