The combination of autism and exceptional cognitive ability is associated with suicidal ideation

Introduction

Autism Spectrum Disorders (ASD) are a prominent topic in the research community. From gene linkage, genetic inheritance, to management, autism is a complex developmental disability with many unanswered questions. When autism is cooccurring in parallel with exceptional cognitive ability or twice exceptionality, those inquires grow larger. In this study, researchers aimed to determine the correlation between cognitive ability in ASD individuals and risk for suicidal thoughts. They predicted the greater cognitive ability in someone with ASD (IQ > 120), also referred to as "twice-exceptional", tranlsates to a higher risk for suicidal ideation. [1]

In previous studies, it has been supported that autism is associated with higher rates of suicide than those without ASD. [2] The higher rates of suicide are most likley due to the increase in depressive symptoms that those with ASD experience. [3] In addition, a study completed by the same group (Michaelson Lab) found that children with a high IQ (> 120) and ASD have greater feelings of inadequacy and internalizing problems compared to others with ASD and a below average IQ. [4] This praticular study utilizes these established observations to support that a twice exceptional individials with ASD are predisposed to have greater risk for suicidal idealization.

Figure

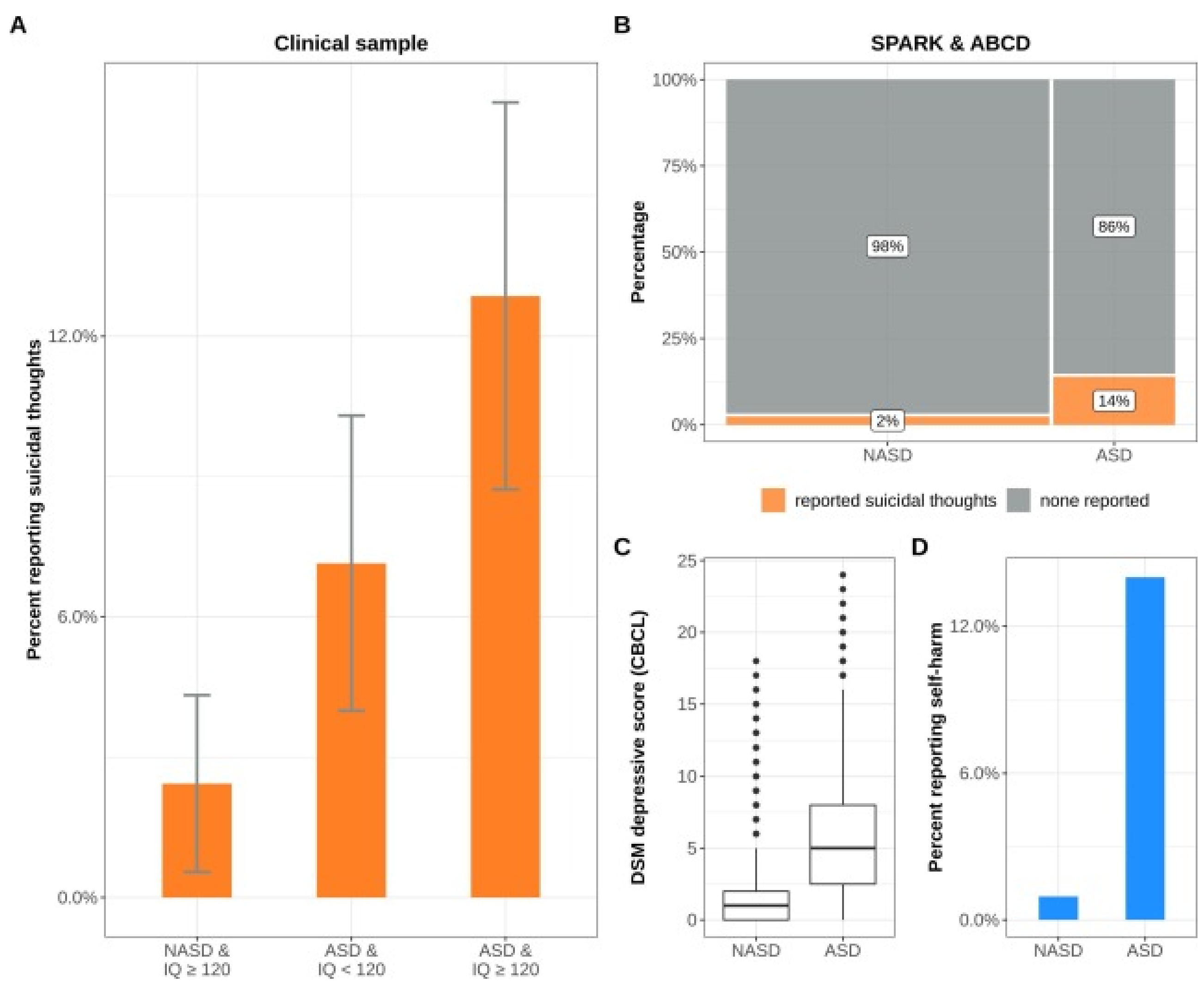


Fig. 2. Suicidal thoughts are increased in autistic children.

ASD = autistic children. NASD = non-autistic children.

A. Rate of parent-reported suicidal thoughts in children seen at a clinic specializing in clinical assessment of children with exceptional cognitive ability ± 95% CI from 10,000 bootstrap samples.

B. Rate of suicidal thoughts (CBCL item 91) in children in larger population samples.

C. Comparison of scores on the CBCL's DSM depressive scale.

D. Reported self-harm (CBCL item 18) in children with and without ASD.

I plan to reproduce graph C from figure 2. Graph C displays partipant scores from the Child Behavior Checklist (CBCL) and the Diagnostic and Statistical Manual of Mental Disorders (DSM) in non-ASD inidiviudals and ASD individuals. The CBCL was given to asses the emotional and behavior problems of children and adolescents. In this graph CBCL scores were combined with the DSM to yeild subscales of drepressive symptoms. We see the median DSM depressive score median is higher in ASD individuals than non-ASD individuals. We alo see a median sample difference of 4, a 95% CI of 3.99-4, and a p-value $< 2.2 \times 10^{-16}$. The graph provides evidence for ASD inidividuals to experince high depressive symptom scores on the DSM scale.

While I am only reproducing panel C of Figure 1, each graph in this figure is vital in converying the results of this study. Panel A shows the results of parent reported suicidal thoughts in non-ASD individuals with a less than 120 IQ score, ASD individuals with an IQ score above 120 (twice exceptionality), and ASD individuals with an IQ score below 120. The sample in graph A belongs to a clinic specializing in children with twice-exceptionality. Panel B compares suidial thoughs reported in non-ASD children with ASD children from the SPARK and ABCD sample. Graph D comapres the reported self-harm scores on the CBCL test in non-ASD children with ASD children. In combing the resutls from each panel in the figure, it shows further evidence that those with an ASD diagnosis are more depressed those with twice-exceptionality. They may also be at risk to have higher reports of suicidal thoughts and behaviors [3].

Materials and Methods

Data Sources

Sample Cohort	Sample Source	Corresponding Graph
SPARK	*https://www.sfari.org/2022/01/26/spark-december-2021-update-new-phenotypic-and-genomic-data-available/*	Used in graphs A-D of figure 1 to represent ASD individuals
ABCD	*https://www.sciencedirect.com/science/article/pii/S1878929317300890*	Used in graphs A-D of figure 1 to represent NASD individuals
Clinical Sample (Michaelson Lab)	*https://web.archive.org/web/20220517134546id_/https://www.medrxiv.org/content/medrxiv/early/2021/11/04/2021.11.02.21265802.full.pdf*	Ued in graphs A-D in figure 1 to represent twice-exceptional ASD individuals

Data Aquisition

SPARK

This sample provides data from 1,982 individuals who were between the ages of 8-15 and whose Child Behavior Checklist (CBCL) indicated suicidal thoughts. In addition the CBCL scores were combined with the Diagnostic and Statistical Manual of Mental Disorders (DSM) test. Any participant below the threshold of the 95th percentile was recorded. The score results were compared in graph C with SPARK particpants with ASD and ABCD participants without ASD (NASD). Graphs B and D in figure 1 use the CBCL survery to present the amount of participants with ASD reporting self harm and suicidal thoughts (SPARK participants) compared to those individuals reporting the same thoughts/self-harm without ASD (ABCD cohort). [5]

ABCD

The ABCD cohort provides data for 11,878 children to represent a larger population of developing children outside of the ASD cohorts. The participants were subjected to the same CBCL survey and DSM and compared to the SPARK cohort in graphs B,C and D. [6]

Clinical

The clincal sample was made up of 1,054 students/indviduals with an ASD diagnosis and an exceptional cognitive ability (IQ>120), NASD individuals and ASD individuals (IQ<120). This sample originates from a lab that specializes in the assesment of of gifted and twice-exceptional students. The data was compiled using Full Scale IQs from the Wechsler family of IQ tests. The data was presented in graph A in figure 1 to compare the differences in percentges of reporting self-harm among the 3 groups. [4]

Steps in Reproducing Figure 1 Graph C and Seeing Raw Data

figure will be reproduced using R and Rstudio using script from author

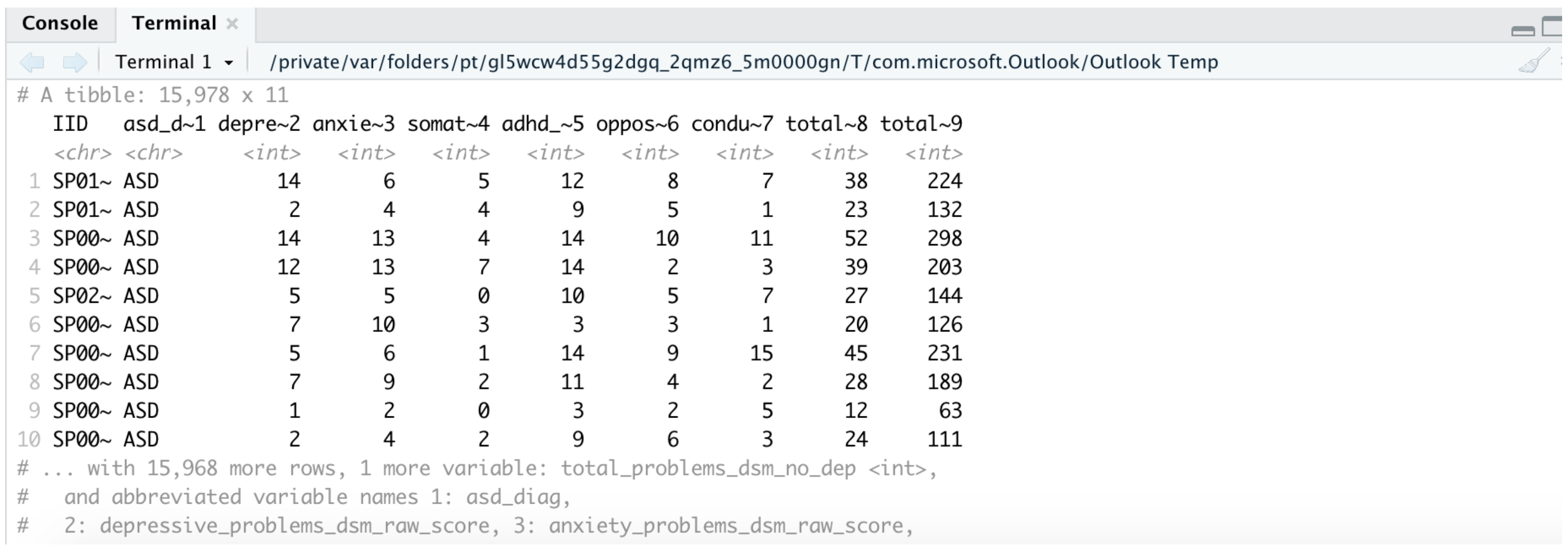
Processing Data and Making Graphs:

1. Log onto Argon through Rstudio
2. Install packages to help with processing data and plotting:

- library(tidyverse)
- library(ggmosaic)

3. Load CBCL and SPARK data from author into R:

- dat_cbcl = read_csv('/Dedicated/jmichaelson-wdata/lcasten/spark/research_match/2e/suicide/paper/data/figure1C_data.csv')
- Data results from above input:



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Console   Terminal ×
Terminal 1 ▾   /private/var/folders/pt/gl5wcw4d55g2dgq_2qmz6_5m0000gn/T/com.microsoft.Outlook/Outlook Temp
# A tibble: 15,978 x 11
   IID   asd_d~1 depre~2 anxie~3 somat~4 adhd_~5 oppos~6 condu~7 total~8 total~9
   <chr> <chr>     <int>   <int>   <int>   <int>   <int>   <int>   <int>   <int>
 1 SP01~ ASD          14       6       5      12       8       7      38     224
 2 SP01~ ASD           2       4       4       9       5       1      23     132
 3 SP00~ ASD          14      13       4      14      10      11      52     298
 4 SP00~ ASD          12      13       7      14       2       3      39     203
 5 SP02~ ASD           5       5       0      10       5       7      27     144
 6 SP00~ ASD           7      10       3       3       3       1      20     126
 7 SP00~ ASD           5       6       1      14       9      15      45     231
 8 SP00~ ASD           7       9       2      11       4       2      28     189
 9 SP00~ ASD           1       2       0       3       2       5      12      63
10 SP00~ ASD           2       4       2       9       6       3      24     111
# ... with 15,968 more rows, 1 more variable: total_problems_dsm_no_dep <int>,
#   and abbreviated variable names 1: asd_diag,
#   2: depressive_problems_dsm_raw_score, 3: anxiety_problems_dsm_raw_score,
```

4. To plot data:

- ggplot(aes(x = asd_diag, y = depressive_problems_dsm_raw_score)) +
  geom_boxplot() +
  ylab('DSM depressive score (CBCL)') +
  xlab(NULL)

5. Adjust the box and whisker plot to design preferences

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1. Lucas G. Casten, Taylor R. Thomas, Alissa F. Doobay, Megan Foley-Nicpon, Sydney Kramer, Thomas Nickl-Jockschat, Ted Abel, Susan Assouline, Jacob J. Michaelson,
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2. Hirvikoski, T., Mittendorfer-Rutz, E., Boman, M., Larsson, H., Lichtenstein, P., & Bölte, S. (2016). Premature mortality in autism spectrum disorder. The British Journal of Psychiatry, 208(3), 232-238. *https://doi:10.1192/bjp.bp.114.160192*. ↩

3. Hudson, C.C., Hall, L. & Harkness, K.L. Prevalence of Depressive Disorders in Individuals with Autism Spectrum Disorder: a Meta-Analysis. J Abnorm Child Psychol 47, 165–175 (2019). *https://doi.org/10.1007/s10802-018-0402-1*. ↩ ↩

4. Michaelson, Jacob J., Alissa Doobay, Lucas Casten, Megan Foley-Nicpon, Thomas Nickl-Jockschat, Ted Abel, & Susan Assouline (2021). "A Discrepancy Between Processing Speed and Verbal Ability in Gifted Youth Is Genetically and Diagnostically Associated with Autism." medRxiv. *https://doi.org/10.1101/2021.11.02.21265802* ↩ ↩

5. Pamela Feliciano, Amy M Daniels, LeeAnne Green Snyder, Amy Beaumont, Alexies Camba, Amy Esler, Amanda G Gulsrud, Andrew Mason, Anibal Gutierrez, Amy Nicholson, et al. Spark: a us cohort of 50,000 families to accelerate autism research. ↩

6. Krista M Lisdahl, Kenneth J Sher, Kevin P Conway, Raul Gonzalez, Sarah W Feldstein Ewing, Sara Jo Nixon, Susan Tapert, Hauke Bartsch, Rita Z Goldstein, and Mary Heitzeg. Adolescent brain cognitive development (abcd) study: Overview of substance use assessment methods. Developmental cognitive neuroscience, 32:80–96, 2018. ↩