### Impact of Camouflaging on Rates of Depression and Anxiety in Children with and without ASD

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### Background

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder characterized by social communicative and behavioral impairments (APN 2013).
- Some individuals with ASD attempt to conceal their social impairments in a coping strategy known as camouflaging (Mandy 2019).
- Camouflaging includes:
  - Masking by suppressing instinctive autistic behaviors
  - Compensating by memorizing and following social-communication norms
  - Assimilating by conforming to fit with others in social contexts
- Rates of camouflaging are higher in females than in males with ASD and may contribute to the lower rates of ASD diagnoses in females (Hall et al., 2020).
- While camouflaging may help individuals with ASD navigate social situations, qualitative reports of camouflaging in individuals with ASD indicate social exhaustion and high levels of stress, anxiety, and suicidal tendencies (Hall et al., 2017).

This study asked the following questions and hypothesized:
1. Is there a correlation between camouflaging severity and anxiety/depression severity for ASD and typically developing (TD) populations?
2. Is there a significant positive correlation between anxiety/depression severity and camouflaging severity for ASD participants, compared to the correlation among ASD symptom severity with depression (Barnett, 2012), anxiety (Barnett, 2012), and autism severity (Constantino & Gruber, 2012)?
3. For ASD and TD participants, controlling for autism severity, is there a stronger correlation between anxiety/depression severity and camouflaging severity for females than for males?

### Methods

#### Participants and Measures

30 participants with a confirmed diagnosis of ASD (18 males, 12 females) and 41 participants with typical development (17 males, 23 females) ages 15 to 23 (M=19.3, SD=2.16) with IQ in the average to above average range were included in this study. For questions 1 and 2, the participants were separated only by ASD diagnosis, and for question 3, the participants were only separated by sex.

#### Table 5: Details on the three measures used in this study.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Area of Interest</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Responsiveness Scale (SRS-2; Constantino, 2012)</td>
<td>Autism Severity</td>
<td>A parent questionnaire that identifies social impairment associated with ASD and quantifies its severity.</td>
</tr>
<tr>
<td>Social Approval Questionnaire (CAfQ: Hull et al., 2012)</td>
<td>Camouflaging-Autistic Traits Questionnaire (CAfQ)</td>
<td>A self-report measure of social camouflage behaviors. 3 subscales for masking, compensation, and assimilation are reported.</td>
</tr>
<tr>
<td>Social Support Questionnaire (ASR: Hull et al., 2012)</td>
<td>Mental Health</td>
<td>A self-report questionnaire for adults (ASR, ages 18-59) or adolescents (YSR, ages 11-17) for identifying co-morbid mental health symptoms. For this study, only the anxiety and depression syndrome subscales were used.</td>
</tr>
</tbody>
</table>

#### Table 1: Participants separated by sex and ASD diagnosis.

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>ASD Camouflaging Total Score</th>
<th>ASD Anxiety Score</th>
<th>ASD Depression Score</th>
<th>Ages in Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASD Males</td>
<td>18</td>
<td>M = 76.0</td>
<td>M = 61.6</td>
<td>M = 62.50</td>
<td>M = 19.11</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SD = 34.205</td>
<td>SD = 9.017</td>
<td>SD = 9.709</td>
<td>SD = 2.152</td>
</tr>
<tr>
<td>ASD Females</td>
<td>12</td>
<td>M = 108.28</td>
<td>M = 62.00</td>
<td>M = 65.50</td>
<td>M = 19.47</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SD = 29.181</td>
<td>SD = 10.963</td>
<td>SD = 16.184</td>
<td>SD = 2.566</td>
</tr>
<tr>
<td>TD Males</td>
<td>17</td>
<td>M = 75.47</td>
<td>M = 62.00</td>
<td>M = 65.50</td>
<td>M = 18.71</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SD = 29.739</td>
<td>SD = 4.085</td>
<td>SD = 5.714</td>
<td>SD = 1.908</td>
</tr>
<tr>
<td>TD Females</td>
<td>23</td>
<td>M = 76.90</td>
<td>M = 56.30</td>
<td>M = 59.91</td>
<td>M = 19.28</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SD = 25.441</td>
<td>SD = 6.609</td>
<td>SD = 9.520</td>
<td>SD = 2.233</td>
</tr>
</tbody>
</table>

### Results

#### Question 1: Correlation of Camouflaging and Mental Health

A series of Pearson correlations were run for ASD and TD participants separately and grouped together to determine associations between camouflaging scores and anxiety/depression symptoms. The total CAT-Q score and SRS-2 total score were set as independent variables, and depression and anxiety symptom severity as measured by the ASRS/YSR were set as the dependent variables. Additional analysis ran correlations for all 3 camouflaging subscale scores.

- There was a significant positive correlation between total camouflaging scores with depression (r=0.308, p=0.009) and anxiety (r=0.381, p=0.001) subscores, meaning youth with ASD and higher severity of camouflaging display more depressive and anxious behaviors.
- There was a stronger correlation for total camouflaging scores with both depression and anxiety for ASD participants, compared to the correlation among ASD symptom severity with depression (r=0.260, p=0.032) and anxiety (r=0.286, p=0.018).
- Further analysis revealed strong correlations between the assimilation subscore on the CAT-Q and mental health for both ASD and TD participants, meaning youth that assimilate to fit into social contexts display more anxious or depressive behaviors.
- For ASD participants there was a significant positive correlation between the CAT-Q assimilation subscale score with depression (r=0.557, p=0.001) and anxiety (r=0.547, p=0.002) subscores.
- For TD participants there was a significant positive correlation between CAT-Q assimilation subscale scores and the anxiety (r=0.343, p=0.031) subscore.

#### Question 2: Camouflaging and Autism Severity as a Predictors for Depression and Anxiety Symptoms

A series of Multiple Regressions were run for ASD and TD participants separately to determine whether a camouflaging subscore or autism severity would be the most significant predictor of mental health. Depression and anxiety subscores from the ASRS/YSR were set as the dependent variables. The four predictors were set as SRS-2, Compensation, Masking, and Assimilation Scores. Results from this analysis highlight the importance of developing robust mental health interventions for youth who engage in camouflaging behaviors, particularly those who engage in camouflaging for social reasons.

- For ASD and TD participants, the assimilation subscore is a better predictor of depression and anxiety symptoms than the total ASD symptom severity and all other camouflaging subscores. For TD participants, the compensation subscore is a better predictor of depression and anxiety symptoms than the total ASD symptom severity.
- For TD participants, compensation is the only significant predictor with a negative β value, suggesting that lower levels of compensation are related to higher levels of depression/anxiety in TD youth.

#### Question 3: Sex Differences in Effects of Camouflaging

To ascertain sex differences in correlations with camouflaging and anxiety/depression, a set of partial correlations were run between males and females. Autism severity, as measured by the SRS-2 total score, was held constant and the correlations of each camouflaging subscore with anxiety and depression for males and females was measured.

- For males and females, there was a significant positive correlation between assimilation and depression/anxiety subscores.
- No other significant correlations were found.

### Discussion

Summary
- The assimilation camouflaging subscore was the strongest predictor of, and most correlated with depression and anxiety, compared to other camouflaging subscores and autism severity. This suggests that assimilating to social contexts is more hazardous to mental health than masking traits or compensating for difficulties in social communication. These results support previous research which hypothesized that camouflaging reduces self-identity, which increases stress and anxiety (Hall, 2017).
- The effect of camouflaging on mental health seems to be more nuanced than originally hypothesized. Although the assimilation camouflaging subscore is the strongest predictor of depression/anxiety for ASD and TD populations, a greater level of compensation predicts a lower level of anxiety for TD populations. This suggests a possible difference in the mechanisms and reasons behind camouflaging between ASD and TD youth.
- For both males and females, assimilation was most correlated to depression/anxiety although females had a slightly stronger correlation for both mental health subscales. Since both males and females displayed significant correlations between depression/anxiety and assimilation, it is not clear how much of a sex difference exists in the effects of camouflaging.

Limitations
- The small sample size of this study means it is hard to generalize findings to all ASD and TD youth as well as make conclusions on sex differences in the effects of camouflaging.
- Observed differences in the predictive power of the CAT-Q vs the SRS-2 could be because the CAT-Q and ASRS/YSR are both self-report while the SRS-2 is a parent-report.

Future Directions
- Results from this analysis highlight the importance of developing robust mental health interventions for youth who engage in camouflaging behaviors, particularly those who engage in camouflaging for social reasons.
- An important next step is understanding how to better make up compacting autism diagnosis tools that can account for camouflage to provide a proper diagnosis and social support to females with autism.

### References