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Exploring Gender Differences in ADHD through Narrative Competency

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## ABSTRACT

Individuals affected by Attention-Deficit Hyperactivity Disorder (ADHD) often present with pragmatic language impairment. While not unanimous, existing literature on narrative language use generally provides evidence of a relationship between ADHD and narrative impairment. However, despite the large body of work studying ADHD and language, very little of it focuses on adults. Additionally, there is only a small (but increasing) data pool describing the effect of gender on ADHD symptomatology. The present study explores whether young adults with ADHD have less cohesive and coherent narratives than young adults without ADHD, and whether there is a gender component to narrative competence. Three prompt-driven narratives were collected from four groups of three people each: Clinical women (i.e. women with ADHD), clinical men, non-clinical women, and non-clinical men, and analyzed in domains of narrative competency. Because these are largely mental organizational/executive functioning (EF) skills, study activities were designed to ensure participants were genuinely challenged in those areas. In the opinion of the investigators, activities used in prior research such as story retelling or other highly structured narrative tasks may mask deficits due to an insufficient EF load placed on the narrator. EF measures were also collected from participants using the Executive Skills Questionnaire (ESQ). Young adults with ADHD were found to have less competent narratives than young adults without ADHD. Gender did not have an overall effect on narrative competency, but did play a role when combined with clinical status. Finally, speakers who reported higher difficulty with executive functioning produced less competent narratives with more production errors. Understanding how ADHD affects narrative abilities can enhance understanding of ADHD's effect on areas such as executive function, social interaction, and language use for spoken discourse.

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## **1. Introduction**

### **1.1 What is ADHD?**

Attention-Deficit Hyperactivity Disorder (ADHD) is a neurodevelopmental disorder that is characterized by patterns of inattention, hyperactivity/impulsivity, and executive function deficits. ADHD is currently more prevalent in male populations (particularly in childhood, where the ratio is approximately 4:1 male:female), but extenuating circumstances such as societal expectations of gender and differences in ADHD presentation may contribute to underdiagnosis in females. Although ADHD has often been considered a childhood disorder, a majority of ADHD children experience symptoms into adulthood (Abdelnour & Gold, 2022).

The set of symptoms associated with ADHD of most interest in the present study are pragmatic language deficits and executive dysfunction. Pragmatic language refers to the social use of language. People with pragmatic language deficits may have difficulties taking turns speaking, interrupt often, or say situationally-inappropriate things. Executive function (EF) describes a set of higher-order cognitive skills; these include planning, task initiation, emotional regulation, task switching, response inhibition, and sustained attention. ADHD is associated with executive dysfunction, or the impairment of EF skills.

### **1.2 Gender and Age in ADHD<sup>1</sup>**

ADHD research has historically focused on entirely or mostly male subjects, leaving the impact of gender ambiguous. Studies that do include females are often weakened by issues such as small sample size or controlling for possible effects of gender. However, we do know that ADHD is more often referred, diagnosed, and treated in males than in females, due to both

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<sup>1</sup> Note: This study included only cisgender men and women (discussed further in the “Conclusions” section), and because of that, the word “gender” is used for convenience to describe both the gender and the sex of the participants.

differing clinical presentations and differing social perceptions of male vs. female ADHD. A significant pattern suggested by the existing literature is that females present with more internalizing behaviors and symptoms, while males present with more externalizing behaviors/symptoms (Rucklidge 2008).

While there are some notable differences, core symptoms of ADHD are more similar than different between males and females. A meta-analysis on the topic by Gaub and Carlson (1997) explained that there was no evidence of a correlation between gender and academic performance, social functioning, or impulsivity in ADHD populations. Green et. al (2001) similarly indicated that females and males with ADHD both experience significant degrees of social dysfunction compared to their non-ADHD counterparts. In addition, both men and women with ADHD are highly likely to have a comorbid psychiatric or behavioral disorder. However, multiple studies have demonstrated that females with ADHD present with higher anxiety and lower self-esteem than ADHD males. While there are similar rates of comorbid depression and anxiety between males and females, women report higher symptom severity. On the other hand, males tend to engage in more disruptive and rule-breaking behavior. This internalizing/externalizing pattern means females are more likely to be diagnosed with the Inattentive ADHD subtype than men (Skogli et. al, 2013). Therefore, differences in subtype - though not equivalent to sex- or gender-linked differences - can be important in understanding how ADHD commonly presents in women and girls.

The internalizing/externalizing pattern is also one of the primary reasons females with ADHD are under identified. Multiple studies have demonstrated that adults (teachers, parents, and other professionals) are more likely to recognize ADHD symptoms in boys and to refer them for treatment than girls (Slobodin & Davidovitch, 2019). This pattern persists even when the



children show similar levels of clinical impairment (Sciutto, Nolfi, & Bluhm, 2004). Another study (Mowlem et al., 2019) demonstrated that behavior issues and hyperactivity/impulsivity were among the ADHD symptoms most strongly correlated with clinical diagnosis and pharmacological treatment. These symptoms are more common in males with ADHD than females, further indicating that women and girls who do not have externalizing problems are less likely to be diagnosed and medicated. In addition, other children are more likely to tolerate higher ADHD symptomatology in boys than in girls (Rucklidge 2008). This places pressure on girls to mask their symptoms in order to be socially accepted, making it even more difficult to identify them. Waschbusch and King (2006) suggested that there are likely some girls whose behaviors are consistent with ADHD, do not meet DSM criteria, but can be identified using sex-specific norms. In short, ADHD girls are not only under-identified by their support systems, but even when they are in the process of diagnosis, they may not qualify due to the diagnostic criteria being gender-insensitive.

These factors in combination suggest that women are more likely to be diagnosed with ADHD as adults or older teenagers. However, many studies focus on identification, description, and treatment of ADHD only in school-aged children. In fact, Rucklidge noted that ADHD is often underidentified in adults because of the myth that ADHD is solely a childhood disorder. As children, people with ADHD often have positive illusory self-perception (i.e. they believe they are less impaired than they truly are). Rucklidge notes that this is likely a self-preservational coping mechanism, but it does not persist into adulthood. Adults with ADHD are able to accurately recognize their impairments and feel helpless because of them - the feeling that children with illusory self-perception sought to avoid. An undiagnosed adult will begin to attribute their ADHD symptoms to a moral failing or character flaw, exacerbating the

self-esteem, depression, anxiety, and suicidal ideation issues already present in ADHD populations. For this reason, it is not only important to identify ADHD as early as possible, but to educate adult mental health professionals on the impact both of ADHD *and* of the secondary problems that result from late diagnosis. According to Seay (2001, from Taylor & Keltner, (2002)), this may particularly impact intelligent women. Seay's work found that late-diagnosed females were more likely to have higher verbal IQ and be identified only because they sought treatment for depression or anxiety.

Longitudinal studies have demonstrated that ADHD continues to impair both men and women well into adulthood - despite many ADHD symptoms becoming less acceptable as you age. Specifically studying social impairment in adults is of interest due to the lack of treatment, education, or other resources on the topic. While a child may have social-emotional learning support in a K-12 setting, very few such things exist for adults. Adults (appropriately) are held to higher social expectations than children, but an adult with ADHD may not be aware of or understand how to navigate a pragmatic impairment, especially if they or their social partners believe ADHD does not affect you in adulthood.

### **1.3 Narrative in ADHD**

Stories are an integral part of human social structure. They are used to document history as well as strengthen personal connections. Because social competence demands narrative competence, those with impaired narrative ability may be impacted by social, academic, or other repercussions. Many researchers in the field of ADHD have explored a possible link between ADHD and narrative impairment. Though narratives can be used in a variety of contexts, a narrative is often used pragmatically. It is possible, then, that the pragmatic language deficits commonly observed in ADHD populations (Rumpf et. al, 2012) may also impact narrative

ability. Tannock et. al (1993) add a second central element to the conversation: executive function (EF). Global and local organization are essential parts of narrative competency; a storyteller must be able to plan, organize, and monitor content structure while simultaneously responding to the normal cognitive load of language use (morphosyntax, etc.). These organizational processes are executive functions - skills that are typically impaired in people with ADHD. Recognizing the overlap between skills required for narrative and skills impacted by ADHD leads us to the conclusion that storytelling ability in individuals with ADHD may be reduced due to executive functioning and pragmatic language deficits.

So far, there has been no evidence to suggest that ADHD is associated with narrative *comprehension* impairments (Tannock et. al, 1993, Renz et. al, 2003; Rumpf et. al, 2012). Rumpf and colleagues' collected narratives from 31 children aged 8-12 years. The 3 groups of children (one group with Autism Spectrum Disorder (ASD), one with ADHD, and one group of typically developing (TD) children) were shown a wordless picture book and asked to narrate the events as they saw them. The neurodivergent children (children with ADHD or ASD, abbreviated ND) were unable to narrate the main events of the story as well as the TD children (Rumpf et. al, 2012). However, the authors posit that this may not be because the ND children did not understand the story concepts, but because they simply had a different idea about what was worth telling. Because ADHD (and ASD) involves systemic differences in brain chemistry and behavior, the processes that govern atypical social behavior in individuals with ADHD may also affect neurocognitive tasks. ADHD can manifest in atypical interest and motivation behaviors (e.g. hyperfixations, extreme procrastination, etc.) It is possible that they also have atypical ideas of importance and interest in narrative.

Story retelling tasks place a relatively low EF burden on the subject: the story has already been created and organized for them. In addition, many non-retelling studies include some sort of visual aid to anchor the stories. This also reduces EF burden because the narrator is not required to manage the setting, plot, and/or characters internally - they have an external

reference to scaffold them. This low EF burden may lead to a false negative, leading to a conclusion that narratives are not affected in ADHD. However, most social narratives are not anchored visually, nor are they a retelling of events already told to you in story format. If you are telling a social story, you often have to parse real-world information into a coherent narrative completely independently. For this reason, highly structured tasks may not accurately demonstrate a person's ability to use narratives in a naturalistic context; this limitation is noted in many of the studies referenced here. In combination with the factor of atypical interest systems, the present study elected to use storytelling tasks rather than retelling.

Existing literature does suggest that ADHD children *produce* narratives significantly differently than their TD peers. Rumpf et. al found that neurodivergent children's stories were both shorter and less coherent than controls. The work of Renz et. al also showed coherence impairments, but not length differences. Perhaps more importantly, multiple studies have found higher incidences of production errors in ND children. In Rumpf et. al, the ND children made frequent coherence retelling errors, i.e. they did not narrate the main ideas of the story. Additional findings suggest that ADHD children had significant problems with linguistic misinterpretation and cohesion. Renz and colleagues offer an explanation: Individuals with ADHD have improper response inhibition as well as diminished task switching capabilities. An error such as "they went looking for the bird" when there was only one person searching for their pet could be attributed to either of those executive processes. Individuals with ADHD may not take adequate time to consider the relationship between what they are planning to say ("they") and the actual situation they wish to describe (the actions of a singular person). It is also possible that they may not spend the cognitive energy switching from plural pronoun use to singular pronoun use. If there were previously multiple people referenced (as was the case in the study), individuals with ADHD may continue referencing either individual as "they", even when separated. This is perhaps due to the increased burden that comes with changes-of-state.

Evidently, existing research suggests a variety of plausible explanations for impaired narrative competency in ADHD.

The literature on narratives in ADHD falls short due to its focus only on children and its primary use of males as subjects. Narrative as a social tool is used across the lifespan. While a lot of language assessment and intervention happens in childhood (which makes sense, considering language development timelines and the demands of the education system), social demands of language continue in nearly every major aspect of life (home, school, work, many hobbies) for the rest of a person's life. An adult (particularly a late-diagnosed adult) could have no expressive or receptive language impairment, but significant pragmatic/narrative impairment. This will continue to impact their lives, and they might not be able to understand why (because they do not have any other language impairment).

#### **1.4 Hypotheses**

The purpose of the present study was to determine whether young adults with ADHD formulate less competent narratives than young adults without ADHD. Additionally, we aimed to determine if there was a gender component to narrative competence. We wanted to see if there is a difference in the narratives of men and women (with and without ADHD), and if one gender was more affected by ADHD than the other with respect to narrative discourse. Three hypotheses were tested: 1) Young adults with ADHD will have less competent narratives than young adults without ADHD, 2) Gender will have a significant effect on narrative competency, with men having more difficulty than women, and 3) Young adults with higher Executive Function (EF) skills will have higher levels of narrative competency.

## 2. Method

### 2.1 Participants

The study was composed of four groups of three participants each: 1. Non-clinical women (i.e. women that do not have ADHD), 2. Non-clinical men, 3. Clinical women, and 4. Clinical men. Personal information on race, ethnicity, medication status, and bilingual status was collected on a voluntary basis from each participant. Of the 12 participants, 11 were White/Caucasian, and one was Asian. One was Hispanic/Latino, and 11 were not. Three participants were bilingual, while 9 spoke only English fluently. All bilingual participants identified themselves as native English speakers. Of the 6 participants with ADHD, 2 indicated they were medicated for their ADHD, 1 indicated they used to take medication for their ADHD but no longer do, 2 indicated they have never been medicated for their ADHD and do not wish to be, and 1 indicated they have never been medicated for their ADHD and do wish to be.

Participants were recruited via fliers placed on on-campus bulletin boards, digital fliers on social media, a notice on StudyFinder (an online recruitment system used by Penn State University), and by personal invitation. Inclusion criteria included being 18-30 years of age and a native English speaker, while exclusion criteria included uncorrected hearing loss, a diagnosis of ASD, dyslexia, or other neurological impairment. All participants took the Adult ADHD Self-Report Scale for the DSM-V (ASRS-5) as a measure of eligibility: a score of 14 or above (in addition to a diagnosis of ADHD) indicated eligibility for the clinical group, while a score of 13 or lower (in addition to no diagnosis of ADHD) was required for the non-clinical group. This study was approved by the Pennsylvania State University Institutional Review Board. Participants gave their informed implied consent for all study activities at the time of the initial screening questionnaire.

## 2.2 Procedure and Materials

Three sample narratives were collected from each of the 12 participants. This process involved participants meeting study staff 1:1 in a private meeting on the video communications platform Zoom. Participants were given a series of prompts that would elicit narratives from them in three different conditions. The three conditions differed in level of structure provided to the participant. “Structure” refers to the amount of information given to the participant vs. the amount the participant must create on their own. Higher structure indicates more information (e.g. characters, plot points, a setting, etc.) was given to the participant, while low structure indicates less information/guidance was given. The conditions were presented in descending order of structure - Condition 1 (high structure) first, Condition 2 (medium structure) second, and Condition 3 (low structure) last. For all three conditions, the prompts to elicit the narrative were given orally. More details about each condition are provided below.

*Note: Text in brackets is for clarity and was not spoken aloud*

### **Condition 1:**

The first prompt was accompanied by a visual aid (“The Bear and the Bus” picture from the Detroit Tests of Learning Aptitude), which was shown to the participants virtually. The visual aid was visible to the participants from the time the prompt was given until they completed their first narrative.

**Prompt:** “I’m now going to show you an image. [*The Bear and the Bus*] Take a few moments to review it - you do not need to memorize it. When you have finished, let me know. [*when ready*]: Describe what happens after the events shown in the image.”

**Condition 2:**

The Bear and the Bus image was removed from the screen, so the participant could only see the investigator.

**Prompt:** “Tell me about something that you did with other people or another person.”

**Condition 3:**

No changes from condition 2; Only the investigator was visible to the participant.

**Prompt:** “Imagine you are in a fictional world. Take a few moments to think about that world. When you are ready, tell me about something that happened there. In short, I am asking you to simply make up a story.”

Participants were given the opportunity to ask clarifying questions and have them answered by study staff. Study staff gave neutral prompts such as “Can you tell me more about that?” or “What happened next?” if a participant’s narrative was too short. Participants were advised that study staff may be less reactive or responsive than a typical conversation partner - this was done to mitigate possible embarrassment or discomfort on the part of the narrator, and to encourage them to continue their story even if study staff was not reacting overtly positively. Participants were instructed that there were no specific length requirements and that unless explicitly stated in the prompt, there are no requirements or preferences with regards to topic or theme.



### **2.2.1 Data Analysis**

Participants' narratives were recorded on Zoom. Zoom auto-generated a transcript which was checked and edited by a trained undergraduate researcher while listening to the audio recording. Those changes were reviewed and confirmed by the Principal Investigator (PI). Two undergraduate researchers collected all measures for 25% of the samples in addition to the PI. Discrepancies between each person's analysis were resolved by reaching consensus between all three researchers assigned to the story. Additionally, undergraduate researchers scored Topic Maintenance scores for all of the samples. The same consensus procedure was followed for Topic Maintenance for each sample. Any "errors" were not counted if they were appropriate to an informal register between young adult peers, as determined by consensus between the PI and undergraduate researchers.

## **2.3 Measures**

### **2.3.1 Narrative Competency**

Narrative competency was assessed using a set of measures: Story Length, Topic Maintenance, Fluency, Explicitness, Reference, Grammatical Complexity, and Syntactic Accuracy. Story Length was measured using C-units (defined as an independent clause and all its accompanying subordinate clauses), number of words, and MLU (Mean Length of Utterance) in number of words per C-unit. Topic Maintenance was assessed using a modified version of Glosser & Deser's 1987 guidelines on Local Coherence (referenced in Van Leer & Turkstra, 1999). Each C-unit (except the first in each story) was given a score of 1-3 depending on its relatedness to the previous C-unit. Generally, a score of 1 indicated no relationship, 2 some relationship, and 3 a strong relationship. Four types of fluency errors were measured: false starts

(abandoned utterances), retracings (internal corrections), repetitions (repetition of material not used for emphasis), and wordfinding difficulties. Explicitness was measured by counting the number of C-units serving as elaboration (providing optional detail) and the number of C-units including evaluation (the speaker giving their opinion or describing the significance of an event). We also measured the number of critical information omissions, which occur when a speaker leaves out information that is necessary for understanding an event. Pronoun reference errors were collected: 1. repetition of a noun where a noun is expected, 2. erroneous pronoun usage, and 3. pronoun usage without an antecedent. Measures of Grammatical Complexity included clausal density, the ratio of simple to compound main clauses, the amount of passive constructions used, and the amount of indeterminate nouns used. Finally, Syntactic Accuracy was assessed by noting the number of errors in: verb conjugation, agreement, word (or morpheme) level omission, word (or morpheme) level addition, content word misuse, and function word misuse. Full information on each variable collected can be found in the Appendix. When appropriate, measures were regularized to a story length of 30 C-units.

### **2.3.2 Executive Function**

Executive function was measured by the Executive Skills Questionnaire (ESQ). Participants completed the ESQ in the Zoom meeting after they completed their narratives. The ESQ is not a norm-referenced assessment (i.e. there is no threshold for impaired vs not impaired), so we are only looking at the scores in comparison to each other. The ESQ gives an overall score (where higher = more impaired) and 12 subscores, each representing an EF domain. The domains are: response inhibition, working memory, emotional control, task initiation,

sustained attention, organization, planning, task management, flexibility, metacognition, goal persistence, and stress tolerance.

### 3. Results

Measures (other than Story Length, clausal density, and Topic Maintenance) are reported as incidence per 30 C-units. For example, an “Event Sequencing” score of 3 indicates that in a “typical” length story (of 30 C-units), the speaker would be expected to make 3 event sequencing errors.

#### 3.1 Gender

There were virtually no significant effects of gender on narrative competency. Clinical status was more impactful than gender in nearly all scores, with exceptions being function word misuse, agreement error, erroneous pronoun usage, C-units containing evaluation, and event sequencing errors. In all cases except evaluation, the range of error frequency between all groups was so small as to be nearly null. The average incidence for every measure listed above was less than 1.5 times per story, with most occurring less than once.

Although gender itself did not have a large impact on the measures collected, certain individual groups did have relatively higher errors than either their same-status but different gender or same-gender but different clinical status counterparts. For example, the ADHD women had much higher story lengths than any other group. ADHD women also had the most Fluency errors. On the other hand, ADHD men made more Event Sequencing errors than any other group. The salient variables are noted in Table 1.

|  | Control women | Control men | ADHD women   | ADHD men    |
|--|---------------|-------------|--------------|-------------|
| Story Length in C-units                  | 26.67         | 28          | <b>79.33</b> | 49          |
| Story length in words                    | 290           | 296         | <b>848</b>   | 468.67      |
| Fluency errors (per 30 C-units)          | 1.97          | 4.95        | <b>9.92</b>  | 6.56        |
| Event Sequencing errors (per 30 C-units) | 1.13          | .83         | 1            | <b>2.52</b> |

Table 1. Variables in which one group had a significantly higher score than all other groups

Those patterns can be visualized another way by comparing the differences between control vs. ADHD women and control vs. ADHD men. ADHD women made comparatively more Fluency errors (7.95 more than control women) than did ADHD men (1.61 more than control men). They also made comparatively more syntactic errors (3.35 more than control women) than did ADHD men (.53 more errors than control men). On the other hand, ADHD men made more Referencing errors (2.85 more than control men) than ADHD women (1.8 more than control women).

|                    | Control women (1) | Control men (2) | ADHD women (3) | ADHD men (4) | Difference between women (1-3) | Difference between men (1-3) |
|--------------------|-------------------|-----------------|----------------|--------------|--------------------------------|------------------------------|
| Fluency errors     | 1.97              | 4.95            | 9.92           | 6.56         | <b>7.95</b>                    | 1.61                         |
| Syntax errors      | 2.8               | 4.95            | 6.25           | 5.48         | <b>3.35</b>                    | .53                          |
| Referencing errors | 1.52              | 1.23            | 3.32           | 4.08         | 1.8                            | <b>2.85</b>                  |

Table 2. Notable variables when examining the combination of gender and clinical status.

### 3.2 ADHD

Clinical status had significant impacts on narrative competency. The most significant impact was on Fluency, with the clinical groups having an average of 8.24 errors while controls only had 3.46. In particular, false starts (4.02 vs. 1.19) and retracings (2.93 vs. 1.01) differed significantly between these two groups.

|                      | Non-clinical group | ADHD group |
|----------------------|--------------------|------------|
| Total Fluency errors | 3.46               | 8.24       |
| False starts         | 1.19               | 4.02       |
| Retracings           | 1.01               | 2.93       |
| Repetitions          | .14                | .47        |

Table 3. Fluency errors per 30 C-units in the clinical and non-clinical groups.

The clinical group made more errors in every main and submeasure except for wordfinding difficulties. Referencing errors were more than twice as common in the clinical group (3.7 vs 1.37). Syntax errors were more prevalent in control groups than other errors - they made 3.87 vs. the clinical group's 5.82 errors. While the clinical group made relatively few critical omission errors (1.07 per story), the control group had none. Topic Maintenance was lower in the clinical group than the control group (average Local Coherence score of 2.43 vs. 2.64, with an individual range of 2.33-2.78).

|                          | Non-clinical group | ADHD group |
|--------------------------|--------------------|------------|
| Total Referencing errors | 1.37               | 3.7        |
| Total Syntactic errors   | 3.87               | 5.82       |
| Critical omission errors | 0                  | 1.07       |
| Topic Maintenance scores | 2.64               | 2.43       |

Table 4. Additional variables affected by clinical status

Clinical status had no impact on clausal density and played a small role in MLU - control groups had an MLU of 10.77, while the clinical group had an MLU of 9.89. In contrast, story length was affected: the clinical group had an average of 64.17 C-units per story, almost 2.5 times the amount of the control group (27.33 C-units).

|                         | Non-clinical group | ADHD group |
|-------------------------|--------------------|------------|
| Story length in C-units | 27.33              | 64.17      |
| Story length in words   | 293                | 658.33     |
| MLU                     | 10.77              | 9.89       |
| Clausal density         | 1.39               | 1.42       |

Table 5. Story Length measures in the clinical and non-clinical groups.

### 3.3 Executive Function

Some scores on the ESQ did have a significant correlation with lower narrative competency. Group, gender, or clinical status was not considered when analyzing these measures; the only variable of interest was executive function. Working Memory, Sustained Attention, Organization, Planning, and total score were compared to Topic Maintenance, Event Sequencing errors, total Fluency errors, total Referencing errors, total Syntax errors, and total errors across the 4 previous categories. Nine combinations reached statistical significance ( $p < .1$ ) using a simple linear regression model.

Total ESQ score was associated with higher incidence of all errors ( $p=.033$ ), Fluency errors ( $p=.035$ ), and Referencing errors ( $p=.080$ ). Total errors were also strongly predicted by higher Sustained Attention scores (i.e. more impairment in that domain) ( $p=.022$ ) and moderately by higher Planning scores ( $p=.069$ ). Fluency errors were strongly predicted by Sustained Attention scores ( $p=.0016$ ). Referencing errors had a moderate association with higher scores in

the Planning domain ( $p=.029$ ) and Sustained Attention ( $p=.038$ ). Finally, Sustained Attention scores had a moderate association with lower Topic Maintenance scores ( $p = .043$ ). No effects from Working Memory or Organization reached statistical significance, and no EF domain was shown to have a statistically significant impact on syntactic or event sequencing errors. While the relationship between Planning scores and sequencing errors did not reach statistical significance at  $p < .1$ , there was a moderate association between them ( $p = .104$ ).

|   | R-squared Value | P-value |
|---|-----------------|---------|
| Sustained Attention/Fluency                 | .46             | .016    |
| Sustained Attention/Total errors            | .42             | .022    |
| Planning/Referencing errors                 | .39             | .029    |
| Total ESQ/Total errors                      | .38             | .033    |
| Total ESQ/Fluency errors                    | .37             | .035    |
| Sustained Attention/Referencing Errors      | .36             | .038    |
| Sustained Attention/Topic Maintenance score | .35             | .043    |
| Planning/Total errors                       | .29             | .069    |
| Total ESQ/Reference errors                  | .28             | .080    |
| Planning/Sequencing errors                  | .24             | .104    |

Table 6. R-squared values and p-values for selected combinations of ESQ domains and error types.



## 4. Discussion

This study was intended to be exploratory in nature. Due to the small number of participants, all results should be interpreted with caution.

### 4.1 Gender

The hypothesis that gender will have a significant impact on narrative competency, with men being more impaired than women, was not supported by the results of this study. Gender alone appeared to have very little effect on narrative competency in our sample. When comparing ADHD with non-ADHD participants (regardless of gender) and men with women (regardless of ADHD status), differences were larger in the former group than the latter in almost all scores. Exceptions were noted in measures which were extremely infrequent across all groups, so it is unlikely that there is a genuine relationship between gender and those variables.

However, gender did at times play a role in distinguishing members of like-clinical statuses. For example, while ADHD vs. non-ADHD was more impactful than gender when looking at story length, ADHD women had longer narratives than ADHD men. There were three narrative samples that were noticeably longer than all other participants: two ADHD women at 119 and 81 C-units respectively, and one ADHD man at 78. The next longest sample (of the remaining 9) was 38 C-units. These comparisons are similar when looking at story length in words. The small sample size limits us from making broad generalizations about this pattern, but as the longest non-ADHD sample was only 36 C-units, such a pattern is certainly worth exploring further. In Story Length categories, as well as Fluency and Syntax errors, women scored worse compared to their control counterparts than did ADHD men compared to control

men. This indicates a possible difference in the way ADHD affects men and women in these domains.

While gender does not seem to affect the general narrative competency of one group over the other, ADHD *may* impact men and women at different severities in different domains. The extreme story length of two of the female ADHD participants may indicate a relatively worse ability to gauge the appropriate amount of talking. Gender of study staff was not controlled, but it is possible that participants' narratives would differ between a like-gender environment and a mixed-gender environment. Women with ADHD in particular report higher levels of shame and feelings of personal failure related to their ADHD symptoms (Rucklidge 2008), so it is possible that these women are more conscious of 'appropriateness' in a certain kind of situation (mixed- or like-gender). In short, while ADHD men and women had narratives far more similar to each other than to their same-gender counterparts, data indicate that gender may impact narrative competency *when combined with clinical status*. Discovering whether those differences are related to socialization or sex-linked differences in ADHD presentation is a worthwhile area of future exploration.

## **4.2 ADHD**

The hypothesis that participants with ADHD would produce less competent narratives was supported by the findings of the present study. ADHD participants produced more errors than controls in every measure except for two: agreement errors and wordfinding difficulty. Higher wordfinding difficulty in the control group is possibly attributable to the fact that quite a few participants could not remember the word for "park ranger", a main character in the *The Bear and the Bus* image. This may have led to scores that do not reflect the true frequency of

participants' wordfinding difficulty in a day-to-day context. Agreement errors were extremely rare across all samples, and even then, the difference between the clinical and non-clinical groups was less than 1/10th of an error. Participants with ADHD had comparatively more difficulty than the non-clinical participants in all combined measures (e.g. total Referencing errors) as well as Topic Maintenance.

Lower Topic Maintenance scores are likely related to a variety of common ADHD impairments. Individuals with ADHD have difficulty with advance planning, increasing the likelihood that they will remember necessary context for an utterance only after they have said it. Working memory and attention difficulties may also contribute: an ADHD speaker may *intend* to speak about a topic fully before moving to another, but forget what they wanted to say about that topic, only to remember it after they have moved on. Individuals with ADHD may also struggle to simultaneously produce a narrative *and* monitor how a listener may interpret it. They may not realize that they are switching topics often or be able to anticipate how that might impact the listener's experience. Although the difference in Topic Maintenance scores appears to be larger than the difference in Event Sequencing errors, the impairments that contribute to the two are likely similar. Event sequencing and topic maintenance are often interrelated - a speaker who recalls previously forgotten context may narrate events out of order as a result; a speaker who narrates events chronologically is less likely to veer off-topic than one who does not.

Higher incidences of production errors (Referencing, Fluency, and Syntax) are in line with findings in existing literature with regards to ADHD children. It is, of course, expected that adults have more mastery over all language domains than children, so research on production errors in childhood is not wholly applicable to an adult context. It is important to discover to what degree production errors persist into adulthood, as well as what form those errors take.

The most common Referencing error by far was using a pronoun without an antecedent. Two possibilities for this are that speakers were either *unsure* as to whether they had already given an antecedent or *unaware* that they had not. To continue, not only did participants with ADHD make almost 5 more Fluency errors per 30 C-units than controls, Fluency errors were the most common error for both ADHD men and ADHD women. (Control men tied between Fluency and Syntactic errors, and control women made more Syntactic errors). There were very few repetition errors - most dysfluencies were false starts and retracings. Interestingly, the control groups had similar incidences of false starts and retracings, while ADHD individuals had over a full point more false starts than they did retracings (see Table 3). It is plausible that a retracing could be the result of a linguistic performance error (e.g. someone intended to say “me” but it came out “we”), but this seems less likely with a fully abandoned utterance (false start). Therefore, it is not surprising that individuals with ADHD had a comparatively higher rate of false starts. As demonstrated in the Topic Maintenance discussion, they are more susceptible to kinds of topic shifts that may lead to abandoned utterances.

Finally, errors of Syntactic Accuracy were the least impacted by clinical status. ADHD participants made fewer syntactic errors than they did Fluency errors (but more than Referencing errors), but perhaps more importantly, the non-clinical groups made more syntactic errors than any other error type. Function word misuse and word-level omission were the most common errors, followed by tense/aspect errors. Most of the errors were relatively minor across groups. Importantly, the measurements used in this study were not able to capture the degree to which *any* production error (either alone or in combination) impacted the overall coherence of the narrative. Future studies may find it useful to either a.) denote how much (in their opinion) a

specific error impacted narrative coherence or b.) explore in-depth whether certain kinds of errors tend to impact listener comprehension and experience more severely than others.

### **4.3 Executive Function**

The hypothesis that higher EF skills would be associated with more competent narratives is at least partially supported by the results of the present study. It should be noted that not all subdomains of the ESQ were considered in the analysis of this topic, as some of them were deemed less relevant to the specific task of storytelling (although do contribute to a person's overall impairment, which in turn may impact their storytelling). Working Memory, Sustained Attention, Organization, and Planning were the subdomains of interest, in addition to the total score on the ESQ. Those domains were compared with Topic Maintenance scores, Event Sequencing errors, total Referencing errors, total Fluency errors, total Syntactic errors, and total errors (Sequencing + Referencing + Fluency + Syntax).

Sustained Attention scores tracked the most closely with the number of errors across all error types analyzed. The only variable it did not reach significance with was Syntactic errors, which were not associated with any of the ESQ domains. Sustained Attention/Fluency and Sustained Attention/total errors were the two strongest associations revealed with analysis. The impact on fluency seems fairly straightforward: everyone has at some point gotten distracted from a conversation and lost track of what they were saying. If a person has more difficulty with sustained attention, it makes sense that those distractions would be more frequent and impact their fluency more. Sustained Attention was also the only ESQ domain to be associated with Topic Maintenance (Higher Sustained Attention score → lower Topic Maintenance score). No other domain neared significance. This gives credence to the idea that frequent topic switching may be caused by an inability to remain on one topic without getting distracted by another.

Higher total scores on the ESQ were associated with higher total errors, Fluency errors, and Referencing errors. This may indicate that Syntax errors and lower Topic Maintenance scores have less to do with overall EF than the error types listed above. However, people with higher total ESQ scores are also likely to have relatively higher scores for each individual domain, so this association may simply be another way of capturing the associations between error types and Sustained Attention and Planning scores. More clarification in this area is needed.

Finally, higher Planning scores were associated with both Referencing errors and total errors. Narratives, out of all types of discourse, place a particular burden on a speaker's mental planning skills. First of all, they rely heavily on temporal (or another logical) order to be coherent. Additionally, a storyteller is not supported by a conversation partner's utterances. During a narrative, one interlocutor is more of an audience for the narrator's monologue than an equal contributor. Because of these factors, narrators are required to "prepare" their story in advance - they do not have the downtime provided by a conversation partner's response. A typical narrator is equipped with the skills to organize their memories and language skills in order to produce a coherent narrative. However, a person with lower planning skills may struggle to plan both the content and the structure of their narrative at the same time, leading to errors in one of those areas. Referencing errors, in particular pronoun-without-antecedent errors, may be especially prone to this lapse in planning because by the time you get to a pronoun, you must have *already* said the antecedent.

Organization and Working Memory scores did not have any significant associations with the categories analyzed here. However, one participant with a high degree of narrative challenges self-reported a fairly low Organization score (indicating low impairment), while one participant

with low narrative challenges self-reported a very high Organization score. Due to the small sample size, it is possible these two participants had an outsized effect on the analysis. There were no such anomalies in the Working Memory scores, so it is unclear why no associations were revealed by the analysis.

#### 4.4 Other Findings

People with ADHD were more likely to have difficulty with the low-structure task. Although explicitly asked to make up their own story, 4 out of the 6 ADHD participants retold an existing story. One even said they simply could not complete the task, and only after thinking about it for a period of minutes, retold Andy Weir's *The Martian*. On the other hand, all 6 non-ADHD participants gave an original narrative. It should be noted that an adult is unlikely to naturally come across a situation where they would need to produce a narrative with as little structure as this task. Most social situations call for a narrative similar to that elicited in Condition 2, where they are relaying their own lived experience to another person. Most people do not tell stories in conversation because they want to *tell a story* as such, but because a *particular* story is a relevant addition to conversation. In other situations, such as a job interview, a person may be explicitly asked to give a narrative with only a topic for guidance (e.g. "Tell me about a time you overcame hardship."), but even that is more structured than both Condition 2 and Condition 3. Regardless, naturalistic opportunities for narratives are generally less structured than a story *re-telling* task, and often rely only on the speaker's memory as a guide. So, tasks that are too low-structured to be realistic may still give us information on where a person's limits lie with regard to skills such as on-line monitoring and global and local organization.

## 5. Conclusion

### 5.1 Limitations

The major limitation of this study is the sample size. The small sample size made most forms of statistical analysis impossible, and limited the power of those analyses that were able to be carried out (specifically with regards to the EF/errors analysis). The demographics covered in this study are also not representative of the population as a whole. Eleven out of 12 participants were white and eleven out of 12 were 22 years old or younger. Participants were necessarily all cisgender, as the study was not designed to distinguish between gender differences that occur due to gender socialization and differences that may come about due to biological sex. However, when exploring gender differences as a whole, it is important to include transgender and gender non-conforming individuals in academic research.

Some measures may have also been limited in their ability to detect incoherent narratives. Global coherence (adherence to the topic at-large) was not measured. Additionally, it is possible that people with ADHD *do* give an inappropriate amount of detail, but they underexplain some things and overexplain others, leading to an average of a “correct” amount of detail. However, details are inherently event- or topic-specific (rather than applicable to the whole narrative), so a measure like the total # of C-units of elaboration would not capture an error pattern like the one described above. In this case, measuring subjective perception of appropriate amounts of detail may be necessary. This study also did not measure whether people with ADHD can appropriately *use* narratives in a social context - for example, can they accurately gauge the interest of a listener and tailor their narrative based on that information? Other factors, like selecting an appropriate topic, or knowing when to use a narrative in response to a conversation partner may



impact a person's actual daily use of narrative in addition to the competency of the narrative itself.

## **5.2 Future Directions**

Future areas of interest include the perception of narrative and whether that is affected by gender. Although the present study found no relationship between gender and narrative competency, it is possible that similarly competent narratives are perceived differently due to societal gender bias or gender-related linguistic factors (such as rate of speech). Previous work has explored the idea of gender bias in language perception; For example, a 1990 study found that when presented with recorded mixed-sex dialogues, both male and female listeners estimated that the female speaker spoke more than the male speaker, despite their contributions being identical (Cutler & Scott, 1990). Perception is particularly relevant in the case of narratives because one of their primary purposes is social bonding. If one gender is perceived as having less fluent or cohesive narratives, the speaker may be less successful in creating and strengthening bonds as intended.

## **5.3 Conclusion**

The present study supports previous findings that ADHD impacts narrative competency, and it extends that finding into the young adult population. After examining gender and clinical status, it was determined that clinical status had a much larger impact on narrative competency than gender, but that there were some gender differences among individuals with ADHD. Lower executive function skills, in particular sustained attention and planning, were associated with higher incidences of production errors and lower topic maintenance.

Continued research on adult ADHD as well as gender differences in ADHD presentation is critical to supporting individuals with the disorder. Understanding how ADHD impacts pragmatic language use and general social functioning is vital to ensuring the success of ADHD individuals across the lifespan. Educating clinicians, families, and teachers about ADHD presentation in women and girls can aid proper identification of the disorder and reduce the negative self-image commonly associated with ADHD symptoms. The general public has begun to move away from stereotyping ADHD as a disorder only for young boys. We understand that ADHD does not disappear on one's 18th birthday; Neither, then, should academic interest or clinical support.

## APPENDIX

Full list of variables collected:

| <b>Variable</b>                      |   | <b>Score Range</b> |
|--------------------------------------|---|--------------------|
| <b><u>Story Length</u></b>           |   |                    |
| C-units                              | A C-unit is defined as an independent clause plus all of its associated dependent clauses.  | 21-119             |
| Words                                | All words included in C-units were counted. Filler words/phrases, fluency errors and non-C-unit utterances were not included in the word count.   | 234-1490           |
| MLU                                  | # words / number of C-units   | 8.81-12.52         |
| <b><u>Topic Maintenance</u></b>      |   |                    |
| Local Coherence                      | <p>Average Local Coherence per C-unit</p> <p>The relationship of the meaning or content of an utterance to that of the preceding utterance. The relationship may be achieved through continuation, elaboration, repetition, subordination or coordination of ideas from the preceding utterance</p> <p>A score of 3:<br/>The topic of the preceding utterance is continued by elaboration; temporal sequencing; enumeration of related examples; or maintaining the same actor, subject, action or argument as the focus<br/><i>"I was working on a project with my friend Griffin / but we couldn't do it."</i></p> <p>A score of 2:<br/>The utterance topic generally relates to that of the preceding utterance, but with a shift in focus from the subject or activity of the preceding utterance; or the utterance is referentially vague or ambiguous so that the relation to the preceding utterance must be inferred.<br/><i>"He ends up surviving/It's a bit gory."</i></p> <p>A score of 1: The utterance has no relationship to the content of the immediately preceding utterance. It may be a radical topic shift, a comment on the discourse, or an unintelligible utterance.<br/><i>"The scores were just really funny/We spent every day skiing."</i></p> | 2.33 - 2.77        |
| <b><u>Grammatical Complexity</u></b> |   |                    |
| # Simple main clauses                | A main clause (the independent clause of any given C-unit) with a   | 25.56-28.89        |

simple subject *and* simple predicate  
*"She ate ice cream"*

Example of a compound subject: *"Mom and I had fun last night"*  
 Compound predicate: *"You should go home and go to bed."*

|                                    |  |            |
|------------------------------------|--|------------|
| # Passives                         | Constructions where the subject of the sentence is not the agent of the verb.<br><i>"The picnic was ruined by the bears"</i> | 0-7.14     |
| # Subordinate clauses              | total # of subordinate clauses   | 6.67-19.91 |
| Ratio of simple to complex C-units | # C-units without a subordinate clause / # C-units with a subordinate clause   | 1-4.4      |
| # Indeterminate nouns              | A noun with possible reference so broad as to include all or nearly all nouns.<br><i>stuff, things</i>                       | 0-3.46     |
| Clausal density                    | total # clauses / # C-units  | 1.22-1.66  |

### **Event Sequencing**

|          |   |        |
|----------|---|--------|
| # Errors | Two error types were measured: I. explaining events out of temporal or logical order without indication that the speaker will be doing so and II. omission of critical events | 0-2.81 |
|----------|---|--------|

### **Explicitness**

|   |  |            |
|---|--|------------|
| # Critical information omissions                  | Failing to provide information critical to the understanding of the story. This most often came in the form of presenting specialized knowledge as something any general listener would be expected to know.<br><i>"My hand-jam didn't hold, so I took a whip on my last piece."</i> | 0-1.88     |
| # C-units including/serving as elaborative detail | Elaboration is considered optional detail that is not critical to understanding the general events of the story.<br><i>"Her wedding dress had ornate beading on the bodice."</i>   | 7.14-14.44 |

# C-units containing or serving as evaluation Evaluation is when the speaker explains the significance of an event to them, often in the form of an opinion. .76-5.71  
*"It was my first time, so I was terrified."*

### **Referencing**

0-7.5

Noun repetition where a pronoun would be expected *"James had pizza for dinner last night. James had two slices."*

Erroneous pronoun usage *"Levi and Chris went to bed early; he had school in the morning."*

Pronoun lacking antecedent *"Do you want to go get it from Norah?"*

### **Fluency**

1-12.35

# False starts An incomplete utterance that is abandoned in favor of another utterance.  
*"They had a - We went to the store yesterday."*

# Retracings An incomplete utterance that was then internally corrected  
*"Can you get me a - get him a pencil?"*

# Repetitions Repetition of words or phrases not used for emphasis. Single-word repetitions used as filler were not counted.  
*"Let's get started early tomorrow so that we can start early."*

Wordfinding difficulties Explicit difficulty retrieving a desired word  
*"She took a - oh, what's that called? - an exam earlier"*

### **Syntax**

1-8.89

Tense/aspect error An error in verb conjugation related to incorrect tense or incorrect aspect.  
*"There was a million stars last night."*

Agreement error An error in (typically adjectival or noun) agreement.  
*"My friends and I would be mermaids or fantastical creature[s]."*

Word-level omission A word or morpheme that has been inappropriately dropped  
*"We hung out and [I] played baritone with him."*

|                      |  |
|----------------------|--|
| Word-level addition  | A word or morpheme that has been inappropriately added<br><i>"She doesn't like to be with around other people."</i>                                      |
| Content word misuse  | A noun, adjective, verb, adverb, or other word with semantic meaning that was used incorrectly<br><i>"And that was relatively the night."</i>            |
| Function word misuse | A word such as a determiner or preposition used incorrectly, but in an appropriate place.<br><i>"I had to climb the highest mountain in this planet"</i> |

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