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Focus on Hyperfocus: How ADHD Symptoms Impact Difficulty with Disengagement and Inattention

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by

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Abstract

Attention Deficit Hyperactivity Disorder (ADHD) is a chronic neurodevelopmental disorder marked by patterns of inattention and hyperactivity. Hyperfocus (HF) is a concept that has heavily been associated with ADHD; however, it is not part of any diagnostic criteria and the literature pertaining to HF is rather underdeveloped. The present study adds to existing research by examining how HF differentially impacts ADHD populations compared to non-ADHD populations. The three main hypotheses explored in this paper are that ADHD positively predicts HF in the moment, HF in the moment negatively predicts inattention in the moment, and that the correlation between HF and inattention is made even more negative when ADHD moderates the relationship. The present study used baseline measures for ADHD and Ecological Momentary Assessment (EMA) surveys to gather in the moment data on HF and inattention. 101 undergraduates participated in the data collection last spring, giving information on overly positive automatic thoughts and other measures. Multilevel modeling for the hypotheses were conducted in R using the lmer and glmer packages. Results indicate that ADHD positively predicts HF in the moment, HF positively predicts inattention, and the relationship between HF and inattention is made even stronger with the introduction of ADHD. Results of this study can be used to support the claim that HF may impact those with ADHD differently than those without ADHD. Additionally, it calls for future research that can better explore the relationship between HF and inattention as there was a significant correlation in the direction opposite than predicted.

Keywords: Hyperfocus, Attention Deficit Hyperactivity Disorder, disengagement difficulties, inattention, ecological momentary assessment

Focus on Hyperfocus: How ADHD Symptoms Impact Difficulty with Disengagement and Inattention

Attention Deficit Hyperactivity Disorder (ADHD) is a common neurodevelopmental disorder characterized by clinically significant inattention, impulsivity, and hyperactivity. ADHD is estimated to affect between 3.4-4.4% of adults in the United States (Kessler et al., 2006). In the past, ADHD was believed to be a disorder exclusive to childhood and adolescence due to the prevalence of ADHD decreasing with age (Faraone et al., 2003). This decreased rate in the adult ADHD population historically led researchers to place their attention elsewhere, making this population important to study. Additionally, adult ADHD needs to be examined due to the outcomes those with the disorder experience. Some of these outcomes include lower employment rates, increased rates of substance abuse and mood disorders, poor academic performance, poor interpersonal skills, and more (Halmoy et al., 2009; Ingram et al., 1999).

The current study looks to expand the current knowledge on the under researched idea of Hyperfocus (HF). HF is not a part of the DSM-5 criteria for ADHD and does not have an agreed upon clinical definition; however, clinicians share that their patients often report HF-like experiences, giving credence to its existence and impact (Scheckleman et al., 2008; Carver, 2009). Further, this impact seems to extend outside of just the clinician as HF-like states are also commonly referred to with ADHD in popular science media, such as *Psychology Today* (Maucieri, 2014). Even though HF is not explicitly a part of the diagnostic criteria for ADHD, some symptoms of ADHD from the DSM-5 appear to capture similar psychological misalignments that HF refers to, such as, “often does not seem to listen when spoken to directly” (APA, 2013).

As aforementioned, there is no agreed upon definition for HF in the literature. This is due to many factors, including the little research that has been conducted on HF. Despite no formal definition, some commonalities do exist across various posited definitions. For the purposes of the present two studies, the working definition outlined by Hupfeld et al. (2019, p. 192) will be used:

> "A state of heightened, intense focus of any duration, which most likely occurs during activities related to one's school, hobbies, or "screen time" (i.e., television, computer use, etc.); this state may include the following qualities: timelessness, failure to attend to the world, ignoring personal needs, difficulty stopping and switching tasks, feelings of total engrossment in the task, and feeling "stuck" on small details."

This definition is heavily corroborated by the definition proposed in a recent literature review (Ashinoff & Abu-Akel, 2021). Ashinoff & Abu-Akel propose four pillars of HF within their operational definition of HF, being 1) HF is induced by task engagement; 2) HF is characterized by a state of sustained or selective attention; 3) During HF, there is a diminished perception of non-task relevant stimuli; and 4) During a HF state, task performance improves. There is direct crossover between the two on three of the four pillars that Ashinoff & Abu-Akel (2021) used to fuel their research.

Although prior scholarly research on HF is sparse due to the lack of a generally accepted definition, Ashinoff and Abu-Akel (2021) present additional reasons for the lack of HF literature. First, some studies refer to the concept of HF but do so by different terms and states, such as flow state literature. Flow literature is more developed and can provide insight into HF. Flow and HF are used interchangeably in some papers (Sklar, 2013) and follow a similar definition. A pioneer in flow state proposed a theory of flow, (Csikszentmihalyi & Csikszentmihalyi, 1992),

which cites seven attributes of flow that align with current understandings of HF. The three most relevant flow criteria for HF include full concentration on the task, a changed sense of time, and removal of awareness of other thoughts. HF and flow state appear to often be describing similar phenomena, just by different names. Secondly, Ashinoff and Abu-Akel (2021) suggest HF is under researched because it is difficult to manipulate and observe HF, resulting in experimental inconsistencies. Not surprisingly, this is an issue that also plagues flow research, further supporting the idea of a relationship between the two phenomena (Csikszentmihalyi, 1997).

A pioneering study in the field of HF attempted to induce the state through engagement with a video game (Sklar, 2013). The 2013 study collected data on brain activity to measure HF across their two groups (ADHD and Non-ADHD) via an EEG. This underpowered study of 10 total participants took baseline EEG scans and compared those to brain data while playing the video game. After the manipulation, post-surveys about HF and their experience were completed. Sklar was able to find that individuals with ADHD reported both more distorted time perceptions and inability to perceive outside stimuli (i.e. background noise) during the session. Furthermore, the ADHD population displayed lower cortical activation as well as significant differences in parietal lobe activation while playing the video game compared to the healthy participants. These findings would indicate that individuals with ADHD are experiencing HF differently than others. Presently, no other papers have attempted to induce HF in any manner.

Being that HF is hard to manipulate, many other studies in the field rely on correlational and observational data. Groen et al. (2020) created a 4-item questionnaire that examined HF along four dimensions: occurrence, duration, frequency, & situation. Using a matched comparison sample, Groen et al. compared HF across these dimensions in those with and without ADHD. Findings include that the occurrence of HF was 78% for the ADHD sample compared to

74% for the matched control sample. Groen and colleagues found slight positive correlations between self-reported ADHD scores and frequency of HF episodes. No significant difference was found on either duration or situation of HF between the matched pairs. There was little evidence to suggest that the ADHD population experienced HF significantly differently in any of the four areas outlined.

Similarly, a 2016 study (Ozel-Kizil et al.) examined if HF outcomes were different among healthy populations, ADHD non-stimulant use populations, and ADHD stimulant use populations. Using the team's developed 11-item questionnaire, the study revealed that both ADHD groups presented higher HF scores than the healthy group, but did not show any difference between the two ADHD groups. Ozel-Kizil et al. also found that adults with ADHD exhibited higher HF scores than children with ADHD. This finding has been used to argue that HF could be clinically significant as it can be used as an indicator of ADHD, potentially helping the under-recognized adult ADHD population more if they are experiencing HF even more than children with ADHD.

The final pillar study in the HF literature is the previously mentioned Hupfeld et al. (2019) study that the present paper borrows its HF definition from. Hupfeld et al. were able to characterize HF and the team created the Adult Hyperfocus Questionnaire (AHQ). The only other HF scale at the time was the one developed by Ozel-Kizil and colleagues (2016). Hupfeld et al. cited limitations with the items of the Ozel-Kizil and colleagues (2016) scale that could lead to the scale capturing executive functioning differences, not HF differences and thus the AHQ was created. The AHQ looks to quantify HF across five subscales consisting of three unique settings and six unique dimensions of HF. A modified version of this questionnaire will be used in the proposed second iteration of the present study to measure HF. Hupfeld et al.

(2019) used the AHQ to compare levels of HF between healthy populations (n = 221) and ADHD populations (n = 199). Those with higher ADHD symptomatology reported higher total levels of HF and more frequent HF experiences across all three settings. Hupfeld et al. provided evidence that HF is a feature of adult ADHD. These findings may have clinical implications for treatment of adults with ADHD as well as how we understand ADHD as a disorder.

As shown through the HF correlational studies (Sklar, 2013; Groen et al., 2020; Ozel-Kizil, 2016; Hupfeld et al., 2019), findings on the differential impacts of HF on those with ADHD and those without ADHD are mixed. There are potential explanations for this, such as lack of consistency in how HF was operationalized and measured; some measures may have better captured HF than others and these differences could have altered findings. Inconsistencies in HF findings is why more research such as the present study are necessary in advancing understanding of HF and for examining its relationship with ADHD.

The goal of the two studies in the current work, one completed and one proposed, is to expand on the current information on differences between the ADHD and neurotypical population on total levels of HF and frequency of HF across multiple settings. The first study investigates whether HF-like experiences are correlated with ADHD symptoms in adults and the second study (proposed) investigates whether they present differently or in different frequencies across the various types of ADHD (inattentive, hyperactive, combined).

The studies will measure participant experience via Ecological Momentary Assessment (EMA). EMA is a measurement method that involves repeated sampling of participants' current behaviors and experiences in real time (Shiffman et al., 2008). One of the most impactful limitations of questionnaires is that they are retrospective examinations of how an individual perceives the tested content. The time in between the occurrence of events and testing allows for

bias and other contaminants to result in invalid datasets. Often researchers have to settle for estimates; however, EMA can address this problem. EMA has been shown to provide more accurate representations of participants' experiences than other retrospective methods, including daily end of day reflections (Stone & Shiffman, 1994). Experience sampling methods have also been used in flow literature to get better data on how flow state appears in everyday life (Csikszentmihalyi, 1988). Study 1 and Study 2 both will use data from an EMA survey that collects data on a myriad of different topics; however, this paper focuses on the data and patterns pertaining to HF.

Study 1 is a secondary analysis based on a dataset collected by the Knouse Lab (KNAB) in the spring of 2021 for a study titled, “Ecological Momentary Assessment of Positive Automatic Thoughts”. This study used EMA to measure the frequency of overly positive automatic thoughts, their association with other behaviors, thoughts, and feelings, and their association with variables related to psychological well-being across one week. It also collected a baseline dataset with a battery of questionnaires.

The data gathered in the exploratory KNAB dataset was not collected with my study in mind; thus, Study 1 will use measures for HF that are indirect. An informed decision was made to use disengagement difficulties as a proxy for HF. Disengagement difficulty items on the EMA include, “I can’t stop right now”, “I have time to do that later”, and “I do better waiting until the last minute”. Although these items were originally meant to measure overly positive automatic thoughts, they also display the intense focus and dismissal of the outside world, which is why it is being used to hopefully capture HF-like experiences.

Study 1 will test three main hypotheses:

1. ADHD symptom severity (according to the baseline Barkley Adult ADHD Rating Scale) during the pretest will positively predict momentary disengagement struggles (according to the EMA measurement of the ADHD Cognitions Scale).
2. Disengagement difficulties in the moment will negatively predict inattention in the moment (measured by the EMA Inattention questionnaire)
3. The negative relationship between momentary disengagement difficulty and inattention will be moderated by ADHD symptom severity, causing inattention to further weaken.

Hypothesis 1 is rooted in previous research that has connected ADHD and HF in a manner that it is more impactful in that population than non-ADHD populations (Hupfeld et al., 2019; Ozel-Kizil, 2016; Sklar, 2013). Hypothesis 2 operates under the assumption that if at a particular moment, an individual is experiencing the intense focus of HF they should not in that same moment be experiencing inattention. Hypothesis 3 similarly follows the literature's findings that HF differentially impacts those with ADHD, such that it is hypothesized that the relationship between momentary HF and inattention will further weaken as the intense attention necessary during a HF-state of someone with ADHD will further pull from a state of inattention.

An exploratory hypothesis for Study 1 is as follows: Difficulty with disengagement in the moment will negatively predict the awareness of avoidance in the moment; however, this relationship will be moderated by ADHD symptom severity, causing awareness to weaken.

This hypothesis is based on one of the defining characteristics of HF is the absorption in the task and dismissal of off-task stimuli. Thus, if someone is experiencing HF in the moment, they should be unaware of their avoidance in that same moment. Similarly to hypothesis 3, due

to ADHD's impact on HF, the outcome of the negative relationship becoming further negative when ADHD is introduced is predicted.

Data for Study 2 is currently being collected and has particular measures of HF. Specifically, Study 2 will implement a modified version of the AHQ to the baseline survey. This scale will allow researchers to measure HF in addition to other phenomena of interest. Study 2 will also screen participants for ADHD such that explored relationships will be based on a more representative sample of symptom severity and allow for testing of between group differences. Study 2 will also contain additional methods such as smartphone tracking to provide additional context into human behavior as they are experiencing overly positive automatic thoughts, inattention, and more. Due to Study 2's measurement improvements, it will also iterate on the hypotheses of Study 1 in a more refined manner. Study 2 is in the process of data collection; thus, this paper will only propose expected results

Hypothesis 1 for Study 2 is similar to Study 1's as it will examine how the severity of ADHD symptoms impacts both the frequency and duration of HF. It is predicted that those with heightened ADHD symptom severity will experience both greater frequency and duration of HF. Hypothesis 2 will look at if HF predicts inattention in the moment, similar to Study 1. During these analyses, other patterns such as if HF is more correlated with a specific subtype of ADHD (inattentive, hyperactive, combined) will be examined. It is hypothesized that HF will be more closely related to the inattentive type of ADHD on the basis of the theory that ADHD is better represented as a disorder of attention maldistribution (Kaufmann et al., 2000).

Method

Participants

Data for this study was collected from 102 undergraduates attending the University of Richmond. Of this sample, the mean age was just over 19 years old (M = 19.70; SD = 1.15) and the ages ranged 18-22. The final analysis was only conducted on 101 participants as one participant did not complete enough EMA surveys (N = 101). The sample gender breakdown is as follows: 74 identify their gender as “Cis-Female”, “Female” and “She/Her/Hers”, 23 as “Cis-Male”, “Male”, and “He/Him/His”, 1 as non-binary, and 3 participants had missing data for this portion. The reported race also skewed towards the White/Caucasian category (62), followed by Asian (22), Black/African American (12), Pacific Islander (1), and Other (10). While future iterations of Study 1 will select for ADHD this study did not. However, 7 of the 101 participants self-identified as having previously been diagnosed with either ADHD or ADD. Other Demographic information can be seen below in Table 1. Because this was an observational study, no manipulations or experimental groups were introduced.

Table 1. Sample Demographics.

N	101
Age (SD)	19.70 (1.15)
Gender (%)	
Male	23 (22.8)
Female	74 (73.3)
Non-Binary	1 (1.0)
Missing	3 (3.0)

Race (%)	
White/Caucasian	62 (61.4)
Black/African	12 (11.9)
American	22 (21.8)
Asian	1 (1.0)
Pacific Islander	0 (0)
Native American	10 (9.9)
Other	
Ethnicity (%)	
Hispanic	14 (13.9)
Non-Hispanic	87 (86.1)
Sexual Orientation (%)	
Asexual	6 (5.9)
Bisexual	10 (9.9)
Gay/Lesbian	3 (3.0)
Heterosexual/Straight	78 (77.2)
Pansexual	3 (3.0)
Queer	2 (2.0)
Prefer Not to Answer	2 (2.0)
First-Gen College Student (%)	
Yes	18 (17.8)
No	71 (70.3)
Missing*	12 (11.9)
Work for Pay (%)	
Yes	62 (61.4)
No	27 (26.7)
Missing*	12 (11.9)

Note. Participants were able to check more than one race and sexual orientation category. *Some entries for these variables were missing because they were added shortly after data collection began.

Study 1 was advertised through personal social media outlets of researchers, word of mouth, and the university wide emailing program, called “SpiderBytes”. This study was an open study with the only inclusion/exclusion criteria being that the students had to be students at the

University of Richmond, own a smartphone and a laptop, be willing to participate in the study, and had to be over 18 years of age. Because this was not an experimental study, there was no assignment of conditions to the participants, but rather results and data was observed based on the multiple scales given throughout the day by the EMA method.

Measures

Note: All measures described below were only a portion of the complete set of measures used in the data set. The measures described here are limited to those relevant to Study 1.

Baseline Measures

The Barkley Adult ADHD Rating Scale (BAARS-IV; Barkley, 2011a). The BAARS-IV has participants self-report various ADHD symptoms they may have experienced during the past six months. The items on the scale are on a four-point Likert scale with 1 = never or rarely and 4 = very often. Additionally, the scale includes *DSM-IV* ADHD items (18 total) and asks participants to report the age during which they started to exhibit these symptoms. Evidence of reliability and validity comes from a normative sample of 1,249 adults (test-retest reliability = .75 at 2-3 weeks; internal consistency = .91).

EMA Measures

ACS-10. The ACS-10 is an expansion of the ACS-7, developed for the purpose of this study. The ACS-7 allows researchers to measure overly positive thoughts through a Likert scale ranging 1 to 5, with 1 = *not at all* and 5 = *all the time* (Knouse et al., 2019). The purpose of this modification was to add an additional 3 items in to create a better balance of item distribution. The ACS-7 included more thoughts about difficulty disengaging from a current activity (e.g., “I have plenty of time; I’ll just do one more thing before I go.”) but did not have ample representation of

thoughts about not engaging in a potential behavior. While the ACS-10 was developed for the EMA measure, Study 1 analyzed the difficulty disengaging items.

Inattention. Three items were drawn from the baseline BAARS measure to assess momentary inattention. These items included, "how much were you having difficulty sustaining your attention in tasks?" "How much were you having difficulty organizing tasks and activities?" and "how much were you easily distracted by extraneous stimuli or irrelevant thoughts?" Participants answered each question using a 5-point scale ranging from 1 = not at all to 5 = a great deal.

Avoidance. Participants responded on a 5-point Likert scale, specifying the extent (1 = not at all, 5 = a great deal) to which they were currently putting off doing something they needed to accomplish. If participants gave a response other than "not at all," they were also asked to choose the best answer for what it was they were putting off. Participants were then asked to specify the urgency of the avoided task and its importance, both on 5-point Likert scales. Lastly, participants were also asked to specify the extent to which they were aware of their own avoidance prior to being asked about it in the survey (1 = not at all aware, 3 = very aware). This final item about awareness was used for the avoidance awareness measure.

Recruitment & Screening

Participants of Study 1 came from the student body of the University of Richmond during the 2021 Spring academic term. Recruitment efforts continued until 100 participants with both baseline and follow up visit data were obtained. Some slight over recruitment occurred (N = 102) to account for who screened but did not complete baseline visits. Eligible students had to live on campus, own both a smartphone and a laptop, be 18 years of age and older, and be willing to

participate. Recruitment was accomplished through personal social media outlets of researchers, word of mouth, paper and electronic flier postings, and the university wide emailing program, called “SpiderBytes". All recruitment methods brought potential participants to a Qualtrics survey that would ensure users met all the inclusion criteria. If the criteria was met, students were directed to a YouCanBookMe age that allowed them to schedule their baseline and, for early participants, post sessions.

Procedure

Study procedures were approved by the Institutional Review Board at the University of Richmond. Study procedures, measures, and analyses were also pre-registered on Open Science Framework: https://osf.io/2bmvc/?view_only=c49fd12fadfe4a0abac4fc244f967600

The basic framework is that participants attended baseline meetings and then completed EMA assessments (short questionnaires on their smartphones) daily during the following six days.

Individuals interested in the study completed a short online screening to determine eligibility. Cleared participants completed hour-long baseline sessions with research assistants via Zoom. During baseline sessions, participants were asked to read and indicate consent through an online consent form. Following, willing participants completed online baseline questionnaires to assess a variety of psychological variables relevant to overly positive automatic thoughts. Afterwards, research assistants explained what to expect and how to operate the EMA collection via SurveySignal. Research assistants helped participants set up a SurveySignal account and assigned a Study ID tied to a participant to use in place of identification information.

For the six days following baseline meetings, participants received three text messages per day with a link to the Qualtrics survey. Each one of these three texts were sent between

10AM-2PM, 2PM-6PM, and 6PM-10PM. Surveys were sent at least two hours apart and participants had two hours to respond before each survey link became inactive. If the survey was not completed within 30 minutes, reminder texts were sent to participants. EMA questions include subsets, modified, and additional scales to measure psychological variables in the moment. After the 6 days of EMA concluded, post visits were conducted and participants were debriefed.

Participation in the study was rewarded with a $20 Amazon Gift Code for completing the baseline and post visits. Additional compensation was rewarded for EMA responses. For each daily survey completed, $0.50 was added to this $20 Gift Code. Across the six days, participants could accumulate an additional $9.00 dollars (6 days * 3 EMA surveys per day = 18 possible surveys). On top of this, any participant who completed at least 75% of the EMA surveys (14 out of 18 surveys) was also entered into a raffle to win one of two $100 gift cards to Amazon. Participants received their compensation the next Wednesday following their completion of the post study visit.

Plan of Analysis

Due to the nature of this study including hierarchical data across three levels (Level 1 = in the moment, Level 2 = Day, Level 3 = Participant), multilevel modeling was used to properly capture how our data differed across various levels of our variables. Difficulty disengaging was included as a predictor variable at Level 1 and Level 3, reflected by HF, centered within-person and with each participant's mean included in the models. Additionally, average ADHD symptom severity was a predictor variable at level 3 centered at the grand mean. When testing the effects of person-centered difficulty disengaging, both within-person centered variable and each

participant's mean were included in order to parse the within vs. between person variance associated with each Level 1 variable (Enders & Tofighi, 2007).

Multilevel modeling analyses were conducted within R, using the lmer package for continuous outcomes (such as inattention) and the glmer package with a binomial link function for dichotomous outcomes (such as difficulty disengaging). For each dependent variable (pre-registered: Inattention & difficulty disengaging; exploratory: Avoidance awareness), a null model was calculated to estimate the proportion of variance at each level and confirm that multilevel modeling was the appropriate analytic approach for the data (i.e., that there was substantial variance present at each level). Even though the main multilevel models explored in this paper operate with the Level 1 and Level 3 variables, excluding Level 2 from nesting in these models will redistribute the variance to both Level 1 and 3, potentially interfering with power and standard error measures (Moerbeek, 2004). Clearly, Level 2 models displayed considerable variance as shown below in Table 2. Level 2 models were also considered as the day of response could impact variance in our outcome variables, especially when we compare a weekend to a week day. Three level models (Moment, Day, Person) were calculated and a variable for weekend (1 - Friday and Saturday) vs. weekday (0 - Sunday through Thursday) was included.

In accordance with the pre-registered analysis (https://osf.io/uwk8m), I first tested whether ADHD symptom severity (Level 3) predicted difficulty disengaging in the moment (Level 1). Next, I investigated whether difficulty disengaging in the moment (Level 1) negatively predicted inattention in the moment (Level 1). Building off of this analysis, I tested to see if ADHD symptom severity (Level 3) would further weaken this relationship. In a similar manner, I investigated my exploratory analyses using similar methods, to see whether difficulty

disengaging in the moment (Level 1) negatively predicted avoidance awareness in the moment (Level 1) and if this relationship was further weakened by ADHD symptom severity.

Table 2. Intraclass correlation coefficients from null models for outcome variables (Inattention, Difficulty Disengaging, Avoidance Awareness)

Outcome Variable	**Variance at Level 2 (Day)**	**Variance at Level 3 (Person)**
Inattention	0.14	0.49
Difficulty Disengaging	0.06	0.60
Avoidance Awareness	0.16	0.31

Results

Relationship Between Baseline ADHD Symptom Severity & Momentary Difficulty Disengaging

As predicted, the self-reported ADHD symptoms at baseline were associated with greater likelihood of momentary difficulty disengaging (*CE* = 1.34, *SE* = 0.29, *p* = <.001). We tried to better quantify the relationship between the two by calculating the odds ratio (*OR* = 3.83). The odds ratio provided better insight on association because of the dichotomous nature of the difficulty disengaging variable that was unable to be fully captured by the coefficient estimate.

ADHD Symptom Severity Impact on Momentary Relationships Between Difficulty Disengaging and Inattention

Main Effect. As shown in Table 3, against my prediction, the relationship between momentary difficulty disengaging and momentary inattention was positive. This positive relationship was significant across all variables, including at the within-person mean centered variable for difficulty disengaging (individual experiencing difficulty disengaging in the moment compared to normal individual difficulty disengaging) (*CE* = 0.28, *SE* = 0.05, *p* = <0.001), the

grand mean for difficulty disengaging (general difficulty disengaging) (*CE* = 0.74, *SE* = 0.22, *p* = <0.001), and the Average ADHD symptom severity grand mean (self-reported ADHD symptom severity compared to the other participants) (*CE* = 0.90, *SE* = 0.12, *p* = <0.001). When participants were experiencing heightened disengagement difficulties (compared to either themselves or others in the sample), they were more likely to also be experiencing heightened inattention at the same time point. Additionally, those who self-reported more severe ADHD symptoms at baseline are more likely to experience greater inattention at any given moment.

Interaction. Similarly against my prediction, the relationship between difficulty disengaging and inattention was strengthened and became more positive when considering ADHD symptom severity. In other words, those with more difficulty disengaging in the moment experienced more inattention in the moment and those with higher self-reported ADHD symptoms who experienced difficulty disengaging in the moment experienced even greater inattention in the moment compared to those with less self-reported ADHD symptoms (*CE* = 0.24, *SE* = 0.11, *p* = 0.03). This relationship can be seen below in Figure 1.

Exploratory Relationships

Similar analyses were run on my exploratory variables to look at the impact of ADHD symptom severity on momentary relationships between avoidance awareness and difficulty disengaging. Difficulty disengaging did not predict avoidance awareness at any point other than when the mean difficulty disengaging was centered within-person (*CE* = 0.18, *SE* = 0.04, *p* = <0.001). In other words, when participants were experiencing disengagement difficulties more than normal, they were more aware of their avoidance–this was contrary to the predicted relationship. No significance was found at the relationship between momentary avoidance and momentary difficulty disengaging grand mean (*CE* = -0.08, *SE* = 0.17, *p* = 0.65) and

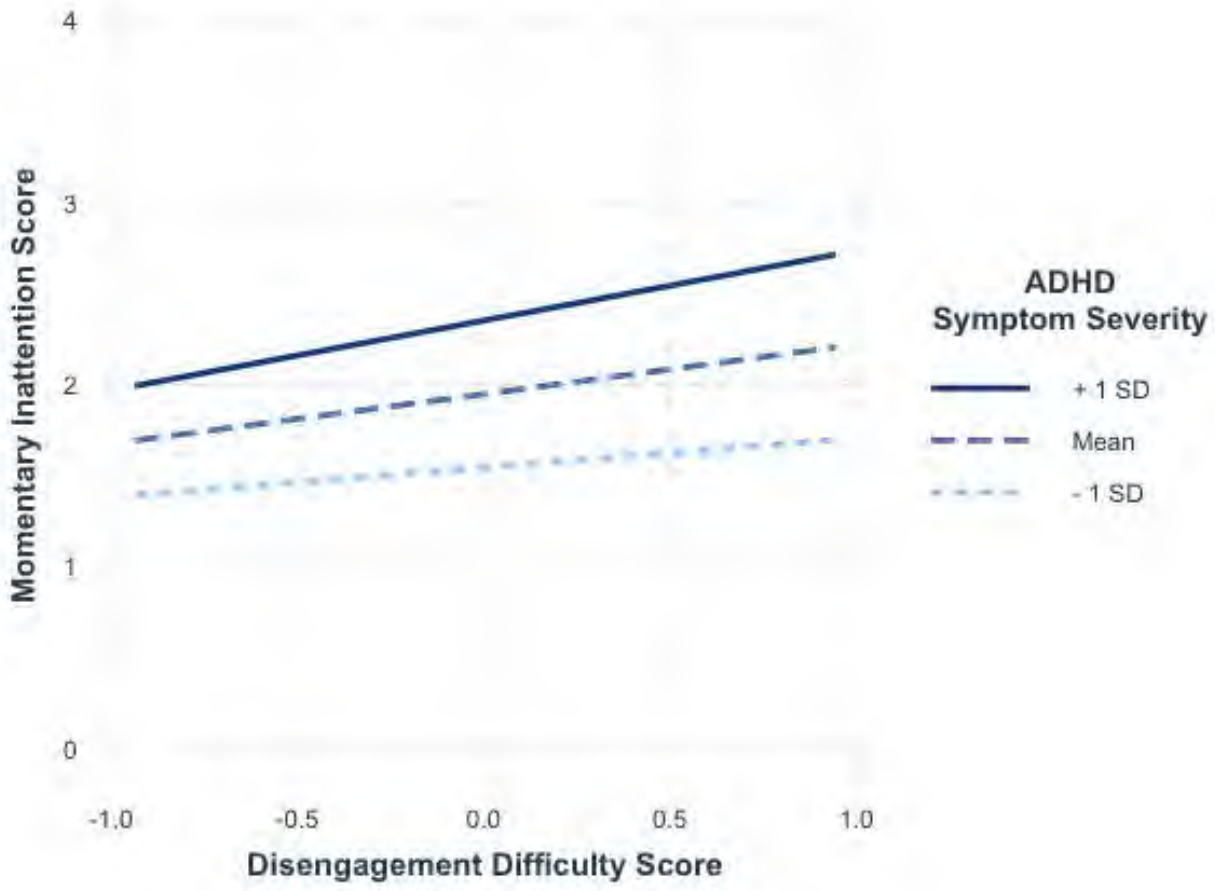
self-reported ADHD symptom severity at baseline (*CE* = 0.02, *SE* = 0.09, *p* = 0.87). The interaction effect that ADHD had on this relationship was also non-significant (*CE* = 0.03, *SE* = 0.09, *p* = 0.76).

Table 3. Fixed Effects of Difficulty Disengaging, ADHD Symptom Severity, and the Interaction between the two on the Dependent Variable Momentary Inattention

	Coefficient Estimate	**Standard Error**
OPAT CWC	0.28***	0.05
OPAT GM	0.74***	0.22
Average ADHD CGM	0.90***	0.12
OPAT CWC : Average ADHD CGM	0.24*	0.11

Note. Fixed effects for weekend (Level 2) was included in these models
***p < 0.001, **p < 0.01, *p < 0.05

Figure 1. ADHD Symptom Severity Impact on the Relationship between Momentary Disengagement Difficulties and Momentary Inattention



Discussion

As reported in the results section above, ADHD symptom severity significantly predicted difficulty disengaging in the moment – an experience that may be related to HF. Additionally, difficulty disengaging in the moment can predict greater inattention in the moment, which is not in line with HF's proposed relationships to more focused attention in the moment. The modeled relationship is further strengthened when ADHD is introduced, as those with more severe ADHD symptoms experiencing difficulty disengaging have even higher inattention in the moment. Exploratory analyses examining momentary avoidance awareness and difficulty disengaging

indicate no significant relationship between the two other than within-person disengagement difficulty and greater avoidance awareness. Nothing within any relationship is altered when ADHD symptom severity is introduced to these two variables. With these findings, the first hypothesis that ADHD symptom severity can be used to predict disengagement struggles in the moment can be accepted. However, the second hypothesis that disengagement difficulties will positively predict inattention in the moment must be rejected. Similarly, the third hypothesis which stated that the relationship between inattention and HF would be moderated by ADHD symptom severity, causing inattention to weaken must also be rejected. Furthermore, my exploratory hypothesis that there would be a similar negative relationship between HF and avoidance awareness that would also be weakened with the presence of ADHD symptoms must also be rejected.

Even though most of this paper's hypotheses were rejected, there are strong explanations that support some outcomes found from this research. ADHD may predict heightened disengagement difficulties (HF) in the moment as HF may be a fundamental symptom of ADHD. This idea is not a new one, as Doyle (2006) has suggested shifting ADHD the idea of changing ADHD from an "attention deficit" to an "attention disorder" on the basis that those with ADHD experience attention more extremely, hyperfocused and inattentive. HF predicting inattention was an unanticipated finding and further research must be conducted to potentially explain this relationship. However, the relationship might be strengthened by ADHD if HF is an outcome of ADHD as inattention is already a pillar of the disorder.

The findings of this study supports those of both Ozel-Kizil et al., (2016) and Hupfeld et al. (2019) as they reported that HF was more common within the ADHD population as compared to the standard population; however, this study contradicts Groen et al. (2020) as they found no

difference between these two groups. As this field is under researched, more studies should be conducted to ensure replication of findings. No research has been conducted examining the relationship between HF and inattention specifically. Given the findings presented above, I recommend that further research test the relationship between HF and inattention, with a more accurate HF measure. This will be done in the proposed Study 2, but additional research will help validate findings.

One of the clinical implications that comes from this study is that the field of psychology and psychiatry may need to rework its perspective on ADHD. The shift would be moving from the idea that it is a disorder of inattention towards the idea that ADHD is a disorder of attention maldistribution. This idea is more inclusive of HF and is supported by this paper among others, such as Doyle (2006). Another application is that better understanding of HF and its relationship to ADHD helps clinicians recognize and support those who struggle with both HF and ADHD. If HF truly is a characteristic of ADHD such as it appears from findings presented here and in papers such as Hupfeld et al. (2019), understanding HF can help clinician sensitivity to diagnosing ADHD, potentially in the under-supported population of adults with ADHD.

This paper, although informative, is not without flaws. The biggest limitation on this paper's findings is that there was no specific HF measure. For all statistical models, difficulty disengaging was used as a proxy for HF, thus all findings were based off of the responses to disengagement difficulties on the EMA. Although an informed decision was made when selecting this variable, results for hypothesis 2 and 3 may have been impacted by the choice of measure. A more valid measure of HF will provide a better understanding of the underlying mechanisms fueling HF. Another major limitation which could have impacted results and why the second hypothesis had to be rejected is participant confusion on responses to inattention

items. The inattention questions asks about how much trouble participants had sustaining attention in tasks right before responding to the survey. If a participant sat down to do work then hyperfocused on a hobby, their response might be that they are having trouble sustaining attention on tasks because they were not doing their work, when in reality they were sustaining their attention very well, just on another task. This confusion on responses for off task attention items may have been why models displayed that when participants were experiencing difficulty disengaging in the moment they were also experiencing inattention in the moment. Clarity on this item about sustaining attention may impact the relationship between disengagement difficulties and inattention.

Altogether, the findings from this study add to the existing and growing literature of hyperfocus by measuring how HF presents in the moment through EMA items on disengagement struggles. HF appears to be a phenomena that impacts everyone; however, episodes of HF may be more frequent in those with ADHD. As HF is further researched, understanding how and why HF presents itself will help those who struggle to receive more specialized care.

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