Psychology of Consciousness: Theory, Research, and Practice

Investigating Emotion Dysregulation and the Perseveration- and Flow-Like Characteristics of ADHD Hyperfocus in Canadian Undergraduate Students

Samantha Ayers-Glassey and Peter D. MacIntyre

Online First Publication, September 9, 2021. http://dx.doi.org/10.1037/cns0000299

American Psychological Association
SOCIETY OF PSYCHOLOGICAL HYPNOSIS
Psychology of Consciousness: Theory, Research, and Practice

ISSN: 2326-5523
https://doi.org/10.1037/cns0000299

Investigating Emotion Dysregulation and the Perseveration- and Flow-Like Characteristics of ADHD Hyperfocus in Canadian Undergraduate Students

Samantha Ayers-Glassey and Peter D. MacIntyre
Department of Psychology, Cape Breton University

Attention-deficit hyperactivity disorder (ADHD) has been referred to as a disorder of dysregulation due to its paradoxical association with *hyperfocus*: periods of intense concentration, often during interesting tasks. However, existing descriptions and measures of hyperfocus might tap into related constructs like *perseveration* and/or *flow*. Furthermore, previous studies have not sufficiently accounted for comorbidities like depression when examining the specificity of hyperfocus to ADHD. Therefore, the present study investigated the relations between hyperfocus, perseveration, and flow from a transdiagnostic *emotion dysregulation* perspective to facilitate insights into the separate associations between the attentional and emotional components of ADHD and hyperfocus-like experiences. In a nonclinical sample (neither ADHD nor another mental health diagnosis reported, $n = 186$), the following were examined: (a) the correlation between ADHD symptomatology and emotion dysregulation tendencies, (b) the similarities between hyperfocus, perseveration, and flow measures, and (c) the predictability of phenomena scores by ADHD symptomatology over and above emotion dysregulation tendencies. Then, the scores of 26 clinical participants (i.e., self-reported ADHD with or without comorbidities) and a matched sample of 26 nonclinical participants were compared to examine the clinical specificity of hyperfocus, perseveration, and flow. The results replicated existing findings regarding the clinical specificity of hyperfocus and its relation to ADHD symptomatology. The results also extended the literature by confirming a more perseveration-like approach to the conceptualization and measurement of hyperfocus in the existing literature, although ADHD symptomatology accounted for more unique variance in hyperfocus scores than in perseveration scores. Finally, future avenues for research on these topics are discussed.

Keywords: adult ADHD, hyperfocus, flow, perseveration, emotion dysregulation

Supplemental materials: https://doi.org/10.1037/cns0000299.supp

Attention-deficit hyperactivity disorder (ADHD) is one of the most researched childhood mental health disorders known to persist into adulthood (Kooij et al., 2019). Yet, much remains unknown regarding its characteristics and presentations, especially in adult populations. Typically, ADHD is characterized by inattention and hyperactivity/impulsivity (American Psychiatric Association, 2013). However, paradoxical subjective reports by individuals with

Samantha Ayers-Glassey https://orcid.org/0000-0001-7159-6217
Peter D. MacIntyre https://orcid.org/0000-0002-1085-6692

The datasets generated and/or analyzed during the present study are not publicly available as specified consent was sought from participants.

We would like to thank Dr. Daniel Smilek of the University of Waterloo and Dr. Paul Seli of Duke University for their input. We also thank Keith Gelhorn and Alana Tattrie for their help and support with this project. Finally, we thank all the participants for their contributions.

Correspondence concerning this article should be addressed to Samantha Ayers-Glassey, Department of Psychology, Cape Breton University, 1250 Grand Lake Road, Sydney, NS B1P 6L2, Canada. Email: s.ayersglassey@outlook.com

ADHD have described a phenomenon called *hyperfocus*: prolonged periods of intense concentration, often during tasks that are of interest to the individual. Therefore, it has been suggested that ADHD might better be described as a disorder of attention regulation than of deficit attention (Hupfeld et al., 2019; Kooij et al., 2019; Ozel-Kizil et al., 2016). Further support for a focus on dysregulation (rather than deficit) rests with the strong association between ADHD and difficulties with regulating emotions, as well as the common comorbidity of ADHD with emotion-based mental health disorders such as anxiety and depression (Adler et al., 2018; Brown, 2017; Kooij et al., 2019).

To date, there has been only preliminary investigation into the reported experience of hyperfocus with varying conceptualizations (see Ashinoff & Abu-Akel, 2019, for summary) and mixed results regarding the specificity of hyperfocus to ADHD. This could be due to the novelty of the self-report measures being used (i.e., Hupfeld et al., 2019; Ozel-Kizil et al., 2013, 2016) and their development being based largely on anecdotal reports by participants with ADHD in clinical and nonclinical settings, sometimes without controlling for comorbid diagnoses.[1] Thus, existing descriptions and measures of hyperfocus might be tapping into related constructs and/or other ADHD- or psychopathology-specific characteristics.

The Conceptualization of Hyperfocus in ADHD

Hyperfocus and Perseveration

Hyperfocus in the ADHD literature is often described as a difficulty in task-shifting or feeling stuck on a task, particularly when the task is of particular interest to the individual (Ashinoff & Abu-Akel, 2019; Hupfeld et al., 2019; Kooij et al., 2019; Ozel-Kizil et al., 2016). These descriptions are reminiscent of a phenomenon called *perseveration*: rigid thinking or behavior (such as staying focused on one task or thought pattern with difficulty switching to another) that seems out of the individual's attentional control (APA, 2013; Barkley, 1999; Greenberg et al., 2012; Ruscio et al., 2011). While the term "hyperfocus" is typically used to describe this type of behavior or thought pattern in the ADHD literature, "perseveration" is a term that has been more broadly used in the literature on autism spectrum disorder in reference to ritualized behaviors and thinking patterns as well as excessive focus on interests (e.g., APA, 2013; Ashinoff & Abu-Akel, 2019), on depression in reference to rumination (i.e., perseveration on past events and negative self-directed thoughts; e.g., Boyes et al., 2017; Ripper et al., 2018; Ruscio et al., 2011), and on anxiety in reference to worry (i.e., perseveration on potential future negative events or outcomes; e.g., Boyes et al., 2017; Ripper et al., 2018; Rudaizky et al., 2012; Ruscio et al., 2011), as well as for ADHD in reference to poor response inhibition (i.e., perseverative errors on attention tasks; e.g., Barkley, 1999; Boucugnani & Jones, 1989).

To date, the characteristics of hyperfocus and perseveration have not been empirically investigated alongside each other (see Table 1 for summary of the characteristics). However, Hupfeld et al. (2019) suggested that future research examine perseveration as a possible mechanism of hyperfocus, and Ashinoff and Abu-Akel (2019) noted in their recent review of the literature that descriptions of these two phenomena in ADHD and autism spectrum disorder are alike and may reflect a similar etiology between the disorders.

Hyperfocus and Flow

Hyperfocus has been preliminarily investigated in relation to the experience of *flow*—a positive,

[1] It is unclear whether the "ADHD patients" interviewed during the development of the Hyperfocusing Scale (Ozel-Kizil et al., 2013) had any comorbid diagnoses, because the authors did not specifically report the presence or absence of any comorbidities. However, in their 2016 study using the measure, Ozel-Kizil et al. controlled for "psychiatric/neurological comorbidities like mental retardation, bipolar disorder, schizophrenia, alcohol-substance abuse disorder, pervasive developmental disorders and epilepsy" (p. 353) but did not control for major depressive disorder due to its high comorbidity rate. Additionally, the Adult Hyperfocus Questionnaire (Hupfeld et al., 2019) was developed based on previous research (including the Ozel-Kizil et al., 2016 study) and interviews conducted with five ADHD participants, two of whom reported comorbidities (one reported comorbid anxiety and depression and another reported comorbid bipolar disorder; see Supplemental Materials of Hupfeld et al., 2019). Therefore, whether the anecdotes regarding hyperfocus used to develop these two measures can be interpreted as reflecting only ADHD-specific experiences—and not those of other commonly comorbid disorders or possible underlying transdiagnostic processes—is unclear.

Table 1
Comparing Characteristics of Hyperfocus, Perseveration, and Flow

Hyperfocus	Perseveration	Flow
Heightened, intense focus on current task[a,b,c,d]	Rigid thinking or behavior; remaining focused on one task rather than switching to another[d,e,f,g]	Intense concentration on current task[g,h,i,j]
Feelings of total engrossment in task[a,b]	Responses based on past conditioning; automatic[e,f]	Complete absorption in task; seems automatic[h,i,j]
Failure to attend to the world[a,b,d]	Difficulty interrupting tasks when asked to do so[e]	Loss of self-consciousness[h]
Instant gratification; immediate feedback[b,c]	Active response and feedback; immediate gratification[e,f]	Clear goals and immediate feedback[d,h,i]
Positive and negative connotations[a]	Negative connotations[e,f,g]	Positive connotations[h,i,j,k]
Sense of timelessness[a]		Transformation of time[h]
Usually related to hobbies/ interests; highly motivating[a,b,c,d]		Autotelic experience; intrinsic reward for task[d,h,i]
Difficulty stopping and switching tasks[a,b]	Difficulty switching response patterns even when given negative feedback[e,f]	
Feeling "stuck" on small details[a,b]	Getting "stuck" on thoughts or ideas[f,g]	
Ignoring personal needs[a]		
Lack of control[c]		Sense of control[h,i]

[a] Hupfeld et al. (2019). [b] Ozel-Kizil et al. (2016). [c] Kooij et al. (2019). [d] Ashinoff and Abu-Akel (2019). [e] Barkley (1999). [f] Greenberg et al. (2012). [g] Ruscio et al. (2011). [h] Jackson and Marsh (1996). [i] Šimleša et al. (2018). [j] Marty-Dugas and Smilek (2019). [k] Csikszentmihalyi (2004).

optimal experience of feeling completely concentrated on a task (Csikszentmihalyi, 1991)—due to several similarities between the two phenomena (e.g., task absorption and sense of timelessness during an intrinsically motivating task; see Table 1 for summary of characteristics). Sedgwick et al. (2019) published a qualitative interview-based study involving six adult males who had been diagnosed with ADHD[2] and who the authors described as being "high-functioning and successful" (i.e., they held gainful and/or professional employment and were said to be "flourishing" in their daily lives). The authors asked open-ended questions about the participants' perceptions of positive/advantageous aspects of their ADHD, responses to which involved descriptions of intense hyperfocus-like concentration. Because of the positive and productive outcomes of this hyperfocus described by the participants, the authors noted that this type of hyperfocus was more similar to flow than to the perseveration-like task-switching difficulties more often associated with ADHD. The authors concluded that the hyperfocus reported by their participants was a positive ADHD-specific attribute, although they acknowledged the lack of generalizability of their findings due to the small sample size, lack of female participant perspectives, and the overall exploratory/qualitative nature of their study's approach.

Similarly, Ashinoff and Abu-Akel (2019) concluded in their review of the literature that hyperfocus and flow seemed conceptually to be the same phenomenon, reporting no existing evidence to suggest otherwise. Yet, their conclusion did not take into account the results of the Hupfeld et al., 2019 study involving ADHD and non-ADHD adults, in which participants' general tendencies to experience hyperfocus (using the authors' novel Adult Hyperfocus Questionnaire) and flow (Jackson & Eklund, 2002; Jackson et al., 2008) were compared. Hupfeld et al. found small positive correlations between the hyperfocus and flow measures and no significant association between flow scores and ADHD diagnoses in their sample. This led them to conclude that, although tendencies to experience these two phenomena might be positively correlated, hyperfocus was ADHD-specific. However, the authors also noted that participants' responses to open-ended questions about their experiences included both positive and negative descriptions of hyperfocus (e.g., feelings of productivity *and* of wasting time); thus, the positively worded instructions

[2] The presence or absence of possible comorbidities was not reported.

in their hyperfocus measure[3] may have influenced the association observed between hyperfocus and flow scores.

In sum, although descriptions of hyperfocus often involve perseveration-like wording and characteristics such as difficulty controlling the focus of one's attention, these two phenomena have yet to be empirically compared. Furthermore, descriptions of flow resemble some aspects of hyperfocus, although their characteristics are not identical: Among the main characteristics of flow are attentional involvement, positive affect/enjoyment, and a sense of control (Šimleša et al., 2018), which are not always included in descriptions of hyperfocus. Thus, there is a clear need for further investigation into the appropriate terminology being used to describe hyperfocus in relation to other similar phenomena such as perseveration and flow.

ADHD, Emotion Dysregulation, and Comorbidities

Although ADHD is typically associated with difficulties in attention, there are significant emotional components to the disorder. First, up to 60%–80% of ADHD diagnoses are accompanied by one or more comorbid diagnosis such as anxiety, depression, bipolar disorder, conduct disorder, or substance use disorder (Adler et al., 2018; Brown, 2017). Second, *emotion dysregulation*—difficulty in managing emotional and behavioral responses to poor recognition, understanding, acceptance, and control of one's emotions (Gratz & Roemer, 2004)—is listed as an associated feature of ADHD, supporting its diagnosis (APA, 2013; Corbisiero et al., 2013; Kooij et al., 2019). However, emotion dysregulation is not ADHD-specific, and is instead understood to be a transdiagnostic indicator for mental health difficulties (Gratz & Roemer, 2004; Hallion et al., 2018; Kaufman et al., 2016), which is why it is not included as one of ADHD's main diagnostic criteria.

These associations between ADHD, emotion dysregulation, and comorbid diagnoses suggest that existing conclusions regarding the diagnostic specificity of hyperfocus (i.e., that it is a unique ADHD experience, separate from related phenomena such as flow) might not sufficiently account for additional emotion-related difficulties that might contribute to these phenomenological experiences. For example, although previous studies comparing hyperfocus in ADHD versus non-ADHD samples have attempted to control for varying levels of these associations, the relation between hyperfocus and depression is not well understood. In their study, Ozel-Kizil et al. (2016) did not exclude ADHD participants with comorbid depression from their analyses and observed higher hyperfocus scores in their ADHD group compared to their non-ADHD group (using the Hyperfocusing Scale; Ozel-Kizil et al., 2016). Yet, Hupfeld et al. (2019) found that participants with comorbid ADHD and depression reported higher hyperfocus scores than participants with either ADHD or depression alone (using their Adult Hyperfocus Questionnaire). Therefore, a relation between hyperfocus and depression is not implausible, and it might be assumed that the perseveration-like wording of these two existing measures could be contributing to these findings.[4]

Although distinguishing between ADHD and its comorbidities is complex, these relations highlight the importance of extending this understanding to include the association between hyperfocus and other related mental health disorders such as depression and anxiety. Approaching these relationships from a transdiagnostic emotion dysregulation perspective might facilitate insight into the separate associations between the attentional and emotional components of ADHD and its comorbidities, especially considering the obscurity regarding the affective valence of hyperfocus (i.e., as either a positive or negative experience).

Finally, it is worth noting that despite the common dichotomy between individuals with and without diagnoses, mental illness and mental health are not mutually exclusive; symptoms can present differently across the course of an individual's life, and they occur over a continuum within the general population (APA, 2013; Brown, 2017; Kooij et al., 2019; Payton, 2009; Sedgwick et al., 2019). Thus, it is important to approach the topic of ADHD and other mental

[3] "You will be asked to answer some questions about your feelings and experiences when you are doing activities *that you enjoy* [emphasis added]" (Supplemental Materials of Hupfeld et al., 2019).

[4] Hupfeld et al. (2019) also examined the association between hyperfocus scores and anxiety diagnosis, which was not significant in their sample when anxiety was either separate from or comorbid with ADHD.

health disorders from both a dichotomous and continuous perspective.

Therefore, the overarching goal of the present study was to better understand the measures being used and the conclusions being drawn from the existing studies on hyperfocus in ADHD and to explore an alternative approach to distinguishing between the attention- and emotion-related characteristics of hyperfocus and similar phenomena.

The Present Study

The present study aimed to extend the existing literature on hyperfocus by quantitatively investigating it along with two conceptually related phenomena using existing measures of hyperfocus and flow and a novel measure of perseveration. Although the dichotomy of self-reported clinical and nonclinical participants was examined, analyses were also conducted investigating the dependent variables' relations to ADHD symptomatology and emotion dysregulation tendencies across a continuum in nonclinical participants. It was hypothesized that:

1. ADHD symptomatology and emotion dysregulation would be positively correlated , as emotion dysregulation is understood to be an associated feature of ADHD (APA, 2013; Corbisiero et al., 2013; Kooij et al., 2019).
2. Hyperfocus would correlate positively with both flow and perseveration measures, as (i) hyperfocus appears to involve characteristics of both other phenomena, (ii) hyperfocus has been reported to correlate positively with another measure of flow (Hupfeld et al., 2019), and (iii) perseveration has been suggested as a possible mechanism of hyperfocus (Hupfeld et al., 2019) and/or to reflect a similar etiology between ADHD (hyperfocus) and ASD (perseveration; Ashinoff & Abu-Akel, 2019).
3. Hyperfocus would appear as clinically specific based on the existing measures. That is:
   a. ADHD symptomatology would predict hyperfocus scores over and above emotion dysregulation, as hyperfocus is hypothesized to reflect difficulties in attention regulation (Hupfeld et al., 2019; Kooij et al., 2019; Ozel-Kizil et al., 2016), not only of emotion dysregulation or general psychopathology; and
   b. Hyperfocus and perseveration would be more prominent in the clinical sample, as these phenomena have been previously related to psychopathologies such as ADHD, autism spectrum disorder, depression, and anxiety. In contrast, flow would be more prominent in the nonclinical sample , as previous associations between flow scores and ADHD diagnoses have been nonsignificant (Hupfeld et al., 2019) and some characteristics of flow (e.g., sense of control over one's attentional/flow experience) seem antithetical to psychopathology, especially ADHD.

Method

Participants

Data were collected from 281 undergraduate-level students from a Canadian university and 17 individuals from a provincial ADHD coaching service for a total of 298 adult participants. Data from 19 of the total participants were removed from the analyses due to incomplete scores, and data from four additional participants were removed due to nonstudent occupation status. Twenty-nine participants self-identified as having received an ADHD diagnosis.[5] Sixty of the non-ADHD participants self-identified as having received a mental health diagnosis other than ADHD and were removed from any further analyses. Thus, the final sample consisted of 215 undergraduate participants: 29 ADHD and 186 non-ADHD (see Table 2 for demographics).

The six-item Adult ADHD Self-Report Scale Screener (ASRS-S; Kessler et al., 2007; Cronbach's $\alpha = .76$), which has been used in previous research for grouping ADHD and non-ADHD samples (e.g., Hupfeld et al., 2019; Seli et al., 2015), supplemented self-reported ADHD diagnoses. A comparison of the self-identified

[5] Participants self-reported ADHD and other diagnoses based on the following prompts: "The following questions reference self-reported diagnosis of mental health disorders. If you are uncomfortable with answering any of the following questions, please indicate "Rather not say." Please answer truthfully: 1. Have you ever been diagnosed with an attention disorder (i.e., ADD, ADHD) by a qualified healthcare professional? (*Yes/No/Rather not say*) 2. Have you ever been diagnosed with any other mental health disorder by a qualified healthcare professional? (*Yes/No/Rather not say*)"

Table 2
Summary of Total, Group, and Matched Comparison Demographics

Demographic variables	Total (N = 215)	Clinical (n = 29)	Nonclinical (n = 186)	Matched comparisons: Clinical (n = 26)	Matched comparisons: Nonclinical (n = 26)
Gender					
Male	68	9	59	9	9
Female	144	17	127	17	17
Other	3	3	0	0	0
Age					
18–25	188	23	165	21	21
26–32	20	5	15	4	4
33+	7	1	6	1	1
Race					
Asian/Pacific Islander	42	1	41		
Black/African Canadian	11	0	11		
First Nations/Native Canadian	6	0	6		
White/Caucasian	140	23	117		
Other	9	1	8		
Biracial	7	4	3		
Other diagnosis[a] (self-reported)	24	24	0	21	0
ASRS-S score M (SD)		17.4 (3.3)[b]	11.3 (4.0)	17.6 (3.1)[c]	6.6 (2.0)

Note. ASRS = Adult ADHD Self-Report Scale Screener; Clinical = attention-deficit hyperactivity disorder (ADHD) diagnosis with or without another diagnosis, Nonclinical = neither ADHD nor other diagnoses reported.
[a] Other than ADHD. [b] Significantly higher than Nonclinical group, $t(42) = 8.93$, $p < .001$, 95% CI [4.70, 7.45], $d = 1.66$. [c] Significantly higher than Matched Comparison Nonclinical group, $t(43) = 15.25$, $p < .001$, 95% CI [9.55, 12.46], $d = 4.23$.

diagnosed-ADHD and not-diagnosed participants' mean scores using a Welch's independent t test confirmed that the self-identified ADHD participants scored significantly higher on the ASRS-S than the self-identified non-ADHD participants, $t(42) = 8.93$, $p < .001$, 95% CI [4.70, 7.45], $d = 1.66$. Of the ADHD sample, 83% reported at least one other mental health diagnosis; therefore, the two groups of participants are hereafter referred to as *Clinical* (i.e., self-reported ADHD with or without self-reported comorbidities) and *Nonclinical* (i.e., neither ADHD nor any other mental health diagnoses reported).

Matched Comparison Groups

Due to the substantial difference in sample sizes between the Clinical and Nonclinical participants, a matched comparison group was created from the Nonclinical sample based on age and gender (as suggested by Groen et al., 2020). Nonclinical participants with high ASRS-S scores (≥14; Hupfeld et al., 2019) were not considered for this comparison. Three Clinical participants with gender identities other than "male" or "female" were also dropped from the analysis because there were no Nonclinical participants who had matching gender identities.[6] Therefore, the final matched comparison groups consisted of 26 Clinical and 26 Nonclinical participants (see Table 2).

Measures

Emotion Dysregulation

An 18-item short form of the Difficulty in Emotion Regulation Scale was used (DERS-SF; Kaufman et al., 2016) with items reflecting difficulties in the six dimensions of emotion dysregulation: nonacceptance of emotional response ("Nonacceptance"), difficulties engaging in goal-directed behaviors ("Goals"),

[6] Some research suggests a possible relationship between gender identity and ADHD (see Thrower et al., 2020, for review), giving us more reason to want to ensure that we had properly matched comparisons based on gender identity. We recommend that future studies also collect information on biological sex, especially if examining the potential effects of ADHD medications or other biological factors that were not examined in the present study.

impulse-control difficulties ("Impulse"), lack of emotional awareness ("Awareness"), limited access to emotion dysregulation strategies ("Strategies"), and lack of emotional clarity ("Clarity"). Participants rated how often each item applied to them on a 5-point Likert-style scale, with higher scores indicating greater emotion dysregulation (Cronbach's $\alpha = .90$[7]).

Flow

The Flow Experiences Scale (FES; Schwartz & Waterman, 2006) with adjustments based on Ross and MacIntyre (2018) was used to measure self-reports of general flow experiences. The scale was originally developed to measure the nine dimensions of flow using eight items rated on a scale of 0%–100%, although the adjusted version included ten items. The original prompt for the scale (*When I engage in an activity that I enjoy . . .*) was modified to *When I am fully engaged in an activity . . .* to reduce response bias toward positive experiences. Before analysis, the item "I lose track of time" was removed due to low item–total correlation, resulting in an adjusted nine-item scale (Cronbach's $\alpha = .85$).

Perseveration

A novel combination of items was compiled to create a self-report Perseveration Questionnaire (PQ; see Supplemental Material). Select items were first taken from the Perseverative Thinking Questionnaire (PTQ; Ehring et al., 2011) and the Perseveration subscale of the Persistence Perseveration and Perfectionism Questionnaire (PPPQ; Serpell et al., 2009). Although the existing questionnaires have shown acceptable reliability on their own, they did not sufficiently cover the perseveration characteristics listed in Table 1, even when the scales were combined. Therefore, eight novel items were created. All items were rated on a 5-point Likert-style scale. The scale had the highest reliability when all items were combined in the PQ (Cronbach's $\alpha = .88$) rather than the thinking (PTQ, Cronbach's $\alpha = .84$), behavior (PPPQ, Cronbach's $\alpha = .59$), or new items on their own (Cronbach's $\alpha = .81$). The three measures had significant ($p < .001$) moderate-to-strong correlations among each other and with their combined total (PTQ and PPPQ: $r = .47$; PTQ and New: $r = .58$; PTQ and Total: $r = .80$; PPPQ and New: $r = .53$; PPPQ and Total: $r = .73$; New and Total: $r = .92$).

A factor analysis using principal components analysis was performed on the PQ to determine how the new items would fit with the existing thinking and behavior items ($N = 215$). Bartlett's test of sphericity determined that factor analysis was appropriate for the data, $\chi^2(105) = 1{,}217$, $p < .001$. The Kaiser–Meyer–Olkin measure of sampling adequacy indicated that the variables were strongly related (KMO = .89). Although a two-factor model (hypothesized as Thinking and Behavior) showed promising fit with no low communalities (<.2) and accounted for 48.4% of the total variance, both the thinking and behavior items loaded onto one factor, while three items with emotional wording (e.g., "I get extremely upset") loaded onto the second factor. Therefore, a three-factor model was assessed (see Table 3), accounting for a cumulative 56.6% of the overall variance with no low communalities. Factor 1 ("Perseverative thinking") consisted of seven items, had an eigenvalue of 5.74, and accounted for 38.3% of the total variance. Factor 2 ("Emotional reactivity") consisted of three items, had an eigenvalue of 1.52, and accounted for an additional 10.1% of the total variance. Factor 3 ("Perseverative behavior") consisted of the remaining five items, had an eigenvalue of 1.23, and accounted for the final 8.2% of the variance. Items 7 and 9 loaded similarly onto Factors 1 and 3 but were included in Factor 1 due to their focus on studying/thinking. Using a direct oblimin (oblique) rotation, the factors were found to be positively correlated (1 and 2: $r = .18$; 1 and 3: $r = .47$; 2 and 3: $r = .23$).

Hyperfocus

Two measures were used to assess hyperfocus: the Hyperfocusing Scale (HFS; Ozel-Kizil et al., 2016) and the Dispositional Hyperfocus subscale of the Adult Hyperfocus Questionnaire (AHFQ; Hupfeld et al., 2019). The HFS, translated from Turkish to English (K. Hupfeld, personal correspondence, June 25, 2019), consisted of 11 items rated on a 4-point Likert-style scale (Cronbach's $\alpha = .83$). The Dispositional Hyperfocus subscale of the AHFQ was used to measure more specific occurrences of hyperfocus, consisting of 12

[7] Reliabilities were assessed using the total sample ($N = 215$).

Table 3
Final Three-Factor Model of Novel Perseveration Questionnaire (PQ) Items (N = 215)

Scale items	Factor 1 Perseverative thinking	Factor 2 Emotional reactivity	Factor 3 Perseverative behavior
2. Stuck on certain issues and cannot move on[a]	**.84**	.18	.33
4. Feel driven to continue dwelling on same issue[a]	**.81**	.40	.37
3. Keep thinking about same issues all the time[a]	**.83**	.39	.49
1. Think about problems without solving any of them[a]	**.72**	−.04	.42
8. Struggle with breaking old habits	**.64**	.15	.55
9. Tend to make the same mistakes on tests or assignments, even when given feedback on errors	**.51**	.20	.50
7. Stay up late studying, even when no longer taking in the material[b]	**.43**	−.06	.40
14. Get extremely upset if routine is interrupted	.18	**.86**	.29
15. Cannot let it go or adapt if things do not go as planned	.39	**.81**	.21
12. Get extremely upset when asked to stop doing something enjoyable in order to switch to something less enjoyable	.21	**.68**	.52
13. Go all in when it comes to passions or interests	.22	.23	**.73**
11. Typically struggle with putting off something fun or enjoyable in the moment to gain something better in the future	.45	.21	**.73**
6. Continuing to do something even when there is no point[b]	.45	.27	**.71**
10. Difficult to stop doing something enjoyable and switch to something less enjoyable	.52	.23	**.74**
5. Keep trying to sort out problems in relationship[b]	.27	.07	**.56**

Note. Bold indicates factor-specific loadings.
[a] Perseverative Thinking Questionnaire item (Ehring et al., 2011). [b] Persistence Perseveration and Perfectionism Questionnaire item (Serpell et al., 2009).

6-point Likert-style items with the common prompt of *Generally, when I am very focused on something or I am doing something that I find especially engaging* ... (the word "engaging" replaced "rewarding" from the original prompt to reduce positively biased responses; Cronbach's $\alpha = .93$). For the analyses, standardized mean scores from the two hyperfocus measures were averaged for each participant to produce an overall hyperfocus score. Together, the combined hyperfocus scales had good reliability (Cronbach's $\alpha = .93$).

Procedure

Data were collected in January and February of 2020, before the COVID-19 pandemic became prevalent in Canada. Participation was voluntary, with university students recruited through classroom visits and coaching clients recruited through the ADHD coaching service. Each participant read and signed the informed consent, then filled out the questionnaires. Measures were randomly sorted into six different configurations to control for order bias, except for the demographic items, which were always presented first. Following the completion of the measures, results were entered manually into Microsoft Excel to compute participants' scores and further analyses were conducted using IBM SPSS (Version 27.0) and JASP (Version 0.11.1.) software.

Ethics Statement

This study was reviewed and approved for ethical clearance through the Cape Breton University Research Ethics Board (REB#1920-002, December 9, 2019).

Results

The Link Between ADHD Symptomatology and Emotion Dysregulation

As an overview, Table 4 provides a summary of descriptive statistics for the measures used in the study. To address Hypothesis 1 (*ADHD symptomatology and emotion dysregulation would be positively correlated*), a Pearson correlation analysis was performed examining the relationship between ADHD symptomatology

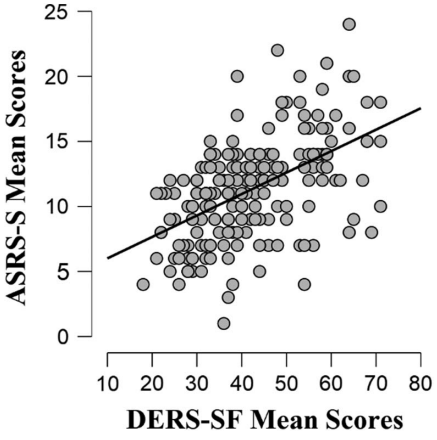
Table 4
Summary of Descriptive Statistics

Measures	Total (N = 215)	Nonclinical (n = 186)	Matched comparisons: Clinical (n = 26)	Matched comparisons: Nonclinical (n = 26)
ADHD symptomatology (ASRS-S)	12.2 (4.4)	11.3 (4.0)	17.6 (3.1)	6.6 (2.0)
Emotion dysregulation (DERS-SF)	44.0 (12.9)	42.3 (12.6)	54.1 (9.1)	33.1 (9.5)
Hyperfocus				
HFS	25.7 (5.6)	25.0 (5.2)	30.3 (5.4)	21.2 (4.3)
AHFQ	35.5 (14.0)	33.3 (12.9)	48.6 (13.9)	23.8 (9.9)
Standardized combined score	-7.45×10^{-4} (0.6)	0.004 (0.6)	0.5 (0.5)	−0.5 (0.4)
Perseveration (PQ)	38.9 (10.6)	37.7 (10.3)	46.4 (8.1)	29.6 (8.1)
Flow (FES)	69.3 (15.4)	69.7 (15.2)	65.1 (16.4)	74.7 (12.5)

Note. M (SD); ASRS-S = Adult ADHD Self-Report Scale Screener (Kessler et al., 2007); DERS-SF = Difficulty in Emotion Regulation Scale Short Form (Kaufman et al., 2016); HFS = Hyperfocusing Scale (Ozel-Kizil et al., 2016); AHFQ = Adult Hyperfocus Questionnaire (Hupfeld et al., 2019); Standardized Combined Score = HFS and AHFQ; PQ = Perseveration Questionnaire (see Method section of present study); FES = Flow Experiences Scale (Schwartz & Waterman, 2006); Clinical: self-reported ADHD diagnosis with or without self-reported comorbid diagnosis, Nonclinical: no self-reported ADHD or other mental health diagnosis.

and emotion dysregulation tendencies in Nonclinical participants (n = 186).[8] Scores on the ASRS-S were positively correlated with those on the DERS-SF, r = .52, p < .001, 95% CI [0.41, 0.62] (see Figure 1), indicating that Nonclinical individuals who had difficulty regulating their emotions were also likely to have difficulties with attention.[9]

Figure 1
Pearson Correlation Between Mean ADHD Symptomatology and Emotion Dysregulation Scores



Note. ADHD symptomatology = Adult ADHD Self-Report Scale Screener (ASRS-S, Kessler et al., 2007), emotion dysregulation = Difficulty in Emotion Regulation Scale Short Form (DERS-SF, Kaufman et al., 2016), (r = .52, p < .001).

The Relations Between Hyperfocus, Perseveration, and Flow Measures

To address Hypothesis 2 (*Hyperfocus would correlate positively with both flow and perseveration measures*), an exploratory factor analysis using principal components analysis was performed using the Nonclinical participants' data (n = 186). All hyperfocus, flow, and perseveration items were included to examine whether the scales for these experiences were measuring them as similar or separate phenomena. Bartlett's test of sphericity indicated that factor analysis was appropriate for the data, $\chi^2(1081) = 4{,}261, p < .001$, and the Kaiser–Meyer–Olkin measure of sampling adequacy was acceptable (KMO = .84).

Initially, a three-factor solution was extracted as suggested both by the scree plot and the assumption that measures of hyperfocus, flow, and perseveration would load onto separate factors. However, the resulting factor structure was complex. Of the 47 total items, 42 loaded above .40 on two of the three factors; most of the perseveration and hyperfocus items loaded onto

[8] That is, emotion dysregulation and ADHD symptomatology scores across a normal distribution (DERS-SF: skew = 0.41, SE = 0.18, kurtosis = −0.69, SE = 0.36; ASRS-S: skew = 0.28, SE = 0.18, kurtosis = 0.23, SE = 0.36).

[9] When the total sample was examined (N = 215, i.e., including the Clinical participants), similar Pearson correlation results were observed between ASRS-S and DERS-SF scores, r = .58, p < .001, 95% CI [0.48, 0.66].

Table 5
Two-Factor Model of Hyperfocus, Perseveration, and Flow Items

Scale items	Factor 1	Factor 2
HF2-11. Completely engrossed or fixated with activity	**.78**	.22
HF2-6. Focus too long on small detail of task and avoid other important parts	**.78**	.11
HF2-5. Feel totally captivated or "hooked" by activity	**.78**	.26
HF2-10. Cannot stop activity, even with more important responsibilities	**.77**	.04
HF2-12. Get "stuck" on little details instead of finishing other important parts of task	**.77**	.00
HF2-4. Difficult to quit/move on, even if other important things to be doing instead	**.74**	−.02
HF2-9. Forget to attend to personal needs (e.g., sleeping, eating, using bathroom)	**.69**	.01
HF2-3. Accidentally miss meals, stay up all night, or wait until last minute for bathroom	**.67**	−.03
HF2-7. Unaware of time of day or how much time has passed	**.64**	.10
HF1-6. Often delay other important tasks when working on something	**.59**	−.24
HF1-2. Neglect self and others because of excessively concentrating on single task	**.57**	.03
HF2-2. Not notice the world around, realize if someone calls name or if phone buzzes	**.56**	.12
HF2-1. Tend to completely lose track of time	**.55**	−.06
HF1-1. Do not hear or react despite being called repeatedly when busy with something	**.53**	.05
HF1-8. Feel like little time has passed, even when it has been a long time	**.52**	.03
Pers-10. Difficult to stop doing something enjoyable to switch to something less enjoyable, even when necessary	**.50**	−.32
Pers-13. Tend to go all in to passions or interests, to the point of not doing more important tasks	**.48**	−.08
HF1-10. Postpone other things that I must do because I spend hours doing hobbies	**.48**	−.19
Pers-8. Struggle with breaking old habits, even when I try very hard to	**.46**	−.32
Pers-1. Think about problems without solving any of them	**.46**	−.29
HF2-8. Do not react to any distractions (e.g., if someone talks to me)	**.45**	.14
HF1-4. Do not give a damn about the world when busy doing something	**.44**	−.20
HF1-5. Relationships with others often damaged due to spending a lot of time on task	**.43**	−.16
Pers-4. Feel driven to continue dwelling on the same issue	**.42**	−.36
Pers-2. Get stuck on certain issues and cannot move on	**.41**	−.33
Pers-3. Keep thinking about same issues all the time	**.41**	−.46
Pers-11. Typically struggle with putting off something fun or enjoyable in the moment in order to gain something even better in the future	**.40**	−.33
Pers-6. Continue to do something even when there is no point in carrying on	**.40**	−.20
Flow-7. Feel fully involved	.06	**.77**
Flow-8. Skills are challenged and meeting challenge very well	.05	**.76**
Flow-5. High level of concentration	−.05	**.74**
Flow-1. Clear goals	−.01	**.72**
Flow-2. Feel in control	−.08	**.67**
Flow-10. Experience gives feelings of enjoyment	.05	**.66**
Flow-4. Know how well I am doing	−.03	**.65**
Flow-9. Things happen automatically, without having to think about what I am doing	.23	**.57**
Flow-6. Forget personal problems	.38	**.47**

Note. $n = 186$; HF1 = Hyperfocusing Scale items (Ozel-Kizil et al., 2016); HF2 = Adult Hyperfocus Questionnaire Dispositional Subscale items (Hupfeld et al., 2019); Pers = Perseveration Questionnaire items (see Method section); Flow = Flow Experiences Scale items (Schwartz & Waterman, 2006); bold indicates factor-specific loadings, loadings <.40 suppressed.

a single factor and the two scales had a strong positive correlation following a direct oblimin (oblique) rotation ($r = .53$). Therefore, a two-factor model was assessed, which resulted in a simpler structure with only one item showing loadings above .40 on both factors (Pers-3: "Keep thinking about same issues all the time" had a factor loading of .41 on Factor 1 and of −.46 on Factor 2; see Table 5 for factor loadings). These two factors accounted for a cumulative 36.2% of the overall variance with six items having low communalities (<.2). Factor 1 consisted of hyperfocus and perseveration items, had an eigenvalue of 12.42, and accounted for 26.4% of the total variance. Factor 2 consisted of only flow items, had an eigenvalue of 4.61, and accounted for the remaining 9.8% of variance. Using a direct oblimin (oblique) rotation, the factors were found to be negatively correlated ($r = -.26$), further indicating that the hyperfocus and perseveration items were measuring a construct separate from flow.

Table 6
Hierarchical Regression Results Predicting Flow, Perseveration, and Hyperfocus Scores

DV	Step	Predictor	Unstandardized coefficients		Standardized coefficients		R^2	ΔR^2	ΔF	p
			B	SE	β	p				
Flow	1						.097	.097	19.80	<.001
		Emotion dysregulation	−0.38	0.09	−0.31	<.001				
	2						.100	.003	0.53	.466
		Emotion dysregulation	−0.34	0.10	−0.28	<.001				
		ADHD symptomatology	−0.23	0.32	−0.06	.466				
Perseveration	1						.527	.527	205.17	<.001
		Emotion dysregulation	0.59	0.04	0.73	<.001				
	2						.579	.052	22.63	<.001
		Emotion dysregulation	0.48	0.05	0.59	<.001				
		ADHD symptomatology	0.69	0.15	0.27	<.001				
Hyperfocus	1						.245	.245	59.57	<.001
		Emotion dysregulation	0.02	0.003	0.50	<.001				
	2						.445	.206	68.73	<.001
		Emotion dysregulation	0.01	0.003	0.22	<.001				
		ADHD symptomatology	0.08	0.009	0.53	<.001				

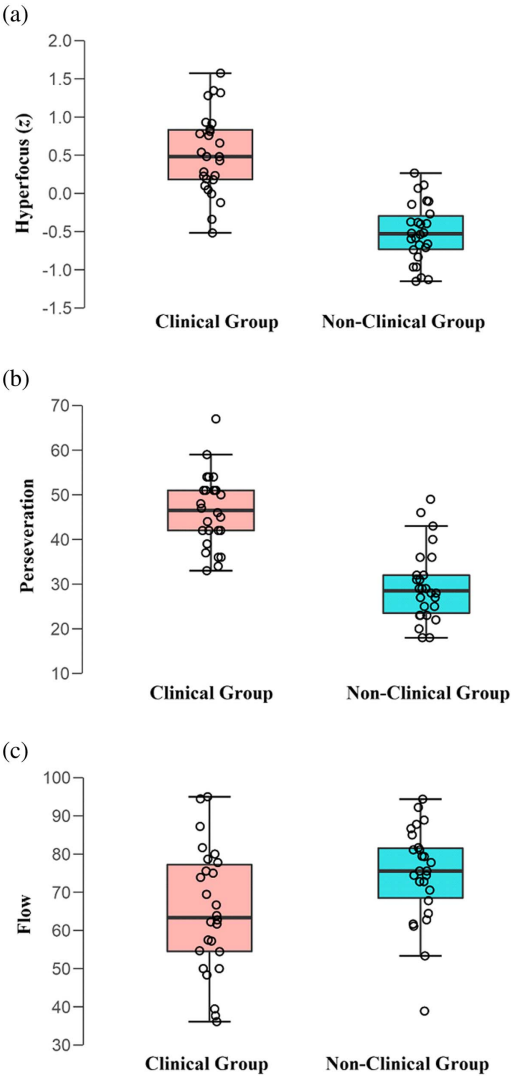
Note. Nonclinical sample (n = 186); SE = standard error of β, Δ = "change in" (R^2, F); Flow = Flow Experiences Scale scores (Schwartz & Waterman, 2006); Perseveration = Perseveration Questionnaire scores (see Method section); Hyperfocus = average standardized scores from Hyperfocusing Scale (Ozel-Kizil et al., 2016) and Adult Hyperfocus Questionnaire Dispositional subscale (Hupfeld et al., 2019); Emotion dysregulation = Difficulty in Emotion Dysregulation Scale Short Form scores (Kaufman et al., 2016); ADHD symptomatology = Adult ADHD Self-Report Scale Screener scores (Kessler et al., 2007).

The Clinical Specificity of Hyperfocus

Hypothesis 3 predicted that: *Hyperfocus would appear as clinically specific based on the existing measures*. To address Hypothesis 3a (*ADHD symptomatology would predict hyperfocus scores over and above emotion dysregulation*), hierarchical regression analyses were conducted examining whether hyperfocus, flow, and perseveration scores could be predicted by ADHD symptomatology over and above emotion dysregulation scores in Nonclinical participants (n = 186). For each analysis, DERS-SF scores were entered first to account for general difficulties with emotion dysregulation; then, ASRS-S scores were entered to determine if attention-specific difficulties would contribute any additional predictive value (see Table 6). For flow, emotion dysregulation significantly predicted 9.7% of the variance (R^2 = .097, p < .001) but ADHD symptomatology did not significantly contribute any additional predictive value (R^2 change = .003, R^2 = .100, p = .466). For perseveration, emotion dysregulation predicted a large percentage of the variance (R^2 = .527, p < .001) and ADHD symptomatology significantly predicted an additional 5.2% (R^2 change = .052, R^2 = .579, p < .001). Finally, for hyperfocus we found the strongest additional contribution of attention-specific difficulties: Emotion dysregulation predicted an initial 24.5% (R^2 = .245, p < .001) and ASRS-S scores predicted an additional 20.6% of the variance (R^2 = .451, p < .001). Therefore, in the Nonclinical sample, ADHD symptomatology appeared to be substantially more predictive of hyperfocus scores when already accounting for emotion dysregulation tendencies than for flow or perseveration.

To address Hypothesis 3b (*Hyperfocus and perseveration would be more prominent in the Clinical sample*), direct comparisons were conducted between the Clinical (n = 26) and matched Nonclinical participants (n = 26) using Welch's independent-sample t-tests (see Figure 2a–c). The Clinical group had significantly higher standardized hyperfocus scores (M = 0.52, SD = 0.53) than the Nonclinical group, M = −0.52, SD = 0.39; $t(46)$ = 8.02, p < .001, 95% CI [0.77, 1.29], Cohen's d = 2.22. Similarly, the Clinical group had significantly higher perseveration scores (M = 46.39, SD = 9.14) than the Nonclinical group, M = 29.62, SD = 8.11; $t(50)$ = 7.44, p < .001, 95% CI [12.25, 21.29], Cohen's d = 2.07. However, the Nonclinical group scored significantly higher on the flow measure (M = 74.67, SD = 12.51) than

Figure 2
Welch's Independent-Sample t *Tests Comparing Mean Scores Between Matched Clinical and Nonclinical Groups*



Note. (a) Hyperfocus (standardized), (b) perseveration, and (c) flow scores between matched clinical and nonclinical groups ($n = 26$ each). See the online article for the color version of this figure.

the Clinical group, $M = 65.05$, $SD = 16.43$; $t(47) = -2.38$, $p = .022$, 95% CI [−17.77, −1.47], Cohen's $d = -0.66$.

Discussion

The present study extends the existing literature on hyperfocus by showing that (a) ADHD symptomatology is related to emotion dysregulation; (b) hyperfocus and perseveration items define a factor separate from flow; and (c) there is a clinical specificity of hyperfocus and perseveration, in that higher hyperfocus and perseveration scores were related to clinical diagnoses and ADHD symptomatology predicted hyperfocus and perseveration scores over and above emotion dysregulation tendencies.

Attention and Emotion Tendencies

The first goal of the present study was to examine the relationship between ADHD symptomatology and emotion dysregulation. It was hypothesized that these tendencies would be positively correlated; we predicted that individuals who experienced difficulties regulating their emotions would likely also have difficulties regulating their attention, and vice-versa. The current findings supported this hypothesis. This is an important question to address, as ADHD is typically approached primarily as a disorder of attention, despite it having a strong emotional component and being highly comorbid with emotion-based disorders such as anxiety and depression. Therefore, understanding that emotion dysregulation and ADHD symptomatology are positively related even in nonclinical participants is an important step in understanding how individuals in the general population might experience hyperfocus.

It should be noted that the present study used the DERS-SF measure of emotion dysregulation (Gratz & Roemer, 2004), which only focuses on the regulation of negatively valenced emotions, not of positively valenced emotions. Results from DERS-SF are often discussed in terms of general "emotion dysregulation," although the wording of most of its items relate to negative emotions (e.g., beginning with the stem *When I'm upset* . . .). A complementary scale measuring emotion dysregulation for positively valenced states has more recently been developed (the DERS-Positive; Weiss et al., 2015), which instead uses the stem *When I'm happy* . . . . Further understanding of the relation between emotion dysregulation and phenomena such as hyperfocus, flow, and perseveration in ADHD and other populations would greatly benefit from the joint use of both these measures, especially considering that hyperfocus has been described in both positive and negative contexts (Ashinoff & Abu-Akel, 2019; Groen et al., 2020; Hupfeld et al., 2019; Ozel-Kizil et al., 2016; Sedgwick et al., 2019).

Hyperfocus, Perseveration, and Flow in Clinical and Nonclinical Samples

The second goal of the present study was to further the understanding of hyperfocus in relation to two conceptually similar phenomena: perseveration and flow; the third goal was to investigate the clinical specificity of hyperfocus. It was hypothesized that hyperfocus would correlate positively with both the other phenomena, as Hupfeld et al. (2019) found a small positive correlation ($r = .26$) between scores on the Dispositional Hyperfocus subscale and those on a measure of flow, and because descriptions and items measuring hyperfocus often resemble those of perseveration. The current results partially supported this hypothesis. The hyperfocus and perseveration measures' items were positively correlated and loaded onto a similar factor, whereas these measures and their combined factor were negatively correlated with flow. That is, the results from the present study support hyperfocus being more similar to perseveration than flow. Furthermore, it was hypothesized that hyperfocus would appear as clinically specific based on the existing measures of these phenomena. This hypothesis was supported by the current results, as ADHD symptomatology was more predictive of hyperfocus when accounting for emotion dysregulation tendencies in the Nonclinical sample than it was for flow or perseveration. Additionally, the Clinical sample scored significantly higher on the hyperfocus measures than the matched Nonclinical sample. Taken together, these results support the conclusion that adult ADHD symptomatology and diagnosis are positively related to hyperfocus scores (Hupfeld et al., 2019; Ozel-Kizil et al., 2016).

Hyperfocus and Perseveration

The present study provides the first empirical support for a commonality between hyperfocus and perseveration. The data here are consistent with Hupfeld et al. (2019) suggestion that perseveration may be a possible mechanism of hyperfocus. Support comes from the current findings that (a) hyperfocus and perseveration items loaded onto a similar factor that negatively correlated with flow, (b) ADHD symptomatology significantly predicted a portion of the variance in perseveration scores within the Nonclinical (and total) sample, and (c) the Clinical group scored significantly higher on the measure of perseveration than the Nonclinical group. These findings are understandable given the perseveration-like wording used in descriptions of hyperfocus such as feeling "stuck" on a task or feeling unable to control the focus of one's attention, as well as the known association between psychopathology and perseveration (APA, 2013; Ashinoff & Abu-Akel, 2019; Barkley, 1999; Boucugnani & Jones, 1989; Boyes et al., 2017; Ripper et al., 2018; Rudaizky et al., 2012; Ruscio et al., 2011). Interestingly, the present study uncovered this relationship by using a novel measure of perseveration, the Perseveration Questionnaire. Approximately half (7/15) of the measure's items are from the previously validated Perseverative Thinking Questionnaire (Ehring et al., 2011) and Perseveration subscale of the Persistence Perseveration and Perfectionism Questionnaire (Serpell et al., 2009), which may lend some support to the new questionnaire's validity. However, it is important that future studies explore replicating these findings and examining the test–retest validity and reliability of this scale.

There are several possible reasons and implications for these findings, all of which will require additional investigation in future research. First, the perseveration-like wording of many of the existing hyperfocus items may be driving the ADHD-specific results observed in this and other studies. Second, the issue of comorbidities possibly driving the relation between perseveration (and therefore possibly hyperfocus) and ADHD is also of importance, as perseveration is not only characteristic of ADHD but also of several of its most commonly comorbid disorders. This might also help explain findings in previous research, such as Hupfeld et al. (2019) finding that participants with comorbid depression and ADHD scored higher on their measure of hyperfocus than participants with either depression or ADHD alone. Similarly, it might help explain Ozel-Kizil et al. (2016) finding that ADHD participants—who were filtered for other mental health disorders *except* depression—scored higher on their measure of hyperfocus than their non-ADHD participants, who were also filtered for any mental health diagnosis, *including* depression. Thus, further investigation into the perseveration-like characteristics of hyperfocus experiences in ADHD and other

populations might provide some clarity to these findings.

One similar avenue for future research might be a focus on perseveration of positively valenced stimuli, which hyperfocus seems implied to be. This type of perseveration has been found to be unrelated to symptoms of major depressive disorder, generalized anxiety disorder, and general indicators of stress, whereas perseveration on negatively valenced stimuli have been positively related to these conditions (Boyes et al., 2017; Ripper et al., 2018). This might explain the differences observed in the present study between hyperfocus and perseveration scores despite the similarities between the two phenomena: Whereas emotion dysregulation predicted a very large percentage of the variance in perseveration scores (52.7%) with ADHD symptomatology only predicting an additional 5.2% (although significant), the variance in hyperfocus scores were almost equally predicted by emotion dysregulation (24.5%) and ADHD symptomatology (20.6%). Therefore, future investigations might find perseveration on positive emotions to be uniquely related to ADHD, over and above perseveration on negative emotions (which might perhaps be related to ADHD and/or comorbidity symptoms).[10]

Hyperfocus and Flow

There are several possible reasons for the differing flow results observed in the present study compared to previous work by Hupfeld et al. (2019). First, the present study uses a different measure of flow than Hupfeld et al. (2019). The Flow Experiences Scale (Schwartz & Waterman, 2006; used in the present study) asks about general experiences, whereas the Long Dispositional Flow Scale 2 General (Jackson & Eklund, 2002; Jackson et al., 2008; used in the Hupfeld et al., 2019 study) asks participants to answer based on one specific experience. Therefore, the present study's participants may have responded to the flow items in reference to one or several different engaging experiences rather than only one engaging experience. Second, the present study altered the wording of the common stems within both the Adult Hyperfocus Questionnaire (replaced "rewarding" with "engaging" from the original *Generally, when I am very focused on something or I am doing something that I find especially rewarding* . . .) and the Flow Experiences Scale (changed the stem of *When I engage in an activity that I enjoy* . . . to *When I am fully engaged in an activity* . . .). These changes were made in an attempt to more directly compare the measures' items in attentional states that were not already assumed to be positive. Therefore, the wording used by Hupfeld et al. may have led to more positive/flow-like interpretations of the hyperfocus scale's items, resulting in the positive correlation observed in their study. On the other hand, the present study's wording may have resulted in the affective differences between the scales' items driving the negative correlation observed.

However, even with the differential results between hyperfocus and flow, the present study did replicate other findings. Like Hupfeld et al. (2019), the present study found that flow scores were not significantly related to ADHD diagnosis or symptomatology. Additionally, like both Hupfeld et al. (2019) and Ozel-Kizil et al. (2016), the present study found that hyperfocus scores (using both existing measures of hyperfocus) were positively related to ADHD diagnosis and symptomatology. The present findings also extend those of previous studies on this comparison, as flow scores in the Nonclinical group were significantly higher than those of the Clinical group (despite large variance in the Clinical group's scores, which might be due to the similarities in the altered questionnaire prompts and/or differences in comorbidities). Therefore, the notion that hyperfocus might be a phenomenon that is uniquely experienced by individuals with ADHD was partially supported, although again taking into consideration that these results are based on the existing measures being used and their inherent assumptions about the phenomena, as well as the fact that the "ADHD" (i.e., Clinical) group in the present study included comorbidities.

Generalizability of Findings

The present study's findings were correlational. Therefore, we cannot speak to the causal nature of emotion dysregulation, ADHD

[10] Additionally, investigations into other related areas of the literature such as bias in attentional engagement and disengagement (e.g., Boyes et al., 2017; Ripper et al., 2018) and novelty processing (e.g., Maes et al., 2011) might be helpful.

symptomatology, clinical diagnoses, or experiences of hyperfocus-like phenomena. Additionally, the current sample was smaller than some other recent publications on hyperfocus (Hupfeld et al., 2019; Ozel-Kizil et al., 2016), was predominantly female (67%), and groups were established based on self-reported diagnoses. However, the sample size was large enough to produce substantial effect sizes (Cohen's $d > 2.0$) for the matched comparison analyses on hyperfocus and perseveration. Furthermore, scores on a measure of ADHD symptomatology (the ASRS-S) were significantly higher for participants that reported a diagnosis of ADHD than those who reported no diagnosis.

Similarly, specific "other" mental health disorders were not recorded, although a larger sample size would likely have been necessary to analyze results based on other disorders, and emotion dysregulation tendencies were used as a transdiagnostic marker for emotional difficulties instead. Future studies should aim for larger sample sizes—especially oversampling from a pool of ADHD participants—to further ensure sufficient analytic power.

Finally, the current sample was from an undergraduate population; thus, the present study's results are not generalizable to other demographics. However, this allowed for education level and age to be relatively controlled for, which has been noted as a limitation in previous studies on hyperfocus (see Groen et al., 2020). Therefore, future research investigating the replicability of the present study's findings in an undergraduate population or the extension of these findings to other populations would be beneficial.

Conceptual and Measurement Issues

The concept and measurement of hyperfocus is still very much in the development stage, given that it has only begun to be empirically investigated in the past decade. Conceptually, hyperfocus has been defined in a slightly different way in each of its recent publications: as locking onto or feeling stuck on a task of interest (Ozel-Kizil et al., 2016); as a state of heightened attention most often occurring during an interesting activity with additional potential qualities such as timelessness or ignoring personal needs (Hupfeld et al., 2019); as an experience of intense mental focus associated with productivity, similar to the flow state (Sedgwick et al., 2019); as intense concentration/focus on an interesting task, involving ignoring or "tuning out" external stimuli, equivalent to the flow state (Ashinoff & Abu-Akel, 2019); and as a more broad experience of being completely caught up in an activity and not noticing time or external stimuli (Groen et al., 2020).

Thus, there appears to be only minor consensus on some of the characteristics that might define "hyperfocus." The present study does not attempt to offer a comprehensive definition of hyperfocus, but rather to contribute additional insight into which aspects of previous descriptions might be more or less likely to be ADHD-specific based on existing measures. Before definitive conclusions are drawn about this phenomenon, more research needs to be conducted to fine-tune the conceptualization of hyperfocus as it relates to ADHD and other similar constructs such as flow and perseveration. This will in turn affect the measurement of hyperfocus, which also requires much more attention and consensus before strong conclusions can be made regarding the uniqueness of hyperfocus to ADHD. As suggested previously, an investigation into the relation between emotion dysregulation and emotional perseveration (both positively and negatively valenced) and ADHD and its comorbidities, as well as hyperfocus and related phenomena, could be a fruitful next step in narrowing down the conceptualization and measure of hyperfocus.

Similarly, agreement on the concept and measurement of flow is a work in progress, despite flow being extensively researched since its original conceptualization by Csikszentmihalyi in 1975. Due to the varying conceptualizations and measures of flow, a new approach to the phenomenon has recently been proposed: Marty-Dugas et al. (Marty-Dugas & Smilek, 2019; Marty-Dugas et al., 2020) presented a simplified conceptualization of flow as *deep, effortless concentration* (DEC) and have created two complementary measures of what they defined as *internal* (thought-related) and *external* (behavior-related) flow/DEC. If such an approach was adopted in the flow literature, perhaps measures of hyperfocus and other related phenomena could be more consistently and appropriately compared, and a better understanding of the relationships between these types of phenomena could be accomplished, that is, comparing results from studies that used different flow measures, such

as the results from Hupfeld et al. (2019) and the present study, could be avoided.

Like hyperfocus and flow, perseveration is conceptualized and measured in several different ways in multiple different fields of literature. For example, a novel measure of perseveration in relation to thinking, behavior, and emotions was proposed in the present study, whereas emotional perseveration in the anxiety and depression literature has been measured by several different scales (e.g., Boyes et al., 2017; Ripper et al., 2018; Rudaizky et al., 2012) and perseverative behavior in ADHD and autism spectrum disorder populations is often measured using the Wisconsin Card Sorting Test (Berg, 1948; Nelson, 1976). Therefore, inferring relations between different populations and results from different literatures is made more difficult due to the wide variety of measures and conceptual interpretations of hyperfocus and its related phenomena, an issue that needs to be addressed in future studies.

Conclusions

The paradoxical experience of hyperfocus by individuals with ADHD—a disorder typically characterized by a deficit in attention—has only recently started to be empirically examined. To date, two main perspectives have been approached when studying hyperfocus: (1) that it is an experience unique to ADHD and (2) that it is phenomenologically equivalent to the optimal experience of flow. However, the wording used to describe hyperfocus is often perseveration-like, suggesting that hyperfocus involves more negatively valenced feelings of being "stuck" on a task, unable to redirect one's focus in a controlled manner. The present study partially extended previous findings that hyperfocus (when measured using existing scales) is more prominent in clinical than nonclinical samples and correlates positively with ADHD symptomatology. Additionally, the present study provided novel insight into the association between current measures of hyperfocus and the two related phenomena of flow (positively valenced) and perseveration (negatively valenced), as well as with a transdiagnostic indicator of emotion difficulties (emotion dysregulation). These findings contribute to a better understanding of the potential uniqueness of hyperfocus to ADHD and its possible mechanisms. In all, the results from this study support the notion that ADHD might be better described as a disorder of dysregulation rather than simply of attentional deficit.

References

Adler, L. A., Faraone, S. V., Sarocco, P., Atkins, N., & Khachatryan, A. (2018). Establishing US norms for the Adult ADHD Self-Report Scale (ASRS-v1.1) and characterising symptom burden among adults with self-reported ADHD. *International Journal of Clinical Practice*, *73*(1), Article e13260. https://doi.org/10.1111/ijcp.13260

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.).

Ashinoff, B. K., & Abu-Akel, A. (2019). Hyperfocus: The forgotten Frontier of attention. *Psychological Research*. Advance online publication. https://doi.org/10.1007/s00426-019-01245-8

Barkley, R. A. (1999). Response inhibition in attention-deficit hyperactivity disorder. *Mental Retardation and Developmental Disabilities Research Reviews*, *5*(3), 177–184. https://doi.org/10.1002/(SICI)1098-2779(1999)5:3<177::AID-MRDD3>3.0.CO;2-G

Berg, E. A. (1948). A simple objective technique for measuring flexibility in thinking. *The Journal of General Psychology*, *39*(1), 15–22. https://doi.org/10.1080/00221309.1948.9918159

Boucugnani, L. L., & Jones, R. W. (1989). Behaviors analogous to frontal lobe dysfunction in children with Attention Deficit Hyperactivity Disorder. *Archives of Clinical Neuropsychology*, *4*(2), 161–173. https://doi.org/10.1093/arclin/4.2.161

Boyes, M. E., Carmody, T. M., Clarke, P. J. F., & Hasking, P. A. (2017). Emotional reactivity and perseveration: Independent dimensions of trait positive and negative affectivity and differential associations with psychological distress. *Personality and Individual Differences*, *105*, 70–77. https://doi.org/10.1016/j.paid.2016.09.025

Brown, T. E. (2017). *Outside the box: Rethinking ADD/ADHD in children and adults: A practical guide*. American Psychiatric Association.

Corbisiero, S., Stieglitz, R. D., Retz, W., & Rösler, M. (2013). Is emotional dysregulation part of the psychopathology of ADHD in adults? *Attention Deficit and Hyperactivity Disorders*, *5*(2), 83–92. https://doi.org/10.1007/s12402-012-0097-z

Csikszentmihalyi, M. (1991). *Flow: The psychology of optimal experience*. Harper Perennial.

Csikszentmihalyi, M. (2004). *Flow, the secret to happiness* [Video file]. TED Talks. https://www.ted.com/talks/mihaly_csikszentmihalyi_flow_the_secret_to_

Ehring, T., Zetsche, U., Weidacker, K., Wahl, K., Schönfeld, S., & Ehlers, A. (2011). The Perseverative Thinking Questionnaire (PTQ): Validation of a content-independent measure of repetitive negative

thinking. *Journal of Behavior Therapy and Experimental Psychiatry*, *42*(2), 225–232. https://doi.org/10.1016/j.jbtep.2010.12.003

Gratz, K. L., & Roemer, L. (2004). Multidimensional assessment of emotion regulation and dysregulation: Development, factor structure, and initial validation of the difficulties in emotion regulation scale. *Journal of Psychopathology and Behavioral Assessment*, *26*(1), 41–54. https://doi.org/10.1023/B:JOBA.0000007455.08539.94

Greenberg, J., Reiner, K., & Meiran, N. (2012). "Mind the trap": Mindfulness practice reduces cognitive rigidity. *PLOS ONE*, *7*(5), Article e36206. https://doi.org/10.1371/journal.pone.0036206

Groen, Y., Priegnitz, U., Fuermaier, A. B. M., Tucha, L., Tucha, O., Aschenbrenner, S., Weisbrod, M., & Garcia Pimenta, M. (2020). Testing the relation between ADHD and hyperfocus experiences. *Research in Developmental Disabilities*, *107*, Article 103789. https://doi.org/10.1016/j.ridd.2020.103789

Hallion, L. S., Steinman, S. A., Tolin, D. F., & Diefenbach, G. J. (2018). Psychometric properties of the Difficulties in Emotion Regulation Scale (DERS) and its short forms in adults with emotional disorders. *Frontiers in Psychology*, *9*, Article 539. https://doi.org/10.3389/fpsyg.2018.00539

Hupfeld, K. E., Abagis, T. R., & Shah, P. (2019). Living "in the zone": Hyperfocus in adult ADHD. *Attention Deficit and Hyperactivity Disorders*, *11*(2), 1–18. https://doi.org/10.1007/s12402-018-0272-y

Jackson, S. A., & Eklund, R. C. (2002). Assessing flow in physical activity: The flow state scale-2 and dispositional flow scale-2. *Journal of Sport & Exercise Psychology*, *24*(2), 133–150. https://doi.org/10.1123/jsep.24.2.133

Jackson, S. A., & Marsh, H. W. (1996). Development and validation of a scale to measure optimal experience: The flow state scale. *Journal of Sport & Exercise Psychology*, *18*(1), 17–35. https://doi.org/10.1123/jsep.18.1.17

Jackson, S. A., Martin, A. J., & Eklund, R. C. (2008). Long and short measures of flow: The construct validity of the FSS-2, DFS-2, and new brief counterparts. *Journal of Sport & Exercise Psychology*, *30*(5), 561–587. https://doi.org/10.1123/jsep.30.5.561

Kaufman, E. A., Xia, M., Fosco, G., Yaptangco, M., Skidmore, C. R., & Crowell, S. E. (2016). The difficulties in emotion regulation scale short form (DERS-SF): Validation and replication in adolescent and adult samples. *Journal of Psychopathology and Behavioral Assessment*, *38*(3), 443–455. https://doi.org/10.1007/s10862-015-9529-3

Kessler, R. C., Adler, L. A., Gruber, M. J., Sarawate, C. A., Spencer, T., & Van Brunt, D. L. (2007). Validity of the World Health Organization Adult ADHD Self-Report Scale (ASRS) Screener in a representative sample of health plan members. *International Journal of Methods in Psychiatric Research*, *16*(2), 52–65. https://doi.org/10.1002/mpr.208

Kooij, J. J. S., Bijlenga, D., Salerno, L., Jaeschke, R., Bitter, I., Balázs, J., Thome, J., Dom, G., Kasper, S., Nunes Filipe, C., Stes, S., Mohr, P., Leppämäki, S., Casas, M., Bobes, J., Mccarthy, J. M., Richarte, V., Kjems Philipsen, A., Pehlivanidis, A., … Asherson, P. (2019). Updated European Consensus Statement on diagnosis and treatment of adult ADHD. *European Psychiatry*, *56*(1), 14–34. https://doi.org/10.1016/j.eurpsy.2018.11.001

Maes, J. H. R., Eling, P. A. T. M., Wezenberg, E., Vissers, C. Th. W. M., & Kan, C. C. (2011). Attentional set shifting in autism spectrum disorder: Differentiating between the role of perseveration, learned irrelevance, and novelty processing. *Journal of Clinical and Experimental Neuropsychology*, *33*(2), 210–217. https://doi.org/10.1080/13803395.2010.501327

Marty-Dugas, J., Howes, L., & Smilek, D. (2020). Sustained attention and the experience of flow. *Psychological Research*. Advance online publication. https://doi.org/10.1007/s00426-020-01433-x

Marty-Dugas, J., & Smilek, D. (2019). Deep, effortless concentration: Re-examining the flow concept and exploring relations with inattention, absorption, and personality. *Psychological Research*, *83*(8), 1760–1777. https://doi.org/10.1007/s00426-018-1031-6

Nelson, H. E. (1976). A modified card sorting test sensitive to frontal lobe defects. *Cortex*, *12*(4), 313–324. https://doi.org/10.1016/S0010-9452(76)80035-4

Ozel-Kizil, E., Demirbas, H., Bastug, G., Kirici, S., Tathan, E., Kasmer, N., & Baskak, B. (2013). P.7.b.012 A scale for the assessment of hyperfocusing in attention deficit and hyperactivity disorder. *European Neuropsychopharmacology*, *23*(Suppl. 2), S593. https://doi.org/10.1016/s0924-977x(13)70944-1

Ozel-Kizil, E. T., Kokurcan, A., Aksoy, U. M., Kanat, B. B., Sakarya, D., Bastug, G., Colak, B., Altunoz, U., Kirici, S., Demirbas, H., & Oncu, B. (2016). Hyperfocusing as a dimension of adult attention deficit hyperactivity disorder. *Research in Developmental Disabilities*, *59*, 351–358. https://doi.org/10.1016/j.ridd.2016.09.016

Payton, A. R. (2009). Mental health, mental illness, and psychological distress: Same continuum or distinct phenomena? *Journal of Health and Social Behavior*, *50*(2), 213–227. https://doi.org/10.1177/002214650905000207

Ripper, C. A., Boyes, M. E., Clarke, P. J. F., & Hasking, P. A. (2018). Emotional reactivity,

intensity, and perseveration: Independent dimensions of trait affect and associations with depression, anxiety, and stress symptoms. *Personality and Individual Differences*, *121*, 93–99. https://doi.org/10.1016/j.paid.2017.09.032

Ross, J., & MacIntyre, P. D. (2018). Differentiating flow experiences in physical versus mental activities: A sequential explanatory study. *Journal of Clinical Sport Psychology*. Advance online publication. https://doi.org/10.1123/jcsp.2018-0003

Rudaizky, D., Page, A. C., & MacLeod, C. (2012). Anxiety reactivity and anxiety perseveration represent dissociable dimensions of trait anxiety. *Emotion*, *12*(5), 903–907. https://doi.org/10.1037/a0025612

Ruscio, A. M., Seitchik, A. E., Gentes, E. L., Jones, J. D., & Hallion, L. S. (2011). Perseverative thought: A robust predictor of response to emotional challenge in generalized anxiety disorder and major depressive disorder. *Behaviour Research and Therapy*, *49*(12), 867–874. https://doi.org/10.1016/j.brat.2011.10.001

Schwartz, S. J., & Waterman, A. S. (2006). Changing interests: A longitudinal study of intrinsic motivation for personally salient activities. *Journal of Research in Personality*, *40*(6), 1119–1136. https://doi.org/10.1016/j.jrp.2005.12.003

Sedgwick, J. A., Merwood, A., & Asherson, P. (2019). The positive aspects of attention deficit hyperactivity disorder: A qualitative investigation of successful adults with ADHD. *Attention Deficit and Hyperactivity Disorders*, *11*(3), 241–253. https://doi.org/10.1007/s12402-018-0277-6

Seli, P., Smallwood, J., Cheyne, J. A., & Smilek, D. (2015). On the relation of mind wandering and ADHD symptomatology. *Psychonomic Bulletin & Review*, *22*(3), 629–636. https://doi.org/10.3758/s13423-014-0793-0

Serpell, L., Waller, G., Fearon, P., & Meyer, C. (2009). The roles of persistence and perseveration in psychopathology. *Behavior Therapy*, *40*(3), 260–271. https://doi.org/10.1016/j.beth.2008.07.001

Šimleša, M., Guegan, J., Blanchard, E., Tarpin-Bernard, F., & Buisine, S. (2018). The flow engine framework: A cognitive model of optimal human experience. *Europe's Journal of Psychology*, *14*(1), 232–253. https://doi.org/10.5964/ejop.v14i1.1370

Thrower, E., Bretherton, I., Pang, K. C., Zajac, J. D., & Cheung, A. S. (2020). Prevalence of autism spectrum disorder and attention-deficit hyperactivity disorder amongst individuals with gender dysphoria: A systematic review. *Journal of Autism and Developmental Disorders*, *50*(3), 695–706. https://doi.org/10.1007/s10803-019-04298-1

Weiss, N. H., Gratz, K. L., & Lavender, J. M. (2015). Factor structure and initial validation of a multidimensional measure of difficulties in the regulation of positive emotions: The DERS-Positive. *Behavior Modification*, *39*(3), 431–453. https://doi.org/10.1177/0145445514566504

Received October 1, 2020
Revision received May 19, 2021
Accepted May 29, 2021 ■