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Hyperfocus: Questionnaire Development and Associations with ADHD

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Abstract

Hyperfocus is a cognitive phenomenon in which an individual effortlessly concentrates on a task for a prolonged period of time whilst having a reduction in perception of surroundings, time and interoceptive needs. This paper looked to refine the definition of hyperfocus as well as explore its dimensionality by developing a questionnaire. Moreover, it also aimed to understand how ADHD relates to hyperfocus. To do this, 322 participants, mostly students from the University of Groningen, answered an initial item pool consisting of 46 items as well as an ADHD risk screener. An exploratory factor analysis identified five highly reliable dimensions of hyperfocus (Automatic Focus, Reduced Awareness, Time Distortion, Self-neglect, and Stopping and Initiating Things). Furthermore, a hierarchical regression looked to understand how these dimensions related to ADHD risk. Higher levels of ADHD risk were associated with higher levels of Reduced Awareness and Self-neglect as well as lower levels of Automatic Focus. No association was found between ADHD symptoms and Time Distortion or Stopping and Initiating Things. This paper has added onto previous literature of hyperfocus by refining its definition, supporting its multidimensionality, and supporting partial clinical utility in ADHD (some dimensions of hyperfocus may be related to ADHD risk). Further research should continue the development of this measure by conducting a confirmatory factor analysis, removing items that were not found to load on the factors and potentially rewriting items. Lastly, this questionnaire should be provided to clinical ADHD populations.

Keywords: Hyperfocus, Attention Deficit Hyperactivity Disorder, Questionnaire development

Hyperfocus: Questionnaire Development and Associations with ADHD

Hyperfocus: A Definition

Hyperfocus is a psychological construct defined variably throughout the literature. It can be generally described as a phenomenon in which a person is effortlessly concentrated in an inherently interesting activity to the extent that they lose track of time and surroundings (Ashinoff & Abu-Akel, 2019; Ozel-Kizil et al., 2016). The first mentions of the construct were noted in Brown (2005) wherein clinical interviews were carried out with patients and their family members (spouses or parents) regarding their daily experiences with ADHD symptomatology. Several reported experiencing a state of hypnosis or "laser focus" whilst performing tasks which were fun. When in these states, patients also described experiencing difficulties responding to or noticing both interoceptive needs as well as external stimuli. Furthermore, they felt extreme difficulty with shifting attention from the task at hand. Since then, the definition of the construct seems to have evolved with diverse authors focusing on different aspects of the concept. In Khal & Wahl's (2006) work on ADHD characteristics, there is a mention of hyperfocus as an ability to mobilize effort in tasks that are interesting to the individual. Slightly more complete is Schecklmann et al.'s (2008) definition of hyperfocus which emphasizes the lack of spatial awareness but leaves the loss of time perception absent. In these mentions, hyperfocus was used informally to describe a reported cluster of behaviors in ADHD patients. It was only with Ozel-Kizil et al.'s (2013) research on the concept that the development of an empirically supported definition started. This initial investigation of hyperfocus sparked other authors to develop the concept as well. With an attempt to create a comprehensive definition, Ashinoff & Abu-akel's (2019) review highlighted four general features of Hyperfocus (an intense state of concentration; a reduced perception of exterior stimuli while concentrating; the task must be interesting; task performance must be improved when in this state). This definition added onto Ozel-Kizil et al.'s (2013) definition with the

concept of “improved task performance”. Despite its seeming completeness, this definition failed to grasp the timelessness of hyperfocus as well as the “locking on” to the task associated with a failure to attend to the world/self. Currently, it seems that the most complete definition of the construct is the one proposed by Hupfeld et al. (2019) which argues that hyperfocus is:

> 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. (p.192)

Regardless, this definition and the previous mentioned differ in several aspects and thus, more research is needed in this field to further support either or none.

Previous questionnaires

In recent years, two questionnaires have been developed to measure hyperfocus. The first was developed by Ozel-Kizil et al. (2013) and intended to analyse hyperfocus in typically developing populations. With 11 items in total, the Hyperfocus Scale (HS) attempted to measure hyperfocus, time management as well as procrastination. They found hyperfocus to be associated with the other two concepts but to be a unidimensional concept. HS posed two main problems. Firstly, the few items (11) in it overlapped with executive dysfunction (such as functional impairments in time management or procrastination; Barkley, 2011). In this way, their EFA which intended to understand hyperfocus resulted in three factors separating different concepts (hyperfocus, time management and procrastination) rather than resulting in dimensions of one single construct (hyperfocus). This undermined the definition of the construct and reduced content validity. Secondly, the deficit-based approach to hyperfocus emphasized the negative consequences of hyperfocus whilst overlooking any positive aspects.

It is relevant to consider the latter as hyperfocus can be positively perceived by people with ADHD (Sedwick et al., 2019). Following Ozel-Kizil et al.,'s (2013) research, one other questionnaire was developed to understand hyperfocus. Hupfeld et al.'s (2019) "Adult Hyperfocus Questionnaire" (AHQ) aimed to understand the concept in terms of dispositional (overall tendency to experience an increased state of concentration while performing enjoyable or interesting activities regardless of the situation) and situational aspects (frequency of the phenomenon in particular situations). Alongside dispositional hyperfocus, three settings were included "school", "hobbies" and "screen time". The AHQ emphasized the positive aspects of the phenomenon as well as included a wider proposed definition of hyperfocus. However, some limitations were still present. The measurement of hyperfocus was restricted to rewarding experiences which may have affected the reported frequency of hyperfocus experiences by the participants (an example of an item from the questionnaire which shows this restriction is "Generally, when I am busy doing something I enjoy or something that I am very focused on, I tend to completely lose track of the time"). Furthermore, despite providing an operational definition which included six dimensions, the results of the factorial analyses only found three of these proposed dimensions to significantly explain hyperfocus (Failing to Notice the World; Failing to Attend to Personal Needs; and Getting "Stuck" on Small Details). This can be a result of item content overlap, item misrepresentation or even faulty item construction. In this way, an improved operationalized definition of hyperfocus is warranted.

Flow, perseveration and being "in the zone"

To construct an operationalized measure of hyperfocus, it is first necessary to understand whether hyperfocus may have been researched before under alternate names. Flow (Csikszentmihalyi, 1990; Judith, 1996), perseveration (Bombaci, 2012; Maes et al., 2011) and being "in the zone" (Stamatelopoulou et al., 2018) are all concepts which closely relate to

hyperfocus despite seemingly different origins and contexts. In Ashinoff & Abu-akel's (2019) literature review of hyperfocus, connections between this construct and flow as well as with being "in the zone" were established. They concluded from previous literature that "flow" is a synonym of hyperfocus and the act of being "in the zone" is distinct from hyperfocus. It is of note that these comparisons were made according to the previously mentioned four dimensions of hyperfocus only, which can be limiting. Later developed research contradicted these findings. Ayers-Glassey & MacIntyre's (2021) compared both perserveration- and flow-like characteristics in ADHD experiences of hyperfocus and concluded that although perseveration is a synonym of hyperfocus, flow correlated negatively with both perseveration and hyperfocus. Operationally speaking, the two mentioned papers conceptualized hyperfocus differently. Ayers-Glassey & MacIntyre (2021) utilized altered items from (to neutralize the positive and negative connotation of the experiences depicted in them). They found hyperfocus to be unidimensional and be defined with 11 characteristics. However, Ashinoff et al.'s (2019) considered it to be multidimensional with a four-characteristic definition. Hence, it seems hyperfocus could be more related to perseveration and less to flow than previously thought. With only very recent and scarse literature investigating the relations between concepts, clear connections between hyperfocus and flow/perseveration/being "in the zone" are yet to be established.

Hyperfocus in clinical settings

Different psychological fields develop independent research on their respective phenomena of interest. Hyperfocus had a pathological origin with multiple mentions in reports related to psychological disorders characterized by attentional disturbances namely ADHD, Autism and Schizophrenia (Ashinoff & Abu-Akel, 2019). Most hyperfocus research has been associated with ADHD. This is amongst the most prevalent and researched neurodevelopmental disorders and is characterized by impairments in attention,

(hyper)activity and/or impulsivity (American Psychiatric Association [APA], 1994; 2013). Alongside it, some articles on Schizophrenia and Autism have mentioned the concept. Nonetheless, both psychological disorders also have well established attentional problems. Schizophrenia's cognitive dysfunction (Luck & Gold, 2008) has been associated with a hyperfocusing hypothesis wherein hyperfocus stands for an intense use of cognitive resources to concentrate on a limited number of representations (Luck et al., 2014; 2019). Furthermore, a myriad of research has highlighted how autism spectrum patients demonstrate increased focus on specific behaviors or topics (Mayes, 2014; Clark, 2016; Fein, 2015; Bombaci, 2012). This particular behavioral demonstration has been addressed as hyperfocus, although as a part of stimming. Moreover, the previously mentioned concept of perseveration (which may or may not be a synonym for hyperfocus) is more commonly found in Autism literature to characterize unrelated fixation behaviors like stimming (Bombaci, 2012; Maes et al., 2011). Thus, there is some uncertainty regarding whether the hyperfocus in ADHD literature and hyperfocus in Autism literature (as well as perseveration) are all the same concepts. This is especially relevant considering the disorders all share cognitive features despite different etiologies and presentations (Park et al., 2018). Hence, the current item pool attempts a broader definition of hyperfocus. This definition aims to reflect different ways in which the varying diagnostic groups might experience hyperfocus.

ADHD and Hyperfocus

Focusing on ADHD, although originally thought to be a disorder limited to childhood, a myriad of research has gathered evidence otherwise (Kessler et al., 2006; Kooij et al., 2019; Wender et al., 2001). It is currently estimated that a total of 2.5 to 4.4% of the adult population suffers from the disorder (Searight et al., 2000; Seidman et al.,1998). Efforts to understand the aetiology of ADHD currently agree upon this disorder's complexity and multidimensionality with numerous genetic, environmental, and neurobiological components

(Nigg, 2005). Although the name suggests a disorder of attention, the impairments observed appear to be related to general executive dysfunction (Boonstra et al. 2005; Fuermaier et al. 2015). Thus, the existence of multiple ADHD patient reports depicting individual experiences of hyperfocus (Brown, 2005; Conner, 1994) seems paradoxical. Kaufmann et al. (2000) proposed a reconceptualization of ADHD as an attentional dysregulation rather than attentional deficit. This is in line with the state regulation theory which postulates that people with ADHD have difficulty with energy mobilization (Sergeant et al., 1999; van der Meere, 2002; 2005). In this hypothesis, these individuals have problems with matching task demands to the appropriate level of effort and thus perform worse in tasks which instigate suboptimal levels of stimulation such as slow/boring tasks or fast/overstimulating tasks (Sonuga-Barke et al., 2010). In this way, a situation of hyperfocus could occur when the tasks provide optimal stimulation levels. Furthermore, the disorder's timing deficits especially when adjusting behavior to timeframes can contribute to the timelessness described in the hyperfocus definition (Adler & Cohen, 2004; Noreika et al., 2013). Indeed, not only have these populations registered self-reported hyperfocus experiences but have also been found to suffer from higher levels of it than typically developing populations (Ayers-Glassey & MacIntyre, 2021; Ozel-Kizil et al., 2016; Hupfeld et al., 2019;). In this way, finding a correlation between ADHD symptom levels and hyperfocus levels can support a reconceptualization of attentional deficits in the disorder as well as allude to the potentially similar experiences of people with other attentional disorders. Thus, taking the considerations mentioned, this paper attempts to develop the construct of hyperfocus as well as understand its relationship with ADHD.

Present study

According to Loevinger's (1957) monograph for scale construction, to ensure construct validity, its three components must be present: substantive, structural and external validity (Clark & Watson, 2019). To ensure substantive validity (the extent to which an

instrument reflects the concept under observation; Holden & Jackson, 1979), the first step of the current study relied on analyzing the content of an initial item pool. Separating core hyperfocus (hyperfocus' definition) from its consequences (positive or negative) and determinants (situational, motivational, and task type) was essential. Since the construct of hyperfocus would later be derived from the data obtained from the questionnaire (via an EFA) it was relevant to add as many items with a certain degree of homogeneity as there were available to ensure content validity (Oosterveld et al., 2019). From the HS and AHQ, adaptations to their items originated homogenous item clusters (World Awareness, Time Awareness, Self-awareness, Stopping and Initiating Other Things and Narrow Focus). Additionally, other item clusters were added. One created for this research (Prolongued Concentration) and two others from questionnaires on a similar concept (Deep and intense focus as well as Automatic Focus; Marty-Dugas & Smilek, 2019).

The other relevant questionnaire was considered for the item construction was created by Marty-Dugas & Smilek (2019). They conceptualized flow as a deep effortless concentration. Two questionnaires were created to measure flow according to this definition with two different dimensions (internal and external as differentiated by whether the concentration was cognitive, through thinking or externally during physical actions). Part of the definition of hyperfocus has been associated with a deep effortless concentration (Hupfeld et al., 2019; Sedwick et al., 2019). Thus, some elements from these questionnaires were also included in the current research as a way to further ensure substantive validity. Lastly, to ensure structural validity of the current research, a factor analysis on the hyperfocus experiences was conducted. Items correlating with other items from the same content dimension induced structural validity.

The current research aims to develop and expand on an operationalized concept of hyperfocus by constructing a scale based on the items which have resulted from an initial

content analysis (initial item pool) and been proposed to be associated with hyperfocus. To do this, the items were given to a random sample whose answers resulted in factors according to the EFA. These, if correlated may represent dimensions of the construct. Then, a refined definition will arise as well as an understanding regarding the dimensionality of hyperfocus. Furthermore, the current research also aims to see whether the resulting dimensions associate with ADHD risk levels. If so, this might lead to clinical implications. For this latter goal, it is hypothesized that people with higher levels of ADHD will report higher levels of hyperfocus in accordance with previous literature (Ayers-Glassey & MacIntyre, 2021; Hupfeld et al. 2019; Ozel-Kizil et al., 2016). This study's outcomes attempt to represent second stage of questionnaire development that may eventually provide a methodological and valid concept of hyperfocus. Moreover, the outcomes should also include evidence supporting either a multi- or unidimensionality of the construct. Lastly, it should provide further evidence supporting/contradicting a connection between ADHD and hyperfocus.

Methods

Participants

The sample of the present study consisted of a total of 368 participants recruited via a first-year psychology program pool (SONA), a paid participants' pool hosted by the University of Groningen as well as via the researchers' social media (through Instagram and WhatsApp groups wherein a link to the paid participants' pool provided compensation). Of the total of participants, 46 were removed based on both the exclusion criteria (being at least 18 years of age and having completed participation) as well as quality checking procedures (providing self-reported valid answers, stating English language comprehension and following the instructions of all bogus items correctly). A majority (95%) of the sample were students or working students with the remaining participants (5%) either having a full-time job, volunteering position, self-employing or none of the above. Furthermore, the ages of the participants ranged from 18 to 54 with 88.2% being aged between 18 and 24 years old, 11.2% between 25 and 32 and 0.6% between 49 and 56 years old. In terms of nationality, 49.7% of participants were Dutch, 22.7% were German and the remaining 27.4% included diverse nationalities (for example, Austrian, Belgian, British, etc.). Regarding gender, the sample consisted of 240 females (74.5%), 79 males (24.5%) and three self-reported as 'other' (0.9%). Lastly, regarding the achieved education levels, a majority of participants classified for either the 5th or 6th level of education (highly educated) according to the ISCED (Table 1; UNESCO, 2012).

Table 1

Frequencies of the Education Levels of Participants

Levels	Counts	%
3	1	0.3
4	7	2.2
5	241	74.8
6	55	17.1
7	18	5.6

Note. Levels 1, 2 and 8 consisted of no counts and thus were not included in the table above.

Materials

Demographics and Personal Questionnaire

The participants answered seven demographic questions regarding age, nationality, mother-tongue, sex, highest attained level of education, country of highest attained level of education and current occupation or professional status. Moreover, they answered 10 personal information questions. Three of these were multiple choice questions and each had an integrated open question regarding specification on previously and current/recently acquired psychological diagnosis as well as medication regimes. The remaining questions were multiple choice and regarded smoking habits, alcohol intake, illegal drug intake and medication abuse.

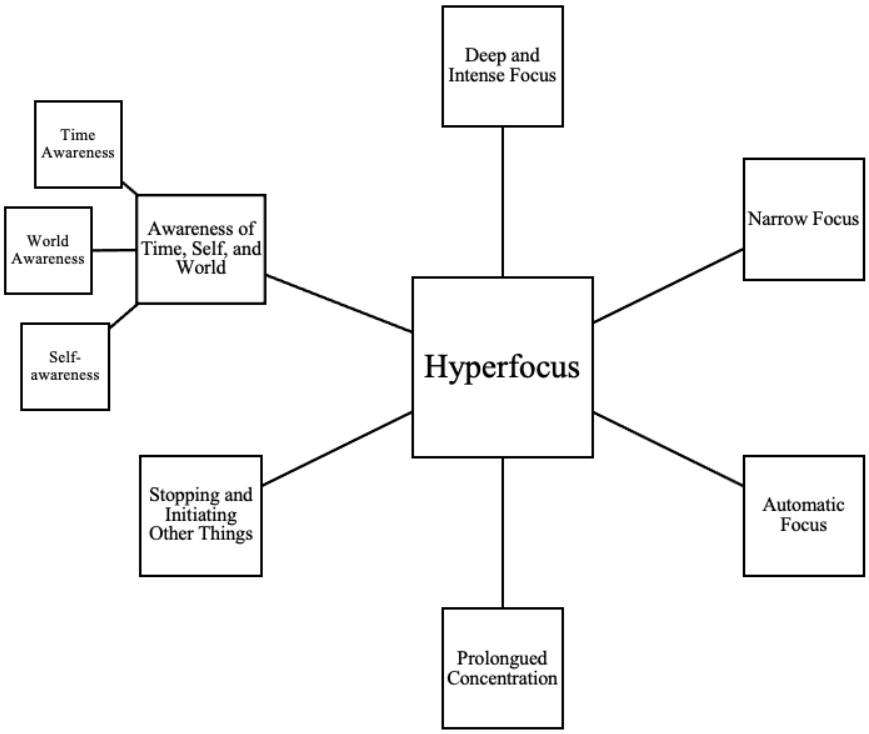
Core Hyperfocus Questionnaire

The novel questionnaire consisted of 46 items which were adapted from the HS (Ozel-Kizil et al., 2013), the dispositional subscale of the AHQ (Hupfeld et al., 2019), the questionnaires of effortless concentration (DECI and DECE; Marty-Dugas & Smilek, 2019) and novel items. The items were grouped into six homogenous item clusters. These were either based on the proposed dimensions of previous questionnaires (Awareness, which divided into 3 subsections, Awareness of world, time and self; Deep and intense focus; Stopping and initiating other things; Automatic focus; Narrow focus;) or newly created (Prolonged concentration) (see Figure 1). Each of the dimensions included six items, except for the dimension of Deep and intense focus which included only four. The individual items were to be answered in terms of frequency with a 6-point likert-scale (never, rarely, infrequently, sometimes, frequently, very frequently/always) regarding behavior in the previous six months. Two items (CH_32 and CH_33) were written inversely (being able to interrupt task they are focused on and being able to move on and start a new task) to account

for invalid ‘yea-saying’ or ‘nay-saying’ responding. These items’ coding was reversed when analyzing the data to match the remaining items. Furthermore, two explicit instructed response bogus items were included to account for careless responding (“Choose the answer “sometimes” to confirm that you have been paying attention.”). One additional hyperfocus item was formulated in an open question where participants were asked to state the average duration of their hyperfocus episodes (“You previously reported having had times when you were concentrating on something for a long time. What was the approximate/average duration of that/those period(s)?”) in terms of hours and minutes.

Figure 1

Illustration of Hyperfocus and its proposed dimensions



Note. The connections in the illustration do not imply correlation nor causation. The size of the letters does not indicate hierarchy between dimensions.

Adult ADHD Self-Report Scale (ASRS-v1.1) Symptom Checklist

For the present study, only part A of The Adult ADHD Self-Report Scale Symptom Checklist, ASRS screener, was used (ASRS-v1.1; Kessler, 2005). This includes six questions

regarding frequency of experienced ADHD symptoms in a 5-point Likert scale (Never, Rarely, Sometimes, Often and Very often). This measure has been reported to have adequate to high sensitivity and high specificity (Carlucci et al., 2017; Green et al., 2018; Kessler et al., 2005; Silverstein et al., 2008). For the current study, a bogus question was also added to detect careless responding. Participants were asked to focus on their behavior throughout the previous six months and choose the option that best suited their experience. Although the symptom checklist instructions included reference values for at risk individuals, these were not used. Separating those with at risk versus not at risk would pertain to a categorical view of ADHD. However, the current paper's sample consists of a healthy population and thus takes a dimensional approach. Hence, to classify the individual symptoms, the answers on the 5-point likert scales were summed from one to five according to the frequencies and a new variable ('TotADHD') was created to assess individual symptom severity.

Procedure

This study was approved by the Ethical Committee of Psychology of the University of Groningen. Additionally, it was fully held online. Both students as well as non-students were invited to participate through a link published on the researchers' social media as well as on an official participants' pool of the University of Groningen. Upon choosing to participate, they were given an introduction and information sheet followed by informed consent. In it, participants accepted that their data be utilized and stored until the end of the research and chose whether they wanted their personal data to be processed or not. After consenting to participating (not necessary for sensitive data), they were presented demographic questions. One of these questions regarded education levels. This question required a careful coding process with a team of researchers who compared the levels within different education systems according to the ISCED classifications and then ran a reliability check to ensure interrater reliability (UNESCO, 2012). Furthermore, the participants answered the Core

Hyperfocus Questionnaire as well as the ASRS screener. In addition, they also answered the sensitive information questions. In this section, skipping questions was possible and participants were given the option to do so if uncomfortable with answering them. Before receiving debriefing, they were asked two questions related to the validity of their answers ("Did you try to answer all questions in this survey seriously and honestly so that we can use your data in our research?" and "Do you think your level of English was good enough to answer the questions in the survey reliably?"). Lastly, they were given the debriefing message and redirected to the payment. The entirety of the study took the participants about 15 minutes to complete.

Data analysis

To address the first goal of the research, the assumptions for an exploratory factor analysis were checked (EFA). Normality of the hyperfocus' items answered by the participants was assessed through skewness and kurtosis values. Then, linearity was assessed for every hyperfocus item with Q-Q residual plots. In the final EFA, the sample size was deemed appropriate with the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy test (Kaiser & Rice, 1974). Furthermore, boxplots were used to highlight outliers. The outliers identified for each item pertained to different participants. Since most of the exposed participants did not appear more than once (by being an outlier in more than one item), no participants were excluded. Lastly, the Bartlett's (1954) test of sphericity confirmed the factorability of the correlation matrix. The EFA was run to identify the main dimensions (factors) of hyperfocus. To aid this analysis, a parallel analysis was conducted to determine the number of factors to be retained in the EFA. These were run multiple times alongside item exclusions on the basis of low communalities (below 0.2) (Child, 2006), low factor loadings (below 0.3) (Kite & Whitley, 2018), loading on multiple factors or loading on no factor.

Using the resulting factors created from the EFA, the dimensions of hyperfocus were determined. Then, participant averages on the items corresponding to the EFA factors were used as independent variables for a hierarchical regression. The dependent variable was the individual sum of the ADHD self-reported symptom scores. A forward selection method based on semi-partial correlations between ADHD symptoms and the different factors was used to identify relevant hyperfocus dimensions as explanatory variables for ADHD symptoms. For this, the assumptions for a hierarchical regression were checked (linearity of the model via partial regression plots, normality of the conditional distribution of y via the Shapiro Wilk test, homoscedasticity via scaterplots and a randomly selected sample). All statistical analyses were conducted via Jamovi, Version 2.3 (Jamovi, 2022) with its add-on packages (Fox & Weisberg, 2020; Kim, 2015; R Core Team, 2021; Revelle, 2019).

Results

Exploratory Factor Analysis

Before conducting the EFA, its assumptions were checked. Using Curran et al.'s (1996) reference interval levels for kurtosis (-7 and 7) and skewness (-2 to 2) there were no violations despite some suspicious items having skewness values close to either 1 or -1 (CH_26, CH_CH_ 10, CH_27, CH_44, and CH_45). According to Bulmer's (1979) rules of thumb, these values could be considered moderately skewed. Despite performing several transformations (Log10, Square root, cube root), these values did not improve and hence, the data was kept without transformations. This did not pose a problem since it has been argued that slight violations of normality may not be problematic for an EFA as long as there are no linearity violations. Regarding linearity, this assumption was not violated as seen via Q-Q residual plots. Moreover, according to Tabachnick & Fidell (2013), appropriate sample size depends on the correlations within a sample, however, the data respects the advised rule of thumb of 300 participants minimum. To provide further support, the final EFA showed an overall measure of sampling accuracy of 0.93 in the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy test (indicating appropriate sample size). The presence of multivariate outliers in all items was analyzed with boxplots and no significant outliers were spotted. Then, to assess the assumption of factorability of the correlation matrix, the Bartlett's (1954) test of sphericity was used. This test yielded significant results indicating that the use of an EFA is appropriate for this data ($X^2 = 4352$, $df = 378$, $p = <.001$).

Additional item exclusions were performed beyond the already mentioned in the methods. Items with insignificant correlations ($r < .1$) with more than two items were discarded from the research (CH_33_Trans and CH_32_Trans). Additionally, a minimum residuals extraction was performed to understand communalities. Items with communalities lower than 0.2 were excluded from further analysis as an attempt to reduce noise within the data (items CH_22, CH_24, CH_39 and CH_46) (Child, 2006).

Upon conducting the previous steps, the EFA was then run with 40 items. Alongside the EFA, a parallel analysis was also conducted (with minimum residuals as extraction) to divide the items by factors. In this analysis, the eigenvalues from the current sample were compared to those generated by a Monte-Carlo simulated matrix based on a randomly generated sample of the same size and number of variables. This analysis indicated a total of five factors. Although the eigenvalues revealed potentially four factors grouping the items (as evidenced by values above 1), the confidence interval produced by the parallel analysis indicated that an additional factor could be included (with an eigenvalue above 0.75). After opting for minimum residuals as extraction and setting the minimum factor loadings to 0.4, different rotations were performed (varimax, quartimax, promax, simplimax and oblimin). Promax deemed the best results and thus was the most suitable rotation. Items which loaded on more than one factor or did not load on any factor were removed (CH_16, CH_19, CH_25, CH_27, CH_28 and CH_34). A final EFA was conducted (with minimum residuals as extraction method, promax rotation) with 28 items (Table 2). The resulting five factors had high loadings and at least three items per factor as is recommended (Velicer & Fava, 1988). Furthermore, the factors had medium to high correlations with one another (ranging from 0.5 to 0.7) except when it came to factor 2 which demonstrated medium to low correlations (ranging from 0.3 and 0.4) (view Table A1 in the Appendix).

Regarding factor 1, this included items from multiple clusters generally related to a wider concept of Reduced Awareness (World Awareness, CH_1, CH_2, CH_4, CH_5, CH_6; Time Awareness, CH_7; Self-awareness, CH_17, CH_18; Narrow Focus, CH_20). Additionally, it explained the largest proportion of variance in hyperfocus (14.27%). The reliability analysis for this factor indicated high values (α = .87, ω = .87) wherein the World Awareness items included some of the highest item-rest correlations. Furthermore, deleting the item which did not match the content of this factor (CH_20, related to being able to focus

on something and ignoring other stimuli) did not increase the Cronbach's α nor the McDonald's ω (α =.84, ω =.85) and thus was not deleted. The use of two internal consistency measures stemmed from the Cronbach's α reported underestimation of reliability (McNeish, 2018). No other items warranted deletions with regards to the reliability analysis (find item reliability statistics for all factors in the Appendix, from Table A2 to Table A6).

Regarding factor 2, the items included related mostly to the homogenous composite of Automatic Focus (CH_35, CH_36, CH_37, CH_38, and CH_40). Although this factor includes an unrelated item according to the clusters (CH_23), it is also the item with the least item-rest correlation. The reliability analysis for this factor revealed high a Cronbach's α (α = .87) and a high McDonald's ω (ω = .87). Additionally, if item CH_23 is dropped, the Cronbach's α and McDonald's ω are slightly lower (.86 and .86, respectively). Hence, it was kept in the factor. Furthermore, this factor explained the second largest proportion of variance in hyperfocus with a total of 13.53%.

Regarding factor 3, the reliability analysis reported lower scale reliability statistics than factors 1 and 2 (α = .85, ω = .85). Moreover, it explained 9.25% of variance in hyperfocus. This same factor, denominated as "Self-neglect", included three items from the cluster Self-awareness (CH_13, CH_14 and CH_15) and one item from the cluster Stopping and Initiating Other Things (CH_31). Just as in the previous factor, the item which seemingly did not belong to the same cluster as the other items had parsimonious sentence formulation and content (not being able to interrupt a task even for basic needs tasks). Additionally, if this item were dropped, the Cronbach's α and McDonald's ω would be reduced (α = .81, ω = .81). Hence, CH_31 was kept in the factor.

Regarding factor 4, the reliability analysis reported scale reliability statistics slightly lower than the previous factors (α = .84, ω = .84). This factor included 4 items belonging to cluster Time Awareness (CH_8, CH_9, CH_11and CH_12) and one from Prolonged

Concentration (CH_44). It is of note that the item formulation of CH_44 resembled the content of the Time Awareness cluster (having been surprised at a lengthy concentration period). However, it constitutes the item with the lowest item-rest correlation of the factor. Additionally, when it is dropped, the McDonald's ω increases (ω = .85) (find remaining item reliability statistics for factor in the Appendix). Thus, the item CH_44 was excluded from the factor. Even then, the factor explained a slightly higher proportion of variance in hyperfocus than the previous factor (9.35%).

Finally, regarding factor 5, the reliability analysis reported the lowest scale reliability statistics (α = .72, ω = .72) and lowest proportion of explained variance in hyperfocus (4.78%). With two items belonging to the cluster Stopping and Initiating Other Things (CH_29 and CH_30), and one item belonging to the Prolonged Concentration cluster (CH_43), this factor consists of only three items. However, the dimension captured clearly relates to the concept of Stopping and Initiating Other Things, including item CH_43 (being able to be so concentrated that it is hard to shift attention). Since this factor has the minimum recommended number of items (Velicer & Fava, 1988) it is not wise to delete any as to not compromise construct validity.

Table 2

Exploratory Factor Analysis

	Factor					
	1	*2*	*3*	*4*	*5*	Communalities
CH_5	0.80					0.60
CH_4	0.80					0.66
CH_6	0.77					0.53
CH_1	0.68					0.52
CH_18	0.56					0.33
CH_20	0.53					0.54
CH_7	0.44					0.30
CH_2	0.42					0.40
CH_17	0.37					0.25
CH_40		0.81				0.58

	Factor					
	1	*2*	*3*	*4*	*5*	Communalities
CH_37		0.77				0.60
CH_35		0.77				0.58
CH_42		0.68				0.54
CH_36		0.65				0.51
CH_38		0.60				0.44
CH_23		0.56				0.35
CH_13			0.77			0.62
CH_15			0.76			0.62
CH_14			0.74			0.55
CH_31			0.74			0.59
CH_8				0.96		0.75
CH_12				0.68		0.62
CH_9				0.58		0.50
CH_11				0.56		0.56
CH_44				0.45		0.30
CH_29					0.65	0.53
CH_30					0.60	0.51
CH_43					0.49	0.44

Note. 'Minimum residual' extraction method was used in combination with a 'promax' rotation.

Hierarchical Regression

Before checking the assumptions of the multiple regression, the data was prepared. The individual participant average score of the items for each factor was calculated. In this way, five new variables corresponding to the participants average self-report on each hyperfocus dimension were made (Factor1_Reduced_Awareness, Factor2_Automatic_Focus, Factor3_Self_Neglect, Factor4_Time_Distortion and Factor5_StopInitiate). The assumptions for a hierarchical regression were all met except for normality (for the independent variables mentioned above as well as for the dependent variable, TotADHD; view them in the Appendix, Tables A7 and A8 as well as Figures A1 to A11). Hence, all five factors as well as ADHD scores were standardized and the respective transformations were used as independent (RA, for factor 1, Reduced Awareness; AF, for factor 2, Automatic Focus; SN for factor 3,

Self-Neglect; TD, for factor 4, Time Distortion; and SI for factor 5, Stopping and Initiating Other Things) and dependent (ADHD_Stand) variables in the regression.

In the present forward selection hierarchical regression, the independent variables were added according to their semipartial correlations (highest to lowest). Results indicated that AF, RA and SN were significant predictors for ADHD_Stand whereas TD and SI were not (Table 3). Moreover, the adjusted proportion of explained variance increases from the addition of factors AF, SN and RA, remains the same with factor TD and decreases with factor SI (Table 4). The best model to explain ADHD risk includes only factors AF, SN and RA (Table 5).

Table 3

Coefficients and Semipartial Correlations

Predictor	Estimate	*SE*	*t*	*p*	*sr*
Intercept	-0.0	0.05	-0.0	1.000	-
AF	-0.58	0.06	-10.12	< .001	-.41
SN	0.28	0.06	4.61	< .001	.19
RA	0.17	0.08	2.28	.023	.08
TD	0.05	0.07	0.73	.467	.03
SI	0.05	0.06	0.75	.452	.03

Note. The table depicts Model 5, which consisted of the standardized versions of Factor1_Reduced_Awareness (RA), Factor2_Automatic_Focus (AF), Factor3_Self_Neglect (SN), Factor4_Time_Distortion (TD), Factor5_StopInitiate (SI). The dependent variable was ADHD_Stand.

Table 4

Model Fit Measures

Model	*R*	R^2	Adjusted R^2
1	.35	.12	.12
2	.52	.27	.26
3	.54	.29	.28
4	.54	.29	.28
5	.54	.29	.28

Note. Model 1 consisted of variable AF (Automatic Focus) only.
Model 2 consisted of variables AF and SN (Self-Neglect).
Model 3 consisted of variables AF, SN and RA (Reduced Awareness).
Model 4 consisted of variables AF, SN, RA and TD (Time Distortion).
Model 5 consisted of variables AF, SN, RA, TD and SI (Stopping and Initiating Other Things).

Table 5

F-change Statistics

Model Comparisons	*F*	df_2	*p*
1-2	62.39	319	<.001
2-3	10.34	318	.001
3-4	0.72	317	.398
4-5	0.57	316	.452

Note. Model 1 consisted of variable AF (Automatic Focus) only.
Model 2 consisted of variables AF and SN (Self-Neglect).
Model 3 consisted of variables AF, SN and RA (Reduced Awareness).
Model 4 consisted of variables AF, SN, RA and TD (Time Distortion).
Model 5 consisted of variables AF, SN, RA, TD and SI (Stopping and Initiating Other Things).

Discussion

The primary goal of the present study was to develop and expand on the concept of hyperfocus through an exploratory factor analysis on an initial item pool (a). Furthermore, within this goal, this research aimed to understand whether hyperfocus is unidimensional or multidimensional (b). The secondary goal looked to investigate the relation between hyperfocus experiences and ADHD risk.

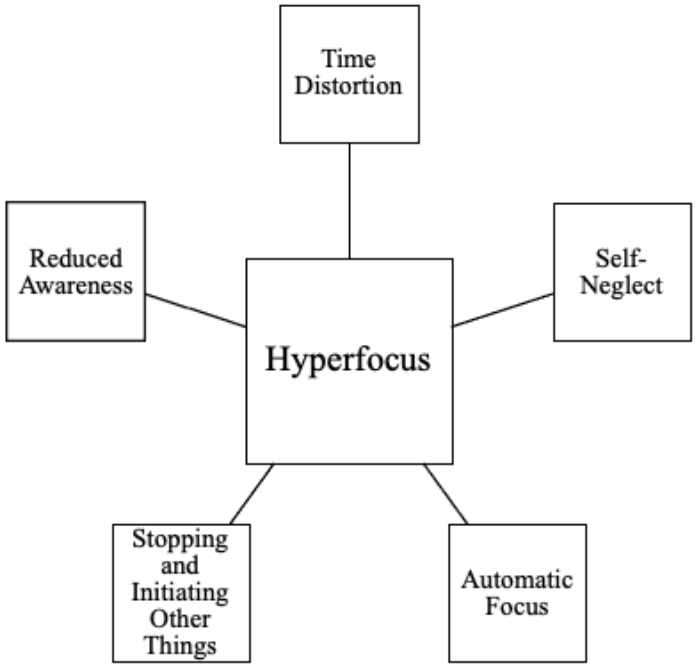
Regarding the primary goal, the initial item pool consisted of some items from already existing questionnaires (Hupfeld et al., 2019; Marty-Dugas & Smilek, 2019; Ozel-Kizil et al., 2013) and novel ones. These items were grouped into six proposed homogenous composites which aimed to represent dimensions of hyperfocus. One of these proposed dimensions (Awareness) was divided into three (Figure 1; World Awareness, Self-awareness, and Time Awareness). Of the total eight proposed dimensions, only five were found by the EFA. However, these did not fully match the original composites. Hence, they were named according to their constituting items: Automatic Focus, Reduced Awareness, Self-neglect, Time Distortion, and Stopping and Initiating Other Things (Figure 2). The dimensions which were originally expected to result from the research but did not, included the subdimension World Awareness from the proposed dimension Awareness, Deep and Intense Focus, Narrow Focus and Prolonged Concentration.

With an interest on these latter dimensions, although Narrow Focus, World Awareness and Prolonged Concentration loaded on to other dimensions, Deep and Intense Focus did not. Regarding the first three, these findings suggest that perhaps these homogenous item composites should not be viewed as separate dimensions but rather integrated in other dimensions. In this way, item CH_44, for instance, which loaded on Time Distortion but belonged to Prolonged Concentration, may be incorporated in the first. Regarding Deep and Intense Focus, the current findings could be due to a lower item count in the homogenous

item composite than of others (four items in comparison to six items in all other clusters). Having additional items may originate different results. Nonetheless, the findings indicate that Deep and Intense Focus is neither a major dimension of hyperfocus (although confirmation by other studies is needed), neither does it seem to be related to the concept.

Figure 2

Illustration of Hyperfocus and its found dimensions



Note. The connections in the illustration do not imply correlation nor causation. The size of the letters does not indicate hierarchy between dimensions.

The factor Reduced Awareness included items from all the subsections of the proposed item composite Awareness (self-awareness, time awareness and world awareness) as well as items from Narrow Focus. This was the most relevant dimension in hyperfocus, explaining the highest variance in the construct (14.27%). It included adapted items from the work of Hupfeld et al. (2019), Ozel-Kizil et al. (2013) and additional ones. In their work, Hupfeld et al. (2019) found the dimensions “Failing to notice the world” (from which adapted items created “World Awareness”) and “Failing to attend to personal needs” (from which adapted items created the proposed “Self-awareness” dimension) to be dimensions of

hyperfocus but not “Losing track of time” (from which adapted items created the proposed “Time Awareness” dimension). The two found factors alongside “Getting stuck on small details” (from which some items were adapted to create the proposed dimension “Narrow Focus”) were the only three which constituted hyperfocus in their research (apart from the setting related factors). The present research seems to suggest that unlike the work of Hupfeld et al. (2019), factors Narrow Focus and World Awareness may not be major dimensions of hyperfocus but Time Distortion may. The findings of Self-awareness as a hyperfocus dimension were in line with Hupfeld et al.’s (2019) research. Then, the factor Automatic Focus was found to explain the second largest variance in hyperfocus (13.53%). Composed of the items from the corresponding homogenous item composite as well as an item from Narrow Focus, this dimension was adapted from the work of Marty-Dugas & Smilek (2019). This was not investigated by previous hyperfocus questionnaires (Hupfeld et al., 2019; Ozel-Kizil et al., 2013). These results show a novel dimension of hyperfocus that was previously only associated with flow. Furthermore, Self-neglect (explaining 9.25% of variance) included elements from the corresponding homogenous item composites of Awareness (self-awareness) and one from Stopping and Initiating Other Things (related to not being able to take a break for the toilet or food). Since there was a pattern of neglect of interoceptive needs as opposed to a general lack of self-awareness, this dimension was named differently than the proposed (Self-awareness versus Self-neglect). Its constituting items were adapted from the work of Hupfeld et al. (2019) (either from Failing to attend to personal needs or Difficulty stopping and moving on to a new task). Alike the current research, the authors’ EFA found this dimension to be significant for hyperfocus. Then, the dimension of Time Distortion explained 9.35% of variance in hyperfocus. It included items from the homogenous composite of Awareness (Time Awareness) and one from Prolonged Concentration (related to being surprised at the length of time spent concentration). With content related to time

misperception and items mismatching with the proposed composite (Time Awareness), this dimension was named differently (Time Distortion). Most of its items were the result of adaptations from the work of Hupfeld et al. (2019) (Losing track of time). Although these authors did not find this dimension to be significant in hyperfocus, the earlier work done by Ozel-Kizil et al. (2013) had found "Time Management" to be a factor of their EFA. Hence, for this dimension, the current findings are in line with those of Ozel-Kizil et al. (2013) but not with those of Hupfeld et al. (2019).

The dimension of Stopping and Initiating Things explained the least variance in hyperfocus (4.78%). However, like the other found dimensions, this one had significant reliability (high Cronbach's α and McDonald's ω). It was composed of two items from the original homogenous item composite of Stopping and Initiating Other Things as well as one item from Prolonged Concentration. Furthermore, as previously mentioned, this factor was composed of adapted items of the dimension "Difficulty stopping and moving on to a new task" from Hupfeld et al. (2019). Although the current research found this dimension to be significant in hyperfocus, Hupfeld et al.'s (2019) EFA did not. The differing outcomes may be due to the adaptations of Hupfeld et al.'s (2019) items that were used in the current study. Nonetheless, this represents a strength of the current study. In this way, the several differences in findings now stated reveal a need for further research on the concept as well as its dimensions.

The current work adds onto previous literature by continuing the development of an operationalized definition of hyperfocus. Through the findings, the construct can be defined as a state of increased concentration during a given task wherein the individual experiences a sense of automatic focus, reduced awareness of the environment, distorted time perception, neglect of interoceptive needs and difficulty task switching. Up until now the definitions of the phenomenon that seemed most valid were those of Ozel Kizil et al (2013), Hupfeld et al.

(2019) and Ashinoff & Abu-akel (2019). However, all have been argued to have significant limitations. The first is seemingly incomplete as it fails to include several aspects of hyperfocus (namely, Automatic Focus and Stopping and Initiating Other Things). The second, although more complete, did not include aspects related to Automatic Focus and their EFA did not support the Time Distortion or Stopping and Initiating Other Things. Lastly, the review of Ashinoff & Abu-akel (2019) fails to include the difficulties with Stopping and Initiating other Things and the ability of the individual to effortlessly engage in a task (Automatic focus). The current questionnaire avoids the abovementioned limitations by including items from different questionnaires with a focus to expand the concept. The results of this research are further supported by medium explained variance in hyperfocus and adequate correlations amongst dimensions indicating that they measure the same construct.

Addressing the second part of the first goal, this study suggests that hyperfocus is a multidimensional construct. The multidimensionality of hyperfocus had been hypothesized by Brown (2006) and later operationally investigated by the questionnaire of Hupfeld et al. (2019). Although both supported the idea that hyperfocus is a multi-faceted construct, the earlier work of Ozel-Kizil et al. (2016) argued for unidimensionality. In this work, they found very small factors (hyperfocus, impaired time management and procrastination) in which hyperfocus is concluded to be a single factor. However, it is relevant to mention that with only 5 items aimed at measuring solely hyperfocus, the scale may have an overly narrow grasp on the construct. Thus, it may have insufficiently explored hyperfocus to create a valid definition. In this way, the evidence gathered in this study supported multidimensionality. Yet, no claims regarding dimensionality can be made yet since a CFA must first be conducted.

The secondary goal of the present study focused on the potential clinical relevance of hyperfocus, particularly for ADHD. Multiple scientific sources have investigated the

phenomenon of hyperfocus in patients with ADHD and found a more pervasive occurrence in such populations in comparison to typically developing ones (Hupfeld et al., 2019; Ozel-Kizil, 2016; Sklar, 2013). Using the 5 factors of hyperfocus from the EFA, an association between ADHD risk levels and most factors was found. It appears that higher levels of self-reported Reduced Awareness (of world, time and self in general) as well as Self-neglect were both related to higher ADHD risk levels. However, higher levels of Automatic Focus were associated with lower ADHD risk levels (see Table 3). Additionally, dimensions Time Distortion and Stopping and Initiating Things were not related to ADHD risk. Hence, with only two dimensions (Reduced Awareness and Self-neglect) being positively related with ADHD risk it seems that the hypothesis which stated that individuals with higher ADHD risk levels would self-report higher levels of hyperfocus is only partially supported.

Higher levels of Automatic Focus were related to lower levels of ADHD risk. More surprisingly so, this dimension deemed the second largest proportion of explained variance in risk of ADHD as a dependent variable. It appears that people with higher levels of ADHD may be sheltered from the experience of hyperfocus due to their difficulties with concentration and thus, with Automatic Focus. However, this does not necessarily lead to a reduction in the experience of hyperfocus as higher levels of ADHD were also associated with higher levels of other dimensions (Reduced Awareness and Self-neglect) which facilitate the occurrence of hyperfocus. A potential explanation for automatic focus relating negatively with hyperfocus regards the state regulation theory. The items in the present questionnaire asked about frequency of experiences. Since people with ADHD require optimal conditions to effortlessly focus on a task (Sonuga-Barke et al., 2010), it is understandable that they may experience such conditions less often than those who can mobilize energy. Hence, the smaller window of opportunity for those with ADHD hinders the experience of hyperfocus. In this way, further research could analyze how different populations report automatic focus and

hyperfocus experiences to compare the currently found proportion of explained variance (clinically diagnosed ADHD populations versus typically developing, for instance).

Higher levels of Self-neglect were related to higher levels of ADHD risk. Little research has been conducted on interoceptive awareness and subsequent regulation on ADHD populations and the results are currently mixed. The present findings are in line with a recent study by Kutscheidt et al. (2019). They found that patients with ADHD had less internal bodily signal awareness as well as deficits in monitoring and regulating own overt behaviors. However, the present findings oppose an earlier paper by Wiersema et al. (2018) which found insignificant differences between ADHD and typically developing populations when it came to interoceptive awareness during tasks. In this way, the current findings spark an interest in understanding how interoceptive awareness and subsequent regulation may be associated with ADHD symptomatology. Thus, further research on this topic is recommended.

Lastly, the dimensions of Time Distortion and Stopping and Initiating Other Things were insignificantly related to ADHD symptoms. These results are unexpected in that both these dimensions have been associated with ADHD. Losing track of time as well as misperceiving time have both been noted as more pervasive in both children as well as adults with ADHD when compared to typically developing populations (Meaux & Chelonis, 2003; Nielsen, 2020; Ptacek et al., 2019; Smith et al., 2002). Additionally, difficulties with Stopping and Initiating Other Things, or task-switching, constitute higher-order processes which have been consistently associated negatively with ADHD (Cepeda et al., 2000; King et al., 2007). One possible explanation for these results relates to the sample of this paper which consisted of a mainly high functioning population (as mentioned earlier) which may not display levels of ADHD risk high enough to report difficulties with the abovementioned dimensions (maximum achieved level of ADHD risk was 24/30). Future research should investigate how

clinical populations compare to typically developing populations when it comes to hyperfocus experiences.

The abovementioned findings regarding the relationship between ADHD and hyperfocus seem to indicate that different dimensions of the phenomenon relate positively (Reduced Awareness and Self-neglect) and negatively (Automatic Focus) with the experience of ADHD symptoms. In this way, higher individual ADHD symptom severity serves as a potential risk factor as well as a protective factor when it comes to hyperfocus experience. Hence, the dimensions which correlate with ADHD (Automatic Focus, Self-neglect and Reduced Awareness) show promise for the development of a future clinical measure.

Limitations

Firstly, although significant differences were found between the relationships of the hyperfocus dimensions (represented by the factors) and varying ADHD risk levels, the factors explained a low proportion of variance in ADHD. Together, the five factors explained no more than 29.2% of ADHD risk levels (if adjusted then only 28%). This is especially concerning since factor Reduced Awareness, which had statistical significance, added only 2.4% of variance. Future research should conduct studies with clinical ADHD populations to understand whether the found connections (between ADHD and the factors Reduced Awareness, Automatic Focus and Self-neglect) are stronger. Additionally, the current findings do not necessarily generalize to other attentional disorders. Thus, further research should investigate the experience of hyperfocus, and respective dimensions, in other psychiatric disorders related to attentional dysregulations (namely, autism and schizophrenia).

Secondly, it is of note that many of the items (31 in 46) were constructed as “I can (…)”. This type of sentence construction may illicit a sense of identity rather than action. For instance, items such as CH_42 (being able to concentrate for a long time with no break), suggest an ability or conscious behavior from the individual. This nuance could have affected

how participants reported their hyperfocus experiences (mainly those with higher levels of ADHD risk who appear to negatively correlate with Automatic Focus). Items which started with “There have been times (…)” do not impose necessarily a regular occurrence of said behavior but rather that such experience has happened to the individual before. A suggestive alteration could be to phrase the items in a more impersonal form (e.g. a suggestion for CH_42 rewording would be that the individual has, in the past, concentrated for a long time with no break).

Then, Deep and Intense Focus was the only dimension which did not load on any of the remaining. As mentioned earlier, this could be due to the number of constituting items (only four instead of six). Thus, items should be added to the dimension to understand whether this impacted the loading of this dimension on hyperfocus. Furthermore, since the current study is only a second stage of questionnaire development, further research should attest whether this study achieved full coverage of all construct domains by adding new items.

The last limitations of this study involve the sample used. Most of the participants (70.8%) were recruited from the University of Groningen’s first-year Psychology program (SONA). This brings two separate limitations. Firstly, the population in the sample at hand may not reflect the target population for this paper (typically developing with multiple levels of socioeconomic status, age, education levels, etc.). In the Netherlands, it has been estimated that around 15% of people complete a university degree (Maslowski, 2020). Furthermore, between 2 to 8% of university student are diagnosed with ADHD (DuPaul et al., 2009). This small highly educated population neither represents extreme nor average levels of ADHD (as would be expected from either a clinical or a general population sample, respectively). Thus, future studies should investigate samples of individuals with multiple education backgrounds and clinical populations of ADHD. Secondly, the students recruited via SONA were required by their study program to complete experiments in exchange for credits. Thus, concerns

regarding the voluntary aspect of the research are raised. Further research should not include credit-bound recruitment of participants.

Implications

The current research adds onto the previously investigated concept of hyperfocus in that it incorporates adapted versions of items from not only hyperfoccus questionnaires (HS and AHQ) but also questionnaires on Flow (DECI and DECE). These lead to a redefinition of the concept of hyperfocus. Future developments in the field should aim to conduct a CFA to attest whether the present findings are corroborated. In addition, if confirmed by further studies, the identified dimensions that were related to ADHD may spark future investigation. This is especially related to the nature of the relationship between ADHD and hyperfocus. Additionally, future investigation should try to understand how other attentional psychiatric disorders may relate to hyperfocus. From this research, future work may revolve around the clinical validation of the measure with potential for establishing it as a transdiagnostic tool.

Conclusion

This paper looked to expand and develop an operationalized definition of hyperfocus and understand its dimensionality. It also looked to understand if/how hyperfocus related to ADHD risk. In this second step at item pool analysis for scale construction, dimensions of hyperfocus were identified (Reduced Awareness, Automatic Focus, Self-neglect, Time Distortion and Stopping and Initiating Things). These allowed for a refined and empirically supported definition of the concept. Futhermore, this research also gathered evidence supporting multidimensionality. Lastly, ADHD seems to be related to some dimensions of hyperfocus (Reduced Awareness, Automatic Focus, and Self-neglect) that can lead to future clinical measure developments for a better understanding of ADHD experiences of hyperfocus. Lastly, it is advised that a CFA is run with the dimensions found to structurally validate the findings.

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Appendix A

Table A1

Correlation Matrix for Standardized Factors

	RA	*AF*	*SN*	*TD*
RA	-			
AF	.54	-		
SN	.59	.34	-	
TD	.67	.43	.54	-
SI	.57	.41	.5	.51

Note. The table depicts the standardized versions of Factor1_Reduced_Awareness (RA), Factor2_Automatic_Focus (AF), Factor3_Self_Neglect (SN), Factor4_Time_Distortion (TD), Factor5_StopInitiate (SI).

Table A2

Item Reliability Statistics for Factor1_Reduced_Awareness

Item	Item-rest correlation	if item dropped	
		Cronbach's *α*	McDonald's *ω*
CH_1	.63	.85	.85
CH_2	.57	.85	.86
CH_4	.74	.84	.84
CH_5	.69	.84	.85
CH_6	.64	.85	.85
CH_7	.49	.86	.87
CH_17	.45	.87	.87
CH_18	.52	.86	.87
CH_20	.68	.84	.85

Table A3

Item Reliability Statistics for Factor2_Automatic_Focus

Item	Item-rest correlation	if item dropped	
		Cronbach's *α*	McDonald's *ω*
CH_23	.55	.86	.86
CH_35	.67	.85	.85
CH_36	.64	.85	.85
CH_37	.72	.84	.84
CH_38	.60	.86	.86
CH_40	.69	.85	.85
CH_42	.65	.85	.85

Table A4

Item Reliability Statistics for Factor3_Self_Neglect

Item	Item-rest correlation	if item dropped	
		Cronbach's *α*	McDonald's *ω*
CH_13	.70	.80	.81
CH_14	.67	.82	.82
CH_15	.70	.81	.81
CH_31	.69	.81	.81

Table A5

Item Reliability Statistics for Factor4_Time_Distortion

Item	Item-rest correlation	if item dropped	
		Cronbach's α	McDonald's ω
CH_8	.72	.78	.79
CH_9	.63	.81	.81
CH_11	.66	.80	.81
CH_12	.72	.78	.79
CH_44	.49	.84	.85

Table A6

Item Reliability Statistics for Factor5_StopInitiate

Item	Item-rest correlation	if item dropped	
		Cronbach's α	McDonald's ω
CH_29	.55	.63	.64
CH_30	.56	.62	.62
CH_43	.53	.65	.65

Table A7

Shapiro Wilk's test for normality

	SD	Shapiro-Wilk *W*	Shapiro-Wilk *p*
Factor1_Reduced_Awareness	0.8	0.99	.151
Factor2_Automatic_Focus	0.86	0.99	.022
Factor3_Self_Neglect	1.08	0.97	<.001
Factor4_Time_Distortion	0.88	0.99	.002
Factor5_StopInitiate	0.88	0.98	<.001
TotADHD	3.91	0.99	0.033

Note. Above are included the unstandardized factors Reduced Awareness (Factor1_Reduced_Awareness), Automatic Focus (Factor2_Automatic_Focus), Self-neglect (Factor3_Self_Neglect), Time Distortion (Factor4_Time_Distortion) and Stopping and Initiating Other Things (Factor5_Stop&Initiate).

Table A8

Collinearity Statistics

	VIF	Tolerance
RA	2.52	0.4
AF	1.46	0.7
SN	1.70	0.6
TD	1.98	0.5
SI	1.64	0.6

Note. The reference value for the variance inflation factor (VIF) is 4. Furthermore, the table depicts standardized versions of Factor1_Reduced_Awareness (RA), Factor2_Automatic_Focus (AF), Factor3_Self_Neglect (SN), Factor4_Time_Distortion (TD), Factor5_StopInitiate (SI)

Figure A1

Q-Q Plot for Factor1_Reduced_Awareness

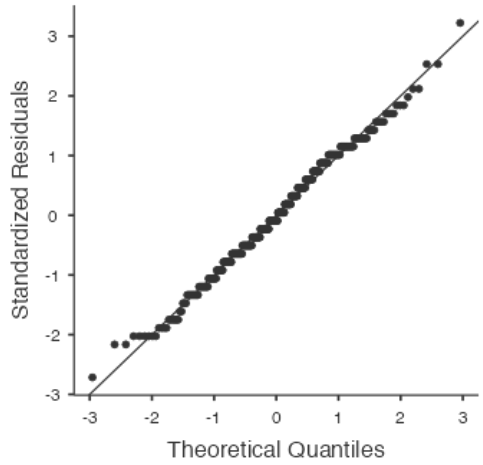

Figure A2
Q-Q Plot for Factor2_Automatic_Focus

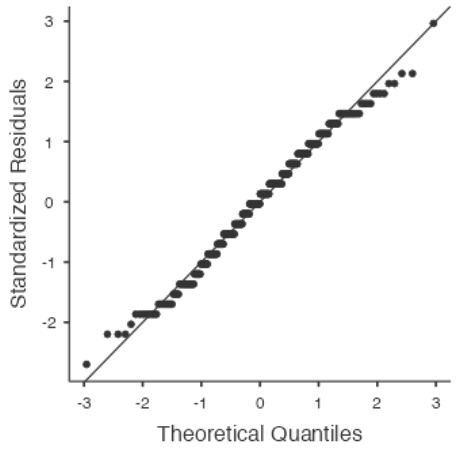

Figure A3
Q-Q Plot for Factor3_Time_Distortion

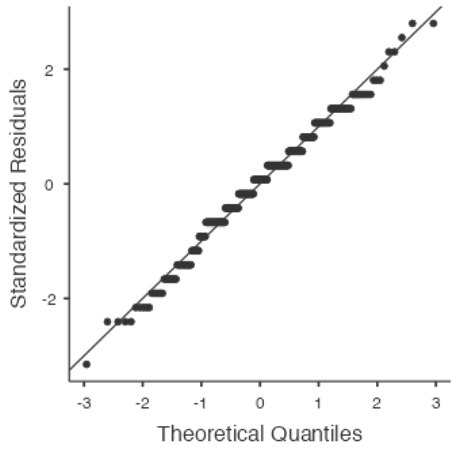

Figure A4
Q-Q Plot for Factor4_Self_Neglect

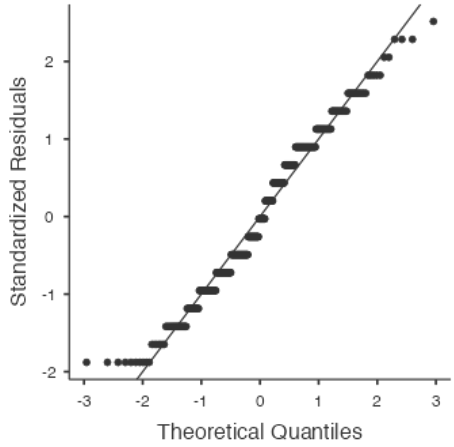

Figure A5
Q-Q Plot for Factor5_StopInitiate

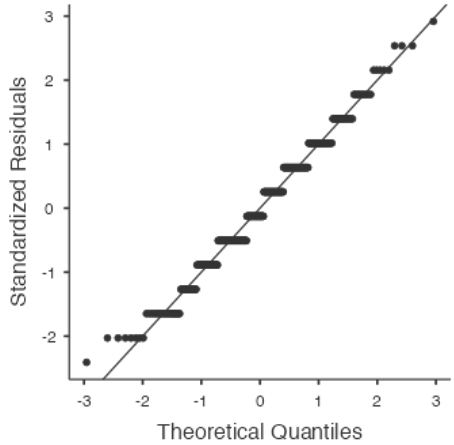

Figure A6
Q-Q Plot for TotADHD

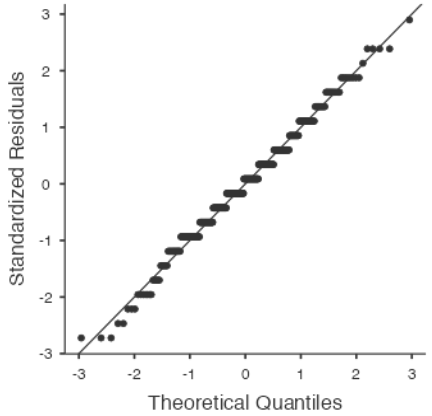

Figure A7
Q-Q Plot for Factor1_Reduced_Awareness and TotADHD

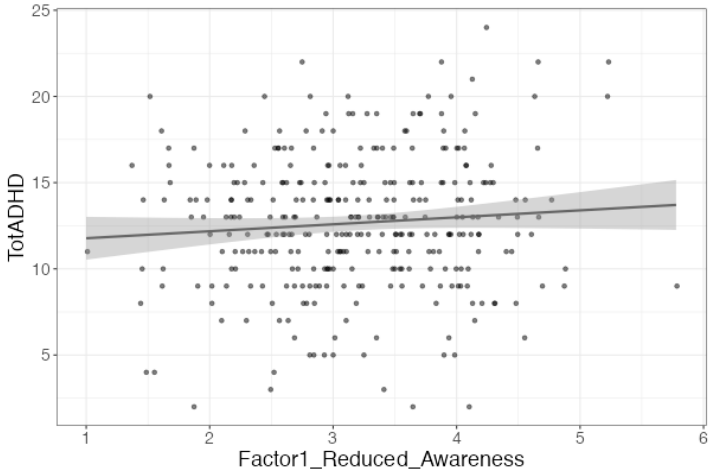

Figure A8
Q-Q Plot for Factor2_Automatic_Focus and TotADHD

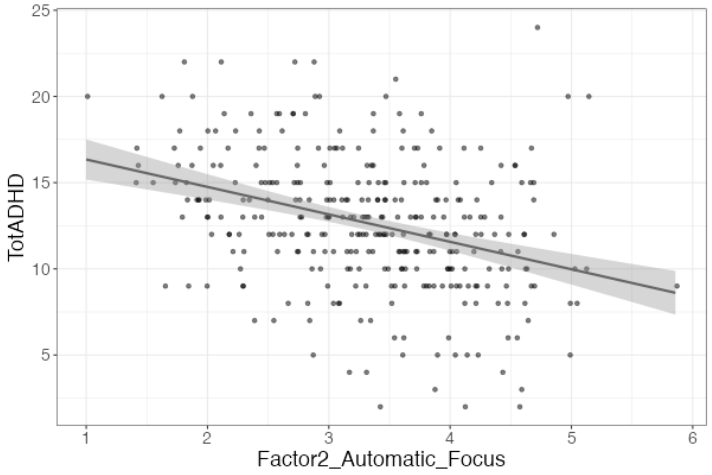

Figure A9
Q-Q Plot for Factor3_Self_Neglect and TotADHD

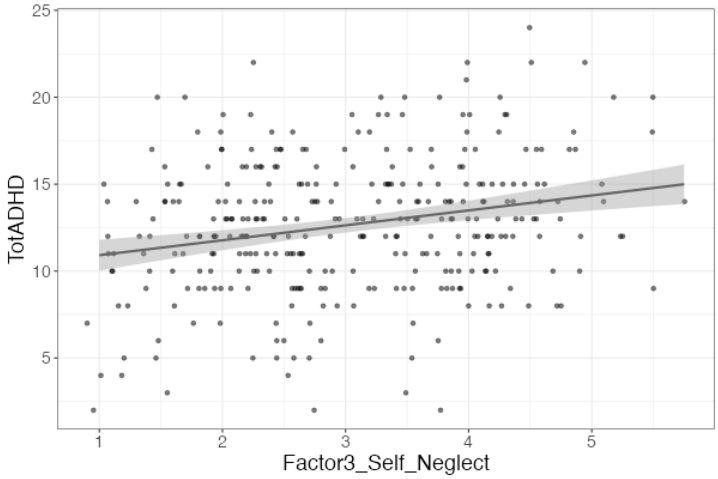

Figure A10
Q-Q Plot for Factor4_Time_Distortion and TotADHD

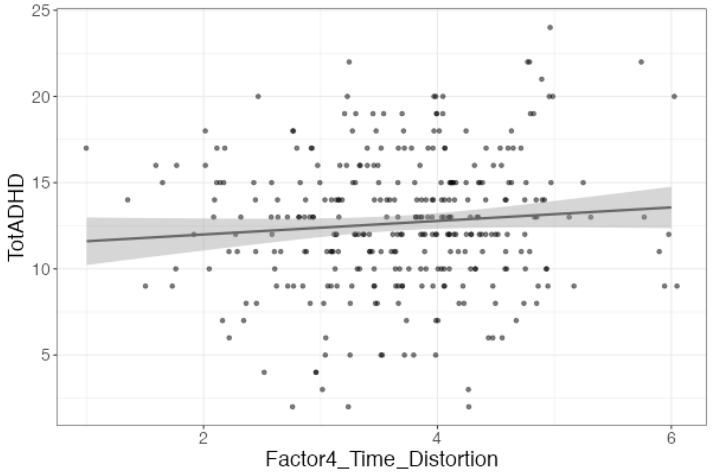

Figure A11
Q-Q Plot for Factor5_StopInitiate and TotADHD