ADHD Traits in the General Population and Their Association with Positive Aspects of ADHD

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ABSTRACT

Background: Attention deficit hyperactivity disorder (ADHD) is a common neurodevelopmental condition characterised by inattention and/or hyperactivity/impulsivity. Historically, ADHD research has focused on deficits in people with ADHD. We know from qualitative studies that people with ADHD experience positive aspects related to their ADHD. Quantitative evidence for these positive aspects is scarce, and no studies to date have investigated multiple positive aspects of ADHD in one study.

Aim: To quantitatively investigate the relationship between self-reported positive aspects of ADHD and ADHD traits in the general population.

Methods: We collected data from ten questionnaires investigating positive aspects related to ADHD, and ADHD traits. Our primary analysis consisted of correlation analysis between ADHD traits and *hyperfocus, enthusiasm*, *perseverance*, *up for anything*, *curiosity*, *empathy*, *sensitivity*, *sociability*, *humour* and *flexibility*. Exploratively, we performed factor analysis to help us understand how positive aspect occur together, and network analyses to identify how positive aspects influence each other.

Results: We found positive correlations between ADHD traits and *hyperfocus*, *sensory processing sensitivity*, and *cognitive flexibility*. Network analysis revealed that positive aspects interact with and influence ADHD traits and each other.

Conclusions: We have shown that people with high rates of ADHD traits also experience more *hyperfocus*, *sensory processing sensitivity* and *cognitive flexibility*. We also found aspects that were indicated previously as positive aspects of ADHD, but correlated negatively with ADHD traits (e.g., *perseverance*). Future studies should investigate the origin and development of positive aspects, as some of these aspects could be coping mechanisms of people with ADHD and do therefore not correlate with ADHD traits in a population sample. Moreover, it is important to test and translate our results to a clinical ADHD population, to develop psychoeducation or strength-based interventions for this group. Our results can help people with ADHD to improve their self-esteem and can reduce stigma.

KEYWORDS

ADHD, strengths, positive psychology, neurodiversity

INTRODUCTION

Attention deficit hyperactivity disorder (ADHD) is a common neurodevelopmental condition that occurs in 5.9% of children and 2-3% of adults, with a higher prevalence in males than in females (Posner et al., 2020; Fayyad et al., 2007; Willcutt, 2012). Core characteristics of ADHD include hyperactivity, impulsivity and/or inattentiveness (Posner et al., 2020). Hyperactive/impulsive characteristics can include, for example, talking before your turn, not being able to stay seated when expected to, and fidgeting. Inattentive characteristics can include making careless mistakes, losing things, and being easily distracted. For a diagnosis of ADHD, symptoms should be present before the age of twelve, interfere with at least two different contexts, and cause significant impairment of daily functioning. Three different presentations of ADHD are defined, the mainly hyperactive/impulsive presentation, the mainly inattentive presentation, and the combined presentation (Posner et al., 2020).

ADHD traits are continuously distributed in the population, with ADHD diagnoses occurring at the higher end of the spectrum (Greven et al., 2018). From a research perspective there are advantages of approaching ADHD as a continuum rather than as a categorical condition. It allows for example to address variability and heterogeneity, as symptoms and symptom severity differ from person to person. Moreover, this approach conserves information about people who may be close in the continuum, but are separated by a cut-off (Luo et al., 2019).

People with ADHD can experience a wide range of challenges in their daily lives. Cognitive problems have been identified for people with ADHD, such as altered reward processing, deficient time estimation, and executive dysfunction (Barkley & Murphy, 2011; Elliott, 2003; Plichta & Scheres, 2014; Ptacek et al., 2019). These problems can interfere with daily life activities, and can cause for instance problems at work, as planning might be hard due to executive functioning problems, while deficient time estimation can make it hard to stick to a planning (Primich & Iennaco, 2012; Sarkis, 2014). Other challenges include dealing with (self-)stigma, having low self-esteem and reduced quality of life (Agarwal et al., 2012; Masuch et al., 2019; Newark et al., 2016).

Historically, ADHD research has almost exclusively focused on symptoms and deficits, as this is what caused impairment for people with ADHD or disturbance for their environment. However, there is evidence for positive sides of ADHD. In recent years, researchers have started to move away from a deficit-focused psychopathology view, towards focusing on individuals' strengths, and the benefits of ADHD (Greven et al., 2018). Research into the strengths of ADHD contributes to a more balanced view ADHD. Moreover, knowing about strengths can help people with ADHD thrive. Lastly, it can contribute to a shift in how we see ADHD in our society towards a more positive and inclusive view and approach of ADHD.

The scientific evidence for the positive sides of ADHD is still scarce. Quantitative scientific evidence is even sparser. Qualitative research has identified a wide range of positive aspects of ADHD. A first, qualitative, international study investigated the ability and disability in ADHD, among people with ADHD and other stakeholders such as family members and professional caregivers. They found 'high energy', 'creativity', 'hyperfocus', and 'empathy' as positive aspects of ADHD (Mahdi et al., 2017). In a second study researchers interviewed six successful women with ADHD investigating their experiences of living with ADHD, and found 'creativity', 'determination', 'ability to get easily interested and excited about new things', 'adventurousness', and 'willingness to take risks' as positive aspects these women link to their ADHD (Holthe & Langvik, 2017). In the third study, six successful males with ADHD were interviewed about their views of positive aspects in ADHD (Sedgwick et al., 2019). The researchers found six core themes, 'cognitive dynamism', 'courage', 'energy', 'humanity', 'resilience' and 'transcendence', to which the positive aspects of ADHD in their study were linked (Sedgwick et al., 2019). Schippers et al. (under review) conducted a fourth qualitative study on positive aspects of ADHD and used a larger and more diverse (not only high functioning) sample. They identified five themes, namely 'Being dynamic', 'Flexibility', 'Socio-affective skills', 'Higher-order cognitive Skills', and 'Creativity'. The results of this study showed that experiencing positive aspects is common in ADHD as almost all participants reported positive aspect of ADHD and that these aspects cover a wide variety of domains. Concluding, these qualitative studies have found a wide range of positive aspects related to ADHD, with recurring themes, such as high energy, creativity, hyperfocus, and perseverance.

Initial qualitative studies have been vital in our search for positive aspects of ADHD, since we first need to identify strengths of people with ADHD, before we can quantify them. However, we do not know yet if people with ADHD are indeed more empathic/have more humour (for instance) than people without ADHD. To investigate this, we need quantitative studies. Creativity is one of the positive traits for which qualitative studies have been conducted in ADHD research (Hoogman et al., 2020). Specifically, divergent thinking, which is one of the core aspects of creativity, has been found to be associated with ADHD traits, however the relationship between ADHD and creativity in categorical research designs (case-control) is less clear (Hoogman et al., 2020). Other positive traits of ADHD such as, hyperfocus and sensory processing sensitivity were found to be positively correlated with ADHD characteristics in quantitative studies (Hupfeld et al., 2019; Panagiotidi et al., 2018, 2020). Quantitative studies on positive aspects in ADHD often focus on one positive aspect and its relation to ADHD. Consequently, we do not know how different positive characteristics correlate and interact with each other.

Building on previous work, the present study aims to quantitively investigate the relationship between positive aspects of ADHD and ADHD traits in the general population. Assessing positive aspects in a quantitative way gives us information on generalisation of the qualitative results and helps us understand the correlations between ADHD symptoms and symptom domains, and the positive aspects. We hypothesise that the positive aspects of ADHD positively correlate with ADHD traits in the general population. Moreover, we will contribute to the understanding of strengths in ADHD by providing knowledge about how strengths are associated with each other by performing factor and network analyses. In short, this is the first study to quantitatively investigate multiple positive aspects in relation to ADHD traits in a large population sample. The outcomes of this study can help people with ADHD, and their clinicians identify ADHD-based strengths, which is important to help them flourish, and have a higher quality of life.

METHODS

Participants

Our participants were recruited via Academic Prolific, an online platform designed to bring researchers and participants together (*Prolific | Online Participant Recruitment for Surveys and Market Research*, n.d.). Academic prolific ensures trustworthy, high-quality samples and participants are paid fairly (Adams et al., 2020; *Prolific | Online Participant Recruitment for Surveys and Market Research*, n.d.).

We used the following inclusion criteria in our study: Age between 18-60, English as first language, current residence in the UK, UK nationality, an acceptance rate by researchers in Academic Prolific higher than 75%, and having completed at least ten and maximum 1000 studies at Academic prolific. We chose to have participants with English as first language, current residence in the UK, and UK nationality to minimise cultural effects on both ADHD traits and (positive) personality traits (Gómez-Benito et al., 2015; Triandis & Suh, 2002). Including the selection criterion on having a minimum number of studies completed, was advised by Academic Prolific for multi-part studies, to have a better chance of people completing both parts of the study (*Longitudinal / Multi-Part Study FAQs*, n.d.). Participants with literacy difficulties were excluded, as this could interfere with the ability to fill out the surveys. We used the option in Academic Prolific to balance sex distributions. All participants accepted informed consent before starting the questionnaires. This study was marked as exempt for ethical review by the CMO Radboudumc CMO (research ethics committee).

Procedures

We decided to split our test battery into two surveys to optimize attention to the questionnaires. The first round contained five questionnaires on positive aspects, one questionnaire on ADHD traits, and a question on ADHD diagnosis. The second round of surveys contained five

questionnaires on positive aspects. Both surveys had two attention checks built in, to ensure that participants paid close attention to the questionnaires (Oppenheimer et al., 2009). It was obligatory to answer all questions. Surveys were created using LimeSurvey (Limesurvey GmbH., n.d.).

For the first survey, we aimed to recruit 700 participants to complete the questionnaires. After recruitment and approval of the first 700 participants, the second round of surveys was sent out to these 700 participants. We aimed to recruit 500 of the 700 participants, on a first come, first serve base.

Each survey was estimated to be completed in approximately 30 minutes, for which the participants received £3.75 per survey, independent of the time it took them to complete the survey. Moreover, participants could earn £1 as bonus payment for completing both surveys.
We excluded participants who failed both attention checks, were unreasonably fast or slow (e.g., faster than two minutes or slower than two hours), or who had unusual response patterns (for instance always filling out the first option in all questionnaires). In case of technical difficulties direct contact with the participants was possible via the chat system in Academic Prolific. LS checked all submissions in LimeSurvey for rejection or approval in Academic Prolific. MH was asked for advice in case of doubt.

Measures

The demographic data that were collected were age, sex, and employment status. Moreover, we asked one question on whether someone had ever been diagnosed with ADHD, and, if so, when.

We selected ten self-reported positive aspects from the largest study on self-reported positive aspects of ADHD (Schippers et al., under review) (Table 1). The selection was based on three criteria. The first criterium was the frequency the reported positive aspects, with aspects with a higher frequency having a higher priority. The second criterium was the category to which the positive aspect belonged. We sought to choose positive aspects from diverse categories, to capture a broad spectrum of positive traits. The last criterium was the availability of a reliable measurement scale to capture the positive trait.

The first round of surveys contained the Adult ADHD Self Report scale (ASRS) to measure *ADHD traits*, Toronto Empathy Questionnaire (TEQ) to measure *empathy*, Cheek and Buss Shyness Scale (CBSS) to measure *sociability*, Adult Hyperfocus Questionnaire (AHQ) to measure *hyperfocus*, the Multidimensional Sense of Humour Scale (MSHS) to measure *humour*, The Highly Sensitive Person Scale (HSP) to measure *sensitivity*, and a question about ADHD diagnosis ("Have you ever been diagnosed with ADHD?"- Yes as a child, Yes as an Adult, I am in the process of receiving a diagnosis, No but I think I have ADHD, No). For the second round, surveys contained the big five aspect scale on enthusiasm (BFAS) to measure *enthusiasm*, the grit scale to measure *perseverance*, the Curiosity and

Exploration Inventory (CEI) to measure *curiosity*, the Intolerance of Uncertainty Scale (IUS) to *measure up for anything*, and the Cognitive Flexibility Scale (CFS) to measure *flexibility*.

For two positive aspects, we measured the opposite concept. *Sociability* was measured using the concept of shyness with the Cheek and Buss Shyness Scale (CBSS) (Hopko et al., 2005). This was done by Brook et al. to measure sociability, but they only used the reversed items, while we will use the full scale and invert the total score (Brook & Schmidt, 2020). We will use the same approach to measure *up for anything* by measuring intolerance of uncertainty, using the opposite score of the Intolerance of Uncertainty Scale short form (IUS) (Carleton et al., 2007). The final measurements that were selected for this study are listed in Table 1. Besides measuring positive aspects of ADHD, we also assessed ADHD traits. For this, we used the Adult ADHD Self-Report Scale (ASRS), developed by Kessler et al. (Kessler et al., 2005). The well-validated questionnaire contains eighteen questions on common ADHD traits, distributed in two subscales, inattention, and hyperactivity/impulsivity.

Analysis

Our analyses were preregistered at Open Science Framework, except for the network analysis (Schippers & Hoogman, 2021).

To assess the association between ADHD traits and our positive aspects we performed correlation analyses for each of the questionnaires with the total ASRS scores. Exploratively, we did correlation analyses between the total ASRS score and subscales of the positive aspects, and ASRS subscales and both total scores of positive aspects and their subscales. We corrected for age and sex for the correlation analyses. We used a M_{eff} correction to correct for multiple testing for our confirmatory analysis, according to Li and Ji (Li & Ji, 2005). The correlation matrix contained eleven variables, the total scores for the ten positive aspects and the total score for the ADHD traits. The analysis resulted in ten independent variables, and subsequently in a p-value threshold of $p=0.005$.

To confirm the themes from Schippers et al. (under review) we performed a confirmatory factor analysis by running the psych package in R, using total scores from the ten investigated positive aspects (Revelle, 2022). In their paper, they linked positive aspects to subthemes, which are in turn linked to themes. In our analysis, we linked the positive aspects directly to the themes (figure 1), as we would otherwise only have one questionnaire per factor in most cases. In concordance with the literature, the model was considered a good fit with a non-significant $\chi 2$, test, a Root Mean Square Error of Approximation less than 0.06, Comparative Fit Index and Tucker-Lewis index over 0.95, and a Standardized Root Mean Square Residual less than 0.08 (Hu & Bentler, 1999). We analysed the correlation matrix of the ten positive aspects to find the weighted least squares solution. We chose this method because our data failed the multivariate normality assumption.

In addition, we performed exploratory factor analysis to unravel potential new themes among our variables using the package lavaan (Rosseel et al., 2022). To analyse whether factor

analysis is possible, the Kaiser–Meyer–Olkin test (>0.6), Bartlett's Test of Sphericity ($p<0.05$), and calculation of the determinant of the correlation matrix (>0) were performed (Bartlett, 1951; Kaiser & Rice, 1974). The number of factors was determined using parallel analysis (Henson & Roberts, 2006). We used Promax rotation, as we assumed our factors to be correlated (Brown, n.d.).

As the Academic Prolific sample is a population-based sample, we expect people with ADHD in our sample at a rate that is comparable to the prevalence of ADHD. This allows to also conduct case-control analyses. We compared mean scores between people with and without an ADHD diagnosis for the ASRS and all positive aspects using a student's t-test or an appropriate non-parametric alternative.

Lastly, to investigate how positive characteristics influence each other, we performed a network analysis, using the package qgraph in R (Epskamp et al., 2022). We used multidimensional scaling, so the network would be visually interpretable regarding the distances between the positive characteristics (nodes). For the network estimation, we used graphical least absolute shrinkage operator (GLASSO), with a gamma of 0.5 (Epskamp et al., 2018). We investigated four networks. The first two networks contain total questionnaire scores, one including ASRS total score and one excluding ASRS total score. The third and fourth network contains all items from all questionnaires, again one network with ASRS items, and one network without ASRS items. Since network analysis assumes independent nodes, we calculated item redundancy using the goldbricker function from the package Networktools. Items with an overlap of >95% were considered redundant and are combined into one construct. We calculated Expected Influence (EI) as a measure of centrality, which is recommended in case of both positive and negative edges. All analyses were done in R (R Core Team, 2021).

Table 1.

The list of questionnaires used in the study

Questionnaire	Subscales	Number of items (scale)	Positive aspect	Round
Adult ADHD Self-Report Scale (ASRS) (Kessler et al., 2005)	Inattention Hyperactivity/impulsivity	18 (five-point scale)	-	1
Toronto Empathy Questionnaire (TEQ) (Spreng* et al., 2009)	-	16 (five-point scale)	Empathy	1
Revised Cheek and Buss Shyness Scale (CBSS) (Hopko et al., 2005)	-	13 (six-point scale)	Sociability	1
Multidimensional Sense of Humour Scale (MSHS) (Brook & Schmidt, 2020)	Production and Social Use of Humor Adaptive Humor Negation to Use Humor Attitude toward Humor Appreciation of Humor	24 (five-point scale)	Humour	1
Sensory processing sensitivity HSP scale (HSP) (Aron & Aron, 1997)	-	27 (six-point scale)	Sensitivity	1
Adult Hyperfocus questionnaire, dispositional hyperfocus subscale (AHQ) (Hupfeld et al., 2019)	-	12 (six-point scale)	Hyperfocus	1
Big Five Aspect scale items from enthusiastic (BFAS) (DeYoung et al., 2007)	-	10 (five-point scale)	Enthusiasm	2
Grit Scale (Grit) (Duckworth et al., 2007)	Persistence of effort Consistency of effort	12 (five-point scale)	Grit, perseverance and passion for long term goals	2
Curiosity and Exploration Inventory (CEI) (Kashdan et al., 2009)	Stretching Embracing	10 (five-point scale)	Curiosity	2
Intolerance of Uncertainty Scale (IUS) (Carleton et al., 2007)	-	12 (five-point scale)	Up for anything	2
Cognitive Flexibility Scale (CFS) (Martin & Rubin, 1995)	-	12 (six-point scale)	Flexibility	2

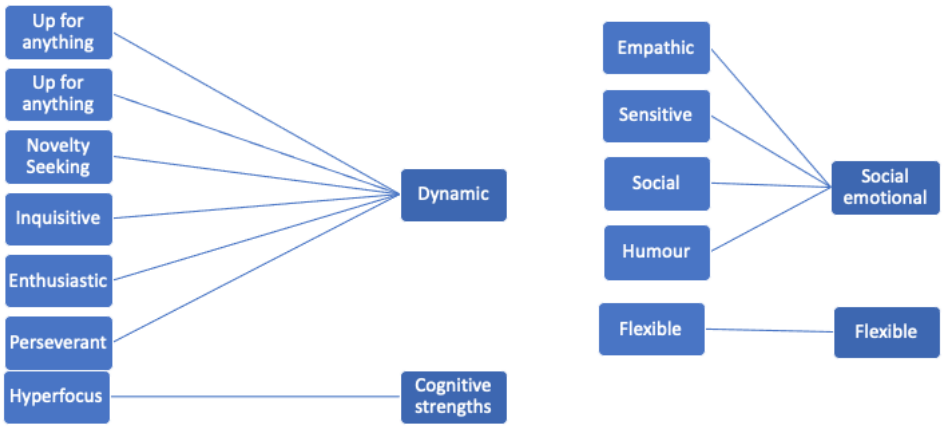

Figure 1- Representation of the factor structure to be tested in the confirmatory factor analysis

RESULTS

Participants

Of the subjects that were invited to participate in our study, we excluded 5 participants because they were too fast to produce reliable results, and one participant because they failed the attention checks. There were two participants who participated twice, we only kept the first session. Five participants were excluded because they were time outliers (they took over 200 minutes to complete the questionnaires, the median was 29 minutes). Lastly, we excluded one participant, because the questionnaires were not completed. In all, this resulted in a sample of 694 participants. For the second round of questionnaires, we invited 500 participants from the previous participants. We did not invite all 700 participants, because of the expected response rate. Within Academic Prolific we excluded one participant because they failed both attention checks, resulting in 500 participants. We excluded one participant because they were a time outlier, 12476 minutes as opposed to the median of 6.3 minutes, and one participant because they ticked the same answer for every question in all questionnaires. Participants excluded in round one, were also excluded from round two, resulting in 496 participants.

Finally, we included 694 participants in round one (50% female) and 496 participants in round 2 (50% female). We did not exclude outliers on questionnaire scores, as all scores fall within the normal distribution of the questionnaires. The demographic information of the study sample can be found in Table 2. The average age was 37.35 (sd=11.25) years in round 1 and 38.33 (sd=11.27) in round 2. Three percent of people reported to have an ADHD diagnosis in round 1, and 2.9% in round 2.

Questionnaires

Mean scores and standard deviations are calculated for all questionnaires (see Table 2). None of the responses for the questionnaires passed the Saphiro-Wilk test for normality, except for the Grit scale. Consequently, we used non-parametric tests. Figure 2 shows the distribution of ADHD traits in the sample.

Main Analysis

We found significant positive corelations between total ASRS score and *sensitivity* (HSP) ($r= .36$, $p< .0001$), *hyperfocus* (AHQ) ($r= .31$, $p< 0.0001$), and *flexibility* (CFS) ($r= .20$, $p< .0001$). We found significant negative correlations between the ASRS and *sociability* (CBSS) ($r= -.20$, $p< .0001$), *enthusiasm* (BFAS) ($r= -.14$, $p< .0001$), *up for anything* (IUS) ($r= -.20$, $p<.0001$), and *perseverance* ($r= -.34$, $p< .0001$). We found no statistically significant correlations between the ASRS and *empathy* (TEQ), *humour* (MSHS), and *curiosity* (CEI). See Table 3 for an overview of correlations.

Explorative Analysis

Association Between ADHD Traits and Positive Aspect Subscales

Exploratively, we looked at the correlations between total ASRS scores and the subscales from *humour* (MSHS), *perseverance* (grit), and *curiosity* (CEI) (Table 3). For the correlations between total ASRS scores and the subscales of the positive trait questionnaires, we found negative correlations between total ASRS score and both subscales of *perseverance* (grit), *consistency of interest* and *persistence of effort* ($r=0.17$, $p<0.0001$) and ($r=-0.37$, $p<0.0001$), respectively. Interestingly, we found a positive correlation between total ASRS score and the *humour* (MSHS) subscales *Production and Social Use of Humor* and *Adaptive Humor*, ($r=0.10$, $p<0.0001$) and ($r=0.12$, $p<0.0001$) respectively, and negative correlations with the MSHS subscale *Negation to use humour* ($r=0.08$, $p<0.005$), while we did not find a significant correlation for total humour (MSHS) score.

Association Between ADHD Symptom Domains and Positive Aspects

To further promote our understanding of the link between ADHD and positive aspects we explored the association between the ADHD symptom domains of inattention and hyperactivity/impulsivity and positive aspects. Moreover, we calculated correlations between the ASRS subscales and the positive aspect subscales (Table 4).

Looking at the ASRS inattention subscale, we see the positive and negative correlations for the same scales and in the same direction as for the total ASRS score. On the other hand, for the ASRS hyperactivity/impulsivity subscale, we do see differences in correlations as compared to total ASRS scores. Besides the positive correlations we found for the total ASRS score, we found statistically significant positive correlations between ASRS hyperactivity/impulsivity and the *humour* (MSHS) ($r=0.10$, $p<0.005$), and *curiosity* (CEI) ($r=0.10$, $p<0.005$). Lastly, we did not find negative correlations anymore between ASRS hyperactivity/impulsivity and *enthusiasm* (BFAS).

Confirmatory Factor Analysis

We performed confirmatory factor analysis on total scores of all ten positive aspects. The model we tested was based on the proposed themes by Schippers et al. (under review) The analysis indicated a poor fit with the proposed model ($\chi2<0.000$, RMSEA=0.12, CFI=0.57, TLI=0.37 and SRMR=0.14).

Exploratory Factor Analysis

We conducted an exploratory factor analysis on the total score of all ten positive aspects to investigate if we could find new and better themes than previously proposed (Schippers et al. under review). The results from the Kaiser–Meyer–Olkin test (0.79), Bartlett's Test of Sphericity ($p<0.05$)

and calculation of the determinant of the correlation matrix (0.05) indicated that our data was fit for factor analysis. Parallel Analysis indicated a four-factor solution (Table 5). The first factor contains *sensitivity* (HSP) and *hyperfocus* (AHQ) with positive factor loadings, and *sociability* (CBSS) and *up for anything* (IUS) with negative factor loadings. The second factor contains *enthusiasm* (BFAS) and *empathy* (TEQ). The third factor consists of *humour* (MSHS) and *curiosity* (CEI). The fourth and last factor consists of *perseverance* (grit scale) with a positive loading and *flexibility* (CFS) with a negative loading. Together the four factors explained 55% of variance. The RMSR is 0.01, the RMSEA 0.031, and TLI 0.99, which together indicate that our model is adequate.

Diagnosed individuals versus people without ADHD

People who reported to have an ADHD diagnosis scored higher on total ADHD traits (ASRS) ($p<.00001$), *hyperfocus* (AHQ) ($p<.00001$), and *sensitivity* (HSP) ($p<.00001$) and lower on *perseverance* (grit) ($p<.001$) than people without reporting to have ADHD. No statistically significant differences were found for the other scales.

Network analysis

No items had a 95% or higher overlap using the goldbricker function, so no items were combined. For the networks containing total scores (Figure 3 and Figure 4), we see clustering of traits. In the network that includes ADHD traits, ADHD traits cluster with *hyperfocus* and *sensitivity*, positively influencing each other. *Perseverance* (grit) is the only trait that has a direct (and negative connection) with ADHD traits. For both the network with and without ADHD traits, *enthusiasm* has the highest expected influence (Table 6 and Table 7).

For the networks containing all questions, we see that the questionnaires do not form separate clusters, but blend and overlap (Figure 5 and Figure 6). However, in the network with ADHD traits, we see a cluster containing ADHD traits and *hyperfocus*, while in the network without ADHD traits *hyperfocus* forms a separate cluster from the other positive aspects. The question with the highest expected influence for both network is question 25 from the Highly Sensitive Person Scale, measuring *sensitivity*: *"Are you bothered by intense stimuli, like loud noises or chaotic scenes?"* (Table 8 and Table 9 represent the top ten questions with the highest expected influence.). Another remarkable finding is that *humour* is among 4 (network with ADHD traits) and 5 (network without ADHD traits) of the top ten question with the highest expected influence, indicating the likely importance of humour in the network.

Table 2.
Participant characteristics

	Round 1	**Round 2**
Number of participants	694	496
Percentage female	50%	50%
Mean age	37.35(sd=11.25)	38.33 (sd=11.27)
ADHD diagnosis	2.9%	3.0%
	Mean (sd)	**Mean (sd)**
ADHD (ASRS)	49.29(10.91)	
• *inattention*	26.35(5.95)	
• *hyperactivity/impulsivity*	22.95(6.12)	
Empathy (TEQ)	44.88(8.43)	
Sociability (CBSS)	36.49(10.79)	
Sensitivity (HSP)	110.59(25.07)	
Hyperfocus (AHQ)	39.05(13.75)	
Humour (MSHS)	64.68(14.17)	
Curiosity (CEI)		28.07(8.19)
Enthusiasm (BFAS)		32.27(6.87)
Up for anything (IUS)		37.1(9.76)
Flexibility (CFS)		31.72(7.94)
Perseverance (Grit)		38.17(7.55)

Note. TEQ, Toronto Empathy Questionnaire, CBSS, Cheek and Buss Shyness Scale, HSP, Highly Sensitive Person Scale, AHQ, Adult Hyperfocus Questionnaire, MSHS, Multidimensional Sense of Humor Scale, CEI, Curiosity and Exploration Inventory, BFAS, Big Five Aspects Scale, IUS, Intolerance of Uncertainty Scale, CFS, Cognitive Flexibility Scale, GRIT, Grit scale

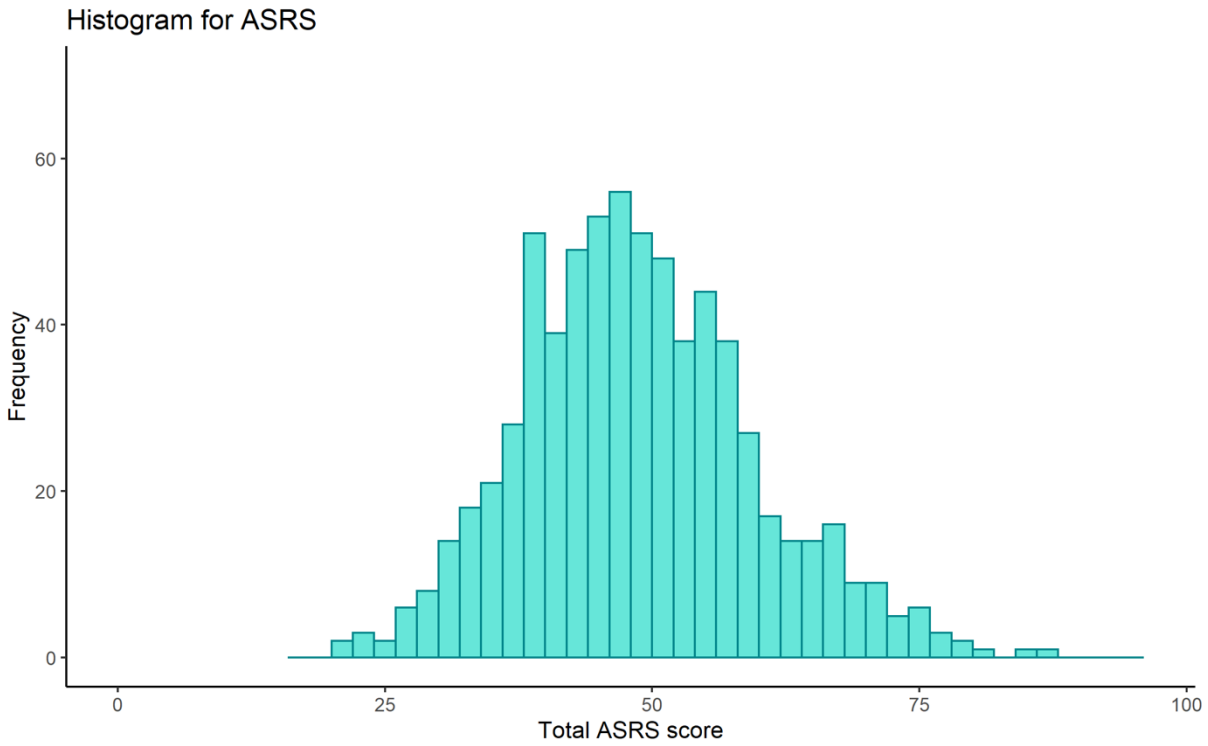

Figure 2- Histogram of ADHD traits in the general population

Table 3

Correlations between ADHD traits and positive aspects

Positive Aspects	ASRS total score r
Empathy (TEQ)	-0.04
Sociability (CBSS)	-0.20**
Sensitivity (HSP)	0.36**
Hyperfocus (AHQ)	0.31**
Humour (MSHS)	0.07
Curiosity (CE)I	0.04
Enthusiasm (BFAS)	-0.14**
Up for anything (IUS)	-0.20**
Flexibility (CFS)	0.20**
Perseverance (Grit)	-0.34**
Subscales	
MSHS Production and Social Use of Humor	0.10**
MSHS Adaptive Humor	0.12**
MSHS Negation to use Humor	-0.08**
MSHS Attitude toward Humor	-0.06*
MSHS Appreciation of Humor	-0.04*
Grit consistency of interest	-0.17**
Grit perseverance of effort	-0.37**
CEI stretching	0.03
CEI embracing	0.05

Note. TEQ, Toronto Empathy Questionnaire, CBSS, Cheek and Buss Shyness Scale, HSP, Highly Sensitive Person Scale, AHQ, Adult Hyperfocus Questionnaire, MSHS, Multidimensional Sense of Humor Scale, CEI, Curiosity and Exploration Inventory, BFAS, Big Five Aspects Scale, IUS, Intolerance of Uncertainty Scale, CFS, Cognitive Flexibility Scale, GRIT, Grit scale.

n= 694 for TEQ, CBSS, HSP, AHQ, MSHS n=496 for CEI, BFAS, IUS, CFS, Grit

**<0.005 (significance threshold for multiple testing), *<0.05

Table 4

Correlation coefficients between ADHD trait subscales and positive aspects

Positive Aspects		ADHD Traits	
	N	Inattention r	Hyperactivity/impulsivity r
Empathy (TEQ)	694	-0.05	-0.02
Sociability (CBSS)		-0.25**	-0.11**
Sensitivity (HSP)		0.33**	0.32**
Hyperfocus (AHQ)		0.28**	0.27**
Humour (MSHS)		0.03	0.10**
Curiosity (CEI)	496	-0.03	0.10**
Enthusiasm (BFAS)		-0.18**	-0.06*
Up for anything (IUS)		-0.20 **	-0.16**
Flexibility (CFS)		0.25**	0.10**
Perseverance (Grit)		-0.40**	-0.21**
Subscales			
MSHS Production and Social Use of Humor	694	0.06*	0.13**
MSHS Adaptive Humor		0.10**	0.13**
MSHS Negation to use Humor		-0.08**	-0.05
MSHS Attitude toward Humor		-0.07*	-0.06
MSHS Appreciation of Humor		-0.02	-0.04
Grit consistency of interest	496	-0.25**	-0.06
Grit perseverance of effort		-0.38**	-0.28**
CEI stretching		-0.03	0.09**
CEI embracing		-0.01	0.10**

Note. TEQ, Toronto Empathy Questionnaire, CBSS, Cheek and Buss Shyness Scale, HSP, Highly Sensitive Person Scale, AHQ, Adult Hyperfocus Questionnaire, MSHS, Multidimensional Sense of Humor Scale, CEI, Curiosity and Exploration Inventory, BFAS, Big Five Aspects Scale, IUS, Intolerance of Uncertainty Scale, CFS, Cognitive Flexibility Scale, GRIT, Grit scale.
**<0.00,*<0.05

Table 5

Factor loadings exploratory factor analysis

Positive aspect	Factor loading			
	Factor 1	Factor 2	Factor 3	Factor 4
Empathy (TEQ)			**0.440**	
Sociability (CBSS)	**-0.482**			
Sensitivity (HSP)	**0.889**			
Hyperfocus (AHQ)	**0.563**	0.413		
Humour (MSHS)		**0.546**		
Curiosity (CEI)		**0.707**		
Enthusiasm (BFAS)			**0.899**	
Up for anything (IUS)	**-0.479**			
Flexibility (CFS)		-0.432		**-0.609**
Perseverance (Grit)				**0.578**

Note. Only factor loadings >.3 are shown. TEQ, Toronto Empathy Questionnaire, CBSS, Cheek and Buss Shyness Scale, HSP, Highly Sensitive Person Scale, AHQ, Adult Hyperfocus Questionnaire, MSHS, Multidimensional Sense of Humor Scale, CEI, Curiosity and Exploration Inventory, BFAS, Big Five Aspects Scale, IUS, Intolerance of Uncertainty Scale, CFS, Cognitive Flexibility Scale, GRIT, Grit scale

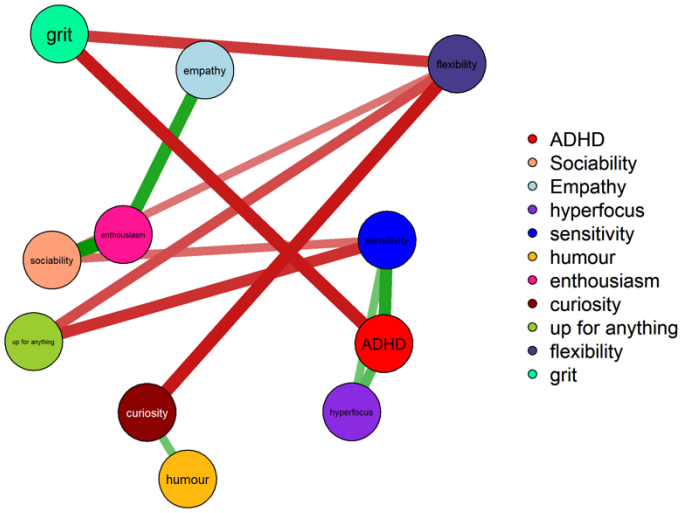

Figure 3- Network representing total questionnaire scores including scores for ADHD traits.

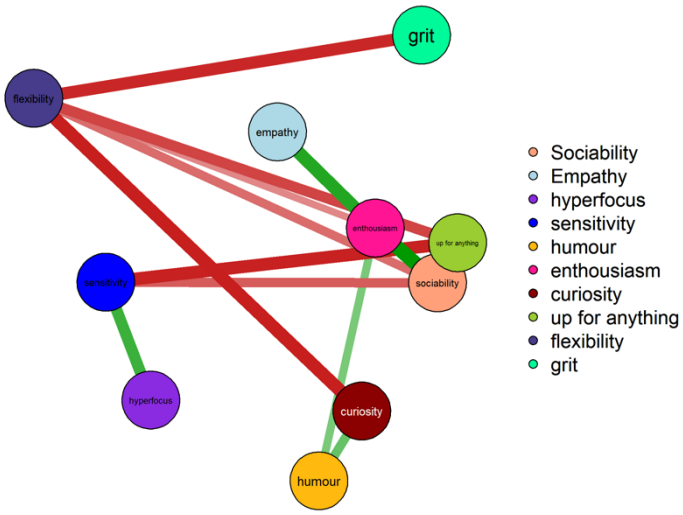

Figure 4- Network representing total questionnaire scores excluding scores for ADHD traits.

Table 6

Expected influence network total items with ASRS

Aspect	Expected Influence
Enthusiasm	0.50
Hyperfocus	0.33
Empathy	0.23
ADHD	0.17
Humour	0.15
Sensitivity	0.01
Sociability	-0.03
Curiosity	-0.09
Intolerance of uncertainty	-0.40
Perseverance	-0.45
Flexibility	-0.78

Table 7

Expected influence network total items without ASRS

Aspect	Expected Influence
Enthusiasm	0.51
Humour	0.30
Empathy	0.23
Hyperfocus	0.20
Perseverance	-0.06
Intolerance of uncertainty	-0.07
Curiosity	-0.20
Sociability	-0.22
Sensitivity	-0.42
Flexibility	-0.92

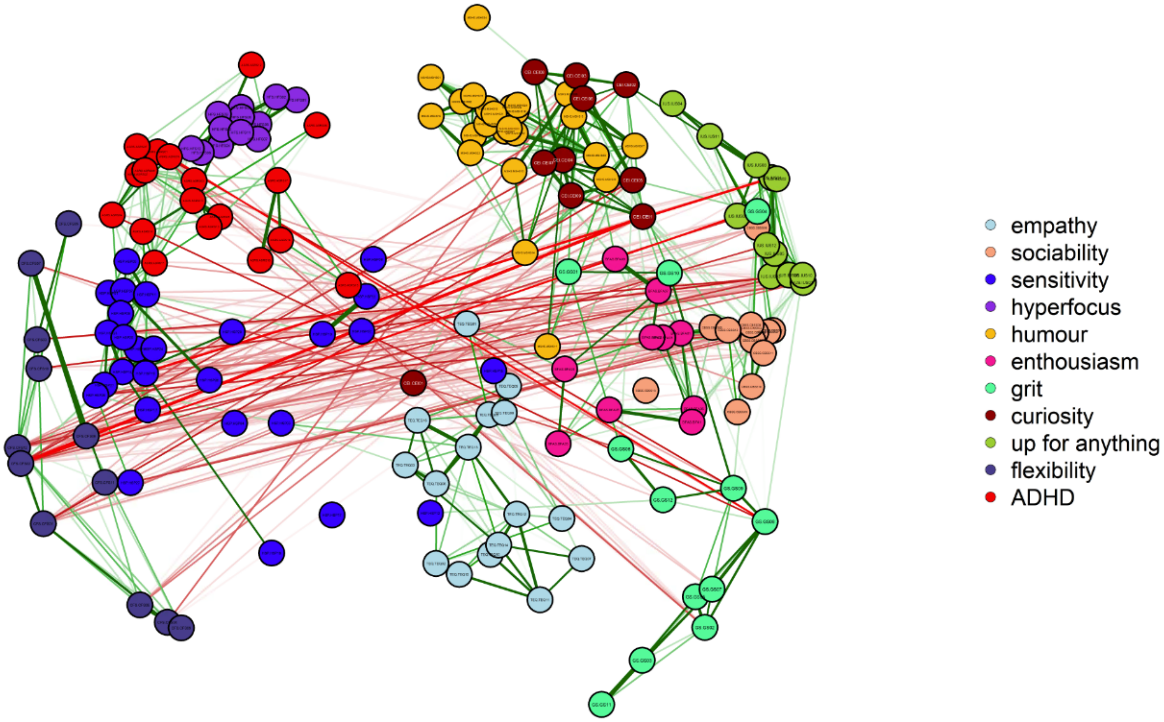

Figure 5- Network representing all questionnaire items including scores for ADHD traits.

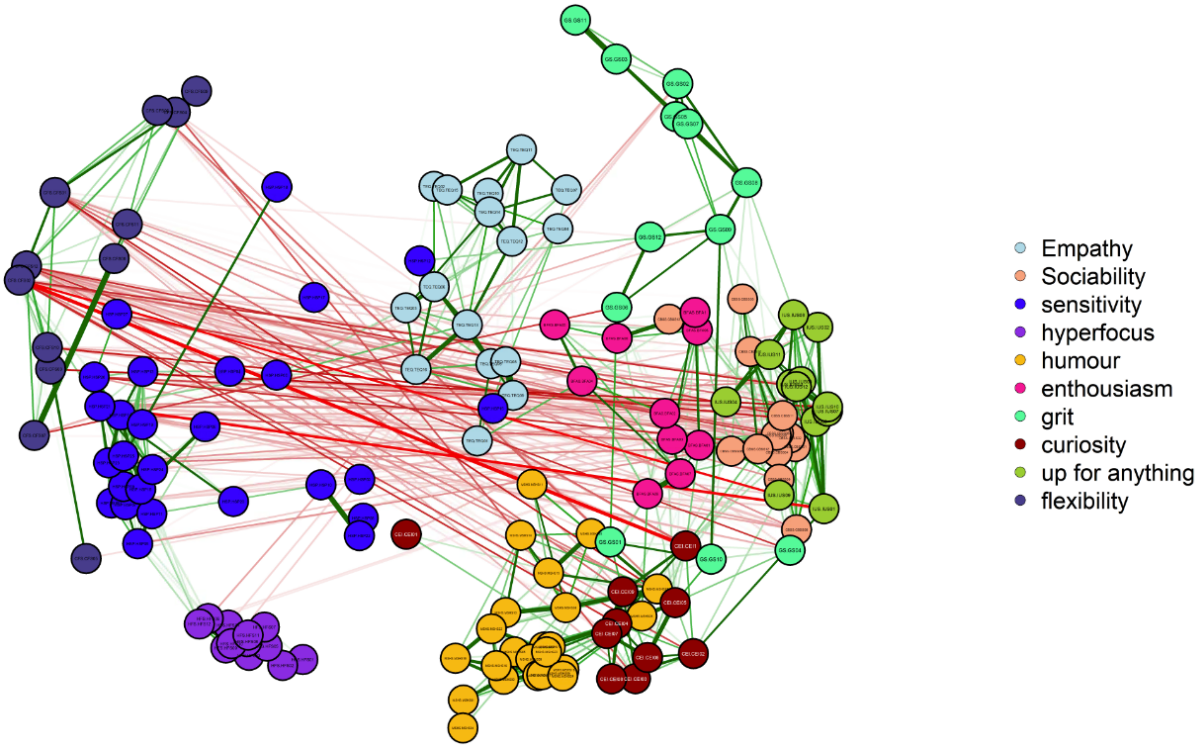

Figure 6- Network representing all questionnaire items excluding scores for ADHD traits.

Table 8

Expected influence network all items with ASRS, top 10 highest expected influence

Aspect and questionnaire	Expected influence	Question number and question
Sensitivity HSP	1.11	*25. Are you bothered by intense stimuli, like loud noises or chaotic scenes?*
Humour MSHS	1.06	*23. I use humor to entertain my friends*
Sensitivity HSP	0.98	*07. Are you easily overwhelmed by things like bright lights, strong smells, coarse fabrics, or sirens close by?*
Sociability CBSS	0.98	*02. I am socially somewhat awkward.**
Humour MSHS	0.96	*06. I can use wit to help adapt to many situations*
Empathy TEQ	0.94	*13. I get a strong urge to help when I see someone who is upset*
Sociability CBSS	0.93	*04. I am often uncomfortable at parties and other social functions.**
ADHD ASRS	0.92	*13. How often do you feel restless or fidgety?*
Humour MSHS	0.91	*15. People look to me to say amusing things*
Humour MSHS	0.89	*07. I can ease a tense situation by saying something funny*

Note. TEQ, Toronto Empathy Questionnaire, CBSS, Cheek and Buss Shyness Scale, HSP, Highly Sensitive Person Scale, MSHS, Multidimensional Sense of Humor Scale, ASRS, Adult ADHD Self-Report Scale * question is scored reversely.

Table 9

Expected influence network all items without ASRS, top 10 highest expected influence

Aspect and questionnaire	Expected influence	Question number and question
Sensitivity HSP	1.11	*25. Are you bothered by intense stimuli, like loud noises or chaotic scenes?*
Humour MSHS	1.01	*23. I use humor to entertain my friends*
Empathy TEQ	0.99	*09. I get a strong urge to help when I see someone who is upset*
Sociability CBSS	0.97	*02. I am socially somewhat awkward.**
Humour MSHS	0.97	*06. I can use wit to help adapt to many situations*
Humour MSHS	0.94	*15. People look to me to say amusing things*
Sociability CBSS	0.94	*04. I am often uncomfortable at parties and other social functions.**
Sensitivity HSP	0.92	*07. Are you easily overwhelmed by things like bright lights, strong smells, coarse fabrics, or sirens close by?*
Humour MSHS	0.90	*07. I can ease a tense situation by saying something funny*
Humour MSHS	0.90	*09. I can often crack people up with the things I say*

Note. TEQ, Toronto Empathy Questionnaire, CBSS, Cheek and Buss Shyness Scale, HSP, Highly Sensitive Person Scale, MSHS, Multidimensional Sense of Humor Scale, *question is scored reversely.

DISCUSSION

In this study, we aimed to investigate how self-reported positive aspects of ADHD are related to ADHD traits and exploratively the ADHD symptom domains, inattentiveness and hyperactivity/impulsivity, in the general population. We found positive correlations between ADHD traits and *sensory processing sensitivity*, *hyperfocus*, and *flexibility*. We found negative correlations between ADHD traits and *perseverance*, enthusiasm, and sociability. Our exploratory factor analysis identified a four-factor solution. Network analysis showed that positive aspects blend and overlap. This indicates interaction between the positive aspects.

Primary Analysis

Previous studies found a correlation between *hyperfocus* and ADHD traits in the general population (Groen et al., 2020; Grotewiel et al., 2022; Hupfeld et al., 2019). Although the definition of hyperfocus differs somewhat across studies, generally the definition includes being completely captivated by a task, without noticing external signals, such as sounds, bodily signals such as hunger, thirst or needing to go to the bathroom, and loosing complete track of time (Ashinoff & Abu-Akel, 2021). While experiencing a state of hyperfocus also occurs in the general population, it is mainly described in the context of mental conditions, such as ADHD, meaning that people with ADHD are more likely to experience benefits related to hyperfocus (Ashinoff & Abu-Akel, 2021; Groen et al., 2020; Grotewiel et al., 2022; Hupfeld et al., 2019). Although hyperfocus is mainly described as a

positive aspect in the context of this study, it can also be problematic for an individual. For example, this is the case when someone is unaware that they are hyperfocussing, and has other tasks to attend to, or are hyperfocussing while they do not want to (Hupfeld et al., 2019). Future research should therefore look into if and how people can control their hyperfocus experience, in such a way that they can use this in their benefit.

Our results also showed a positive correlation between *sensory processing sensitivity* and ADHD traits, which is in line with previous studies with smaller sample sizes (Panagiotidi et al., 2018, 2020). This is a personality trait that is distributed in the population, with 20-30% of the people being classified as 'highly sensitive persons' (Lionetti et al., 2018). Under the right circumstances, highly sensitive persons flourish and can use their sensitivity to their advantage. In two studies, Panagiodtidi et al. showed that in the general population, sensitivity positively correlates with ADHD traits, just like in our results, although we had a larger and non-student based sample to better represent the general population (Panagiotidi et al., 2018, 2020). However, to our knowledge, no study has investigated the differences in sensory processing sensitivity in people with and without ADHD before. In our sample we see that people with ADHD score significantly higher on sensitivity than people without ADHD. Future research should look into this difference to confirm our findings. Moreover, sensory processing sensitivity is often described with a model as differential susceptibility to the environment, meaning people low on sensory processing sensitivity function approximately the same under better or worse environments, while people higher on sensory processing sensitivity function worse than people low on sensory processing sensitivity in bad environments, but in good environments they flourish and function better than people with sensory processing sensitivity. Therefore, it is also important to determine if what is defined as a 'good' environment for people who are highly sensitive in the general population, corresponds to a 'good' environment for people who are highly sensitive with ADHD, and eventually translate this knowledge to the clinic.

Finally, we found a positive correlation between *cognitive flexibility* and ADHD traits. In previous studies, researchers investigated cognitive flexibility in people with ADHD. Cognitive flexibility has been found to be lower in students with ADHD, although this effect was not found in people with a predominantly inattentive presentation (Aydın et al., 2022; Roshani et al., 2020). In our study we found a stronger positive correlation between cognitive flexibility and inattention than between hyperactivity/impulsivity and cognitive flexibility. It might therefore be interesting to repeat this study, including groups of people with ADHD with a predominantly hyperactive presentation and a combined presentation, to investigate how they score on cognitive flexibility compared to a control group. This can give us insight into which strengths more typically occur in which presentation and which occur equally across all presentations.

Besides positive correlations, we found negative correlations between ADHD traits and *sociability*, *being up for anything*, and *perseverance*, while people with ADHD mentioned these aspects as strengths in ADHD (Schippers er al., under review). A large meta-analysis in children with ADHD found that children with ADHD have problems with social functioning, mainly in the peer functioning domain (Ros & Graziano, 2018). A reason for this being mentioned as a positive aspect, might be due to positive illusionary bias, meaning that people with ADHD tend to overestimate their social competence (Owens et al., 2007). On a critical note, this phenomenon has mainly been researched in children. It would be interesting to investigate if adults with ADHD still experience positive illusory bias, to be able to better investigate the relation between sociability and ADHD traits. Another reason why we did not find a positive correlation, could have been due to the way we measured sociability. We used the Chuck and Buss Shyness scale and inverted the score(Hopko et al., 2005). This has been done before only using the positively framed questions, while we used all questions (Brook & Schmidt, 2020). However, sociability can be interpreted much wider than just the opposite of shyness (Boswell et al., 2020). It could be that we would have found a positive correlation with another measure of sociability.

To *measure up for anything*, we measured the concept of intolerance of uncertainty (IUS) and reversed the score. Studies in children with ADHD showed higher scores on intolerance of uncertainty than in children without ADHD (Gramszlo et al., 2018). However, it could be that, just like sociability, IUS changes across the lifespan.

We measured *perseverance* with a grit questionnaire that represents passion and perseverance for long term goals. Previous research found that college students with ADHD scored lower than average for their age, and grit negatively correlated with ADHD traits (Gray et al., 2016). Since grit is an important predictor of success, not only academic, but also for example for keeping a job, staying married or learning a new language, it could be a valuable strength for people with ADHD to have and to foster (Eskreis-Winkler et al., 2014; Teimouri et al., 2020).

The explorative analysis of the ADHD subdomains (inattention and hyperactivity/impulsivity) showed interesting findings. For the inattentive subscale, we see a positive stronger correlation between inattention and *cognitive flexibility* than we see between total ADHD traits and hyperactivity/impulsivity and cognitive flexibility.

For the hyperactivity/impulsivity subscale, on the other hand, we see that the negative correlation between hyperactivity/impulsivity and *sociability* is less strong than the correlation between ASRS total score and inattention and *sociability*. Moreover, the non-significant correlations between total ASRS and inattention and *curiosity* and *humour*, become positive when only looking at hyperactivity/impulsivity. These differences indicate that some positive aspects might be more

prevalent or stronger in certain presentations of ADHD than in others. This information can help us to develop profiles of strengths in ADHD, which can be translated into more personalised care.

Exploratory Analysis

Factor analysis

We have not been able to confirm the themes proposed by Schippers et al. (under review) with a confirmatory factor analysis. We have several possible explanations for this. First, the themes are constructed based on 113 codes, while we have only investigated ten of these positive aspects. It might be that these ten aspects interact with each other differently in the absence of the other positive aspects. Second, the themes were constructed based on the results of an ADHD sample, while our sample comes from the general population. This can cause a discrepancy in strengths, as strengths between a population sample can differ from strengths. We also have negative correlations, which can cause a different clustering, as they load differently onto the factors. Lastly, it might be that the conceptual themes just do not hold when tested quantitively. In that case, we should be looking for better themes than the themes proposed by Schippers et al. (under review).

Our exploratory factor analysis resulted in a four-factor solution. There is some scientific evidence help us explain why certain aspects are in the same factor. For example, for factor 1, *sociability* and *sensitivity* have opposite loadings on factor 1. This relation has been found before in a study in a student population where a positive correlation was found between sensitivity and shyness (Aron et al., 2005). Moreover, factor 3 contains *curiosity* and *humour*, which have been positively correlated in a study using self-report, other-report, and observer reports (Kashdan et al., 2013). Lastly, *perseverance* has been linked to being less *cognitively flexible* (Kalia et al., 2019). These aspects are negatively linked to factor 4. In this case, being too gritty impairs the ability to think of new solutions, keeping on trying something that does not work. This example illustrates that for all positive aspects, there is a balance between the aspect being positive and being too much for being beneficial. The main reason for the explorative factor analysis being so different from our theoretical themes, could be that we included ten aspects, while there will be many more, with which the factor structure might be easier to interpret.

Network analysis

To investigate how the positive aspects do not only cluster together, but influence each other, we performed network analyses. Network analyses are quickly gaining more interest in psychiatric research, because it allows to visualise and inspect how variables interact with each other and get a better understanding of what happens in the rest of the network if a variable changes. The most important finding of this first network analysis investigating positive aspects related to ADHD, is that the positive aspects do not form well-defined clusters per aspect, but blend

and overlap with each other. This highlights the importance of not just looking at one positive aspect in relation to ADHD traits at the time, but especially looking at multiple aspects at the same time, in relation to each other. At the same time, hyperfocus questions, do form a cluster by themselves , indicating that this is a more separate positive aspect than other aspects.

Centrality measures should be interpreted with caution, and therefore we will be as cautious as possible with our interpretation of the expected influence (Fried et al., 2018). From our analysis, a question from the sensory processing sensitivity questionnaire has the highest expected influence. It might therefore be that this is of high importance for development (note that we do not yet know anything about the causal or temporal development of positive aspects related to ADHD) or maintenance of other positive aspects. The same goes for humour. Although it is not a humour question that has the highest expected influence, it has several questions in the top ten, which together might indicate an important role for humour. An important note is that the most central nodes are not always the most clinically relevant nodes. It might be that for people with ADHD, hyperfocus is a more important strength than humour in their daily lives, although it is less central to the network. Qualitative research could investigate what people with ADHD think are important strengths, and how they think positive aspects interact with each other.

While we did cross-sectional network analysis, an important role of network analyses can emerge from temporal within subject network analysis. We know that ADHD traits can change over time, and temporal networks can help us gain insight into the development of ADHD traits and their relation to positive aspects (Martel et al., 2016). Moreover, temporal networks can open the way to personalised care and interventions, as we can build a personal profile of strengths, environmental aspects, and ADHD traits, based on which we can intervene.

Different kinds of positive aspects

Based on our previous work (Schippers et al 2022), we expected to find positive correlations between the number of ADHD traits and all of the positive aspects tested in our study. However, this was not the case. One possible explanation is that some of the positive aspects from our previous study might be coping mechanisms, a consequence of living with ADHD. These aspects will therefore not or to a lesser extend be correlated with ADHD traits in the general population. For example, as a result of overcoming setbacks, people with ADHD can experience due to their symptoms, they might be more perseverant than people without ADHD, but this does not necessarily correlate with the number of ADHD traits in those without a diagnosis. Other positive aspects might be inherent to ADHD traits, potentially having a shared developmental origin. Positive aspects that we found that would fit in this category are *sensitivity*, *hyperfocus* and *flexibility*. Because these positive aspects are inherent to ADHD, the positive correlation can also be found in the general population. The differences between these two kinds of positive aspects could be explored using a case-control study

design where inherent positive aspects should be found in both groups, while the acquired strengths will be hypothesised to be found primarily in the ADHD group.

Another possible difference between the categories could be the age during which the strengths develop. Strengths that are inherent to ADHD would be expected to be present from a young age, while acquired strengths develop with age. A good way to investigate this, would be a longitudinal cohort study. Understanding when strengths develop can help us determine what would be an appropriate age for strength-based interventions, or to develop age-appropriate strength-based interventions.

Strengths and limitations

Our study has several strengths and limitations. One of the strengths is that we were able to collect data from a large and diverse sample, which allows us to capture the whole continuum of ADHD traits in the general population and the correlation with strengths. Advantages of using online platforms for data collection include having many participants available, and a more diverse population than a student population (Adams et al., 2020; Newman et al., 2021). Secondly, unlike previous studies investigating strengths in ADHD, we measured several (ten) strengths at the same time. This allowed us to not only investigate how these strengths correlate with ADHD traits, but also how they interact with each other.

In the current study, we limited our sample to participants from the United Kingdom. However, since ADHD is being diagnosed across different cultures, and views on what strengths are, differ per culture, we also need information on strengths in different cultures. Academic prolific offers the possibility to pre-screen on country, so this would be an ideal option for a follow-up study in different cultures.

A difficulty in conducting this study, was the translation from the qualitative evidence towards quantitative questionnaires. As the study by Schippers et al (under review) was an online survey, we could not ask what participants meant with their answers. Enthusiasm can for example be interpreted as being an enthusiastic, bubbly person around others, or being enthusiastic about your work or hobbies. Another example might be empathy. Empathy can have many definitions, and we do not know for sure if we measured what people meant (Cuff et al., 2016). At the same time, it is very likely that different people resonated with different definitions. Although we tried to interpret as careful as possible, it might be that we have measured a different concept than people with ADHD meant, and that we did not find a positive correlation because of this discrepancy.

Besides the difficulty we had with interpreting the positive aspects, it was also challenging to find adequate questionnaires to measure positive aspects, since they might be hard to grasp or not have been subject to research interest before. An example of positive aspects that were high in frequency in the qualitative study, but we have not been able to find an adequate questionnaire for,

are *energetic* and *broad interest*. Future studies could consider designing appropriate questionnaires or finding an alternative way to quantitatively measure these and other concepts to further expand our knowledge on positive aspects in ADHD.

Implications

For people with ADHD, the results of our study will recognise and validate their knowledge that they experience positive aspects of their ADHD. Using this knowledge in psychoeducation, can help to reduce self-stigma, and to improve self-esteem, which is in general lower in people with ADHD than in the general population (Newark et al., 2016). Psychoeducation has already shown to have a positive effect , not only when it is directed to people with ADHD themselves, but also towards their parents, teachers or partners(Dahl et al., 2020; Hirvikoski et al., 2017). Another aspect where psychoeducation might be useful, is in the workplace. Educating both employers and co-workers could help to be more understanding and accommodating of the struggles of people, and to appreciate the positive aspects more.

For adults with ADHD, knowledge about, and usage of ADHD related strengths, could be especially beneficial for making career choices and in the workplace. At work, people with ADHD can struggle with for example time management, and generally earn less than their peers without ADHD (Sarkis, 2014). For people with ADHD , it can help to know about their strengths, so they can learn how to use them. For their employers, knowing about strengths in general can help them get a more balanced view on ADHD, reducing stigma and discrimination on the work floor. Knowing about an employee's specific strengths and challenges, can help an employer find suitable tasks, where the talents if the employee can be used to help the company thrive. Strength based career advice for people with ADHD could help them to find careers where they can develop their talents and be of great value to society. For example, cognitive flexibility has been found to be associated with entrepreneurship, via risk taking (Dheer & Lenartowicz, 2019). Moreover, sensory processing sensitivity might be advantageous for entrepreneurship (Harms et al., 2019). From literature we also know that people with ADHD tend to be good entrepreneurs (Lerner et al., 2019; Wiklund et al., 2017). Knowing which positive aspects of ADHD are linked to good entrepreneurship, can help people with ADHD become even better entrepreneurs.

Another implication of our research is that it can pave the way for strength-based interventions. Strength use is associated with life satisfaction and well-being (Douglass & Duffy, 2015; Proctor et al., 2011). Strength-based interventions aim to make people aware of their strengths and encourage them to use their strengths (Schutte & Malouff, 2019). A meta-analysis has found that character strength interventions positively influence life satisfaction, and on strength use (Schutte & Malouff, 2019). Future research could look into developing a strength-based intervention program specifically oriented towards people with ADHD.

Our research also supports the perspective of the neurodiversity paradigm. The neurodiversity paradigm states that differences in brain function and structure, and consequent behaviours, are normal variation within the population that are not inherently good or bad (Sonuga-Barke & Thapar, 2021). This variation can be experienced as advantageous or disadvantageous for the individual and for the group (Sonuga-Barke & Thapar, 2021). Impairment is not seen as a consequence of a mental condition, but as caused by the environment. From this perspective we should facilitate fitting and inclusive environments for neurodiverse people, just as we should for example make environments inclusive for wheelchair users of people with visual impairments. The neurodiversity paradigm also fits well with a positive psychology approach. Positive psychology, contradicts a deficit-focused psychopathology view, focusses on individuals' strengths, and how to make people flourish (Gable & Haidt, 2005). It is important to research strengths related to psychiatric disorders, not only for people themselves, but also for society, so we know how people with psychiatric disorders can thrive, and what their unique contributions can be.

CONCLUSION

In conclusion, we investigated ten positive aspects related to ADHD and their relation to ADHD traits in the general population. We found positive correlations between ADHD traits and *hyperfocus*, *sensory processing sensitivity*, and *cognitive flexibility*. Network analysis revealed that the positive aspects interact with each other and with ADHD traits, advocating for investigating multiple aspects in one study. Future studies should investigate the origin of positive aspects, whether they are inherent to ADHD or developed as coping mechanisms, by performing case control studies or longitudinal studies in people with ADHD.

Our results will pave the way for developing strength-based interventions for people with ADHD, so that by knowing what their unique strengths are, they can thrive in their personal and professional lives. For society, our results will help us understand the positive aspects of ADHD better, which will help in reducing stigma, and increase acceptance, and help embrace the diversity that ADHD brings.

PREREGISTRATION LINK AND DATA AVAILABILITY

osf.io/xpd47
Data and code for analysis will be made available on the same platform upon publication.

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