Cogniphobia and its possible explanatory value for noncredible examinations

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Abstract

The reasons for participants responding in a noncredible manner on assessments are multifactorial. In this study, we assess whether cogniphobia, or the fear of cognitive testing and cognitive exertion, might be a possible cause. 342 Participants were sampled through SONA, an internal university program, and through the social networks of the researchers. Participants' responses to the credibility measures (CAARS Infrequency Index (CII), ADHD Credibility Index (ACI), and Inconsistency Scale (INC)) included in the Conner's Adult ADHD Rating Scale (CAARS), a test for the assessment of Attention-Deficit-Hyperactivity Disorder (ADHD) were examined. By comparing these results with scores on the adapted version of the cogniphobia scale (C scale), we determined whether cogniphobia was a possible reason for noncredible responding. A priori analyses revealed the credibility measures (ACI and INC) as possible predictors for cogniphobia. High scores on the cogniphobia scale were associated with low educational status, as well as high scores on noncredible measures. Anxiety did not seem to be a potential mediator between cogniphobia and noncredible responding. The implications of these relationships are discussed.

Keywords: ADHD, anxiety, cogniphobia, INC, noncredible responding, SVT

Cogniphobia and its possible explanatory value for noncredible examinations

Clinical psychology heavily relies on careful diagnostic evaluation and precise testing to ensure that people in need are provided with suitable treatment. Consequences of inaccurate testing procedures can be grave and can include a lack of necessary treatment for genuine patients, significant societal costs for unneeded examinations and treatments, unwarranted use of limited medical resources, and a deterioration of society's trust in the field of psychology (Tucha et al., 2014). Therefore, further expanding our understanding of the measures, procedures, outcomes, and patients' behaviors and motivations is of greatest importance.

While the emphasis is mainly placed on people responding credibly to tests, growing interest is now being directed towards noncredible examinations. According to Giromini (2020), multiple sources of information, such as symptom validity tests (SVT) and performance validity tests (PVT) should be considered when assessing the credibility of a clinical report. While SVTs are instruments used to assess the credibility of self-reported symptoms, PVT are measures used to evaluate the credibility of performance on cognitive tests (Giromini et al., 2020). There is growing evidence for a substantial percentage of noncredible responding (Martin & Schroeder, 2020). Martin and Schroeder (2020) found that depending on the context and setting of the examination, base rates of invalidity vary greatly (i.e., from 5% to 50%). This is supported by Sullivan et al. (2007)'s findings of noncredible performance rates among students ranging from 9.4% to 47.6%. Finally, Martin et al. (2020) warn clinicians to be cautious of cases in which noncredible bodily, cognitive, or psychiatric symptoms are present, as half of these patients are believed to produce invalid neuropsychological test results. As demonstrated by these figures, it is important to investigate the underlying causes and motivations to fully understand the phenomenon of

noncredible examinations. In this study, we will only be making use of SVT as an instrument to detect the examinations' credibility.

No single root cause has been found to be responsible for noncredible symptom reports, rather this is a multifactorial issue. Noncredible reports could be due to differences in individuals' conditions, such as feeling exhausted, tired, or bored, and personal factors, such as having a higher-than-average intelligence. Additionally, the credibility of a symptom report could be affected by certain psychiatric disorders which lie somewhere between conscious and unconscious deception, such as somatoform disorder and conversion disorder. It is important to note that, as Merten & Merckelbach (2013) have noted, SVT failure in forensic contexts should not be seen as an automatic extension of the disorder, but should rather be interpreted as uncooperativeness. According to Martelli et al. (1999), response biases, such as symptom magnification, which is used to meet a variety of psychological needs, for example as a "cry for help", and malingering - defined as the conscious exaggeration or reporting of symptoms for external incentives (Suhr et al., 2010) - should be taken into account as well. Mittenberg et al., (2002) found malingering and symptom exaggeration rates in roughly 30% of examinees pursuing external incentives. Examples of external incentives include possible legal benefits, monetary compensation, or access to medication, which might lead to substance misuse. All of the above could influence the examination´s credibility. Moreover, stimulant misusers have been linked to a greater incidence of psychiatric disorders and general malfunction (Wilens et al., 2016), which further demonstrates the need for measures capable of detecting noncredible responding.

In this study, Attention-Deficit-Hyperactivity Disorder (ADHD) will be used as an example of a psychiatric condition with evidence of high rates of noncredible cognitive performance and symptom reporting among people who self-refer themselves for evaluation (Suhr et al., 2008; Sullivan et al., 2007). ADHD is defined as a "persistent pattern of

inattention and/or hyperactivity/impulsivity that interferes with functioning or development" (Takeda, 2019) and can be seen as an appealing diagnosis for malingering due to the many potential external incentives, such as medication, educational, and legal benefits (Fuermaier et al., 2021). Therefore, over the years, there has been an attempt to develop measures capable of detecting noncredible ADHD examinations. Common assessment methods of noncredible responding for self-reported symptoms are infrequency scales, which consist of embedded items endorsed by malingerers, but rarely by genuine responders, and inconsistency scales, which assess the inconsistency in responding to similar measures (Suhr et al., 2010). The Conner's Adult Attention-Deficit/Hyperactivity Rating Scale (CAARS; Conners et al., 1998), is a frequently used self-report measure to assess ADHD in adults. Included in the CAARS are ADHD symptom scales, an inconsistency scale (INC), the CAARS Infrequency Index (CII; Suhr et al., 2010), and additional infrequency items shown to detect symptom over-reporting highly accurately (Becke et al., 2021). Therefore, we will use these common methods to investigate the degree of attention deficiencies in the community, as well as the types and rates of noncredible responses. These measures, however, are not useful in distinguishing different kinds of noncredible responding. The above explorations of reasons and motivations for noncredible responding indicate the multifactorial nature of this phenomenon, which calls for a more in-depth examination.

Here, we will examine another factor as a potential explanatory value for both cognitive issues and noncredible responding, namely cogniphobia. Cogniphobia originated from and is the cognitive equivalent to kinesiophobia, the unjust fear of pain and re-injury through physical activity, and is defined as the avoidance of mental tasks in fear of causing or worsening cognitive complaints (Martelli et al., 1999). This avoidance of mental exertion could lead people high in cogniphobia "to the point of performing invalidly" (Suhr & Spickard, 2012, p. 1129). Previous research has supported the explanatory value of

cogniphobia in noncredible test results. In general, Henry et al. (2018)'s findings showed that illness perception was an important predictor of cognitive performance validity. In particular, according to Suhr & Spickard (2012), individuals who score high on the fear/avoidance factor failed a symptom validity measure, while Lee et al. (2021) found cogniphobia to be linked to invalid performance on SVT. In this study, cogniphobia will be assessed by an adjusted version of the original cogniphobia scale (Martelli, 1998), which consists of 15 items. The cogniphobia scale has been adjusted to fit the community-based sample used in this study, rather than a specific group of people with headache complaints. In this study, several factors will be investigated as possible mediators in the relationship between cogniphobia and noncredible examinations in the assessment of ADHD symptom severity. Lee et al. (2021), while researching the link between cogniphobia components and validity testing found education levels to be related to cogniphobia. Concerning educational levels, Lee et al. (2021)'s findings are consistent with previous research suggesting that lower levels of education, as well as lower socioeconomic status, are related to more significant health anxiety, which could be linked to cogniphobia (Chen & Miller, 2013; El-Gabalawy et al., 2013; Silverberg et al., 2018). Interestingly, research seems to suggest that anxiety, or feelings of uneasiness, with generalized anxiety disorder being an increased worry about a multitude of factors (Spitzer et al., 2006), is linked to cogniphobia. Higher CS-HD scores were linked to significant generalized anxiety disorder symptoms (Seng & Klepper, 2017), indicating a positive association between the two concepts. Martelli's (1999) design of a cogniphobia scale (C scale) evaluates avoidance behavior based on anxiety, suggesting that the concept of cogniphobia is closely linked to anxiety. Additionally, Martelli (1999) proposes anxiety reduction procedures as a possible treatment for cogniphobia. To investigate the role of anxiety in the relationship between cogniphobia and noncredible examinations, this study will assess anxiety on the State-Trait Anxiety Inventory (STAI; Spielberger, 1983). It will be

investigated how education relates to cogniphobia, and whether anxiety is a possible mediator in the relationship between cogniphobia and noncredible responding. A more in-depth explanation of this study will follow below.

In essence, this study will examine the degree of attention deficits in the community with the help of the CAARS, discover different kinds and prevalence rates of noncredible responding, and explore the explanatory value of cogniphobia for noncredible responding. The study´s community-based convenience sample will be assessed via a survey, which includes measures for the assessment of ADHD (CAARS) and cogniphobia (adjusted version of the original cogniphobia scale). Additionally, anxiety, depression, and stress will be assessed using items from the STAI (Spielberger, 1983) and the Depression Anxiety Stress Scales (DASS; Lovibond & Lovibond, 1995). The dimensional characteristic of ADHD, as well as the generally high prevalence of current and childhood ADHD symptomatology in the general population, allows us to assess ADHD based on a convenience sample from the community (DuPaul et al., 2001; Heiligenstein et al., 2000; Murphy & Barkley, 1996; Murphy et al., 2000).

Exploratory Analysis

Firstly, due to the limited research on the scale, this study explores the cogniphobia scale, Spearman's Rho correlations between the variables 'Years of education', the credibility scales (INC; CII; and ACI), the cogniphobia scale, the DASS, the STAI, the DSM sum scores, and the ADHD index, and possible significant predictors for high cogniphobia sores.

Hypothesis Driven Analysis

We anticipate a positive association between high educational status and low cogniphobia scores, which will be suggested by years of education and low scores on the cogniphobia scale (C scale). Secondly, we expect to see a positive association between cogniphobia and invalid clinical examinations, which will be indicated by high scores on the

C scale, and high scores on the non-credibility measures (CII, INC, ACI). Finally, we will investigate anxiety (on the STAI) as a possible mediator for the relationship between cogniphobia and noncredible reports.

Methods

Participants

The sample consisted of 342 participants who partook in the present study. Participants were recruited from the psychology participant pool called SONA (*n* = 200, 58 %), as well as from the social network of the student researchers (*n* = 142, 42%). Of the 342 respondents, 51 were excluded because they did not finish the questionnaire, and 73 were excluded because their response time was considered too quick compared to the mean response time. Participants completing the questionnaire faster than 758s, below the 25th percentile of the mean response time were excluded. The demographic characteristics of the remaining 218 participants can be seen in Table 1.

Table 1

Demographic Information of the Sample.

Variable		**N**	**%**	**Mean**	**SD**
Age				24.35	10.45
Years of education				14.21	3.48
Gender	Female/male/non-binary	150/ 66/ 2	68.8/ 30.3/ .9		
Nationality	Dutch	73	33.5		
	German	93	42.7		
	Other	52	23.9		
Occupation	Student	166	76.1		
	Full-time working	36	16.5		
	Part-time working	6	2.8		
	Retired	5	2.3		
	Not working	1	.5		
	Looking for a job	4	1.8		
No. of people in household	Living alone	33	15.1		
	+1 person	40	18.3		

	+2 people	49	22.5
	+3 or more people	96	44
Migraine	Yes/No	52/ 165	23.96/ 76.04
Head injury	Yes/No	11/ 205	5.1/ 94.9
ADHD diagnosis	Yes, childhood	2	.92
	Yes, in adulthood	5	2.3
	No	210	96.78
Psychiatric diagnosis	Mood disorder	15	7
	Anxiety disorder	11	5.1
	Eating disorder	1	.5
	No	172	80.4
	Other	15	7

Materials

Conners' Adult ADHD Rating Scale

The Conners' Adult ADHD Rating Scale (long version, CAARS-S:L, Conners et al., 1998) is a self-report measure of ADHD symptoms in adulthood, consisting of 66 items in total. The CAARS includes seven clinical subscales: CAARS-A measures Inattention and memory problems (12 items), CAARS-B measures hyperactivity and restlessness symptoms (12 items), CAARS-C measures impulsivity and emotional lability (12 items), CAARS-D measures problems with self-concept (12 items), CAARS-E measures DSM-IV inattention symptoms (9 items), CAARS-F measures DSM-IV hyperactivity/impulsivity symptoms (9 items), and CAARS-G measures the total DSM-IV symptoms by merging scales E and F. The CAARS further includes an ADHD Index, consisting of 12 items that best distinguish ADHD patients from non-clinical patients, and an Inconsistency Index (INC), which measures careless or random responding, and consists of eight pairs of items (16 items in total) embedded in the original clinical scales of the CAARS. It is sensitive to inconsistent responding on items measuring the same symptoms (Walls et al., 2017). Some items of the CAARS are part of several scales, e.g., items that measure inattention problems may belong to both, CAARS-A and CAARS-E. The CAARS is scored on a four-point scale, ranging from

0 (=not at all/never) to 3 (=very much/very frequently), indicating the frequency with which symptoms are experienced.

Along with these, we also use two other SVTs: The first is the CAARS Infrequency Index (CII; Suhr et al., 2011), consisting of 12 items, which are already embedded in the CAARS and have been infrequently endorsed by ADHD patients and control participants. The items of the CII are also scored on a four-point scale, with a cutoff score of 21 to detect noncredible responding. The other validity measure is the recently developed ADHD Credibility Index (ACI; Becke et al., 2021). In contrast to the CII, items of the ACI are not directly embedded into the CAARS but have been specifically developed for the purpose of detecting noncredible ADHD symptom reporting. The ACI found 12 new items to be infrequently endorsed by control samples and clinical ADHD samples, which can be divided into four subscales: supposed symptoms, exaggerated symptoms, symptom combinations, and selectivity of symptom report (Becke et al., 2021). The items are also rated on a four-point scale, so the maximum possible score on the ACI is 36, and a cutoff score of 21 has been suggested to detect noncredible responding.

Cogniphobia scale

Originally, the Cogniphobia Scale (Martelli, 1998) was created to measure fear-based cognitive task avoidance in headache patients by adapting the popular Tampa Scale for Kinesophobia (Lundberg et al., 2011). While the initial version of the scale included 16 items (Martelli, 1998), subsequent studies modified the original version (Seng & Klepper, 2017; Suhr & Spickard, 2012). To further investigate kinesophobia, Suhr & Spickard (2012) added three additional items to the original version, raising the total item count to 19, and deriving two subscales, Cogniphobia-Avoidance (12 items) and Cogniphobia-Dangerousness (7 items), by running a factor analysis. These two subscales each demonstrated an internal consistency (Cronbach's α) of 0.83 (Cogniphobia-Avoidance) and 0.86 (Cogniphobia-Dangerousness),

suggesting sufficient reliability (Suhr & Spickard, 2012). People scoring higher on this cogniphobia scale indicated greater endorsement of avoidance behavior and dangerousness beliefs, with the internal consistency (Cronbach's α) of these subscales being 0.79 and 0.80 (Silverberg et al., 2018). Seng & Klepper (2017), on the other hand, later on, modified and added to the existing items (Suhr & Spickard, 2012; Martelli, 1998) to fit the concept of cogniphobia, which they closely linked to headaches. Therefore, items mentioning "pain" were changed to "headache/headache pain", to relate more accurately to people with headache complaints. The modified scale, named Cogniphobia Scale for Headache Disorders (CS-HD), displayed high internal consistency, providing initial support for the use of CS-HD for the evaluation of cogniphobia in headache participants (Seng & Klepper, 2017). In this study, an adjusted version of the original scale (Martelli, 1998) with 18 items is used to suit the community sample. Here, due to community sample-related adjustment, items containing terms, such as "head pain" were generalized to "my condition", or "my concentration" (see Appendix). Concerning scoring, participants score the items from 1 to 4 (1= Strongly disagree, 2= Disagree, 3= Agree, 4= Strongly Agree). All items are added up depending on the degree of agreement, except for four inverted items (4, 8, 12, 16), which are scored in the opposite direction (Martelli, 1998). Martelli (1998) found a cutoff score of 37 to be useful.

Depression-Anxiety-Stress Scale-21 (DASS-21)

We are using the Depression-Anxiety-Stress Scale (DASS-21; Lovibond & Lovibond, 1995) to primarily assess current levels of depression and stress in our participants. The DASS-21 is a self-report measure, consisting of 21 items, and includes three different scales: depression (d), anxiety (a), and stress (s). The DASS-21 is scored on a four-point scale (0 = did not apply to me at all; 1 = applied to me to some degree, or some of the time; 2 = applied to me to a considerable degree or a good part of the time; 3 = applied to me very much or most of the time). For our study, we have chosen three items measuring stress (items 1, 11,

and 12) and three items measuring depression (items 3, 16, and 21). Higher scores on those items indicate higher levels of stress and depression.

State-Trait Anxiety Inventory

The State-Trait Anxiety Inventory (STAI; Spielberger, 1983) is a self-evaluation instrument measuring temporary "state anxiety" (items 1-20) and the generalized long-term "trait anxiety" (items 21-40). The original scale consists of 40 items, from which the first 20 questions are scored from 1 to 4 (1= Not at all, 2= Somewhat, 3 = Moderately so, 4= Very much so), and the second 20 questions from 1 to 4 (1= Almost Never, 2= Sometimes, 3= Often, 4 = Almost Always). For this study, due to reasons of brevity, we use a shortened version of the STAI, which consists of only six items (4, 7, 17 = state anxiety; 22, 29, 40 = trait anxiety) chosen from the long version. Sum scores are used in this study. Therefore, higher scores on the shortened STAI version indicate higher levels of anxiety.

Demographic information

The survey includes demographic questions asking for age (in years), gender (Female, Male, Non-binary, Prefer not to say), occupation (Student, Full-time working (>24 hours/week), Part-time working (24 or less hours per week), Retired, Not working, Looking for a job). In addition, questions regarding nationality (German, Dutch or other), years of education including university, and the number of people living in the household including oneself (1,2,3,4+) are incorporated.

Medical history

Questions concerning medical history can be answered voluntarily by participants, including present or past experiences of head injuries. In case participants affirm, questions are asked about the kind of head injury and how long ago (in months or years) they experienced this event. Furthermore, questions concerning head injury in the family, experiencing migraine attacks, and a possible diagnosis of ADHD (diagnosed in childhood,

diagnosed in adulthood, or no diagnosis) are included. This part also asks whether the participant has been diagnosed with another psychiatric diagnosis (no, mood disorder, anxiety disorder, psychotic disorder, eating disorder, or other) as well as for the prescription of medication (yes, no).

Testing experiences

Participants are instructed to rate the statement "Evaluations and assessments are very stressful for me" on a five-point Likert scale (strongly disagree, somewhat disagree, neither agree nor disagree, somewhat agree, strongly agree). Furthermore, participants are asked to indicate the experience of past evaluations and assessments, also on a five-point Likert scale (extremely negative, somewhat negative, neither positive nor negative, somewhat positive, extremely positive).

Procedure

This study was carried out in compliance with the guidelines of the ethical committee psychology (ECP) of the University of Groningen, the Netherlands. Participants were recruited from the local community, including the student researchers' social network as well as from the psychology participant pool, called SONA, of the University of Groningen. Students recruited via SONA received credits for their participation. The rest of the participants completed the questionnaire without any compensation. Since everyone received the same questionnaire, participants were not assigned to different conditions. Subjects answered an online questionnaire, which took around 20 to 30 minutes to be completed. After selecting the preferred language, participants were provided with general information about what kind of questions can be expected in the survey. After giving informed consent, participants answered the demographic questions to provide general information about themselves. Subjects completed several multiple-choice self-report measurements, including the CAARS for the assessment of ADHD symptoms and a cogniphobia scale, asking for

concentration and attention difficulties. Other measures followed, assessing the participants' psychiatric and medical history. After the self-evaluation of symptoms of state and trait anxiety, depression, and stress, as well as past experiences of being evaluated and with testing, participants were debriefed. Since the study took place online, no interaction between participants and researchers occurred, except for the recruitment procedure.

Statistical Analysis

For the exploratory analysis, the cogniphobia scale´s internal consistency, item-total correlation, and cogniphobia mean scores across different groups (age, gender, occupation, and nationality) were investigated. Spearman´s Rho correlations between the variables 'Years of education', the credibility scales (INC; CII; and ACI), the cogniphobia scale, the DASS, the STAI, the DSM sum scores, and the ADHD index were used to inspect associations between the different variables. Possible predictors for high cogniphobia scores were examined using multiple linear regression with the forward method.

Concerning the hypothesis-driven analysis, hypothesis one (do people with low educational status score higher on cogniphobia), as well as hypothesis two (do people with high cogniphobia score highly on the credibility tests), were examined using independent sample t-tests. A series of regression analyses were used for hypothesis three (does anxiety qualify as a possible mediator for the relationship between non-credible responding and cogniphobia).

Results

Assumption checks were performed for the assumptions of normality, normality of residuals, equality of variances, linearity of residuals, and multicollinearity. The examination of boxplots revealed that normality was violated for the distribution of the CII, INC, ACI, and cogniphobia scores. Regarding the CII, INC, ACI, and cogniphobia, the assumption of linearity of residuals and of normality of residuals were met, which was determined by

plotting scatterplots, and QQ-plots. According to Levene's test, the assumption of the equality of variances seems to be partly violated. The calculation of the Variance-Inflation Factor (VIF) with a cutoff score of 25 indicates that multicollinearity is not an issue in the regression model. Due to some of the assumptions being violated, non-parametric tests will be used from this point onward.

Table 2 represents the descriptive statistics of the CAARS, the CII and ACI, the INC, the adapted original cogniphobia scale, the STAI, the DASS, and the percentage of people scoring in the credible and noncredible ranges on the measures CII, INC, and ACI.

Table 2

Descriptive Statistics of the CII, ACI, INC, DSM, ADHD, Cogniphobia scale (C scale), STAI, DASS, and the Frequencies and Percentages of Credible and Non-Credible Responding on the CII, INC, and ACI

	Valid	Mean	SD	Minimum	Maximum	Credible	Non-Credible
CII	218	19.65	4.26	12.00	34.00	154 (70.64%)	64 (29.36%)
INC	218	9.70	6.72	0.00	23.00	85 (23.85%)	165 (75.69%)
ACI	218	17.18	3.71	12.00	30.00	189 (86.69%)	29 (13.3%)
DSM	218	34.44	8.16	20.00	58.00		
ADHD	218	24.01	5.44	13.00	41.00		
C Scale	218	26.36	13.77	0.00	52.00		
STAI	218	13.51	4.28	6.00	24.00		
DASS	218	11.56	3.91	6.00	24.00		

Note. Here, CII = CAARS Infrequency Index, INC = Inconsistency Index, ACI = ADHD credibility index, DSM = DSM total score, ADHD = ADHD index, C Scale = cogniphobia sum scores, STAI = STAI sum scores, DASS = DASS sum scores, SD = Standard Deviation, Credible = Credible responding, Noncredible responding

Exploratory Analysis

Due to the recent nature of the concept of cogniphobia, no cutoff score to date has been validated for the cogniphobia scale. We chose the cutoff at 40, which is the score one

standard deviation above the mean. Therefore, participants with a score of 40 or higher are identified as being high in cogniphobia, which in our case were 39 people. Participants scoring one standard deviation below the mean (13 or lower) are in the low cogniphobia group, which consists of 49 people. In this sample, the 18 cogniphobia items demonstrated good internal consistency (α = 0.83) (Tavakol & Dennick, 2011) and item-total correlations (0.06 – 0.67) (Pope, 2021). Overall, the total scores varied from 0 to 52 (on a scale of 0 to 72). The mean cogniphobia total score was 26.36 (with a standard deviation of 13.77). Here, the distribution of values did not deviate significantly from a normal distribution (kurtosis = -0.96, SE = 0.33, skewness = - 0.22, SE = 0.17) (Bulmer, 1979). Furthermore, as an exploratory analysis, table 3 displays cogniphobia mean scores across different groups (age, gender, occupation, and nationality).

Table 3

Cogniphobia Mean Scores Across the Groups Age, Gender, Occupation, and Nationality

	N	Mean	SD
Age1	191	26.58	13.62
Age2	27	24.78	15.02
Male	66	24.30	12.98
Female	150	27.02	14.00
Non-Binary	2	44.50	0.70
Student	166	26.42	13.46
Full-time	36	27.86	14.83
Part-time	6	24.00	14.03
Retired	5	12.80	15.99
Not Working	1	24.00	
Looking for a job	4	28.00	11.14

	N	Mean	SD
German	93	22.34	14.80
Dutch	73	29.70	11.54
Other	52	28.85	13.14

Note. N = number of participants, SD = Standard Deviation, Age1 = participants from the ages 18 to 30, Age2 = participants from the ages 31 to 77, Full-time = working 24+ hours per week, Part-time = working 24 or less hours a week.

Performing Spearman's Rho correlations between the variables 'Years of Education', the credibility scales (INC, CII, and ACI), the cogniphobia scale, the DASS, the STAI, and the DSM sum scores, and the ADHD index (Table 4) showed that the variable `Years of Education´ did not correlate significantly with any other added variables. All credibility scales showed significant correlations with the mean scores of the cogniphobia scale. Interestingly, while both the ACI ($r_s = 0.58$, $p < .001$), and the CII correlated moderately ($r_s = 0.46$, $p < .001$) with the cogniphobia scale, the INC had a strong correlation with the mean scores of the cogniphobia scale ($r_s = 0.93$, $p < .001$) (Weir, 2011).

Table 4

Spearman`s Rho Correlations

	C Scale	**YOE**	**INC**	**CII**	**ACI**	**STAI**
C Scale	-					
YOE	-0.03	-				
DSM	0.55***	0.09				
ADHD	0.55***	0.03				
INC	0.93***	-0.03	-			
CII	0.46***	4.562e-5	0.36***	-		
ACI	0.58***	0.02	0.46***	0.63***	-	
STAI	0.33***	-0.00	0.25***	0.37***	0.46***	-
DASS	0.28***	-0.07	0.21**	0.34***	0.40***	0.65***
CAARS A	0.46***	0.08	0.34***	0.68***	0.56***	0.27***
CAARS B	0.36***	0.06	0.26***	0.50***	0.65***	0.23***

Table 4

Spearman`s Rho Correlations

	C Scale	YOE	INC	CII	ACI	STAI
CAARS C	0.32***	-0.07	0.26***	0.67***	0.56***	0.44***
CAARS D	0.39***	-0.05	0.28***	0.48***	0.34***	0.55***
CAARS E	0.57***	0.06	0.43***	0.66***	0.63***	0.31***
CAARS F	0.38***	0.10	0.28***	0.66***	0.67***	0.30***

Note. * $p < .05$, ** $p < .01$, *** $p < .001$; C Scale = cogniphobia scale, YOE = Years of Education, DSM = DSM sum scores, ADHD = ADHD index, INC = Inconsistency scale, CII = CAARS Infrequency Index, ACI = ADHD Credibility scale, STAI = State-Trait Anxiety Inventory, DASS = Depression-Anxiety-Stress Scale, CAARS A = inattention and memory problems, CAARS B = hyperactivity and restlessness symptoms, CAARS C = impulsivity and emotional lability, CAARS D = self-concept, CAARS E = DSM-IV inattention symptoms, CAARS F = DSM-IV hyperactivity/impulsivity symptoms.

As part of the exploratory analysis, possible statistically significant predictors for high cogniphobia scores were investigated by conducting a multiple linear regression using the forward method. Cogniphobia was selected as the dependent variable, and in line with the hypotheses, CII, ACI, INC, years of education, and the STAI were added as covariates. In this regression, INC was added by the model first, meaning that the variable INC compared to all other added variables explains the most variability in cogniphobia scores ($R^2 = 0.86$, $F = 1234.32$, $p < .001$). In the second and final step, ACI was added as a covariate, which increased R^2 to 0.88 ($F = 765.10$, $p < .001$). While the covariates CII, years of education, and STAI were considered, they did not add to the model and therefore were not included. Consequently, the complete model (model 3) contains INC and ACI. Table 5 displays the results of the multiple linear regression model.

Table 5

Model Summary of the Linear Regression Model, with CII, ACI, INC, Years of education and STAI

Model	R^2	Adjusted R^2	R^2 Change	F Change	df1	df2	p
1	0.000	0.000	0.000		0	207	
2 (INC)	0.857	0.856	0.857	1234.318	1	206	< .001
3 (INC, ACI)	0.882	0.881	0.025	43.176	1	205	< .001

Coefficients

Model		Unstandardized	Standard Error	Standardized	t	p
2	INC	1.914	0.054	0.926	35.133	< .001
3	INC	1.756	0.055	0.849	31.833	< .001
	ACI	0.653	0.099	0.175	6.571	< .001

Note. The following covariates were considered but not included: CII, YearsofEducation, Sum_Stai.

Hypothesis driven analyses

To analyze whether people with low educational status score higher on cogniphobia, the participants were classified into the low educational group (years of education lies 1SD below the sample mean of 14.26 (SD = 3.48) = 10.77), and into the high educational group (years of education lies 1SD above the sample mean of 14.26 (SD = 3.48) = 17.73). Therefore, people with 10 or fewer years of education were assigned to the low education group (coded 0), while people with 18 or more years of education were categorized as participants with high educational levels (coded 1). After conducting an independent sample t-test, a significant group mean difference with a moderate effect size (U = 245.500, p = 0.007, d = 0.88) was found in cogniphobia scores for people of high and low educational status. This indicates that people of low educational status score highly on cogniphobia.

To investigate whether participants with high cogniphobia scored highly on the credibility tests (CII, ACI, and INC), differences in the mean cogniphobia scores between credible and non-credible groups of the SVTs were examined. Here, significant differences between groups were found, more specifically it appears that people scoring in the noncredible range of credibility measures tend to score highly on the cogniphobia scale (CII

(U(86) = 295.00, $p < .001$, d = 0.69), ACI (U(86) = 2861.50, $p < .001$, d = 0.87) and INC (U(86) = 358.00, $p < .001$, d = 1.00)).

Finally, to explore whether anxiety (measured on the STAI) could be a possible mediator in the relationship between non-credible responding and cogniphobia, a series of regression analyses were conducted (Baron & Kenny, 1986) (Table 6). As reported above, high cogniphobia does appear to be linked to higher levels in non-credible responding. A significant linear regression was calculated to predict STAI scores based on cogniphobia scores (Table 6.1). Another linear regression was calculated to predict non-credible reporting (measured on the CII and ACI) based on STAI scores (Table 6.2). The relationship between cogniphobia and non-credible responding (measured by CII, ACI, and INC) was explored using Partial Correlation while controlling for STAI (Table 6.3).

Table 6

Results of the Mediator Analysis (Linear Regression and Partial Correlation) for Anxiety as a Possible Mediator in the Relationship Between Cogniphobia Scores and Non-Credible Responding

Model	Predictor Variable	Criterion Variable	Credibility	R^2	F	df	N	r	p
1	C Scale Scores (Cogniphobia)	STAI scores (Anxiety)		0.11	26.06	1, 216			< .001
2	STAI scores	Non-credible responding	CII	0.15	39.35	1, 216			< .001
			ACI	0.24	67.78	1, 216			< .001
			INC	0.06	14.28	1, 216			< .001
3	C Scale Scores (Cogniphobia)	Non-credible Responding	CII				216	0.37	< .001
			ACI				216	0.47	< .001
			INC				216	0.92	< .001

Note. Credibility = Credibility measures, 1 = Results for the linear regression calculated to predict STAI scores based on cogniphobia scores, 2 = Results for the linear regression calculated to predict non-credible responding (measured on the CII and ACI) based on the STAI scores, 3 = Results for the

Partial Correlation exploring the relation between cogniphobia and non-credible responding, while controlling for STAI.

Inspecting the zero-order correlation (r_{CII} = .45, r_{ACI} = .55, r_{INC} = .93) indicated that controlling for STAI had little effect on the strength of the relationship of the two variables. Anxiety, therefore, does not seem to be a mediator between cogniphobia and non-credible responding.

Discussion

Exploratory Analysis

This study revealed cogniphobia as a possible explanation for non-credible responding. Here, the assessment of the construct of cogniphobia relied on the cogniphobia scale, which has not been validated to date. Therefore, the reliability of the adjusted cogniphobia scale (C scale) was explored. This scale demonstrated good internal consistency, adding to previous research findings of similarly good internal consistency (Seng & Klepper, 2017; Silverberg et al., 2018; Suhr & Spickard, 2012), which indicates that this scale is psychometrically sound but it remains unclear whether the scale truly measures the construct cogniphobia. Additionally, the item total correlation indicated very good discrimination between items but also revealed that at least one item did not correlate at all with the rest of the items (Pope, 2021). Further research is needed to identify nonsuitable items.

In the German version of the cogniphobia measure used in this study, 14 out of 18 items mention the concept of concentration, while the English version includes eleven items with this concept. Even though most definitions of cogniphobia do not mention concentration (Lee et al., 2021; Martelli et al. (1999); Seng & Klepper, 2017; Silverberg et al., 2018; Suhr & Spickard, 2012), here it seems to be an essential component of cogniphobia. A possible explanation for the statistically significant moderate correlation between the cogniphobia scale and the CAARS E subscale (used to assess DSM-IV inattention symptoms) might be the similarity of the assessed constructs, namely “concentration” and “attention”. Additionally,

this raises the question of whether the items' content is distinct enough to justify their inclusion in the assessment (e.g., "I am afraid that I might make my problems worse if I concentrate too much" and "If I were to try to overcome my concentration difficulties, my condition would become worse") and whether cogniphobia is the construct actually being measured.

Concerning possible predictors for high cogniphobia scores, the CII was predictive of cogniphobia as an individual scale, it was, however, no longer predictive when INC and ACI were considered first. The credibility scale INC was the strongest predictor of cogniphobia, with the credibility scale ACI being the second strongest. A possible explanation for the strong association between the INC and the cogniphobia scale could be the following: Cogniphobia, or the fear of mental exertion, could keep participants from implementing cognitive effort during the assessment, which could manifest in inconsistent responding as measured by the INC. In clinical practice, it would be interesting to consider cogniphobia while assessing ADHD in adults due to the length of the CAARS, and the association between the two constructs. The extent to which certain symptoms of ADHD appear to be present might be explained by the patient's fear of cognitive exertion, namely cogniphobia.

Another interesting aspect of this research is that the correlations and p values between the cogniphobia scale and the credibility measures, are quite similar to the p values and correlations between the cogniphobia scale and the CAARS A and the CAARS E, that is, the subscales assessing inattention. This similarity could be explained by the affinity of the constructs being measured. As stated previously, the construct of cogniphobia is assessed using the concept of concentration, which is akin to the construct of attention measured by the CAARS A and CAARS E. Similarly, the constructs of attention and concentration could affect the relationship between the cogniphobia scale and the credibility measures.

Hypothesis Driven Analysis

Regarding hypothesis one on the relationship between educational background and cogniphobia, a significant moderate effect size was found for differences in group means between low and high educational groups. However, the weak and non-significant correlation between years of education and the cogniphobia scale, as well as education not being a significant predictor of cogniphobia, raises the question of whether this variable is truly linked to cogniphobia. While Silverberg et al. (2017) suspect that low educational levels could contribute to cogniphobia, in Lee et al. (2021)'s study, fewer years spent in education were related to high scores on cogniphobia due to low education being a risk factor for dysfunctional health and illness beliefs, such as cogniphobia (Chen & Miller, 2013; El-Gabalawy et al., 2013; Silverberg et al., 2018). This discrepancy between our research and previous findings might be explained by the different ways education was assessed. Interestingly, years of education did not correlate with any of the inspected variables, which could indicate that the way educational level was assessed in this study might not have been sufficient. Participants interpreted "years of education" quite differently, e.g., some included primary school, while other participants did not, some only considered high school, while others included their complete academic career. This inconsistent nature in which participants responded to the item might lead to results difficult to interpret. Future research could benefit from defining education more precisely.

Concerning hypothesis two, this study found people scoring high on cogniphobia to also score highly on credibility measures (CII, ACI, and INC) (Henry et al., 2018; Suhr & Spickard, 2012; Lee et al., 2021), which is in line with Lee et al. (2021)'s findings of cogniphobia being linked to invalid performance on both SVT and PVT, indicating that the fear of mental tasks might be an explanation for noncredible responding. Participants with high cogniphobia scores might be scared of fully engaging with the test items due to a fear of damaging their brain or enhancing their symptomatology, and, therefore, could resort to

random responding to items (Suhr & Spickard, 2012). This idea is supported by the fact that of all the credibility measures, the largest effect was seen for the INC, which assesses random responding. This finding might have some interesting clinical implications. It appears that a patient failing on SVTs might not be because of malingering but might indicate that he/she is suffering from cogniphobia. Therefore, assessing cogniphobia is of great importance because a patient suffering from cogniphobia, and potentially additional ADHD, could be treated through therapy, for example. This further suggests that including a cogniphobia assessment will lead to more accurate assessments and diagnoses. Cogniphobia should, ideally, be assessed before further evaluation to prevent noncredible results and the repeated use of assessment tools on an individual.

Finally, regarding hypothesis three, anxiety (as measured on the STAI) does not seem to be a mediator in the relationship between cogniphobia and non-credible responding. This is indicated by the STAI having little effect on the strength of the mentioned relationship, the STAI only correlating weakly with the cogniphobia scale, and the STAI not being a significant predictor for cogniphobia while running a multiple linear regression model. Assuming that the shortened version of the STAI was capable of assessing anxiety accurately, it is interesting that the STAI did not correlate highly with cogniphobia. This could be explained by the lack of a clinical group, which prevents this study from truly comparing a clinical sample to a control group. Seng & Klepper's (2017) findings of a weak to moderate correlation between cogniphobia and anxiety are hereby supported. This finding might contradict Martelli et al.'s (1998) claim that cogniphobia is treatable by applying anxiety reduction procedures. The above finding might either indicate that indeed anxiety does not play a role in the relationship between cogniphobia and noncredible responding, and/or that the shortened version of the STAI used in this study was not refined enough to assess the emotional component at play in cogniphobia. Additionally, it remains unclear whether the

participants included in the sample suffer noticeably from anxiety signs and symptoms. Future research would benefit from adding a clinical group to ensure the presence of anxiety symptomatology in the participants.

Strengths

This study's strengths include the sample, which consisted of university students recruited via SONA, and a convenience sample. While this sample does lack generalizability due to it being predominantly white, young, educated, and potentially stemming from the same social environment, the two separate recruitment procedures add some variability to our sample. Additionally, this study provides the first evidence that the adjusted version of the cogniphobia scale could be useful in assessing cogniphobia in a community sample, but future research needs to investigate the possible underlying constructs to determine whether it is indeed cogniphobia that is being measured. Moreover, the exploratory nature of this study allows for future research to investigate the concept of cogniphobia in greater detail, such as the relationship between cogniphobia and INC. Finally, possible predictors of cogniphobia, namely the INC and ACI, as well as variables of no significance to cogniphobia, such as years of education, were explored through this study and suggest several of avenues for later studies.

Limitations and Future Directions

The present results must be interpreted with the study's limitations in mind. Firstly, it must be noted that no causal conclusions can be drawn from this study due to its correlational nature. Future research making use of longitudinal designs should focus on establishing a causal relation between cogniphobia and noncredible responding. Secondly, this study made use of several shortened, modified, and non-validated assessment tools raising the question of whether these adapted versions were still capable of accurate assessment. Specifically, the cogniphobia scale was adapted to fit the community sample, the STAI and the DASS were

shortened due to brevity reasons. Future research should either utilize complete measures or validated, shortened versions. Thirdly, the lack of a clinical sample is a major limitation because it prevents a comparison between clinical and control groups. This lack of clinical groups (e.g., ADHD group, or clinically assessed depression) could be a partial explanation for why no strong correlations could be found between cogniphobia and depression.

Finally, the survey itself comes with multiple limitations. First of all, significant group differences between German and Dutch participants might be an indication of a possible language barrier. The survey was provided in German and English, which could have disadvantaged participants from the Netherlands as well as from other countries because they could not choose to complete the survey in their main language. Future research could investigate whether these differences were due to language comprehension or cultural differences by also providing a Dutch version of the survey. Secondly, only self-report measures were used, which are known to be at risk of bias. In the future, outside information, such as interviews with relatives could be collected to decrease bias. Thirdly, the online setting of the survey increases the influence of environmental factors. While SONA participants were in a closed environment, the participants of the convenience sample could have completed the survey at any given time, in any given condition, in any setting, and without any time constraints. Future research could administer the survey in person to limit external influences. Finally, due to its length, the survey may have assessed other factors, such as attention span, instead of the intended variables. In our survey, the cogniphobia scale followed the CAARS, which is an extensive measure with multiple, similar items. Considering the fact, that many of our participants were sampled through the SONA system, and therefore might not have been highly motivated to accurately complete the survey, one must wonder how much attention people paid to the last part of the survey. Future research should consider assessing cogniphobia first and then consider attention span as a possible

influencing factor. Another factor that might have negatively influenced the participants' ability to concentrate on the survey might be the use of social media (Barton et al., 2018; Karpinski et al., 2012). With university students spending 8-10 hours daily on their phones (Wood, 2015), it might be necessary to revise the methods used to collect data amongst university students due to the negative impact of heavy social media use on students. In our study, this factor may have reduced the participants' ability to concentrate for the period of the survey, which in turn could have impacted the results, causing us to draw incorrect inferences, such as assuming that the participants suffer from cogniphobia rather than from reduced capability to concentrate.

Conclusion

This study explored the relationship between cogniphobia and noncredible responding, and found cogniphobia to be a possible explanation. An interestingly strong association between cogniphobia and inconsistent responding was found. Here, the INC was found to be predictive of cogniphobia, which could be explained by participants fearing and avoiding cognitive tasks, which could have thus led to inconsistent responding. Education does not seem to be linked to cogniphobia and anxiety does not appear to be a mediator between cogniphobia and non-credible responding. In future clinical practice, cogniphobia should be considered while assessing for ADHD in adults, as well as a possible alternative explanation for responses indicating malingering. Overall, cogniphobia could be a potential explanation for noncredible responding, and this possible causal relationship needs to be further explored by future research.

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Appendix A

Cogniphobia – adaptation for use on a community sample

# original H Henry	German – adapted (community sample)	English – adapted (community sample)	English – original (headache sample)
	In einigen Situation in Ihrem Alltag mögen Sie sich unkonzentriert fühlen, oder erleben Probleme mit Ihrer Aufmerksamkeit. **Bitte beurteilen Sie die folgenden Aussagen bezüglich Ihrer Probleme in der Aufmerksamkeit und Konzentration.** **Falls sie eine Aussage nicht beurteilen können, wählen Sie „nicht zutreffend“**	**In some situation of your life you may experience concentration difficulties or problems paying attention.** **Please evaluate the following statements regarding your experienced problems in attention and concentration.** **Please indicate ‘not applicable’ if you cannot evaluate a statement.**	

1. **H**	Ich mache mir Sorgen, dass ich meine Probleme noch schlimmer mache wenn ich mich zu sehr konzentriere.	I'm afraid that I might make my problems worse if I concentrate too much.	I'm afraid that I might make the cause of my head pain worse if I concentrate too much.
2.	Wenn ich meine Konzentrationsprobleme einfach ignorieren würde, würden sich meine Schwierigkeiten vergrößern.	If I were to try to overcome my concentration difficulties, my condition would become worse.	If I were to try to overcome it, my head pain would increase.
3.	Ich glaube, dass meine Konzentrationsschwierigkeiten alarmierend sind.	I have the feeling that my concentration difficulties are alarming.	My head pain is telling me that I have something dangerously wrong.
4.	Meine Probleme würde sich wohl verringern wenn ich Konzentrationsübungen machen würde.	My problems would probably be relieved if I practiced concentration exercises.	My pain would probably be relieved if I practiced concentration exercises.
5.	Leute nehmen meine Konzentrationsprobleme nicht ernst genug.	People aren't taking my concentration difficulties seriously enough.	People aren't taking my medical condition seriously enough.
6. **H**	Meine Konzentrationsschwierigkeiten zeigen, dass mit meinem Gehirn etwas nicht stimmt.	My concentration difficulties indicate that something is wrong with my brain.	My accident/injury has put my head & brain at risk for the rest of my life.

7.	Meine Konzentrationsprobleme sind Anzeichen dafür, dass ich eine echte Krankheit habe oder etwas falsch gemacht habe.	My concentration difficulties mean that I have an injury or have done something wrong.	Headaches always mean I have an injury or have done something to make it worse
8.	Nur weil ich Probleme habe mich zu konzentrieren, muss es nicht gleich gefährlich sein.	Just because I have concentration difficulties does not mean it's dangerous.	Just because something aggravates my pain does not mean it's dangerous
9. **H**	Ich mache mir Sorgen, dass sich meine Probleme verschlimmern, wenn ich mich zu sehr konzentriere oder zu stark nachdenke.	I am afraid that I might make my difficulties worse by concentrating too much or being too mentally active.	I am afraid that I might make my medical condition worse by concentrating too much or being too mentally active.
10. **H**	Ich muss einfach aufpassen, dass ich mich nicht zu sehr oder zu lang konzentriere, damit sich mein Zustand nicht verschlechtert.	Simply being careful not to concentrate too hard or too long is the safest thing I can do to prevent my condition from worsening.	Simply being careful not to concentrate too hard or too long is the safest thing I can do to prevent my pain from worsening.
11. **H**	Ich hätte nicht diese Probleme, wenn mit meinem Gehirn nicht etwas los wäre.	I wouldn't have these problems if there weren't something potentially dangerous going on in my head.	I wouldn't have this much pain if there weren't something potentially dangerous going on in my head.

12.	Obwohl mir meine Konzentration Probleme bereitet, wäre ich gut beraten es öfter zu versuchen.	Although my concentration difficulties cause problems, I would be better off if I were more mentally active.	Although my condition is painful, I would be better off if I were more mentally active
13.	Ich weiß genau wann ich aufhören sollte mich zu konzentrieren damit nichts Schlimmeres passiert.	I know when to stop concentrating so that I don't cause anything bad to myself.	Pain lets me know when to stop concentrating so that I don't injure myself.
14.	Es ist einfach nicht sicher, wenn jemand mit meinen Problemen zu viel nachdenkt und sich zu sehr konzentriert.	It's really not safe for a person with a condition like mine to engage in too much thinking and concentrating	It's really not safe for a person with a condition like mine to engage in too much thinking and concentrating
15.	Ich kann nicht alle Dinge tun die normale Menschen tun weil es so leicht passiert, dass sich meine Probleme verschlimmern.	I can't do all the things normal people do because it's too easy for me to worsen my condition.	I can't do all the things normal people do because it's too easy for me to cause harm to my condition.
16.	Obwohl mir Manches viele Probleme bereitet glaube ich nicht, dass es gefährlich ist.	Even though something is causing me a lot of problems, I don't think it's actually dangerous.	Even though something is causing me a lot of head pain, I don't think it's actually dangerous

17.	Niemand mit meinen Problemen sollte sich zu sehr mit komplexen Aufgaben befassen müssen die viel Konzentration benötigen.	No one should ever concentrate on difficult mental tasks when he/she has problems like I have.	No one should ever concentrate on difficult mental tasks when he/she is in pain
H	Ich vermeide Aufgaben bei denen ich zu sehr nachdenken muss.	I avoid activities that make me think too hard.	I avoid activities that make me think too hard.

Table A. The original cogniphobia scale for the headache sample, and the adapted community cogniphobia scale in both the German and English versions. Cogniphobia-Avoidance items: 1, 2, 4, 5, 7, 9, 10, 12, 15, 17, 18 and Cogniphobia-Dangerousness items: 3, 6, 8, 11, 13, 14, 16