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The relation between procrastination and symptoms of attention-deficit hyperactivity disorder (ADHD) in undergraduate students

HANNAH C.M. NIERMANN & ANOUK SCHERES

Behavioural Science Institute, Radboud University, Nijmegen, The Netherlands

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attention-deficit hyperactivity disorder, symptoms of impulsivity, hyperactivity and inattention, academic and general procrastination

Correspondence
Anouk Scheres, Behavioural Science Institute, Radboud University, Montessorilaan 3, 6525 HR Nijmegen, The Netherlands.
Telephone (+31) (0)24 361 2549, Fax (+31) (0)24 361 59 37
Email: A.Scheres@psych.ru.nl

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Abstract

Procrastination is defined as the tendency to delay activities that have to be completed before a deadline. It is often part of psychotherapies for adults with attention-deficit hyperactivity disorder (ADHD). However, procrastination is officially not acknowledged as an ADHD-related symptom. Therefore, little is known about the role of procrastination in ADHD. We investigated the relation between procrastination and ADHD-related symptoms of inattention, hyperactivity, and impulsivity in 54 students with varying levels of self-reported ADHD-related behaviours. Various measures of procrastination were used, including questionnaires of academic, general procrastination and susceptibility to temptation as well as direct observation of academic procrastination while solving math problems. We expected a positive relation between severity of ADHD-related behaviours and procrastination, specifically for impulsivity. However, partial correlations (corrected for the other symptom domain of ADHD) indicated that only inattention was correlated with general procrastination. This specific and preliminary finding can stimulate future research in individuals diagnosed with ADHD.

Introduction

Attention-deficit hyperactivity disorder (ADHD) is one of the most frequently diagnosed childhood disorders; approximately 3–7% of children are affected worldwide [American Psychiatric Association (APA), 2000]. ADHD is not a disorder which is restricted only to childhood, it can persist into adolescence and even into adulthood. However, the prevalence of ADHD decreases with age (APA, 2000; Faraone *et al.*, 2003). The core clinical features of ADHD include symptoms of inattention, impulsivity, and hyperactivity. The diagnosis ADHD is therefore divided into three subtypes: The inattention subtype is characterized by a failure to pay attention, distractibility, difficulty to sustain focused attention, lack of persistence, and disorganization (Lahey *et al.*, 1998). The hyperactive/impulsive subtype includes behaviours such as fidgeting or restless behaviour, excessive activity, engaging in activity without planning, constantly interrupting or changing the subject, impatience, and low frustration

tolerance (Lahey *et al.*, 1998). The third subtype is a combined subtype consisting of both the inattention and the hyperactive/impulsive symptoms of ADHD. The core symptoms of ADHD are the diagnostic criteria for this disorder in the *Diagnostic and Statistical Manual of Mental Disorders*, Fourth Edition (DSM-IV; APA, 2000), but individuals with ADHD also frequently complain about other, associated problems. However, these associated problems are not officially acknowledged as core symptoms of ADHD in the DSM-IV (Weiss and Weiss, 2004). These problems include impulsive eating, insomnia, and procrastination (Weiss and Weiss, 2004). The focus of the current study was on the relation between procrastination and the core symptoms of ADHD, as measured in undergraduate students.

Procrastination may be defined as the irrational tendency to postpone or delay a task or a decision that actually has to be completed before a certain deadline (see Steel, 2007, for an interesting review). The temptation to engage in other, more fun, activities in the short term plays an important role in procrastination as well. Specifically, proximity of temptations increases procrastination (Steel, 2007). Procrastination has been described to be expressed in different life domains in the current literature: (i) *Academic procrastination* is defined as delaying to start studying for an examination or to write a paper shortly before the deadline (Solomon and Rothblum, 1984); (ii) *Everyday procrastination* is defined as difficulties in organizing daily activities and performing them before the deadline is reached (for example problems in answering phone messages and/or failure in paying bills on time; Milgram, 1988; Milgram *et al.*, 1988); (iii) *Decisional procrastination* is defined as having chronic problems in making decisions on time (Effert and Ferrari, 1989).

All three expressions of procrastination may be highly relevant to ADHD. Anecdotic evidence of parents and teachers of children with ADHD as well as case studies indeed suggest a relationship between procrastination and ADHD (Brown, 2000). Further evidence for this connection is indicated by descriptions of problems associated with ADHD (APA, 2000): difficult, unpleasant, effort-demanding, and uninteresting choices, tasks, daily activities, and decisions are likely to be avoided/procrastinated by children with ADHD. They also show organizational problems in school related activities, like forgetting homework assignments, difficulty to complete long-term projects, to study for tests, and to keep materials organized. These problems are closely related to procrastination behaviour and they can manifest themselves clinically as procrastination, planning difficulties, missing deadlines and problems of keeping work material organized in adults with ADHD (Langberg *et al.*, 2008). Research also indicates that individuals with ADHD are often familiar with multiple negative life outcomes resulting from their long lasting neuropsychological impairments, e.g. attentional difficulties, emotional instability, disinhibition, and disorganized behaviour (Newark and Stieglitz, 2010). Based on these negative experiences, especially adolescents and adults with ADHD are prone to develop negative beliefs about the self, low self-esteem, and low self-efficacy. Typical maladaptive beliefs refer to feelings of defectiveness, failure, and insufficient self-control (Ramsay and Rostain, 2003). When these individuals are confronted with negative and/or stressful circumstances, they are likely to develop maladaptive coping strategies like procrastination and avoidance, which in turn can reinforce their negative beliefs, generating a vicious cycle (Newark and Stieglitz, 2010). Avoidance/procrastination may therefore be viewed as a compensatory strategy for adolescents and adults with ADHD. It allows them to stop dealing with a challenging task, which they experienced as unpleasant and as going beyond their own capabilities (Ramsay and Rostain, 2003).

Procrastination also is an important aspect of several therapeutic interventions for individuals with ADHD. Cognitive behavioural therapy (CBT) identifies and modifies negative cognitions, which are related to the facilitation of maladaptive coping strategies (such as procrastination). It also offers an optional module in order to learn how to manage and overcome procrastination behaviour. This module is frequently chosen by adults with ADHD, indicating that procrastination is a commonly faced deficit and function problem by this adult population (Safren *et al.*, 2005; Safren, 2006). Other interventions such as ADHD coaching (Swartz *et al.*, 2005), ADHD Skills and Strategies Programme (Burt *et al.*, 1997), organizational skills intervention (Langberg *et al.*, 2008), and meta-cognitive therapy (Solanto *et al.*, 2010), have integrated dealing with procrastination and time management as a standard aspect of therapy for individuals with ADHD. These interventions are efficient in reducing ADHD symptoms (e.g., Langberg *et al.*, 2008).

In terms of the specific relation between procrastination and the three symptom domains, most research so far has examined the relation between procrastination and impulsivity. The majority of this research suggests a positive association: persons characterized by high impulsivity are more easily distracted by more pleasant activities while performing a task and are more likely to procrastinate (Ferrari, 1993; Schouwenburg and Lay, 1995). Johnson and Bloom (1995), for example, identified impulsivity as one of the best predictors of procrastination in their study of the contribution of personality factors to

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academic procrastination: highly impulsive students were less able to stay focused during studying. Dewitte and Schouwenburg (2002) investigated the role of three main aspects of impulsivity in procrastination. These three forms of impulsivity were (1) lack of perseverance, reflecting the tendency to not finish an initiated job, (2) lack of premeditation, defined as the tendency not to think before getting into action, and (3) urgency, reflecting the tendency to act on the moment in order to relieve negative feelings. They indicated that procrastination and impulsivity (mainly the lack of perseverance) are closely intertwined and that their relation partially clarifies the association between the personality trait conscientiousness and procrastination. Schouwenburg and Groenewoud (2001), however, did not find a difference in impulsivity between procrastinators and people who are commonly punctual. This finding, however, is based on imaginative data. It is possible that highly impulsive persons do not know that they will not be capable of resisting an actual temptation while performing a task. The intention of highly impulsive individuals might differ from their actual behaviour so that procrastination can still occur even if it differs from their earlier formulated intention.

The relation between inattention and procrastination is not well studied. Persons with inattentive problems tend to have a shortened attention span, are easily distractible, shift their attention from one uncompleted task to another, and often misplace or lose objects important for the completion of a task (Barkley, 1997). Based on these characteristics of persons with attention deficits we suggest that it is possible that procrastination is related to inattention, mainly the incapability to stay focused on a task. A study by Ferrari (2000) investigated the role of inattention on procrastination in a normal population of college students. Analysis of partial correlations (controlled for intelligence) showed that there were moderate to large correlations between attention deficits and procrastination. At the same time, however, factor analysis of these data suggested that procrastination and attention deficits loaded on separate factors.

The relation between procrastination and symptoms of hyperactivity has not yet been studied. However, Ferrari (2000) suggested that although there is no a priori reason for expecting that procrastination would be related to symptoms of hyperactivity, at best, one may predict a negative association. Symptoms of hyperactivity such as "being always on the go" and "often talks excessively" could compensate for procrastination behaviour, because individuals scoring high hereupon may not wait to do activities and tasks. However, in the DSM-IV, symptoms of impulsivity are closely related to symptoms of hyperactivity, described as the impulsivity/hyperactivity symptom domain of ADHD. Therefore, it is also possible to predict that people scoring high on hyperactivity are likely to show procrastination behaviour because of a positive association between symptoms of impulsivity and procrastination. Additionally, it could be argued that the heightened activity level of individuals scoring high on hyperactivity restrains them from beginning a task, resulting in a high level of procrastination.

In sum, current literature about clinical interventions indicates that procrastination is a commonly encountered problem in the ADHD population. Nevertheless, little is known about the role of procrastination in ADHD and about the association between the core symptoms of ADHD and procrastination in general and decisional, everyday, and academic procrastination in particular. Therefore, this study aims at investigating the relation between procrastination and ADHD-related symptoms of inattention, hyperactivity, and impulsivity in young adults. As a first step in this endeavour, we examined this question in undergraduate students with varying levels of ADHD-related symptoms. Based on current literature, we expect to find a positive correlation in number or severity of ADHD-related behaviours and procrastination, specifically for symptoms of impulsivity and for the impulsivity/hyperactivity symptom domain of ADHD. More precisely, we predict that participants with high levels of impulsivity are more likely to procrastinate.

In this study, 54 undergraduate students participated with varying levels of self-reported ADHD-related behaviours. Various measures of academic procrastination, including questionnaires and direct observation of procrastination behaviour while solving math problems, a questionnaire of general procrastination, and of susceptibility to temptation were used in the current study.

Methods

Participants

Four hundred and forty-seven psychology and pedagogy students of the Radboud University Nijmegen (The Netherlands) were pre-screened for self-reported ADHD related behaviours with the help of an online self-report questionnaire of attention problems and hyperactivity/impulsivity for adulthood (Kooij *et al.*, 2005). Based on their ADHD symptoms 74 participants with either high, medium or low scores (see later) were selected for further participation. Fifty-four students (four men, 50 women) with a mean age of 19.72 [standard deviation (*SD*) = 2.05] agreed to participate. A portion of the participants had German nationality, but could speak, write, and understand Dutch. They were either payed for their participation

(€10) or received course credit. The data of all participants were used for analysis.

Screening

Participants completed a questionnaire of attention problems and hyperactivity/impulsivity for adulthood (Kooij *et al.*, 2005). This self-report ADHD scale was earlier used in epidemiological and clinical research in adult populations (Murphy and Barkley, 1996; Kooij *et al.*, 2004; Kooij *et al.*, 2005) and is described as a reliable assessment for symptoms of ADHD in adults (Kooij *et al.*, 2008). It consisted of 23 items about symptoms of impulsivity (three items), hyperactivity (nine items), and inattention (11 items). Participants were asked to rate the severity of these symptoms over the last six months on a four-point scale (ranging from 0 = never or rarely to 3 = very often). Of the 11 inattention items, four measured the same inattention symptoms as a pair. Therefore, for these two paired statements the highest score on each pair was used. The same rule was applied to three paired statements on hyperactivity. The final scores for impulsivity, hyperactivity, and inattention were computed by summing the scores on respectively three impulsivity symptoms, six hyperactivity symptoms, and nine inattention symptoms. Additionally, a total score for hyperactivity/impulsivity was also calculated, because these domains are considered as one symptom domain in the DSM-IV.

Participants were selected based on these scores. Specifically, all participants who had scores in the highest 33% of the score range were invited, because there were relatively few participants with high scores. For the middle 33% and the lowest 33% of the score range, only a random subset was invited, because there were more students with middle and low scores as compared to high scores. As a result, the full range of scores was covered in the current sample, but there were more participants with middle and low scores than with high score [inattention: mean (M) = 10.06, SD = 4.95, range 1–25; impulsivity: M = 3.33, SD = 2.36, range 0–9; hyperactivity: M = 7.52, SD = 3.98, range 0–17; combined hyperactivity/impulsivity: M = 10.85, SD = 5.95, range 0–26]. This reflects the normal distribution of ADHD-related behaviours in the population. See Table 1 for the number and percentage of participants with high, medium, and low scores on ADHD-related symptoms.

Studying procrastination

Observations during math problems

In the first part, procrastination behaviour of participants was observed while they had to solve five subtraction and five addition problems, each consisting of four numbers (ranging from a single-digit to a seven-digit number). The participants first read the instructions which stated that the goal of this study was to investigate if cognitive abilities of students (measured by solving math problems) can predict success in later life as suggested by previous research (see Ferrari and Tice, 2000). Based on pilot testing, it was determined that students could, on average, solve these math problems in 10 minutes. The participants were allowed to solve the math problems in written form, as learned in school. Participants were informed that they would need about 10 minutes for the math problems, but that in total they would be given 30 minutes. They were informed that they had the possibility to perform some other *nice* tasks, such as playing computer games (Sudoku, Otis, and Solitaire), playing gameboy (e.g., Tetris and Snake), and/or reading magazines (*Cosmo girl*, *Voetbal International*, *Glamour*, *freundin*, *tina Astro*) in order to reduce the stress and discomfort, which is often associated by students with solving math problems. This was told as the reason why the participants had 30 minutes time for

Table 1. Number and percentage of participants with a low, medium, or high score on ADHD-related symptoms of inattention, hyperactivity, impulsivity, and combined hyperactivity/impulsivity in the total and selected sample

	Total sample (447 students)						Selected sample (54 students)					
	Low		Medium		High		Low		Medium		High	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
Inattention	288	64	153	34	6	1	23	43	27	50	4	7
Hyperactivity	216	48	218	49	13	3	19	35	26	48	9	17
Impulsivity	297	66	137	31	13	3	21	39	25	46	8	15
Combined hyperactivity/impulsivity	281	63	156	35	10	2	19	35	27	50	8	15

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this part of the study. Additionally, participants were told that they could decide when they would like to do the math problems: at the beginning, or after they had done other *nice* tasks. They were also allowed to take breaks in between solving the math problems.

The experimenter observed the participants via a hidden camera. The activities and the order of the activities of the participants were timed by using a stopwatch and recorded with the help of four categories: (1) solving math problems, (2) playing with computer games and gameboy, (3) reading a magazine, and (4) "other" (e.g., brushing hair, looking around, and drinking water). We were most interested in the time spent on *nice* tasks both before and between solving the math problems. Thus, we used two variables indicating academic procrastination for each participant: procrastination before and between solving the math problems. Twenty-three participants showed some procrastination behaviour while solving math problems (see Table 2).

Table 2. Observed procrastination behaviour before and between solving math problems, indicated in seconds

Students	Procrastination behaviour	
	Before solving math problems (seconds)	Between solving math problems (seconds)
1	0	773
2	0	434
3	130	270
4	0	379
5	250	119
6	326	0
7	98	176
8	137	0
9	10	124
10	0	104
11	58	32
12	0	70
13	0	48
14	30	0
15	25	3
16	0	18
17	0	16
18	0	16
19	0	12
20	11	0
21	0	8
22	0	3
23	0	3

After the math problems and when the 30 minutes were finished, participants were asked to indicate on a five-point Likert scale how much they liked (1 = not at all to 5 = very much) the *nice* tasks and the math problems and how difficult they found the math problems (1 = pretty easy to 5 = pretty difficult; $M = 2.9$, $SD = 0.82$). In fact, no participant felt that the problems were too complex or too taxing. With the help of an open question "Did you experience something noticeable?" we examined whether they were conscious about the fact that they were observed. Five students were conscious about the observation. We did not exclude them from the analysis, because they only realized that they were observed *after* solving the math problems. This could be confirmed by observation of their "looking around" behaviour after solving the math problems.

Self-ratings

Next, participants completed several questionnaires regarding their procrastination and their temptation behaviour:

(1) The first measure of *academic procrastination* was the Procrastination Assessment Scale for Students (PASS) of Solomon and Rothblum (1984). This measurement assessed on a five-point Likert scale (1 = never procrastinate to 5 = always procrastinate) the prevalence of procrastination, the problems related to procrastination and the desire to reduce procrastination in different academic areas. Three total scores were calculated accordingly. An alpha coefficient of 0.75 across prevalence and anticipated problems of PASS ratings and a significant correlation between PASS scores and a behavioural measurement of procrastination behaviour were reported by Howell *et al.* (2006). Onwuegbuzie (2004) estimated a coefficient alpha score reliability of the PASS measurement of 0.84. The alpha coefficient in our own sample was 0.87.

(2) The second measure of *academic procrastination* was used earlier by Ackermann and Gross (2005). The participants were asked to think about and briefly describe an important assignment, which they completed in the past semester (e.g., mini-review, homework assignments). Subsequently, they were asked three questions: "When in the past semester did you complete the assignment?" (all participants completed the assignment in the previous three months); "How many days or weeks did your instructor give you to complete the assignment?" ($M = 35.51$ days, $SD = 19.85$); and "How many days or weeks before the deadline did you start the assignment?" ($M = 20.56$ days, $SD = 15.65$). For

purposes of data analysis the response to the second question was divided by the response to the third question in order to receive a *procrastination ratio* for each subject. A procrastination ratio of one reflects no procrastination at all, while larger ratios reflect more procrastination.

(3) The third questionnaire, measuring *general procrastination*, was the Pure Procrastination Scale (PPS) by Steel (2010). The PPS consisted in total of 12 statements: three statements of the Decisional Procrastination Questionnaire (DPQ; Mann *et al.*, 1997) e.g., "I delay making decisions until it's too late", five statements of the General Procrastination Scale (GPS; Lay, 1986) e.g., "I often find myself performing tasks that I had intended to do days before", and four statements of the Adult Inventory of Procrastination (AIP; McCown and Johnson, 1989) e.g., "I find myself running out of time". These 12 items have together a reliability of 0.92 and provide improved convergent validity with other related measures such as the Susceptibility to Temptation Scale (STS), the Satisfaction with Life Scale (SWLS), and the Irrational Procrastination Scale (IPS) compared to the convergent validity of the DPQ, AIP, and GPS alone (Steel, 2010). The subjects had to rate on a five-point Likert scale (1 = strongly agree to 5 = strongly disagree) their level of agreement with different statements related to procrastination. The PPS measures a general level of procrastination over different life domains. For purposes of data analysis a score for DPQ, GPS, AIP, and a total score for each participant was calculated. The alpha coefficient in our sample was 0.87 for the PPS, and for the subscales: 0.64 for the DPQ, 0.84 for the GPS, and 0.69 for the AIP.

(4) The fourth questionnaire STS (Steel, 2002) dealt with the tendency of the participants to be focused on (short-term) pleasurable activities. The STS comprised of 11 statements and asked participants to indicate on a five-point Likert scale (1 = not true for me to 5 = true for me) the level of agreement with their own behaviour (e.g., "It takes a lot for me to delay gratification", "I feel irresistible drawn to anything interesting, entertaining, or enjoyable"). For each participant, we computed a total score. The alpha coefficient was 0.86 in our sample.

Procedure

The local ethical committee approved the procedures in this study. All participants were tested individually. The participants were informed that they would fill in some questionnaires, solve math problems, and have the possibility to engage in some *nice* tasks. After arrival, the participants read and signed an informed consent. All participants received the tasks in the same order in order to keep the goal of the math problems unclear.

Before the participants started with the first part of the experiment, they received instructions by a female experimenter (see section "Observations during math problems"). The experimenter answered possible questions of the participants, motioned to the clock in the room, and told them that she would return in 30 minutes with several questionnaires. Before the experimenter actually left the room, she asked the participants to read the instructions of this part of the study before making a decision about what to do first. The participants needed on average 13.98 minutes ($SD = 4.81$) to complete the math problems.

The female experimenter was not aware of the score of the participants on the ADHD-related symptoms. At the end of the 30-minute testing period, the participants were asked to complete the questionnaires. The questionnaires (see section "Self-ratings") were presented in a fixed order for all participants. During questionnaire completion, the experimenter stayed in the room to answer possible questions. At the end of the session, participants were debriefed. None of the participants declined the usage of data when they realized that they had been observed. The experiment lasted around 45 minutes.

Statistical analyses

First, Pearson correlations between all procrastination measures were computed. Second, we computed Pearson correlations between symptoms of inattention, impulsivity, hyperactivity, and impulsivity/hyperactivity on the one hand and all procrastination measures on the other hand. Third, as there were significant correlations between the symptoms of ADHD (inattention and hyperactivity: $r = 0.62$, $p < 0.01$; inattention and impulsivity: $r = 0.54$, $p < 0.01$; hyperactivity and impulsivity: $r = 0.75$, $p < 0.01$) we controlled for this shared variance by computing partial correlations. Because of the relatively large number of correlations performed, we used a more conservative p-value ($p < 0.01$) as a threshold for determining statistical significance (two-tailed tests). Finally, we carried out a paired sample t-test in order to compare the mean of the subjective ratings of liking the *nice* tasks to the mean of the subjective ratings of liking the math problems. The SPSS program was used for data analyses.

Results

The correlations between the procrastination measures are displayed in Table 3. Pearson's correlation revealed

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Table 3. Pearson's correlations between the measurements of procrastination

	1a.	1b.	2a.	2b.	2c.	3.	4.	4a.	4b.	4c.	5.
Academic procrastination											
1. Procrastination/math problems											
1a. Before	1										
1b. Between	0.08	1									
2. Procrastination Assessment Scale for Students											
2a. Prevalence of procrastination	0.06	−0.15	1								
2b. Problems of procrastination	0.07	0.03	0.50*	1							
2c. Desire of reducing procrastination	−0.06	0.07	0.55*	0.60*	1						
3. Procrastination ratio	−0.08	−0.12	0.16	0.14	0.18	1					
General procrastination											
4. Pure Procrastination Scale	−0.07	0.04	0.67*	0.54*	0.64*	0.37*	1				
4a. Decisional Procrastination	−0.10	0.11	0.48*	0.40*	0.43*	0.36*	0.85*	1			
4b. General Procrastination Scale	−0.08	−0.08	0.70*	0.41*	0.64*	0.32	0.88*	0.65*	1		
4c. Adult Inventory of Procrastination	0.01	0.12	0.46*	0.58*	0.51*	0.28	0.81*	0.60*	0.50*	1	
Susceptibility to temptation											
5. Susceptibility to Temptation Scale	0.05	−0.01	0.48*	0.57*	0.52*	0.39*	0.64*	0.53*	0.58*	0.49*	1

*$p < 0.01$.

significant positive correlations between ADHD-related symptoms and both PPS and STS, medium to large in size (Table 4). More specifically, inattention was associated with higher scores on all subscales of the PPS, and with susceptibility to temptation. Hyperactivity/impulsivity, however, only correlated with the DPQ of the PPS, and with susceptibility to temptation (see Table 4).

The analysis of the partial correlations revealed that the positive correlations between symptoms of inattention and Decisional Procrastination as well as General Procrastination of the PPS remained significant. The previously found correlations between hyperactivity/impulsivity and procrastination and susceptibility to temptation were no longer significant (Table 4).

Finally, the paired sample *t*-test revealed that the participants preferred doing the *nice* tasks ($M = 3.78$, $SD = 0.71$) above the math problems ($M = 2.82$, $SD = 0.89$) ($t(53) = -5.71$, $p < 0.001$).

Discussion

This study can be considered as a first step in the investigation of the association between ADHD-related symptoms (inattention, hyperactivity, impulsivity, and combined hyperactivity/impulsivity) and both academic and general procrastination behaviour in an undergraduate sample. The present data revealed that symptoms of inattention were positively correlated with general procrastination, using the PPS. Additionally, susceptibility to temptation correlated positively with all symptom domains of ADHD, but only when not controlling for the shared variance between the symptoms of ADHD. Finally, we found that ADHD-related symptoms did not correlate with academic procrastination.

Relation between ADHD symptoms and self-reported procrastination

The positive correlation between inattention and general procrastination was the most robust finding in this study: it remained even after controlling for the shared variance between inattention and hyperactivity-impulsivity. Additionally, this association was specific for the symptom domain of inattention, as the relation between procrastination and hyperactivity/impulsivity did not survive partial correlational analyses controlling for symptoms of inattention. This finding suggests that students with a high level of inattention were likely to show a high general tendency to delay the start or completion of everyday tasks and to procrastinate making decisions. When inspecting the individual items of inattention as specified in the DSM-IV (APA, 2000), it is not hard to imagine that behaviours such as being easily distracted and having trouble remaining focused on a task may contribute to procrastination. Indeed, in this sample, there were three (out of nine) inattention items that correlated significantly with general procrastination: difficulty sustaining attention, having difficulty organizing tasks, and being easily

Table 4. Pearson's correlations (partial correlations) between measures of procrastination and ADHD-related symptoms

	ADHD inattentive[a]	ADHD hyperactive[b]	ADHD impulsive[c]	ADHD hyperactive/impulsive[d]
Academic procrastination				
Procrastination/math problems				
Before	−0.17 (−0.13)	−0.15 (−0.11)	0.06 (0.09)	−0.11 (0.00)
Between	0.02 (−0.05)	0.11 (0.10)	0.06 (−0.02)	0.10 (0.11)
Procrastination Assessment Scale for Students				
Prevalence of procrastination	0.22 (0.30)	−0.05 (−0.22)	0.03 (0.05)	−0.01 (−0.20)
Problems of procrastination	0.22 (0.12)	0.19 (0.00)	0.20 (0.08)	0.20 (0.09)
Desire of reducing procrastination	0.21 (0.05)	0.25 (0.05)	0.27 (0.11)	0.28 (0.19)
Procrastination ratio	0.13 (−0.01)	0.19 (0.05)	0.21 (0.11)	0.21 (0.17)
General procrastination				
Pure Procrastination Scale	0.51* (0.43*)	0.29 (−0.07)	0.28 (0.04)	0.31 (−0.02)
Decisional Procrastination	0.52* (0.40*)	0.37* (0.08)	0.29 (−0.04)	0.37* (0.06)
General Procrastination Scale	0.43* (0.40*)	0.17 (−0.12)	0.18 (0.02)	0.19 (−0.11)
Adult Inventory of Procrastination	0.38* (0.26)	0.24 (−0.06)	0.28 (0.11)	0.29 (0.07)
Susceptibility to temptation				
Susceptibility to Temptation Scale	0.52* (0.29)	0.48* (0.08)	0.48* (0.18)	0.52* (0.28)

*$p < 0.01$.
[a]Correlations corrected for combined impulsivity/hyperactivity.
[b]Correlations corrected for inattention and impulsivity.
[c]Correlations corrected for inattention and hyperactivity.
[d]Correlations corrected for inattention.

distracted. The latter one explained the largest portion of variance in general procrastination (data available from the first author). These findings may contribute to the debate about whether procrastination is primarily caused by distractibility or by negative cognitions about the task (see, for example, Wilson and Nguyen, 2012). Further, these findings suggest that procrastination may play an important role in ADHD-related inattention. However, this initial study only focused on well-functioning, highly educated individuals, and therefore, more research on this relation is needed, especially in individuals with a clinical diagnosis of ADHD.

Additionally, inattentive symptoms were positively associated with susceptibility to temptation. Note, however, that the relation between inattention and susceptibility to temptation just fell short of statistical significance after controlling for symptoms of hyperactivity/impulsivity. Finally, inattention was not significantly associated with procrastination in the academic domain. One possible explanation for this is that the current sample consisted of generally well-functioning students at a university. We may speculate that students at a university may have found a way to succeed academically, independent of their level of inattention, while inter-individual differences in inattention may be associated with procrastination in other domains of their lives, outside academia. Therefore, relations between inattention and procrastination in the academic domain may still be found when individuals with clinical diagnoses of ADHD are included in future research. Another possible explanation is that students with high levels of inattention may have a self-concept that fits with more general statements with regard to procrastination, whereas they may not express high level of procrastination in real life, assessed with procrastination questions in the academic domain.

In contrast to our expectations, symptoms of impulsivity were not related to procrastination (Ferrari, 1993; Johnson and Bloom, 1995; Schouwenburg and Lay, 1995; Dewitte and Schouwenburg, 2002). In the assessment of ADHD-related symptoms, we used a questionnaire with three DSM-IV items reflecting impulsivity (Kooij *et al.*, 2005): difficulty waiting turn, interrupting or intruding, and blurting out answers. In previous studies in which a relation between impulsivity and procrastination was reported, a different and larger set of items relating to impulsiveness has been used, such as impulsiveness items

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of the Revised NEO Personality Inventory. Whiteside and Lynam (2001) indeed indicated a great variety of conceptualizations of impulsivity in the present literature. They identified four conceptions of impulsivity: (1) lack of perseverance, (2) lack of premeditation, (3) urgency, and (4) sensation seeking. Our conceptualization of impulsivity (Kooij *et al.*, 2005) fits best within the impulsivity conceptions of lack of premeditation and urgency. It is possible that the differences between studies in conceptualizations/operationalizations of impulsivity are responsible for the difference in findings. We suggest that future research which may include ratings of ADHD-related symptoms of impulsivity as well as broader measures of impulsiveness such as the Barratt Impulsiveness Scale (BIS; Patton *et al.*, 1995; Stanford *et al.*, 2009) and the UUPS impulsive behaviour scale (Whiteside and Lynam, 2001) can further clarify this.

In this study, there was no evidence that symptoms of hyperactivity are correlated with procrastination. While Ferrari (2000) predicted that there may be a negative correlation between symptoms of hyperactivity and procrastination, no evidence supporting this notion has been reported yet. Thus, symptoms of hyperactivity and procrastination seem to be unrelated.

These preliminary findings suggest that ADHD-related symptoms of inattention, but not hyperactivity and impulsivity, are specifically associated with procrastination. It remains to be elucidated whether the current findings can be explained by personality characteristics and other psychiatric symptoms. A further important question for future research is whether similar correlations between symptoms domains and procrastination will be found in a sample of individuals with a clinical diagnosis of ADHD. Based on the current findings, we hypothesize that procrastination will be observed in individuals with ADHD-Inattentive Type and ADHD-Combined Type (ADHD-C), but not ADHD-Hyperactive-Impulsive Type (ADHD-HI). Additionally, it may be useful to examine the unique contribution of impulsivity versus hyperactivity to procrastination in ADHD-C and ADHD-HI, instead of lumping impulsivity and hyperactivity together (possibly including additional impulsiveness measures, because the DSM-IV criteria for impulsivity in ADHD are limited to three items). Finally, an interesting focus for future research could be to examine whether procrastination as it is observed in relation to inattention may arise from deficits which have been shown to be associated with ADHD symptoms, such as executive function deficits (Barkley, 1997; Willcutt *et al.*, 2005; Castellanos *et al.*, 2006), a unique motivational style (Sonuga-Barke, 2005), or low arousal levels (Sergeant, 2000).

Relation between self-reported procrastination scales and observed procrastination

Somewhat unexpectedly, not all procrastination measures as used in this study correlated with one another. Specifically, the different measures of academic procrastination, i.e. math problems and various self-reported measures, were not correlated with one another. This suggests that these measures may reflect different aspects of academic procrastination. Additionally, the observed procrastination behaviour while the participants solved math problems was also not correlated with any other procrastination measure. We can think of several reasons for the lack of this correlation:

(1) Participants did not demonstrate a broad range of procrastination behaviour while solving math problems (restriction of range problem). Possibly, the context of this study, i.e. a laboratory session, could create feelings of pressure for the participants to solve the math problems immediately. This could prevent them from showing procrastination behaviour. Similarly, the time to express procrastination behaviour (30 minutes) in the current study might be too limited to induce actual procrastination behaviour.
(2) Self-reported procrastination may differ from the observed level of procrastination in real life because the participants lack insight into their behaviour.
(3) It is possible that the observation of procrastination behaviour while solving math problems is an unreliable dimension for the assessment of procrastination behaviour. Further research has to clarify this by taking these limitations into account.

Suggestions for future research

Another possibility to study academic procrastination in future research could be the monitoring of study behaviour in real life. As part of a course, students could be asked to complete an assignment within a certain deadline by logging into a website, so that it would be possible to directly monitor their actual study and procrastination behaviour over a longer time period. Additionally, students could be asked about their activities outside university. Future research has to correct for these activities because they could interfere with the level of academic procrastination. It would also be interesting to compare the level of procrastination behaviour with school grades in order to indicate a possible relation between procrastination and academic achievement.

Another limitation of this study is that we did not use distinct measures for everyday and decisional procrastination.

Future research could include such specific measures. Additionally, it would be helpful to study the relation between procrastination and ADHD in future research by including cognitive tasks that have been shown to demonstrate attention and/or impulsivity problems such as the Continuous Performance Task (CPT; Conners, 1992) and the Stop-Signal Task (SST; Logan and Cowan, 1984). Additionally, the present sample included normal, undergraduate students, mainly females. This participant selection might have biased the result of the current study, since ADHD is more frequently diagnosed in males. Similarly, this participant selection limits the extent of generalizability of the current results, making it not possible to generalize to males. Therefore, these results have to be replicated with a sample consisting of more male participants and/or a clinical sample of participants diagnosed with ADHD.

Conclusion

In conclusion, the current study indicated that there is a positive correlation between ADHD-related symptoms of inattention and general procrastination in a sample of well-functioning students. This preliminary finding may stimulate more research on the possible relation between procrastination and symptoms of ADHD in individuals with a clinical diagnosis.

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References

Ackermann S.D., Gross B.L. (2005) My instructor made me do it: task characteristics of procrastination. *Journal of Marketing Education*, **27** (1), 5–13, DOI: 10.1177/0273475304273842

American Psychiatric Association (APA) (2000) Diagnostic and statistical manual of mental disorders (4th edition). Washington, DC, APA.

Barkley R.A. (1997) Behavioral inhibition, sustained inattention, and executive functioning: constructing a unifying theory of ADHD. *Psychological Bulletin*, **121**(1), 65–94, DOI: 10.1037/0033-2909.121.1.65

Brown T.E. (2000) Emerging understandings of attention-deficit disorders and comorbidities. In Brown T.E. (ed.) Attention-deficit Disorders and Comorbidities in Children, Adolescents, and Adults, pp. 3–55, Washington, DC, APA.

Burt K., Parks-Charney R., Schwean V. (1997) The AD/HD skills and strategies program: a program for AD/HD adults in postsecondary education. *Canadian Journal of School Psychology*, **12**(2), 122–134, DOI: 10.1177/082957359701200209

Castellanos F.X., Sonuga-Barke E.J., Milham M.P., Tannock R. (2006) Characterizing cognition in ADHD: beyond executive dysfunction. *Trends in Cognitive Science*, **10**(3), 117–123, DOI: 10.1016/j.tics.2006.01.011

Conners C.K. (1992) Continuous Performance Test Computer Program, Version 2.0. North Tonawanda, NY, Multi-Health Systems.

Effert B.R., Ferrari J.R. (1989) Decisional procrastination: examining personality correlates. *Journal of Social Behavior and Personality*, **4**(1), 151–156.

Faraone S.V., Sergeant J., Gillberg C., Biederman J. (2003) The worldwide prevalence of ADHD: is it an American condition? *World Psychiatry*, **2** (2), 104–113.

Ferrari J.R. (1993) Procrastination and impulsiveness: two sides of a coin? In McCrown W., Shure M.B., Johnson J. (eds) The Impulsive Client: Theory, Research, and Treatment, pp. 265–276, Washington, DC, APA, DOI: 10.1037/10500-014

Ferrari J.S. (2000) Procrastination and attention: factor analysis of attention deficit, boredomness, intelligence, self-esteem, and task delay frequencies. *Journal of Social Behavior and Personality*, **15**(5), 185–196.

Ferrari J.R., Tice D.M. (2000) Procrastination as a self-handicap for men and women: a task-avoidance strategy in a laboratory setting. *Journal of Research in Personality*, **34**(1), 73–83, DOI: 10.1006/jrpe.1999.2261

Dewitte S., Schouwenburg H.C. (2002) Procrastination, temptations, and incentives: the struggle between the present and the future in procrastinators and the punctual. *European Journal of Personality*, **16**(6), 469–489, DOI: 10.1002/per.461

Howell A.J., Watson D.C., Powell R.A., Buro K. (2006) Academic procrastination: the pattern and correlates of behavioural postponement. *Personality and Individual Differences*, **40**(8), 1519–1530, DOI: 10.1016/j.paid.2005.11.023

Johnson J.L., Bloom A.M. (1995) An analysis of the contribution of the five factors of personality to variance in academic procrastination. *Personality and Individual Differences*, **18**(1), 127–133, DOI: 10.1016/0191-8869(94)00109-6

Kooij J.J.S., Boonstra A.M., Swinkels S.H.N., Bekker E.M., de Noord I., Buitelaar J.K. (2008) Reliability, validity, and utility of instruments for self-report and informant report concerning symptoms of ADHD in adult patients. *Journal of Attention Disorders*, **11**(4), 445–458, DOI: 10.1177/1087054707299367

Kooij J.J.S., Buitelaar J.K., van den Oord E.J., Furer J.W., Rijnders C.A.T., Hodiamont P.P.G. (2005) Internal and external validity of attention-deficit hyperactivity disorder in a population-based sample of adults. *Psychological Medicine*, **35**(6), 817–827, DOI: 10.1017/S003329170400337X

Kooij J.J.S., Burger H., Boonstra A.M., van der Linden P.D., Kalma L.E., Buitelaar J.K. (2004) Efficacy and safety of methylphenidate in 45 adults with attention-deficit/hyperactivity disorder (ADHD). A randomized placebo-controlled double-blind cross-over trial. *Psychological Medicine*, **34**(6), 973–981, DOI: 10.1017/s0033291703001776

Lahey B.B., Pelham W.E., Stein M.A., Loney J., Trapani C., Nugent K., Kipp H., Schmidt E., Lee S., Cale M., Gold E., Hartung C.M., Willcutt E., Baumann B. (1998) Validity of DSM-IV attention-deficit/hyperactivity disorder for younger children. *Journal of the American Academy of Child and Adolescent Psychiatry*, **37**(7), 695–702.

Langberg J.M., Epstein J.N., Graham A.J. (2008) Organizational-skills interventions in the treatment

of ADHD. *Expert Review of Neurotherapeutics*, **8**(10), 1549–1561, DOI: 10.1586/14737175.8.10.1549

Lay C.H. (1986) At last, my research article on procrastination. *Journal of Research in Personality*, **20**(4), 474–495, DOI: 10.1016/0092-6566(86)90127-3

Logan G.D., Cowan W.B. (1984) On the ability to inhibit thought and action: a theory of an act of control. *Psychological Review*, **91**(3), 295–327, DOI: 10.1037/0033-295x.91.3.295

Mann L., Burnett P., Radford M., Ford S. (1997) The Melbourne decision making questionnaire: an instrument for measuring patterns for coping with decisional conflict. *Journal of Behavioral Decision Making*, **10**(1), 1–19,DOI: 10.1002/(SICI)1099-0771(199703) 10:1<1::AID-BDM242>3.0.CO;2-X

McCown W., Johnson J. (1989) Differential Arousal Gradients in Chronic Procrastination. Paper presented at the American Psychological Association, Alexandria, VA.

Milgram N. (1988) Procrastination in daily living. *Psychological Reports*, **63**(3), 752–754, DOI: 10.2466/pr0.1988.63.3.752

Milgram N.A., Sroloff B., Rosenbaum M. (1988) The procrastination of everyday life. *Journal of Research in Personality*, **22**(2), 197–212, DOI: 10.1016/0092-6566(88)90015-3

Murphy K., Barkley R.A. (1996) Prevalence of DSM-IV symptoms of ADHD in adult licensed drivers: implications for clinical diagnosis. *Journal of Attention Disorders*, **1**(3), 147–161, DOI: 10.1177/108705479600100303

Newark P.E., Stieglitz R. (2010) Therapy-relevant factors in adult ADHD from a cognitive behavioural perspective. *ADHD Attention Deficit Hyperactivity Disorders*, **2**(2), 59–72, DOI: 10.1007/s12402-010-0023-1

Onwuegbuzie A.J. (2004) Academic procrastination and statistics anxiety. *Assessment & Evaluation in Higher Education*, **29**(1), 3–19, DOI: 10.1080/0260293042000160384

Patton J.H., Stanford M.S., Barratt E.S. (1995) Factor structure of the barratt impulsiveness scale. *Journal of Clinical Psychology*, **51**(6), 768–774, DOI: 10.1002/1097-4679(199511) 51:6<768::AID-JCLP2270510607>3.0.CO;2-1

Ramsay J.R., Rostain A.L. (2003) A cognitive therapy approach for adult attention-deficit/hyperactivity disorder. *Journal of Cognitive Psychotherapy*, **17**(4), 319–334,DOI: 10.1891/jcop.17.4.319.52537

Safren S.A. (2006) Cognitive-behavioral approaches to ADHD treatment in adulthood. *Journal of Clinical Psychiatry*, **67**, 46–50.

Safren S.A., Otto M.W., Sprich S., Winett C.L., Wilens T.E., Biederman J. (2005) Cognitive-behavioral therapy for ADHD in medication-treated adults with continued symptoms. *Behaviour Research and Therapy*, **43**(7), 831–842, DOI: 10.1016/j.brat.2004.07.001

Schouwenburg H.C., Groenewoud T. (2001) Study motivation under social temptation: effects of trait procrastination. *Personality and Individual Differences*, **30**(2), 229–240, DOI: 10.1016/s0191-8869(00)00034-9

Schouwenburg H.C., Lay C.H. (1995) Trait procrastination and the big five factors of personality. *Personality and Individual Differences*, **18**(4), 481–490, DOI: 10.1016/0191-8869(94)00176-s

Sergeant J. (2000) The cognitive-energetic model: an empirical approach to attention-deficit hyperactivity disorder. *Neuroscience and Biobehavioral Reviews*, **24**(1), 7–12, DOI: 10.1016/s0149-7634(99)00060-3

Solanto M.V., Marks D.J., Wasserstein J., Mitchell K., Abikoff H., Alvir J.M.J., Kofman M.D. (2010) Efficacy of meta-cognitive therapy for adult ADHD. *American Journal of Psychiatry*, **167**(8), 958–968, DOI: 10.1176/appi.ajp.2009.09081123

Solomon L.J., Rothblum E.D. (1984) Academic procrastination: frequency and cognitive-behavioral correlates. *Journal of Counseling Psychology*, **31**(4), 503–509, DOI: 10.1037/0022-0167.31.4.503

Sonuga-Barke E.J.S. (2005) Causal models of attention-deficit/hyperactivity disorder: from common simple deficits to multiple developmental pathways. *Biological Psychiatry*, **57**(11), 1231–1238, DOI: 10.1016/j.biopsych.2004.09.008

Stanford M.S., Mathias C.W., Dougherty D.M., Lake S.L., Anderson N.E., Patton J.H. (2009) Fifty years of the barratt impulsiveness scale: an update and review. *Personality and Individual Differences*, **47**(5), 385–395, DOI: 10.1016/j.paid.2009.04.008

Steel P. (2002) The Measurement and Nature of Procrastination. Unpublished PhD, University of Minnesota, Minneapolis, MN.

Steel P. (2007) The nature of procrastination: a meta-analytic and theoretical review of quintessential self-regulatory failure. *Psychological Bulletin*, **133**(1), 65–94, DOI: 10.1037/0033-2909.133.1.65

Steel P. (2010) Arousal, avoidant and decisional procrastinators: do they exist? *Personality and Individual Differences*, **48**(8), 926–934, DOI: 10.1016/j.paid.2010.02.025

Swartz S.L., Prevatt F., Proctor B.E. (2005) A coaching intervention for college students with attention deficit/hyperactivity disorder. *Psychology in the Schools*, **42**(6), 647–656, DOI: 10.1002/pits.20101

Weiss M.D., Weiss J.R. (2004) A guide to the treatment of adults with ADHD. *Journal of Clinical Psychiatry*, **65**, 27–37.

Whiteside S.P., Lynam D.R. (2001) The five factor model and impulsivity: using a structural model of personality to understand impulsivity. *Personality and Individual Differences*, **30**(4), 669–689, DOI: 10.1016/s0191-8869(00)00064-7

Willcutt E.G., Doyle A.E., Nigg J.T., Faraone S.V., Pennington B.F. (2005) Validity of the executive theory of attention-deficit/hyperactivity disorder: a meta-analytic review. *Biological Psychiatry*, **57**(11), 1336–1346, DOI: 10.1016/j.biopsych.2005.02.006

Wilson B.A., Nguyen T.D. (2012) Belonging to tomorrow: an overview of procrastination. *International Journal of Psychological Studies*, **4**(1), 211–217, DOI:10.5539/ijps.v4n1p211